

CAPITAL ADEQUACY AND CREDIT RISK OF QUOTED BANKS IN NIGERIA**IKHENADE F. A. OSEROGHO, PhD.****Department of Accounting
Wellspring University,
Benin City, Edo State****And****VINCENT ERAKPOTOB, PhD.****University of Benin
Benin City****Abstract**

Capital adequacy is a critical tool for minimizing banks vulnerability to crisis, in terms of financial health and stability. This study empirically examines the impact of capital adequacy on credit risk of 15 selected quoted banks in Nigeria over the period 2011-2017. Employing descriptive statistics, correlation analysis and panel data estimation technique, the empirical results show that strong capital base insulate bank from high credit risk (non-performing loans). Other variables found to be significant in reducing credit risk are bank size (proxied by bank total asset), board size (a corporate governance mechanism) and inflation rate, a measure of the stability of the macroeconomic environment. High inflation on the other hand is found to exacerbate credit risk of banks, as it accentuate the inability to pay back loans. Against the backdrop of these findings, we recommend amongst others; sufficient capital base for banks, increased size, particularly in terms of sound asset base and its efficient deployment and sound macroeconomic environment that minimizes the likelihood of credit risk of banks in Nigeria. This will in no doubt, help to reduce their vulnerability to financial crisis-situation, and consequently enhance their role for rapid national growth and development.

Keywords: *Capital adequacy, Credit risk, financial crisis, Panel Data.*

Introduction

A strong capital base constitute a strong buffer against credit risk and is thus vital to the resilience of banks. It is an important factor that determines the financial strength of any bank and is widely used as parameter for gauging banks' ability to withstand systemic crises. By implication, a bank's capital base determines its resilience and insulation from unanticipated losses, uncertainty (Singh & Milan, 2018). Capital adequacy therefore helps in the determination of banks' ability to withstand liquidity and other crises (Abiad, Ouktar, Hussein, 2008). A good capital adequacy ratio would strengthen banks financial capacity and may lead to increase lending activities that maintains and sustains the real sector of the economy (Garba, 2004). Recapitalization on which strong capital adequacy ratio is hinged on emphasizes the need to strengthens the banking system and ensure a diversified, strong and reliable banking sector that ensures public confidence to carry out efficient financial intermediation.

In the banking industry all over the world, including Nigeria, bank distress/failure has become a recurring issue. This has often prompted shareholders, investors, regulators, researchers and academia to focus interest on the issue of capital adequacy and as well. The issue of sufficient capital adequacy embedded in the minimum capital adequacy of banks came to fore under in the wake of the financial crisis of 2008. A need was felt to further strengthen

the system as banks in the developed and developing economies which were under-capitalized and over-leveraged. This led to the introduction and adoption of the Basel 111 Accord by the Basel Committee on Banking Supervision in 2010, in which the minimum capital requirement of banks were revised (Ukinamenmen & Ozekhome, 2019). Given the financial crises that bank have been subjected in the past, an incident which left trails of woes for investors, depositors, and suppliers of funds, shareholders, employees and other stakeholders, the need for a good capital adequacy ratio has become more imperative.

There is paucity of empirical evidence on the effect of bank's capital adequacy ratio on risk management of banks. To the best of the author's knowledge, the aspect of the empirical examination is missing in the literature, thus creating a perceived gap, which this study intends to fill. In addition, since banks constitute the hub of financial activities and by extension, play critical role in financial intermediation, a study as this is important, given that the resilience of banks will therefore imply economic resilience of the real sector, particularly when funds are particularly channeled to the real sector through sound regulatory and supervisory framework. Following this introduction, the paper is organized as follows. Section two consists of literature review which considers key theoretical, empirical and policy issues associated with capital adequacy and credit risk of banks. Section three contains the methodology, model specification and data, while section four presents the empirical results and analysis. The conclusion and policy recommendations are presented in section five.

Literature Review

Conceptual Issues

Capital adequacy measure the sufficiency of banks' capital base against susceptibility to financial risk, and distress. As a bank financial safety device, a high capital adequacy will protect depositors' funds and promote the stability and efficiency of financial system. Thus, banks with high capital adequacy ratio face lower bankruptcy, funding costs and illiquidity problems, which are the precipitate financial crises. The adequacy of banks' capital thus, determines health and viability of banks to efficiently carry out financial intermediation. A weak bank capital adequacy ratio, if not critically address is therefore a precipitating factor for imminent financial distress. Capital adequacy can be measured in a number of ways; however, the most widely used measure is Capital to Risk-Weighted Assets Ratio (CRAR) (Singh & Milan, 2018, Ukinamemen & Ozekhome, 2019).

Literature Review

Theoretical Review

The importance of sufficient capital base in enhancing efficiency and performance of banks and minimizing credit risk can be found in the celebrated works of Mckinnon (1973) and Levine (2005). According to these theorists, good capital base helps to insulate banks from systemic and non-systemic crises. The link between capital base and credit risk show that a strong capital adequacy ratio will banks maintain, greater viability and ability to promote real sector growth.

Boyd and Runkle (1993) buttressing this, argued that well-capitalized banks are more susceptible to lower fragility. This is against the backdrop that the high capital base provides a buffer against adverse shocks and unanticipated financial crises. Studies on financial development, posit that good capital base is able to withstand high credit risk, financial fragility

and insulate such banks from financial crises (Kishan, & Opiela, 2000). Demirguc-kunt and Levine (2003) assert that well-capitalized bank, and by extension, banks with good capital adequacy have greater the ability to absolve losses arising from non-performing liabilities (NPL) (credit risk). In addition strong capital adequacy ratio will enable banks embrace face healthy competition, exploit economies of scale, adopt advanced technologies, increase efficiency and fit into the global financial architecture (Omowunmi, 2013, Ukinamenmen & Ozekhome, 2019).

Empirical Studies

A review of some of the related studies on the bank capital adequacy-bank credit risk nexus is presented in this section.

De Nicolo et al. (2003) argued that increase bank's capital base reduces the propensity towards risk through leverage and off-balance sheet operations. In addition, scale economies are higher with larger capital adequacy.

The works of Berger et al., (1999) and IMF (2001) find that good capital adequacy encourage innovations, deregulation of financial services, enhancing intermediation and increased emphasis on shareholders' value and international competition. A link between sufficient capital base and financial sector stability in terms of lower risk is found by these studies. Similarly, Berger (2000) using bank-based evidence find that increased size (through capitalization) could potentially increase bank returns through revenue and cost efficiency gain. This may also lead to reduction in industry risks through elimination of weak fragility and create better diversification opportunities.

Ezike and Oke (2013) examine the impact of capital adequacy using Basel accord on the stability of banks in terms of lower credit risk in Nigeria. Using data covering the period 2003 to 2007, and ordinary least variables technique, the findings show that good capital adequacy guarantee lower incidence of risk.

Adams and Ferreira (2009) find that larger banks tend to have greater incidence of risk in terms of non-performing loans. This accordingly is due to diseconomies of scale in the use of internal resources and efficient management of banks funds.

Olalekan and Adeyinka (2013) investigate the link between capital adequacy of banks and banks profitability, which that translates to lower risks. The study used foreign and domestic banks in Nigeria. The findings show a non-significant relationship.

Kumar and Nazeen (2014) investigate the effect of capital adequacy on the performance and stability of the Indian private sector banks. The panel data results show, show that capital adequacy has a positive and significant impact on the financial performance and by implication the stability of private banks.

Nikhat (2014) examines the relationship between the adequacies of capital as a financial soundness indicator for banks. Using various components of regulatory capital in line with Basel's norm in respect to minimum capital requirements for banks, and a trend analysis for the top ten commercial banks in India, the author finds that banks with the highest CAR are able to withstand financial crises.

Mathur (2015) examines effect of capital adequacy norms on the banking sector in India. Employing panel data methodology, the findings show that capital adequacy norms have positive operational effect on banking sector stability.

Agbeja and Olufemi (2015) investigate the link between capital adequacy ratio and bank safety in Nigeria. In particular, the study sought to examine whether or not capital adequacy ratio

affects bank loans and advances, as well as the impact of capital adequacy on bank's exposure to credit risk. They use secondary data for the analysis, which covered the period 2010-14, and multivariate regression analysis. The empirical results show a positive and significant relationship between capital adequacy and bank's profitability, suggesting that banks with more equity capital tend to have higher financial safety.

Torbir, and Zaagha (2016) investigate the effect of capital adequacy measures on bank financial position in Nigeria. They employ co-integration technique and granger causality test approach. The evidence show a significant long run relationship between capital adequacy indicator and bank financial performances in the Nigerian banking industry. The findings thus, suggest that capital adequacy significantly influence the financial position of banks in Nigeria.

Singh and Milan (2018) investigate the impact of capital adequacy on banks in India in two different sub-periods of 2012-13 to 2016-17. Employing ANOVA and multivariate analyses. The results show that higher capital adequacy tend to reduce widespread risk, crisis and distress.

Ukinamenmen and Alfred (2019) examines the impact of capital adequacy on the financial credit position of banks in Nigeria, in terms of their ability to grant credit. A sample of ten (10) listed banks on the basis of size and availability of data were examined over the period 2010 to 2017, using descriptive statistics, and multivariate panel data estimation technique, after conducting the Hausmann, test of correlated random samples, wherein the fixed effect model was selected as the appropriate model, the empirical results revealed that banks' capital adequacy ratio has a positive and significant impact on the financial position of banks, and by implication, greater ability to grant credit in Nigeria. Against the backdrop of these findings, the authors recommend sufficient capital base for banks in order to reduce banks' vulnerability to systemic crises and consequently enhance their stability.

METHODOLOGY

Population and Sample

The entire banking industry in Nigeria is taken as the population for the study. A Sample of fifteen big banks are selected for the period covering 2011 to 2017.

Variables Description.

In this study, Credit risk-measured as ratio of non-performing loans to total loans is taken as the dependent variable. Its selection is based on its ability to appropriately reflect credit risks. The independent variables are capital adequacy ratio (CAR)-measured as risk weighted assets ratio, bank size-measured as size of total assets (BSIZE), board size (BS) (a corporate governance mechanism) whose inclusion has the ability to carry out financial oversight functions and thus minimize incidence of risks through sound managerial decisions. It is measured as total number of director (executive and non-executive) on the board and inflation (INF)- to capture the macroeconomic policy environment. It is measured as changes in the consumer price index.

Model Specification

The model specified in this study demonstrates that credit risk of banks is a function of CAR, BSIZE, BS and inflation. Capital adequacy ratio (CAR) is the explanatory variable of prime interest. The functional form of this model will is thus expressed as:

$$CR = f(CAR, BSIZE, BS, INF) \quad (1)$$

Where; CR= credit risk of banks

CAR= Capital adequacy ratio

BSIZE=Bank size

BS= Board Size

INF= Inflation rate

The econometric form of the model can be specified as:

$$CR_{it} = \alpha_0 + \alpha_1 CAR_{i,t} + \alpha_2 BSIZE_{it} + \alpha_3 BS_{i,t} + \alpha_4 INF_{i,t} + \epsilon_{it} \quad (2)$$

ϵ_{it} =random error term

The apriori expectations in the model are: $\alpha_1, \alpha_2, \alpha_3 < 0, > 0$

The signs are based on financial and economic theory.

Method of Estimation

The model specified in (2) is based on the panel regression analysis procedure that is adopted in this study. The main advantage of the panel data analysis is that it comprehensively takes the individual characteristics of the different firms used in the study. It is generally observed that firm-level behaviour is a strong factor in the determination cross-sectional behavior. This differentiation may bring endogeneity bias into the estimation. The panel data analysis helps to correct this inherent estimation problem. The basic class of models that can be estimated using panel technique may be written as:

$$Y_{it} = f(X_{it}, \beta) + \delta_i + \gamma_t + \epsilon_{it} \quad (3)$$

The leading case involves a linear conditional mean specification, so that we have:

$$Y_{it} = X_{it}'\beta\delta_i + \gamma_t + \epsilon_{it} \quad (4)$$

Where Y_{it} is the dependent variable, and X_{it} is a -vector of regressors, and ϵ_{it} are the error terms for $i = 1, 2, \dots, M$ cross-sectional units observed for dated periods $t = 1, 2, \dots, T$. The α parameter represents the overall constant in the model, while the δ_i and γ_t represent cross-section or period specific effects (random or fixed).

Two techniques are employed in the empirical analysis of this study. These involve the use of descriptive statistics and correlation analysis which gives the summary measures and initial characterization of the data series, as well as the nature and degree of relationships among the variable. The second is the panel data estimation in order to investigate the influence of each of the explanatory variables on the dependent variable.

Data Sources

The study utilizes annual time series data mainly from the secondary sources. The underlying data for the variables of interest are obtained from the banks published annual Financial Reports at the Nigerian Stock Exchange (NSE).

Empirical Results and Analysis

Descriptive Statistic

The descriptive statistics for the variables used in the analysis is presented in table 1.

Table 1. Descriptive Statistics

	CR	CAR	BFSIZE	BS	INF
Mean	8.6	16.2	35.3	6.8	12.3
Median	9.2	17.3	36.7	7.2	12.7
Maximum	28.4	25.3	72.1	9.0	16.2
Minimum	1.5	1.1	4.5	0.0	4.4
Std. Dev.	2.8	4.5	7.2	1.8	4.8

Skewness	1.6	1.2	0.9	0.6	-0.7
Kurtosis	0.8	2.7	1.3	1.9	0.9
Jarque-Bera	24.2	25.5	16.2	40.3	25.4

Source: Authors' computation

The mean value (average value) of non-performing loans to total loans is 8.6 percent. This median value is 9.2, an indication that there appears to be wide dissimilarities in the incidence of non-performing loans (credit risk) to total loans for the individual banks. Apparently some of the banks have relatively high incidence of non-performing loans than others. The maximum and minimum values are respectively 28.4 and 1.45 respectively. This wide variation between the two values indicates a tendency further buttresses the wide variation in non-performing loans among the sampled banks. The mean values for, capital adequacy, bank size, board size and inflation rate are 16.2 percent, 35.3, 6.8 and 12.3 percent. The skewness value of inflation indicates an environment of inflation variability over the period. Overall, the variables exhibit high variability, positive skewness, leptokurtic and highly significant J-B values. Apparently, individual bank's characteristics are significant in explaining variation in non-performing loans over the sampled period.

Correlation Analysis

In order to examine the nature and degree of relationship among the variables, the correlation analysis is carried out. Table 2 presents the results of the correlation matrix.

Table 2 Correlation Results

	<i>CR</i>	<i>CAR</i>	<i>BSIZE</i>	<i>BS</i>	<i>INF</i>
<i>CR</i>					
<i>CAR</i>	-0.72				
<i>BSIZE</i>	-0.15	0.12			
<i>BS</i>	-0.20	0.03	0.10		
<i>INF</i>	0.06	0.194	0.31	0.5	

Source: Author's computation

The correlation results show that credit risk is negatively correlated with capital adequacy ratio, bank size, board composition. And positively correlated with inflation. Apparently, higher capital adequacy ratio, larger bank assets and sound corporate governance mechanism tend to reduce credit risk of banks. Inflation on the other hand is positively correlated with credit risk. Thus, high inflation rate tend to exacerbate incidence of non-performing loans of bank (credit risk), since it inflates the value of loan and make it extremely difficult to be redeemed. Given the absence of high correlation values among the variables, the results are tenable and reliable.

Pooled OLS and Panel Data Estimation

We presenting the estimation results for the fifteen (15) sample banks. Table 2, reports the results derived from the estimation.

The goodness of fit for the OLS estimation is not quite impressive, given the low coefficient of determination, a clear indication of low explanatory and predictive power of the model. The Durbin Watson statistic shows that the estimated suffers from first order positive correlation. The coefficient of capital adequacy ratio and bank size passes the significance test only at the 10 percent level. These results are however not surprising, given the fact that pooled OLS technique is used before conducting the Hausman test. The OLS estimates reported above cannot be relied on for policy directions, since the estimates inherently possess endogeneity issues. To address this, the panel data analysis technique is employed in re-estimating the relationships. The standard test for the method of panel analysis is to employ the Hausman to choose the appropriate method of estimation. The results of the tests for the Hausman test is reported in table 2. In the result, the Hausman test (Chi-Square statistic) of 10.6, with a probability value of 0.03, which is significant test at the 5 percent level. Thus, we reject the null hypothesis that unobserved firm specific heterogeneity are uncorrelated with regressors, and thus base our analysis on estimates provided by the fixed effect model, as the random effect estimates are likely to be biased and inconsistent. The estimates provided by the fixed effect is thus relied on for policy purpose.

In the results, the diagnostic statistics have improved significantly, compared to the OLS estimates. The adjusted R-squared value of 0.64 shows that 64 percent of the net systematic variations in credit risk of banks (measured by non-performing loans to total loans) are explained by the four regressors. The F- statistic of 18.7 passes the significance test at the 1 percent level and validates the existence of significant linear relationship between the explanatory variables and the dependent variable, and suggests that the explanatory variables are jointly significant in the determination of banks' credit risk. The Durbin Watson statistic of 1.70 shows that there is no serial correlation in the model, implying that the model can be used for structural and policy analysis.

Table 2. Credit Risk and its Explanatory Variables

Variables	Pooled OLS	Fixed Effect
Constant		0.234 (1.83)
CAR	-0.18 (-1.96)	-0.212** (-2.14)
BSIZE	1.24 (-1.85)	0.105** (-2.20)
BS	-0.021** (-1.12)	0.032* (-2.16)
INF	0.112 (1.22)	0.160 (1.78)
R²	0.17	0.64
Durbin-Watson	1.05	1.70
F-statistics		18.7***
Hausman Test		10.6 (0.03)

*, ** & *** indicate 1%, 5% & 10% level of significance; T-ratios in parenthesis.

Source: Authors' computation

In terms of the individual performance of the variables in the model, the coefficients of the independent variables are appropriately signed in conformity with theoretical projections. The coefficient of capital adequacy is significant at the 5 percent level. Apparently, high capital adequacy ratio tends to reduce bank credit risk, as it provides financial cushion to minimize incidence of liquidity crises, by protecting depositors' funds, promote the stability, virility and efficiency of financial system. In retrospect, high capital adequacy prevents banks against widespread risks, distress and other systemic crises. Thus, banks with high capital adequacy ratio face lower bankruptcy, funding costs and illiquidity problems.

The coefficient of bank size is significant at the 5 percent level. This implies that larger banks tend to have better economies of scale, financial technological and innovative advantages that give that minimizes their susceptibility to credit risk. The coefficient of board size (a corporate governance mechanism) is also appropriately sign and significant at the 5 percent level. This implies that sound corporate governance structure will enable the credit risk of banks to diminish due to sound board decisions and institutional and regulatory imperatives that such corporate governance mechanism offers. The coefficient of inflation is positively related to bank credit risk. Invariably, accelerating rate of inflation tend to exacerbate banks credit risk and make them vulnerable to liquidity crisis. This is so because inflation make it difficult for loans to be paid back on account of the uncertainty syndrome it creates in the macroeconomic environment.

Conclusion

The study investigates the impact of capital adequacy ratio on banks' credit i 15 quoted bank in the Nigerian Stock Exchange (NSE), over the period 2011-2017. The selection and the estimation period was based on data availability, particularly in a post-financial crises and post-consolidation era, in which bank capitalization become a serious policy issue to prevent the bitter lessons of the past financial crises , resulting from poor bank capitalization and , by extension, low capital adequacy. The empirical results show that capital adequacy of bank has a negative and significant effect on credit risk. Thus, high capital adequacy has the capacity to reduce bank credit risk (non-performing loans), thereby making banks financially stable, virile and able to withstand wide spread and systemic risks.

In retrospect, sound capital adequacy ratio is essential the stability of banks in terms of lower credit risk and lower vulnerability to crisis cannot be under-estimated. High capital adequacy helps to reduce incidence of financial and systemic crisis. Clearly, the ability of banks to minimize their vulnerability to crises lies largely in strong capital base, along with efficient deployment and management of internal resources assets particularly. Without doubt, a strong, vibrant and virile banking sector is critical to efficient financial intermediation. Since banks constitute the major hub of financial intermediation, it is important that monetary and other regulatory bodies, particularly the CBN put up strong and effective institutional mechanisms and intervention, where necessary to enhance their operations.

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