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BANK DIVERSIFICATION AND FINANCIAL STABILITY OF DEPOSIT MONEY BANKS IN NIGERIA

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Abstract

Despite numerous reforms and steps taken by the Central Bank of Nigeria (CBN) to manage the financial sector, financial instability persists among the regulated deposit money banks, mainly due to capital inadequacy. This study examines how diversification affects the financial stability of 15 selected national and international deposit money banks in Nigeria from 2009 to 2024. Diversification was measured by income, asset, and fund diversification, while the capital adequacy ratio (CAR) represented financial stability. The study adopted an ex post facto research design alongside a fixed-effects panel regression analysis in STATA 16.0. The results reveal that both income and fund diversification have a positive and significant impact on CAR, whereas asset diversification exerts

a positive but insignificant effect. Board size and Bank size, used as control variables, also have a significant positive influence on financial stability. The study concluded that effective diversification strategies can improve bank stability. It recommended that banks should focus on increasing income-generating activities, adopt innovative asset allocation strategies, and expand funding sources to strengthen capital adequacy and long-term resilience..

Introduction

The goals of deposit money banks, which act as an economic middleman between surplus and deficit units, are to increase the value of the bank in the market viewpoint, while optimizing financial stability, investor's wealth, and profitability. Ongoing non-performing loans, problems meeting client withdrawal requests, and unstable market share prices have caused commercial banks worldwide to struggle with financial stability (Ojiegbe et al., 2023). These unhealthy indicators in commercial banks pose a threat of financial instability, subsidence, and financial losses for investors in banks and other financial institutions.

Isik and Uygur (2021) state that a high rate of commercial bank financial instability and bank failure is not limited to developing economies but also affects developed and emerging economies, thereby adversely affecting commercial banks' primary role of financial intermediation. The licensed money banks cannot act as economic intermediaries and contribute to the nation's development without sound financial stability components, like the capital adequacy ratio, the asset quality ratio, the management capacity, bank profitability, and liquidity position. However, Ojiegbe et al. (2023) opine that, globally, achieving financial stability mechanisms by commercial banks has become a greater challenge for managers, hindering sound financial intermediation in economic functions.

Financial stability means the financial system is working smoothly, without widespread disruptions or crises. It also encompasses the system's capacity to withstand economic or financial stress (World Bank). The comprehensive performance of the monetary system hinges on the survival capacity of individual bank (Elnahass et al., 2021; Kristóf & Virág, 2022). The risk of failure goes up when banks becomes unstable. These challenges can have serious negative effects often resulting in depositor losses and significant economic costs (Carmona et al., 2019). Consequently, banking regulators prioritize preventing bank failures by maintaining sector stability (Baron et al., 2021). As a result, many commercial bank regulators worldwide have intensified their focus on ensuring bank stability. African banking industry, licensed deposit money banks make significant contribution towards economic activities and growth. As pointed out by Mohammed (2022), commercial banks in Africa experience financial instability due to challenges from financial crisis, competition, fraud and regulatory compliance and changing banking business models.

In Nigeria, various reforms have been implemented by the apex Bank of Nigeria to achieve transaction stability for licensed money banks (commercial banks). In the past three decades, the Nigerian financial institutions have witnessed a series of major reforms and experiences ranging from the merger and acquisition of commercial banks from a total of 89 banks to 25 banks in the year 2005 down to when there was a financial crunch globally, Nigeria inclusive, in the year 2007-2009, all these experiences affected the banks licensed to accept deposits in Nigeria, bringing down the number of commercial banks in Nigeria. The

consequences of these experiences led to a reduction in their numbers, resulting in the concentration of banks and making the market oligopolistic, with service providers doing almost the same thing as financial intermediaries (Fakunmoju, 2023). After that, the financial industry reform initiated in 2005 in Nigeria raised expectations of an enhancement. Within banking operations, this would result in narrower intermediation spreads and, consequently, enhanced access to financial services.

Bank diversification contributes majorly in enhancing bank survival, growth and stability. The period of the 21st century, the banking institutions have operated under a complex, intense competitive economy marked by economic volatility and constant change. These dynamics have significantly influenced the way financial services are delivered to clients (Ehiedu et al., 2021). Banks represent a vital component of the financial system, functioning as intermediaries that channel surplus funds to deficit units. Consequently, they act as quality filters for viable investment opportunities in well-functioning economies, thereby supporting profitability and economic growth. Therefore, diversification is essential for banks to maintain financial stability and withstand external shocks.

Despite several banking reforms in Nigeria, series of operational setbacks in the banking sector between 2000 and 2021 have been witnessed, problem of deposit money banks financial instability caused by capital inadequacy still persist (Nigeria Deposit Insurance Corporation *(*NDIC*)* Report, 2023; Ojiegbe et al., 2023; Fakunmoju et al., 2024). Several banks closed down, for example, Savannah Bank of Nigeria Plc closed in 2002, and Peak Merchant Bank Limited closed in 2003. Other banks that failed include Eagle Bank Plc, Fortune Bank Plc, Liberty Bank Plc, Societe Generale Bank of Nigeria Plc, and Triumph Bank Plc. highlight the recurrent episodes of instability within Nigeria's banking industry. etc., all in 2006. In June 2024, Heritage Bank's license was revoked due to non-performing loans totaling N700 billion (CBN, 2024). Bank failures in Nigeria have made policymakers and the CBN focus on keeping banks running smoothly. As a result, there is now greater interest in understanding what affects bank stability in Nigeria.

Similarly, capital adequacy ratio, as one components of the CBN's bank soundness measure, represents a key measure of the financial efficiency of regulated money banks. However, the NDIC Report (2023) asserted that most Nigerian banks suffer from capital inadequacy due to unprofessional diversification of investments and funds, which threatens their survival. The Apex Bank of Nigeria has prescribed a 10% minimum Capital Adequacy threshold for national and regional banks, and 15% for international banks. Meeting and maintaining this minimum requirement are significant challenge for licensed banks in Nigeria, which hinders sound capital adequacy ratio and has led to financial instability among Nigerian banks (World Bank Report, 2024). According to the report from the Apex Bank of Nigeria 2024 Stress Test, only Tier 1 banks in Nigeria could withstand a 50% increase in their non-performing loans. Smaller banks face serious risks if non-performing loans rise further, which could threaten the stability of most Nigerian banks, even though many remain resilient in their capital adequacy, solvency, and liquidity ratios (NDIC Report, 2024).

Past related studies such as Adesina (2021), Octavianus and Khaira (2022), Amoah et al. (2021), Dang and Dang (2021), Gafrej and Boujelbéne (2021), Sofianingsih and Fitanto (2022), Phan and others (2022), Wang & Lin (2021), Shim (2019), Mengxuan and others (2024), Seho and others (2024), Shabir et al. (2024), Ben and Merzki (2024), Hunjra (2020), Vidyarthi (2019), and Alouane and others (2021) examined the linkage between bank diversification and financial performance of banks. However, none of these studies considered how bank diversification (fund diversification, income diversification and assets diversification) influences financial capacity proxied with the CAR of selected licensed regulatory deposit banks in Nigeria. Resulting from aforementioned background and problem identified as well as gap created, the study examines the effects of bank diversification measures (income diversification, assets diversification and funds diversification) on financial stability (capital adequacy ratio) in Nigerian DMBs.

Literature Review

Financial Stability

Joseph et al. (2021) refers financial stability as a condition in which the regulated deposit money institutions (DMBs) efficiently and effectively performs their intermediation role, thus, fostering confidence amongst persons that use it. Mohamed (2022) asserted that banks may be considered financially efficient when it fulfills its stated assignment with respect to investment funding, maintain adequate deposit protection mechanisms, and the formation of sound corporate governance tools. In the same vein, Bilal and others (2021) described bank stability as a system in which banks operates effortlessly and competently without disruption, when the banking sector faces challenges caused by systematic and unsystematic risks.

Nguyen and Du (2022) described bank stability as a condition in which banks has no insolvency, bank runs, or non-performing loans. In a similar vein, Hassan (2022) defines bank financial stability as an institutional framework that supports smooth banking operations. For the purpose of this study, financial stability is regarded as a situation where there is no financial instability, where a deposit money bank can meet its financial responsibilities as they come due. There is still no widely accepted definition of financial stability, as some authors focus on instability rather than stability (Schinasi, 2009). Ziolo and others (2018) posit that financial stability is important for development and is one of the key condition for sustainable growth. According to Abaidoo and Agyapong (2023), financial stability means companies can manage resources, assess and handle financial risks, and maintain productive assets to keep cash flows steady. In the context of this research, bank financial stability is operationalized through capital adequacy ratio.

Capital Adequacy Ratio

Minh-Sang (2021) described the capital adequacy ratio (CAR) as an important financial measure that helps banks ensure they have sufficient capital to absorb losses before facing bankruptcy. According to Minh-Sang (2021), CAR also measures bank's capital strength as a tool for stress testing. CAR looks at two types of capital. Tier-1 capital is capable of absorbing losses without forcing the bank to stop trading, while tier-2 capital can cover losses if the bank needs to be liquidated. One drawback of CAR is that it does not account for the risk of a bank run or events during a financial crisis. CAR is calculated by comparing the institution's

available capital to its risk-weighted credit exposures. Commonly referred to as the capital-to-risk weighted assets ratio (CRAR), CAR helps protect depositors and supports the stability and proficiency of the global financial system.

Dao and Nguyen (2020) stated that Capital Adequacy Ratio (CAR) was identified as a vital metric for measuring banks risk under Basel I and should be regarded as a global standard. The minimum capital requirement under Basel I must be at least 8%. Because the nature of bank financial risk changed and became more complex, the BCBS created Basel II, which was implemented in 2006. According to Basel II, the minimum CAR was still 8%, and banks were required to hold 2% of their capital in common equity. The capital adequacy ratio reflects the operational risk level of some commercial banks. (Abou-El-Sood, 2016; Minh-Sang, 2021). CAR serves as a safety valve for banks and their stakeholders, reducing the risks that banks face, particularly in other nations operations, because these laws apply to all international banks. Commercial banks will benefit from the implementation of legislation on capital adequacy ratios aligned with international standards (Dao & Nguyen, 2020; Hafez & El-Ansary, 2015).

Bank Diversification

Diversification means a firm expands into new activities, either by growing internally or through acquisitions, or by offering more than one product and operating in more than one industry (Ndungu & Muturi, 2019). For banks, diversification is a growth strategy aimed at increasing profitability and stability by boosting sales and revenue from services, new products, and new markets. Unlike mergers, internal start-ups, or joint ventures, diversification enables a company to learn new skills, use new methods, and invest in extra facilities. Because of these challenges, diversification is seen as the riskiest strategic option (Owino, 2021).

Markowitz's theory uses the phrase "Don't put all your eggs in one basket" to explain diversification. The idea is to reduce risk by spreading investments, so companies are not reliant on a single area (Ndungu & Muturi, 2019; Baroroh, 2023). Companies use diversification to handle strong competition and fast market growth (Halim, 2019; Fadli, 2019). Although diversification may lead to higher systematic risk, it can also help companies grow the value of their investments (Sittichobtham, 2019; Duho et al., 2020; Muharam & Bellinda, 2020; Benjakik & Habba, 2021). In this study, bank diversification could be in terms of; income, asset and funds diversification.

Income Diversification

Under this method, the bank’s total operating income is separated and splitted into: interest base income and non-interest base income (Radojicic & Marinkovic, 2023). The aggregate interest income is the margin between the interest revenue and the interest it pays, mainly from lending and taking deposits. Net Non-interest revenue is found by subtracting net interest income from total operating income. In this context, net operating income excludes gains or losses from indirect write-offs or changes in provisions.

The variable DIV income computes the level of income diversification. A higher DIV income value indicates greater diversification. This measure ranges from 0 to 0.5. When net interest income is equal to net non-interest income, the income sources are

fully diversified, and DIV income equals 0.5. Conversely, when all income comes exclusively from either interest or non-interest activities, DIV equals 0, reflecting complete diversification (CBN, 2022).

Asset Diversification

Asset diversification is assessed by examining the composition of a bank's earning assets, which typically include loans, various investment instruments, and interest-bearing deposits (Radojicic & Marinkovic, 2023). The use of an asset-based diversification measure is necessary because income-based indicators have notable limitations (Laeven & Levine, 2007). First, lending activities may also generate fee-based revenue, which can exaggerate the extent of non-lending operations. Second, accurately determining diversification from income figures is difficult because detailed data on Non-interest revenue are often unavailable.

The proportion of the loans within the aggregate earning assets indicates the extent to which a bank relies on conventional lending activities. The second variable of the DIVassets metric assesses the proportion of all other earning assets relative to total earning assets. These non-loan earning assets are determined by subtracting loans from total earning assets. The DIVassets indicator measures the diversification of a bank's earning assets and is calculated as follows:

DIVassets = 1 – [(Loans ÷ Earning Assets)^2 + (Other Earning Assets ÷ Earning Assets)^2]]

Fund Diversification

Fresno and Hangraeni (2020) argued that diversification of funding increases a bank's non-core liabilities, enhances interconnectivity among banks, and magnifies the influence of aggregate shocks. Banks with less diversified funding typically exhibit increased deposit ratios and are less likely to obtain financing through securities issuance, indicating weaker connections compare to others (Kleinow and others. 2017). Fund diversification is calculated as follows:

FD = 1 - [(EQUITY/FUND)2 + (IBDEP/FUND)2], where EQUITY represents total equity, IBDEP denotes interbank deposits, and FUND refers to total funding, defined as the sum of EQUITY and IBDEP.

Theoretical Framework

The study is underpinned by Survival-Based Theory, which was propounded by Hannan and Freeman (1977) in their work on Organizational Ecology. The theory posits that an organization's primary goal is survival in a competitive and dynamic environment. It emphasizes that continuous adaptation to external changes is more crucial than profit maximization, particularly in volatile sectors like the banking industry. According to Fresno and Hanggraeni (2020), banks must proactively diversify their operations financial and non-financial to remain stable and resilient. This theory becomes highly pertinent in the Nigerian banking environment, where regulatory pressures, capital adequacy requirements, and market competition challenge the long-term survival of Regulated deposit money institutions (DMBs).

In this study, bank diversification strategies such as income diversification (ID), asset diversification (AD), and funds diversification (FD) are conceptualized as strategic responses by banks to adapt to environmental uncertainties and ensure stability. As supported by (Isik and Uygur. 2021), such diversification is an ethical and strategic approach to enhancing survival potential in the banking institutions.

Furthermore, (Joseph and others 2021) emphasize that bank diversification helps deposit money banks align with regulatory expectations (e.g., capital adequacy benchmarks), remain competitive, and efficiently manage risk. The Capital Adequacy Ratio (CAR) applied in the present research as a proxy for financial stability represents a critical survival threshold that banks must meet to remain solvent and operational. The theory clearly connects with the study's core objectives and hypotheses, which explore how ID, AD, and FD affect the financial stability of selected DMBs in Nigeria. The survival-based perspective explains why banks adopt these diversification strategies not just to grow profits, but also to sustain operations and meet capital requirements set by regulators such as the CBN) and Basel III standards. As further supported by Kristóf and Virág (2022), banks that fail to adequately diversify may face capital inadequacy, poor performance, and eventual collapse. Thus, the adoption of effective diversification strategies, involving both internal reforms and external stakeholder engagement, is crucial for achieving long-term survival.

This theoretical framework underpins the study's assumption that diversification is not merely a strategic choice but a survival imperative. It informs the hypotheses tested, which assess the extent to which different dimensions of diversification significantly influence financial stability. The empirical model built in this study using CAR as the dependent variable directly reflects this theoretical foundation, supporting the idea that a diversified bank is more stable, efficient, and resilient in Nigeria's volatile economic and regulatory landscape.

Empirical Review

Yusnita (2024) investigated how financing structure diversification on financial efficiency affect risk confronting Islamic financial institutions in Indonesia. Using longitudinal data drawn from 2018 to 2022, the outcome show that financing diversification and financial performance have a small, positive, but insignificant effect, while there is a partial effect on credit risk in Islamic banks in Indonesia. Chowdhury, Awanis and Rownak (2024) investigated how income and asset diversification affect bank performance in Serbia. The analysis used panel data from 22 banks over the last 15 years. Results show that income diversification while we experienced the COVID-19 pandemic negatively affected bank performance. Baroroh (2023) examined activity diversification, performance, and profitability in Islamic banking using quantitative analysis. The study analysed data from the Islamic Banking Report for 2016 to 2021, applying the HHI index to measure financing diversification. Diversification was evaluated across contract-based, financing-type-based, and economic-sector-based categories. Profitability was measured by the ROA ratio, and credit risk was assessed using the NPF ratio. The findings indicate that contract-based financing diversification negatively influences ROA but positively affects NPF. In contrast, diversification based on financing usage does not improve profitability, However, this approach is connected to a higher probability of loan default.

Adem (2023) investigated the relationship between income diversification and bank stability using a cross-country analysis. The findings indicate that higher profitability is associated with greater bank risk-taking. Egbule et al. (2023) studied how

internationalization relates to the financial stability of licensed money banks in Nigeria. They used ex-post facto with descriptive panel and data analysis. The study relies on data extricated from the audited annual reports of licensed money banks quoted on the Nigerian Exchange Group as of 21 December 2021, which were certified by statutory auditors. The study found that the ratios of the foreign assets to asset holdings sumed and the proportion of foreign taxes relative to total taxes did not have significant influence, whereas the proportion of profits generated from foreign operations relative to total profits and overseas banking operations. The overall analysis showed that international market involvement exert a positive influence on the financial stability of Nigerian licensed money banks. Jacinta and Gaiku (2022) studied how diversified funding structure affects the financial productivity of non-governmental parastatals in Kenya, focusing on the Kenyan National Red Cross Society. Using a descriptive research design, they found that funds diversification is important for NGOs aiming to improve their financial performance.

Anh (2022) examined how diversification influence the operational efficiency of Vietnamese licensed banks using regression analysis. The outcome analyzed 24 commercial banks from 2010 to 2020, including 4 government ownership and 20 domestic joint-stock banks. The branches of overseas banks and jointly owned banking institutions were excluded due to insufficient data. The sample accounts for about 80% approximately of total assets within the banking system. The outcome show that the diversification index has a positive impact on operating efficiency, both before and after risk adjustment. Ajao and Kokumo (2021) focused on corporate diversification and the financial performance of some conglomerate firms in Nigeria. The study used the Panel least-squares analytical method. The findings indicate that product diversification positively affects the financial performance of conglomerates in Nigeria. Abbassi, Hunjra, Hunjra, and Mehmood (2021) examined corporate diversification, financial structure, and firm performance: Evidence from selected South Asian economies indicates that panel data collected over 14 years, from 2004 to 2017, demonstrate that both product and geographic diversification have a significant impact on firms' financial performance.

Methodology

An ex post facto design was utilized for this research to assess the effect of bank diversification on the financial stability of licensed money banks publicly traded on the Nigerian Stock Exchange. This design was chosen because the investigation commenced after the relevant events had occurred, and the data for the study variables had already been generated and published in the financial reports of the selected banks. The *ex post facto* approach is suitable for this research, as it is non-experimental and facilitates the examination of the effects and hierarchical relationships between the explanatory and explained variables across the selected banks. The population of the study were 26 licensed banks, which includes seven (7) international, fifteen (15) national, and four (4) regional authorizations. The study adopted a purposive sampling technique, through which fifteen (15) banks were chosen. The selection was rooted on those banks which were established before 2009 and have survived as well as operated consistently within the period of 2009 to 2024. The utilized data were obtained from the annual reports of the selected banks

from 2009 to 2024. The study employed fixed effect model and random effect model, as well as the pooled panel regression model for analysis, while Breusch-Pagan Lagrange Multiplier (LM) and Hausman test will decide the best panel model. The study adapted Adem (2023) model; as stated below:

$$CAR = \beta_0 + \beta_1 ID_{it} + \beta_2 AD_{it} + \beta_3 FD_{it} + \beta_4 BDSZ_{it} + \beta_5 BANKSZ_{it} + u_{it} \quad 1$$

Where;

ID = Income Diversification
AD = Assets Diversification
FD = Funds Diversification
BDSZ = Board Size
BANKSZ = Bank Size

Table 1: Definition of Measurement Variables

Variable symbols	Definition	Computation	Sources
Response Variables			
CAR	Capital Adequacy Ratio	Tier one capital + Tier two capital / Risk-Weighted Assets	Al Zaidanin (2020), Devendra (2022)
Explanatory Variables			
ID	Income Diversified	1- [(interest revenue/operating revenue)^2 + (Non-interest revenue/operating revenue)^2	Chu, Li, Xia, Liu, Li, and Zhang (2021), Radojicic and Marinkovic(2023)
AD	Assets Diversified	1- [(loans/earning assets)^2 + (other earning assets/earning assets)^2	Chu, Li, Xia, Liu, Li, and Zhang (2021), Radojicic and Marinkovic (2023)
FD	Funds Diversification	1- [(equity/fund)^2 + (Interbank deposits (IBDEP)/fund)^2	Fresno and Hangraeni(2020), Chu, Li, Xia, Liu, Li, and Zhang (2021)
BDSZ	Board size	Board members of directors	El-Chaarani and others, (2022)
BANKSZ	Bank Size	The Log of Total Assets	Fakunmoju et al. (2022)

Source: Authors' compilation (2025)

Results and Discussions

Descriptive statistics

The descriptive statistics include the minimum, average, and maximum values of the series, along with the standard deviation, which measures the level of variation.

Table 2: Descriptive Statistics

Variables	Mean	Standard deviation	Minimum	Maximum
CAR	1.0687	0.7272	1.7055	5.6221
ID	0.2151	0.2603	0.0063	1.6365
AD	0.8842	0.6150	0.1773	9.1037

FD	0.2693	0.2926	-0.1562	3.6038
BDSZ	6.7415	4.1716	1.5101	13.294
BANKSZ	0.0719	0.1055	5.0011	17.521

Source: Authors' computation (2025)

The capital adequacy ratio (CAR) reached a minimum of 1.705539, indicating that, at times, banks operated at a relatively low level of 8% below regulatory requirements which may indicate vulnerability to economic downtown in the short-term obligation. In contrast, the maximum value of 5.622207 suggests a significant surplus of CAR, potentially indicating efficient capital adequacy. Furthermore, the banks at one point had a minimum income diversification (ID) of .0063244 which is typically very low when compared with maximum value of 1.636564 suggests potentially limiting investment and growth opportunities. The asset diversification (AD) of the sampled banks recorded the minimum and the maximum values of 0.177263 and 9.103773, respectively, which indicates a substantial variation in the degree of asset diversification across the institutions bank's lowest level of assets relative to its income, suggesting a relatively healthy financial position since the maximum value was higher. Board size (BDSZ) had the minimum value of 1.510094 and maximum value of 13.29412 and lastly, the bank size (BANKSZ) had minimum of 5.001067 a very strong bank size with minimal risk of default or loss and sound value while maximum value of 17.521031which is relatively higher indicates a higher value of bank size with very lower risk of default or loss and sound financial stability.

Test of Multicollinearity

The Variance Inflation Factor (VIF) measures the extent to which the variance of an explanatory variable's estimate is inflated due to correlations with other explanatory variables, indicating the presence or absence of multicollinearity.

Table 3-: Variance Inflation Factor
Sample: *N* = 15, *T* = 16 (2009 – 2024)

Dependent Variable: CAR		
Variable	**VIF**	**1/VIF**
AD	1.180	0.848
BANKSZ	1.152	0.868
BDSZ	1.060	0.943
ID	1.056	0.947
FD	1.035	0.966
Mean VIF	**1.097**	.

Source: Authors' computation (2025).

Table 3 presents the Variance Inflation Factors (VIFs) and tolerance levels for the explanatory variables. Since all VIFs are below the threshold of 10, it indicates that there is no significant multicollinearity among the variables, meeting the standard requirement for reliable model estimation.

Model Estimation and Results

Following the study's empirical structure, this study employed the static

panel data estimators such as common effect (CE) estimator, random effect (RE) and fixed effect (FE) using least square dummy variable (LSDV) estimator variant, with panel structure of 15 listed deposit money banks (*N* = 15) for a period of 16 years (*T* = 16) ranging inclusively between 2009 and 2024. Prior to model estimation, endogeneity tests were conducted to assess the presence of endogeneity in the models under consideration. Table 4 displays the results of these tests.

Table 4-: Endogeneity Test Results
Sample: *N* = 15, *T* = 16 (2009 – 2024)

Model	H_0	Durbin Chi2	*p*-value	Wu-Hausman F-stat.	*p*-value
UR	Exogenous	4.5282	0.2098	1.4740	0.2231
Test of Over-identifying Restriction					
Model		**Sargan**	***p*-value**	**Basmann**	***p*-value**
UR		5.1201	0.4031	5.0695	0.4411

Source: Computed by the researcher (2025)

The endogeneity test results presented in Table 4 indicate that both the Durbin chi-square and Wu-Hausman test statistics are insignificant for the model. This finding suggests that endogeneity is not present among the explanatory variables. Therefore, the model is not affected by omitted variable bias, error-in-variables bias and simultaneity bias which may result in endogeneity. Moreover, the insignificant over-identifying restriction tests indicate that the instruments used are valid instruments in the conducting the endogeneity test. Overall, the policy variables in model are intrinsically exogenous.

Table 5 summarizes the model estimates and statistics using the specified estimators. The fixed-effect estimation (F-stat. = 30.820, p = 0.000 < 0.05) shows that the (FE) estimator is more appropriate than the CE estimator. The random effect test (BP-LM stat. = 699.82, p = 0.000 < 0.05) indicates that the (RE) estimator is more effective than the CE approach. The Hausman test (χ^2 = 16.470, p = 0.0035 < 0.05) suggests that the RE result is more suitable than the FE approach. Overall, the fixed effect model **(FE)** appears to be the most efficient estimator among the three (3) competing static panel estimators, and thus, adopted in estimating the UR-model. The selection of the FE estimator suggests the presence of heterogeneity among the selected banks. The inferences are conducted as follows:

Table 5-: Panel Model Estimation Results
Panel Structure: *N* = 15, *T* = 16 (2009 – 2024)
Dependent Variable: *CAR*

Estimator:	**CE**	**FE: LSDV**	**RE**
Independent Variables			
Intercept (C)	0.268***	0.454	0.398
	(0.008)	(0.421)	(0.363)
ID	0.522***	0.094***	0.320***
	(0.001)	(0.000)	(0.000)
AD	0.264***	0.068	0.184

	(0.002)	(0.334)	(0.845)
FD	0.142 (0.245)	0.563*** (0.000)	0.084 (0.215)
BS	0.341 (0.540)	0.913* (0.056)	0.053*** (0.000)
BAS	0.341 (0.540)	0.522*** (0.000)	0.398 (0.363)
Further Statistics and Tests			
Effect Tests			
CE-FE: Fixed Effect test (F-Stat.)	-	30.820*** (0.000)	-
CE-RE: BP-LM Test (X^2)	-	-	699.82*** (0.0000)
RE-FE: Hausman Test (X^2)	-	-	16.470*** (0.0035)
Explanatory Power			
Adj. R-squared	0.3564	0.5464	0.4212
F-statistic	7.321*** (0.000)	20.630*** (0.000)	10.650*** (0.000)
Diagnostics			
CD Test:			
Friedman's test	--	5.982 (0.9669)	5.706 (0.9734)
Serial Correlation Test	--	1.850 (0.640)	--

Source: Authors' computation (2025)

***Note*:** The figures in the parentheses **()** represent the *p*-values of the respective coefficients and statistics while ***, ** & * indicate statistical significance at the conventional 1%, 5% and 10% levels of significance, respectively.

Pre-Estimation Results Interpretation

To ascertain the optimal estimation method, Hausman test was conducted, which yielded a p-value of 0.0035. This indicates that the fixed effects model is more appropriate, as there is a correlation between the individual effects and the explanatory variables.

The Testparm test (F = 1.85, p = 0.64) was also conducted to assess the need for including time fixed effects. The result shows that time effects are not significant, and as such, they were excluded from the model. The Wooldridge test for serial correlation returned an F-statistic of 0.642 with a p-value of 0.84, confirming the absence of serial correlation.

This indicates that the residuals and coefficients are uncorrelated, and the model is not affected by autocorrelation issues. Given these diagnostic checks and the structure of the panel data, the study proceeded with fixed effects panel regression for the main analysis.

Income diversification (ID) has a statistically significant positive effect on capital adequacy ratio (CAR). The p-value (0.000) is below the 5% significance threshold, and the positive coefficient indicates that as banks diversify (e.g., Non-interest revenue, fee-based services), their capital adequacy

improves. This finding aligns with theoretical expectations and previous studies indicating that revenue diversification reduces risk and enhances bank stability.

Asset diversification (AD) has a positive but not statistically significant effect on CAR. The p-value (0.334) is greater than the 5% threshold, indicating insufficient evidence to confirm a meaningful impact. Although the positive coefficient suggests a possible upward effect, it is not strong enough to warrant rejection of the null hypothesis. Asset diversification does not significantly affect capital adequacy ratio.

Funds diversification (FD) has a statistically significant and strong positive effect on CAR. The coefficient (0.563) suggests that diversification in funding sources—such as deposits, external borrowing, or capital market financing—greatly enhances a bank's capital base. This result reinforces the importance of funding structure in supporting bank solvency. Therefore, funds diversification significantly affects capital adequacy ratio.

Board size exhibits a positive yet marginally significant influence on capital adequacy ratio. With a p-value of 0.056, it's slightly above the conventional 5% significance threshold. However, this result suggests that larger Board may provide better oversight and governance, contributing to financial soundness. Board size has a positive but marginally not significant effect on CAR. The model remains robust as it passed the serial correlation test. Bank size exhibits a positive and statistically significant influence on capital adequacy. Larger banks are typically more diversified, better capitalized, and more resilient. The result aligns with the theory that bank size enhances financial stability. Bank size significantly and positively affects CAR, reinforcing the strength of the model.

Table 6: Summary Table

Variable	Coefficient (β)	t-stat	p-value	Effect on CAR	Decision
ID (H01)	0.094	4.63	0.000	Significant Positive	Reject H01
AD (H02)	0.068	0.97	0.334	Positive, Not Significant	Fail to Reject H02
FD (H03)	0.563	4.84	0.000	Significant Positive	Reject H03
BDSZ	0.913	6.84	0.056	Positive, Not Significant	Marginal Significance
BANKSZ	0.552	5.94	0.000	Significant Positive	Supports Stability

Source: Authors' computation (2025)

Discussion of Findings

The findings reveal that income diversification (ID) and funds diversification (FD), together with the control variables board size (BDSZ) and bank size (BANKSZ), significantly affect the capital adequacy ratio (CAR) of selected deposit money banks in Nigeria. The model's F-statistic of 14.99 and p-value of 0.000 indicate that all five independent variables (ID, AD, FD, BDSZ, and BANKSZ) collectively exert a statistically significant influence on CAR, supporting the model's robustness and overall fit. Additionally, the R^2 value of 0.5464 suggests that 54.64% of the variation in CAR is accounted for by the independent and control variables, while the remaining 45.36% is due to factors outside the model.

Accordingly, income diversification and funds diversification had effects on CAR, confirming their significant contributions to financial stability. Asset diversification,

although positively related to CAR, was not statistically significant. These results align with prior research, including studies by Lin et al. (2022), Rezvan and Hamid (2016), Tariq et al. (2021), Adesina (2021), Octavianus and Khaira (2022), Amoah et al. (2021), Dang and Dang (2021), Gafrej and Boujelbéne (2021), Sofianingsih and Fitanto (2022), Phan et al. (2022), Wang and Lin (2021), Shim (2019), Mengxuan et al. (2024), Seho et al. (2024), Shabir et al. (2024), Ben and Merzki (2024), Hunjra (2020), Vidyarthi (2019), Alouane et al. (2021).

Conclusion and Recommendations

The study concluded that bank diversification strategies—particularly income diversification and funds diversification—significantly enhance the financial stability of Nigerian DMBs, as measured by their capital adequacy ratios. Although asset diversification was positively related to CAR, its effect was not statistically significant during the study period. In addition, structural factors like board size and bank size demonstrated relevance to financial stability, reinforcing the importance of sound governance and institutional capacity. The findings underscore the vital role of a broad-based diversification strategy in improving resilience within the banking sector. The following recommendations were made:

i. Strengthen Income Diversification Strategies: Bank managers should enhance traditional and digital banking services such as lending, transaction processing, and fintech collaborations to grow consistent income streams and support stronger capital adequacy.
ii. Promote Strategic Asset Diversification: Although not statistically significant in this study, banks should explore new asset classes and investment opportunities to optimize portfolio management and mitigate asset concentration risks.
iii. Expand Funding Sources: Banks should actively pursue diverse funding instruments, such as bond issuance, syndicated loans, and external financing opportunities, to build capital buffers that ensure long-term solvency and resilience.
iv. Reinforce Board Effectiveness and Scale: Boards should be composed of diverse, experienced professionals capable of overseeing diversification initiatives. Meanwhile, policies that support responsible bank expansion should be encouraged to leverage the stability advantages of bank size.

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