



International Journal of Management & Entrepreneurship Research
P-ISSN: 2664-3588, E-ISSN: 2664-3596
Volume 4, Issue 11, P.No.398-415, November 2022
DOI: 10.51594/ijmer.v4i11.393
Fair East Publishers
Journal Homepage: www.fepbl.com/index.php/ijmer



ANALYSIS OF MICRO PRUDENTIAL DETERMINANTS OF CAPITAL ADEQUACY IN DEPOSIT MONEY BANKS

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Article Received: 10-10-22

Accepted: 27-10-22

Published: 02-11-22

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ABSTRACT

This work presents an analysis of micro prudential determinants of capital adequacy of deposit money banks (CADMBs) in Nigeria between the periods of 1990-2021 (32years). This was done in respect to the measures of micro prudential determinants of CADMBs, namely; Profitability (PROF), Liquidity Ratio (LIQR), Bank Size (BS), Ratio of Total Loan and Advances to Total Assets (RTLADTA) and Ratio of Total Deposits to Total Assets (RTDTA) in relation to CADMBs proxied with Capital Adequacy Ratio (CAR) of deposit money banks (DMDs) in Nigeria. The data for the study was sourced from CBN statistical bulletin, CBN bank supervisory annual report and NDIC annual report. Then, the stationary and normality tests was carried out, followed by the descriptive statistics, correlation and multiple regression tool of analysis with the aid of E-VIEW 9.0 statistical package. The findings revealed that PROF exerts negative insignificant effect on CAR of banks in Nigeria; LIQR exerts negative significant effect on CAR of banks in Nigeria; BS exerts positive significant effect on CAR of banks in Nigeria; RTLADTA exerts positive significant effect on CAR of banks in Nigeria and RTDTA exerts positive insignificant effect on CAR of banks in Nigeria. Thus, the study concluded that the identified measures of micro prudential determinants have significant effects

on CADMBs. The study recommended that banks should also ensure strict compliance with regulatory requirements concerning CAR, risk management and loans administration since they may have a toll on the profitability and sustenance of the banks.

Keywords: Prudential, Determinants, Capital Adequacy, Liquidity and Bank Size.

INTRODUCTION

An efficient banking system is essential for a nation's long-term economic growth (El-Menryari, 2019, Obi, & Ehiedu (2020). Contrarily, the failure of banks has a negative impact on the public's confidence and the structure of the financial system. A stable banking system can withstand negative shocks and produce sustainable growth (Sanyaolu, Alao and Yunusa, 2020). Regulations requiring enough capital have been rendered ineffective due to the struggles of well-known financial organizations like Washington Mutual, a sizable commercial bank in the US (Noreen, Alamdar and Tariq, 2018, Oditia. and Ehiedu 2015). Supervisory organizations have focused more on capital adequacy standards in an effort to remedy this shortcoming, such as the Bank for International Settlements (BIS). Additionally, the Basel III accord recommended raising the capital adequacy ratio, which has been applied by banks globally (Sanyaolu, et al, 2020).

Since banks are corporate entities that conduct business in a very unpredictable environment, their capital is crucial to preserving the stability and safety of the banking industry. As it provides a safety value for bank clients and shareholders to reduce risk exposure, the adequacy of banks' capital is one of the most crucial problems for regulatory authorities and bank managements. Additionally, the banking sector uses capital adequacy for a variety of purposes (Ünvan, 2020). It determines and has an impact on the performance level of the bank. Additionally, capital fosters shareholder confidence in the bank and acts as a buffer for operational loss absorption. Additionally, it shows the bank's capacity to finance long-term investments and capital expenditures (Olarewaju and Akanda, 2018).

A minimal ratio for banks' capital levels has been sought after by regulatory agencies for this reason. The Basel Committee is among them and is the most well-known. To reduce the risk of bank default, the Basel capital requirement requirements offer a foundation for a solid capital structure. The Basel Committee on Financial Oversight (BCBS) has the power to tighten rules and raise the bar for global banking supervision (Obi, (2015), (Sanyaolu, et al, 2020). In order to safeguard depositors and advance the stability and effectiveness of the financial system, Basel has proposed a minimum CAR to ensure banks can withstand an acceptable amount of losses before going bankrupt (Alajmi and Alqasem, 2018, Obi, & Ifelunini, (2019). In order to level the playing field for financial regulation and improve the safety and soundness of global banking institutions, the Basel Committee created minimum capital levels (Mekonnen, 2018, Ehiedu, and Obi, 2022).

In addition, numerous studies have noted that sufficient *CADMBs*, is required for a stable banking system. Maintaining a greater capital adequacy ratio enables banks to have enough liquid assets to absorb unanticipated losses and to protect public funds (Jasrotia, Mishra & Sharma, 2020). Additionally, they proposed that adequate capital offers banks leverage to deal with the unstable and uncertain environment. Having a sound financial system and a strong economy go hand in hand. It denotes a reciprocal interaction between them both

(Hadjixenophontos & Christodoulou-Volos, 2018). In order to improve performance and lower risk, regulatory organizations should prudently supervise the banking industry. A financial crisis might be brought on by significant banks failing, which would have a negative impact on the overall economy (Oloo, 2017, Ehiedu, & Toria, 2021).

The Basel Accord and the nation's financial regulatory authority, in general, influence the prudential capital adequacy criteria for banks. All banking activities in Nigeria are governed and overseen by the Central Bank of Nigeria, which is the country's banking regulatory agency. The banks are also required to follow the statutory capital requirements, just as other central banks around the world. The banking system in Nigeria has become more stable as a result of the capital adequacy standards being enforced. As an illustration, the bank capital in Nigeria expanded from 2 billion to 25 billion naira. A merger of small and major capital banks has taken place. Banks that were unable to meet the capital adequacy standards stopped doing business (Sanyaolu, et al, 2020).

Capital requirements, according to Omojefe & Ehiedu. (2017) and Annor, Obeng, and Nti (2020), forced banks to enhance their capital, which also contributed to financial stability. They also claimed that customers' trust in the banking sector has greatly risen as a result of the capital adequacy rules. In addition, banks' deposit bases have grown, giving them more resilience against shocks to the economy.

The reform of the banking system was one of Nigeria's largest financial sector accomplishments in 2005. The increase in bank capital above 1000 percent in 2005 was a success thanks to the CBN. 25 larger, stronger, and more robust financial institutions replaced the Nigerian motley group of 89 primarily anemic banks as a result of the process. The changes brought about a revolution in the financial services sector, increasing both the quantity and quality of financial products available to Nigerians and putting a stop to the banks' lack of adequate capital (Jasrotia, et al., 2020). However, increasing the capital base of banks through recapitalization may raise the capital adequacy ratio in the short-term but may not always do so in the long-term as banks may increase their risk exposure at the expense of their capital base due to increased liquidity and overall financial strength (Williams, 2017). As a gauge of a financial organization's strength and stability, capital adequacy can be defined as the proportion of primary capital to assets (loans and investments) in the financial institution. A bank that lends 12 dollars for every dollar of its capital is within the permitted limitations of the Capital Adequacy Standard established by the Bank for International Settlements (BIS), which states that banks must have a main capital base equivalent to at least 8% of their assets (Harley, 2017).

In the widely used acronym "CAMELS," capital adequacy is represented by the first letter "C." In Nigeria and other nations, there are several research on capital adequacy. However, they had mostly concentrated on the macroeconomic factors that determine the adequacy of capital. Aside from that, previous research have solely concentrated on "particular banks' unique proxies as predictors of capital sufficiency" (Ini & Eze, 2018, Odita and Ehiedu. & Kifordo. (2020). Additionally, there is some tenuous empirical support for the link between capital sufficiency and profitability (Ikue-John & Nkoro, 2019). But unlike the "unique combination of proxies" we utilised in this study, earlier research on "micro-prudential factors" did not. The study therefore explores the impact of micro-prudential factors (profitability, liquidity ratio, bank size, and ratio of total loan and advances to total assets) on the CADMBs in Nigeria.

There have not been enough studies on the micro-prudential factors that affect capital adequacy since the banking industry was consolidated in 2005 and Basel II and III were adopted in Nigeria. The micro-prudential drivers of prudential determinants of capital adequacy of DMBs in Nigeria must therefore be examined. Additionally, this study is distinct from earlier studies in that it is more concerned in aggregate effects than specific bank proxies. This is so that we may concentrate on the changes taking place in the Nigerian banking sector as a result of aggregate outcomes.

Aggregate results were applied for micro-prudential determinants of prudential determinants of CADMBs in Nigerian setting in light of the aforementioned observed inadequacies. Therefore, this study is an effort to close the gaps found and thereby adds to the body of learning in Nigeria about the subject.

REVIEW OF RELATED LITERATURE

Capital Adequacy (CA)

In practice, banks use financing from three primary sources in their operations (i.e., retained earnings, debt and equity capital). The significance of CA varies among the participants in the financial markets, including financial professionals, regulators, and bankers. In order to safeguard the interests of depositors and improve financial market stability by increasing bank liquidity, regulators favour a higher level of equity capital on the one hand. However, bankers favour higher deposits because they allow for a higher spread and greater bank profitability (Koch & McDonald, 2018, Onuorah, Ehiedu and Okoh 2022).

Therefore, CA continues to be one indicator of a bank's financial health based on the ratio of its primary capital to loans with high risk of default. Thus, the minimum capital requirement requires banks to have a minimum amount of funds, which is sufficient to cover a part of their short term obligations (Mendoza & Rivera, 2017).

Bank Specific Determinants of Capital Adequacy

There are various determinants of CADMBs in Nigeria, but the determinants used in this very study are enumerated and discussed below;

Profitability

Profitability is a critical success factor for banks. Profitable banks can maximize shareholder wealth, access capital from depositors, allocate resources to productive investment opportunities, and purchase assets. Besides, profitable banks can manage their obligations and withstand competitive pressures. Bank profitability also assists banks in absorbing shocks due to volatile earnings (Ini & Eze, 2018). It is argued that banks' survival and ability to attract deposits depend on their profitability (Ini & Eze, 2018, Ehiedu, & Ogbeta, (2014). Therefore, successful banking operations and a going concern status require banks to have adequate profitability.

Profitability ratio is usually divided into two ratios which are return on assets (ROA) and return on equity (ROE). These two ratios are usually used as a picture of bank's profitability. ROA ratio is generated from dividing net income of a bank with its total assets while ROE ratio is generated from dividing net income with shareholder's equity (Obi, Ifelunini and Edeme 2017, Gropp and Heider, 2017). Bank's profitability will increase when a profit generating assets is also increase. This will make the bank hold more risky assets in order to gain more profit. Gropp and Heider (2017) found that the more profitable banks, the more chance they tend have more capital relative to assets.

Liquidity Ratio

Liquidity is remarkable aspect which determines the financial position of banks. Liquidity discloses the capability of a bank to discharge its obligations against depositors. The image of bank is greatly reflected by the risk of liquidity. Liquidity is a significant aspect which reflects bank's ability to meet its credit demand and cash flow requirements. Bank can obtain sufficient liquid funds if it has an adequate liquidity position. Liquidity expresses the degree to which a bank is capable of fulfilling its respective obligations. Liquid Assets to Total Assets ratio measures the overall liquidity position of a bank. The liquid assets include cash in hand, money at call and short notice, balance with Central Bank of Nigeria and balance with other financial institutions/banks in Nigeria and Abroad (Rudolf, 2019).

The proportion of funds invested in cash or cash equivalents increases, a bank's liquidity risk declines, leading to lower liquidity premium in the net interest margins. Therefore, an increase in bank liquidity may have a positive impact to CADMBs.

Size of Bank

The study has measured the bank size as the natural logarithm of total assets. According to Raoudha (2017), bank size has a significant impact on the growth opportunities and capital adequacy ratio. Jorgenson, Gollop, and Fraumeni (2017) argue that the size of a bank has a negative association with the risk-bearing behavior of commercial banks. Bank size and CAR are positively associated, which suggest that the large banks are well equipped to meet their financial obligations (Isik, Kosaroglu & Demirci, 2018). Therefore, when creating statutory requirements, central banks should also pay attention to a bank's size and differentiated CAR, (Ali, Butt & Butt, 2019).

Ratio of Total Loan and Advances to Total Assets

Loans or advances represent the primary income-generating assets of banks. The ratio of loans to total assets should be within the statutory requirements. A bank whose loans to total assets ratio are high is more vulnerable to default. Thus, judicious portfolio management in a bank requires maintaining this ratio within the prescribed limits. Maintaining this ratio will not only have a positive effect on the financial health of the banks, but it will also help them to meet both the short term and long term obligations timely (Islam, 2018). McClelland (2019) recommends that banks should monitor the contaminated portfolio and reschedule and reorganize them if necessary. This strategy will be beneficial for banks and customers. Banks should use liquidation as a last resort as it is neither useful to the banks nor to the customers (Masood & Ansari, 2018).

Ratio of Total Loan and Advances to Total Assets

One of the key functions of DMBs is to accumulate funds in the form of deposits from the surplus sectors of the economy and make same available to the deficit sectors of the economy (Abdioğlu, 2018). Hence, deposits make up a sizable amount of banks' overall current liabilities, necessitating the maintenance of adequate capital by banks. Deposits were "secure enough" as long as capital was sufficient. His theory was that the greater the current value of assets in relation to the value of deposits, the safer it would be for a bank's depositors if the value of its assets were to drop in the future. Increase in deposits should be followed by the increase in capital requirements so that rights of the depositors are protected as well as to protect bank from insolvency. In the case if the depositors are not able to determine the position of the bank, financial soundness, the CAR will be lower than optimal (Asarkaya and Ozcan, 2017).

Capital Adequacy Ratio (CAR)

CAR is the ratio propounded by the regulatory authority in the banking industry to judge the health of the banking system and to ensure that banks can take up a reasonable level of losses arising from operational losses. Dang (2017) highlighted that the CADMB, is assessed on the basis of CAR. CAR reveals the internal strength of the bank to bear up losses during the period of crisis. The implementation of minimum CAR helps to improve the financial system's efficiency and testability by lowering the probability of bank insolvency. When a bank fails, it could cause other banks to run into financial difficulties and even jeopardize the efficient operation of the financial markets (Gabriel, Ogere and Abba, 2018).

More protection for investors will be provided by a stronger bank, as shown by a higher CAR ratio. This ratio ensures that banks are capable to fulfill the liabilities and other risk such as operational risk, credit risk and market risk. In India this ratio has been mandated by the Reserve Bank of India (RBI) to protect the interest of depositors and to maintain the confidence of the banking sector. The banks are required to maintain CAR as stipulated by the norms of RBI from time to time. The banks in India should have a CAR of 9% as per latest RBI norms. Sangmi and Tabassum (2017) opined that capital adequacy ratio is directly proportional to the resilience of the bank to crisis situations. It has also a direct effect on the profitability of banks by determining its expansion to risky but profitable ventures.

Capital Adequacy Ratio (CAR) = (Tier-I + Tier-II)/Risk Weighted Assets

Tier 1 capital is the core measure of a bank's financial strength from a regulator's point of view. It consists of the types of financial capital considered the most reliable and liquid. Perpetual non-cumulative preference shares, disclosed reserves, and innovative capital vehicles are a few examples of Tier 1 capital. The second most trustworthy types of financial capital are known as Tier 2 capitals, and they serve as a gauge of a bank's financial health. It consists of Undisclosed Reserves, Revaluation Reserves of Fixed Assets and Long-Term Holdings of Equity Securities, General Provisions/General Loan Loss Reserves, Hybrid Debt Capital Instruments (a range of Instruments which Combine Characteristics of Equity Capital and Debt), and Subordinated Debt (Parvesh and Afroze, 2018).

Theoretical Review

Buffer Theory of Capital Adequacy (BTCA)

Ikpefan (2017), Ederin (2017), and Odunga, et al. have all used the BTCA, which was created by Calem and Rob in 1996. (2017). According to the hypothesis, a bank that is getting close to the minimum capital need may be motivated to increase capital and lower risk in order to avoid the regulatory costs that would result from a capital requirement violation. Given this, Ikpefan (2017) proposed that banks prefer to keep buffer capital to lower the likelihood of failing to meet the legal capital requirement, particularly if the capital adequacy ratio is very volatile. It's also possible for undercapitalized banks to be persuaded to take on more risk in the anticipation of greater expected returns.

The BTCA emphasizes the significance of having capital over the predetermined minimum in order to lower risk. Most Nigerian banks have capital structures that go above and beyond the necessary minimums. However, the banks that violate the minimum capital requirement are harshly penalized, which may include paying fines and having their operating licenses revoked (Ikpefan, 2017). Ikpefan (2017) advises maintaining a buffer capital by several banks in an unstable economy. With the help of this buffer capital, banks are able to fulfil unwarranted

short-term obligations and adhere to statutory capital requirements. Many banks with inadequate management make investments in projects that violate prudential rules. In the short term, these endeavours might improve capital structure, but in the long run, they are devastating for the bank and the general public.

This theory is relevant to this study because it suggests that banks with low capital buffers attempt to rebuild a sufficient capital buffer by raising capital and banks with high capital buffers attempt to maintain their capital buffer. More capital tends to absorb negative shocks and thereby lower the probability of failure. Consequently, portfolio risk and regulatory capital are assumed to be positively related. Banks raise capital when portfolio risk goes up in order to keep up their capital buffer

Empirical Review

Panel least square analysis was used by Ehiedu, Odita, & Kifordu, (2020), Hung and Ngoc (2020) to determine the variables that substantially influenced the capital adequacy ratio (CAR) of Vietnamese commercial banks for the years 2011 to 2018. Due to mergers and acquisitions, there were 31 banks instead of 41 throughout this time. The following factors are thought to have an impact on the CARDMBs in Vietnam: bank size (SIZE), deposit (DEP), loan (LOA), loan loss reserves (LLR), liquidity (LIQ), return on assets (ROA), return on capital (ROE), net interest margin (NIM), non-performing loans (NPL), asset quality (AQT), and leverage (LEV). According to the findings, LEV, LLR, and ROE had negative effects, ROA had positive effects, and SIZE, DEP, LOA, LIQ, NIM, NPL, and AQT had no appreciable impact on the CAR of Vietnamese commercial banks.

The factors that affect capital adequacy in Nigerian banks were studied by Sanyaolu, Alao, and Yunusa in 2020. Ten of Nigeria's top banks provided data for the study, which employed the OLS method to examine the data from 2007 to 2017. Our findings show a substantial relationship between CA and ROA, liquidity, and loan to total assets. But we discovered that nonperforming loans and loan size are inversely related to capital adequacy. The relationship between macroeconomic variables and capital sufficiency is not supported by our findings. As a result, we advise that all banking institutions reserve a significant amount of cash and cash equivalents relative to deposits and employ aggressive risk management techniques to lessen the size of nonperforming loans, (Ehiedu, Olanye 2014, Ünvan, 2020).

This study used data for DMBs from 2008 to 2017 to examine what influences the capital adequacy ratio (CAR) of banks in Ghana. The study specifically looks into the impact of macroeconomic and bank-specific factors on CAR. According to data from the system generalized method of moments (GMM), the size, leverage, and size of the money supply of banks all have a substantial impact on their capital adequacy level. The research also suggests that while bank profitability has a beneficial impact on capital adequacy, the impact is minimal. According to the study, effective policies should be put into place to increase bank size, leverage choices, and money supply.

Among a few Ghanaian DMBs, Ehiedu and Odita (2014), Annor, Obeng, and Nti (2020) investigated the factors that influence capital adequacy. For the years 2009 to 2016, eight banks were chosen as samples, and secondary data was collected from the annual reports of a few of these banks as well as the Price Waterhouse Coopers Ghana Banking Survey (PWC). In order to determine the robustness of the model, estimates from pooled OLS, random and fixed effects models, and generalized least square models were compared. A balanced panel approach was

used to investigate the factors that influence capital adequacy across selected commercial banks in Ghana. The conclusion implies that each independent variable statistically and significantly affects CA. Non-performing loans have a negative correlation with CAR, although LFTD and ROA have a positive correlation with CAR or asset quality. It is advised that the central bank and the numerous banks operating in Ghana pay close attention to rigorous adherence to the regulatory frameworks to keep banks sound and capable of withstanding stress and losses, which could then have an impact on the banking system and economy as a whole.

(2018) Aly and Husain looked into the effects of macroeconomic and bank-specific factors on banks' capital adequacy ratios (CAR). As bank-specific characteristics, we consider factors like size, profitability (ROA & ROE), asset quality, management quality, liquidity, net interest margin, and bank type. Macroeconomic considerations include the gross domestic product (GDP) and inflation. For the years 2009 through 2016, annual data for all Kuwaiti listed banks were used in a pooled OLS study. The research shows that, when it comes to bank characteristics, only bank size, asset quality (AQ), management quality (MQ), and bank liquidity (LIQ) have a significant impact on capital adequacy ratio (CAR), while profitability (ROA & ROE), management quality (MQ), net interest margin (NIM), bank type, gross domestic product (GDP), and inflation have a negligible impact (CAR). The results imply that, compared to any other bank attribute or macroeconomic indicator, CAR appears to be more influenced by how effectively bank resources are used.

Using balanced panel data from the financial statements of 12 chosen quoted banks for the ten-year period 2005-2016, Abba, Okwa, Soje, and Aikpitanyi (2018) examined the bank-specific determinants of CAR in the Nigerian Deposit Money Banks (DMBs). As the factor with the highest coefficient in the multiple regression analysis, ROA, an indicator of profitability, was discovered to be the most significant determinant of CAR. According to the study, Nigerian deposit money banks have capital adequacy ratios that are significantly higher than both the Basel Accord's criteria and the regulatory minimum set by the CBN. The risk portfolio and ROA of Nigerian banks are also relatively large and low, respectively. Because DMBs have a much larger asset base than their total deposits, depositors' interests are properly protected. According to the study's findings, CAR is heavily influenced by a bank's risk-portfolio, deposit level, profitability, and asset quality, and the CAR of Nigerian banks is significantly higher than the required minimum. The report advises Nigerian deposit money institutions to use a risk-based capital maintenance method and a more practical risk-management mechanism, both supported by a reliable data management system. The study makes several recommendations, including an improvement in banks' operational performance, strict adherence to various capital regulations, regular stress tests for banks, and more thorough disclosure procedures, which should include information on changes in Tier I and Tier II capital as well as risk-weighted assets and trend analyses of changes in CAR.

Ehiedu, Onuorah, & Okoh, (2021), Hewaidy and Alyousef (2018) analyzed the effect of bank-specific and macroeconomic factors that influence CA of Kuwaiti banks from 2009 to 2016 using multiple regression analysis. The results show a significant indirect relationship between CA and bank size, assets quality, profitability and bank liquidity. Moreover, management quality was positively associated with CA, while bank type did not have a significant relationship with CA. Further, the study only found vital indirect affect inflation on CA.

Literature Gap: The review of the literature reveals the existence of many gaps of knowledge in respect of the bank specific determinants of CAR, particularly in the context of Nigeria. As per the review of the literature most of the empirical studies that have been conducted with the aim of identifying bank specific determinants of capital adequacy ratio belong to European Union and some emerging markets such as Kuwait. Moreover, the literature review also revealed the existence of controversial conclusions that results from different studies made so far. Furthermore, so far as the review of the literature discloses, very scanty work has been done with the objective of identifying the bank specific determinants of CAR of banks in Sub-Saharan Africa in general and Nigeria in particular. Finally, most of those work in developed and developing countries of the world on this topic are not recent, these now serve as a gap in knowledge this study intends to fill.

RESEARCH METHODOLOGY

The type of research design adopted in this study is the Ex-post facto research design. The Ex-post facto research design is considered most appropriate for this study because it is not possible to directly manipulate or control any of the independent variables.

The Nigeria Deposit Insurance Corporation (NDIC) Annual Reports for the period 1990–2021, the CBN Statistical Bulletin, the CBN Annual Report, Supervisory Annual Report, and Annual Report were used for 32years period. Secondary source of data is used in this study because it deals with the measures of micro-prudential determinants of capital adequacy of events that has already taken place and recorded from their secondary source from the CBN statistical bulletin, bank supervisory annual report and NDIC annual reports. The statistical technique of data analysis was adopted in this study. Since the data are annual time series, they were subjected to unit root test to determine if they are stationary or not, this was followed by the Johansen cointegration test. After which, the descriptive statistics and the correlation analysis was used to determine the nature of relationship between the independent and dependent variables. In view of the hypothesis formulated for this research, the method of data analysis chosen were the multiple regression analysis which will be use through the Regression model, using the computer software, E-VIEWS 9.0. This is the appropriate measures taken to analyze data as regards the study in question.

The model was study of Agbogun, & Ehiedu, (2022), Abba, Okwa, Soje and Aikpitanyi (2018) and it was modified to suit the variable of this study. The model which specifies that capital adequacy [proxy with CAR] is significantly influenced by the determinants of capital adequacy {Profitability (PROF), Liquidity Ratio (LIQR), Bank Size (BS), Ratio of Total Loan and Advances to Total Assets (RTLADTA) and Ratio of Total Deposits to Total Assets (RTDTA)} is formulated as follows;

$$CAR = f(\text{PROF, LIQR, BS, RTLADTA, RTDTA})$$

Thus,

$$CAR_{it} = \beta_0 + \beta_1 \text{PROF}_{it} + \beta_2 \text{LIQR}_{it} + \beta_3 \text{BS}_{it} + \beta_4 \text{RTLADTA}_{it} + \beta_5 \text{RTDTA}_{it} + \epsilon_{it}$$

Where:

CAR_{it}: Capital Adequacy Ratio of bank i at a period t;

PROF_{it}: Profitability of bank i at a period t;

LIQR_{it}: Liquidity Ratio of bank i at a period t;

BS_{it}: Bank Size of bank i at a period t;

RTLADTA_{it}: Ratio of Total Loan and Advances to Total Assets of bank i at a period t;

RTDTA_{it}: Ratio of Total Deposits to Total Assets of bank *i* at a period *t*;

β_0 : Intercept;

β_1 - β_5 : Coefficient of the independent variables;

ε_{it} : Residual or error term.

RESULT AND DISCUSSIONS

Data Descriptions

This section dealt with the descriptions of data, using the mean, minimum, maximum and standard, to descriptions the nature of the variables under study. This was presented in the Table 1 below:

Table 1

Summary Statistics

	CAR	PROF	LIQR	BS	RTLADTA	RTDTA
Mean	11.82781	2.461563	28.99477	4.365041	49.60689	61.04201
Median	11.20000	2.295000	26.55009	4.334053	40.47844	59.82341
Maximum	21.30000	11.20000	65.71478	7.442288	117.8533	93.96550
Minimum	4.900000	-9.820000	3.008866	2.669447	1.522253	5.110259
Std. Dev.	4.435209	3.064223	12.81089	1.379096	27.61257	17.14780
Skewness	0.071358	-1.142775	0.814388	0.472870	0.864984	-0.756793
Kurtosis	2.052688	11.23818	4.108120	2.371293	3.234792	5.200693
Jarque-Bera Probability	1.223690 0.542349	97.45511 0.000000	5.174458 0.075228	1.719597 0.423247	4.063885 0.131081	9.511994 0.008600
Sum	378.4900	78.77000	927.8327	139.6813	1587.420	1953.344
Sum Sq. Dev.	609.8033	291.0734	5087.689	58.95906	23636.08	9115.459
Observations	32	32	32	32	32	32

Source: Computed from E-Views 9.0 (2022)

Table 1 above is the presentation of the summary statistics. The CAR recorded a mean value of 11.8278 with a standard deviation of 4.4352 over the thirty-two year period; this indicates that CAR is highly volatile with a percentage of 443.52%. Also, PROF recorded a mean of 2.4616 and standard deviation of 3.0642, it indicates slow increase over the years, since the standard deviation value is greater than the mean value, LIQR recorded a mean of 28.9948 with a standard deviation of 12.8109, it implies rapid increase since the mean value is greater than the standard deviation value. BS recorded a mean of 4.3650 with a standard deviation of 1.3701; it implies rapid increase since the mean value is greater than the standard deviation value. RTLADTA recorded a mean of 49.6069 with a standard deviation of 27.6126; it implies rapid increase since the mean value is greater than the standard deviation value while RTDTA recorded an average value of 61.0420 with a standard deviation of 17.1478; it implies rapid increase since the mean value is greater than the standard deviation value.

Since the standard deviations for all the variables are smaller than respective means except PROF, it shows that the data is not widely dispersed. The normal distribution has a kurtosis of 3, which indicates that the distribution has neither fat nor thin tails. Consequently, if an observed distribution has a kurtosis greater than 3, the distribution has heavy tails when compared to the normal distribution. Since all the kurtosis coefficients in Table 1 are greater than 3, the data have thick tails when compared to the normal distribution.

Table 2
Correlation Matrix

	CAR	PROF	LIQR	BS	RTLADTA	RTDTA
CAR	1.000000					
PROF	-0.238184	1.000000				
LIQR	-0.567550	0.193235	1.000000			
BS	0.461168	-0.048065	-0.591650	1.000000		
RTLAD	-0.096589	-0.032022	0.434649	-0.547962	1.000000	
RTDTA	-0.094258	-0.296305	0.348311	-0.588934	0.299272	1.000000

Source: Computed from E-Views 9.0 (2022)

The Pearson correlation test is presented in Table 2 and it shows the absence of multi-collinearity among the variables since the correlation values are less than 0.7. Furthermore, the result shows the explanatory variables have an affirmative but pessimistic correlation with the dependent variable.

Table 3
Multi-Collinearity Test

Variables	Variance Inflation Factor	Tolerance Value
PROF	0.055596	1.281250
LIQR	0.004171	1.680009
BS	0.530850	2.478073
RTLADTA	0.000800	1.496910
RTDTA	0.002572	1.855931

Source: Econometric Views Version 9.0 Output (2022)

From the above table, the tolerance level of PROF is 0.0555 that of LIQR is 0.0042; BS is 0.5309, RTLAD for 0.0008, RTDTA is 0.002572; which indicates that about 5.55%, 0.42%, 53.09%, 0.08% and 0.26% variance in the predictor variables is not predicted by other predictors' variable. This is because their tolerance values are higher than 0.10 meanwhile the Variance inflation factor are less than 10. This shows the absence of multi-collinearity problem.

Table 4
Data Validity Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	5.865242	Prob. F(2,24)	0.0884
Obs*R-squared	10.50575	Prob. Chi-Square(2)	0.0952

Source: E-VIEW, 9.0 Outputs, 2022.

Prior to estimating the models, residuals of the variables were ascertained to check for the presence of serial correlation. This was done using the serial correlation LM test. The serial correlation LM test in Table 4.1a details that there is no element of serial correlation in the models owing to the fact that the p-values of the f-statistics are insignificant at 5% level.

Table 5
Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.620227	Prob. F(5,26)	0.6856
Obs*R-squared	3.410051	Prob. Chi-Square(5)	0.6370
Scaled explained SS	1.806829	Prob. Chi-Square(5)	0.8752

Source: E-VIEW, 9.0 Outputs, 2022.

The situation in which the variability of a variable is unequal across the range of values of a second variable that predicts it leads to problem of heteroskedasticity. To ensure that there is homoscedasticity in the model estimation, the heteroskedasticity test via the Breusch-Pagan-

Godfrey was performed. With the result there is no problem of heteroskedasticity in the models as the p-values of the f-statistics are insignificant at 5% significance level.

Table 6
Ramsey RESET Test

	Value	Df	Probability
t-statistic	1.442816	25	0.1615
F-statistic	2.081717	(1, 25)	0.1615
Likelihood ratio	2.559457	1	0.1096

Source: E-VIEW, 9.0 Outputs, 2022

From the Table 6 above, it indicates that the model is homoskedastic since the probability values of three parameters are greater than 0.05 level of significance. Ramsey test result reveals that our model is correctly specified and is stable.

Table 7
Summary of Augmented Dickey-Fuller (ADF) Test

ADF TEST @ LEVEL							
Test Variables	ADF Test Statistic Value	Mackinnon Critical Value @ 5%	Order of Integration	P-Value	Decision		
CAR	-2.452437	-2.967767	1(0)	0.1371	Non Stationary		
PROF	-5.449152	-6.960411	1(0)	0.1001	Non Stationary		
LIQR	-2.637203	-2.960411	1(0)	0.0966	Non Stationary		
BS	-1.917596	-2.960411	1(0)	0.3203	Non Stationary		
RTLADTA	-2.647943	-2.960411	1(0)	0.0946	Non Stationary		
RTDTA	-3.225420	-3.960411	1(0)	0.0779	Non Stationary		
ADF TEST @ 1 ST DIFFERENCE							
Test Variables	ADF Test Statistic Value	Mackinnon Critical Value @ 5%	Order of Integration	P-Value	Decision		
CAR	-7.282243	-2.971853	1(1)	0.0000	Stationary		
PROF	-6.334280	-3.679322	1(1)	0.0000	Stationary		
LIQR	-4.035413	-3.012363	1(1)	0.0058	Stationary		
BS	-5.564514	-2.963972	1(1)	0.0001	Stationary		
RTLADTA	-6.996121	-2.963972	1(1)	0.0000	Stationary		
RTDTA	-7.124713	-2.963972	1(1)	0.0000	Stationary		

Source: E-VIEW 9.0 Arranged Result, (2022).

The ADF unit root test output in Table 7, all of the variables under examination contained unit root tests at their first difference 1(1), implying that the series are non-stationary at level but stationary at first difference. The value of their respective ADF statistics, which is more than the threshold value of 5%, is evidence of this. Furthermore, the p-value for all variables, which is less than 5% level of significance greater than 95 percent confidence level, provides additional proof of stationary series. At the first difference, i.e. at order one, they all achieved stationarity. We can use the Johansen cointegration test because all of the variables are integrated at order one.

Table 8

Johansen Cointegration Test

Date: 08/28/22 Time: 16:14

Sample (adjusted): 1992 2021

Included observations: 30 after adjustments

Trend assumption: Linear deterministic trend

Series: CAR PROF LIQR BS RTLADTA RTDTA

Hypothesized	Trace		0.05		0.05		Prob.**
	No. of CE(s)	Eigenvalue	Statistic	Critical Value	Max-Eigen Statistic	Critical Value	
None *	0.830759	119.6174	95.75366	0.0004	53.29299	40.07757	0.0010
At most 1	0.596999	76.32441	69.81889	0.0010	37.26451	33.87687	0.0295
At most 2	0.455586	49.05990	47.85613	0.0279	28.24136	27.58434	0.0451
At most 3	0.318940	30.81854	29.79707	0.0391	31.52314	21.13162	0.0051
At most 4	0.194002	19.95394	15.49471	0.0388	16.70216	14.26460	0.0436
At most 5	0.089874	2.825178	1.841466	0.0028	2.825178	1.841466	0.0028

Source: E-VIEW 9.0 Arranged Result, 2022.

The results of the multivariate cointegration test by Johansen and Juselius cointegration technique show that both the trace statistic and the Maximum Eigenvalue statistic show evidence of two cointegration relationships (at None and at most 1), where the values of the trace statistic and the Maximum Eigenvalue statistic are greater than their respective critical values at the 5% level of significance. This finding supports the presence of a long-term association of the analysis of micro prudential determinants of capital adequacy of DMBs in Nigeria.

Table 9

Multiple Regression Result

Dependent Variable: CAR

Method: Least Squares

Date: 08/28/22 Time: 16:03

Sample: 1990 2021

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.341339	6.621624	0.504610	0.6181
PROF	-0.041860	0.235787	-0.177533	0.8605
LIQR	-0.172559	0.064580	-2.672017	0.0128
BS	1.581442	0.728595	2.170538	0.0393
RTLADTA	0.049527	0.018282	2.709058	0.0117
RTDTA	0.069344	0.050710	1.367451	0.1832
R-squared	0.861492	Mean dependent var		11.82781
Adjusted R-squared	0.742168	S.D. dependent var		4.435209
S.E. of regression	3.553891	Akaike info criterion		5.541324
Sum squared resid	328.3837	Schwarz criterion		5.816150
Log likelihood	-82.66118	Hannan-Quinn criter.		5.632421
F-statistic	4.456317	Durbin-Watson stat		1.872675
Prob(F-statistic)	0.004588			

Source: E-VIEW, 9.0 Outputs, 2022.

From Table 9 above, the p-value of PROF is 0.8605, which is greater than the significance value of 0.05 and the t-ratio value of -0.1775 lesser than 2, which indicates the extent of significance to which PROF affects CAR of DMBs in Nigeria. The coefficient of PROF of -0.0419, implies that PROF have a negative effect on CAR of DMBs. The implication is that a one percent (1%) increase in PROF would lead to 4.19% decrease in CAR of deposit money banks in Nigeria.

This finding agrees with the findings of Hung and Ngoc (2020) but contradicts the findings of Annor, Obeng and Nti (2020).

The p-value of the LIQR is 0.0128, which is lesser than the significance value of 0.05 and the t-ratio value of -2.6720 greater than 2, which indicates the extent of significance to which LIQR affects CAR. The coefficient of the LIQR of -0.1726, this implies that LIQR have a negative effect on CAR of DMBs in Nigeria. The implication is that a one percent (1%) increase in the LIQR would lead to 17.26% decrease in CAR of DMBs in Nigeria. This means that highly liquid banks may have adverse effects on the CAR. This finding agrees with the findings of Ehiedu, Odita, & Kifordu, (2020), Sanyaolu, Alao and Yunusa (2020) and Annor, Obeng and Nti (2020) but contradicts the finding of Hung and Ngoc (2020).

The p-value of BS is 0.0393 which is less than the significance value of 0.05 and the t-ratio value of 2.1705 greater than 2, which indicates the extent of significance to which BS affects CAR of DMBs in Nigeria. The coefficient of BS of 1.5814, this implies that BS has a positive effect on CAR. The implication is that a one percent (1%) increase in BS would lead to 158.14% increase in CAR. This finding contradicts the findings of Hung and Ngoc (2020), Annor, Obeng and Nti (2020) and Ünvan, (2020) but in line with the findings of Sanyaolu, Alao and Yunusa (2020).

The p-value of RTLADTA is 0.0117 which is less than the significance value of 0.05 and the t-ratio value of 2.7091 greater than 2, which indicates the extent of significance to which RTLADTA affects CAR. The coefficient of RTLADTA of 0.0495, this implies that RTLADTA have an affirmative effect on CAR. The implication is that a one percent (1%) increase in RTLADTA would lead to 4.95% increase in CAR. This finding is in line with the findings of Hung and Ngoc (2020) but contradicts the findings Annor, Obeng and Nti (2020).

Finally, the p-value of RTDTA is 0.1832 which is more than the significance value of 0.05 and the t-ratio value of 1.8727 lesser than 2, which indicates the extent of significance to which RTDTA affects CAR. The coefficient of RTDTA is 0.0693, this implies that RTDTA have an affirmative effect on CAR. The implication is that a one percent (1%) increase in RTDTA would lead to 6.93% increase in CAR. This finding agrees with the findings of Hung and Ngoc (2020) but contrary to the findings of Annor, Obeng and Nti (2020).

CONCLUSION

This study is the analysis of micro prudential determinants of capital adequacy of DMBs in Nigeria between the periods of 1990-2021 (32years). This was done in respect to the measures of micro prudential determinants of capital adequacy, namely; PROF, LIQR, BS, RTLADTA and RTDTA in relation to capital adequacy proxied with CAR. The data for the study was sourced from CBN statistical bulletin, supervisory annual report and NDIC annual report. Then, the stationary and normality tests was carried out, followed by the descriptive statistics, correlation and multiple regression tool of analysis with the aid of E-VIEW 9.0 statistical package. The findings revealed that PROF exerts pessimistic but insignificant effect on capital adequacy of DMBs in Nigeria; LIQR exerts pessimistic but significant effect on capital adequacy of banks in Nigeria; BS exerts positive significant effect on capital adequacy of banks in Nigeria; RTLADTA exerts affirmative and significant effect on CADMBs and RTDTA exerts positive insignificant effect on capital adequacy of DMBs in Nigeria.. Thus, the study concluded that micro prudential determinants of capital adequacy significant effects on CADMBs in Nigeria.

Recommendations

Based on the findings, the following recommendations were made, this is enumerated below;

1. The study, therefore, recommends that banks should also ensure strict compliance with regulatory requirements concerning CAR, risk management and loans administration since they may have a toll on the profitability and sustenance of the banks. Again, banks ought to adopt a risk-based approach in managing capital instead of focusing on the paid-up capital and retained earnings only.
2. Regulators must ensure that DMBs are always liquid since this parameter induces banks' capital adequacy.
3. The study recommends the implementation of efficient policies geared towards enhancing bank size.
4. The study recommends that loan terms and repayment should be strictly monitored and scrutinized by the manager in charge of loans. There must be adequate collateral tendered by the clients and the credit worthiness of these customers must be thoroughly ascertained before granting bank loans so that the negative significance of credit risk on banks will be reversed to a positive one.
5. Finally, all the affected DMBs must gear up and invest more in those significant factors that can lead to improvements in their capital adequacy in order to be viable, sustainable, and stable in the long run and be able to meet all other necessary financial conditions.

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