

# An Empirical Analysis of Capital Adequacy Determinants in Nigerian Banking Sector

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## Abstract

It is an acknowledged economic fact that banks cannot underestimate the role of Capital adequacy since adequacy of capital in banks directly influences the amount of funds available for loans disbursement which invariably affects their risk appetite, efficiency and stability. This paper seeks to examine the determinants of capital adequacy in Nigerian quoted deposit money banks for the years 2005-2014. The study employs both descriptive and fixed effect panel regression. The descriptive analysis shows that the mean and median values are within the minimum values and the standard deviation shows the expected growth rate deviation for each of the identified determinants of capital adequacy. From the analysis of panel data using Cross-Sectional Specific fixed effect estimations, it is discovered that a direct relationship exists among ETA, ROA and SIZ while an inverse linear relationship that exists among ROA, CR, DEP and LIQ are statistically significant in determining the level of capital adequacy among the deposit money banks in Nigeria. The study recommends the need for all these affected banks to gear up and invest more on the significant factors that can lead to improvements in their capital adequacy in order to achieve viability, sustainability and stability in the long run.

**Keywords:** credit risk, re-capitalization, heterogeneity, bank-specific factors

## 1. Introduction

The concept of capital adequacy is rooted in the rearrangement of the existing capital structure of banks to mitigate wide spread distress. Banks, as financial institutions and business establishments, gain more opportunity in an atmosphere of adequate capital. The term 'capital' is related to recapitalization which serves as a means of absorbing losses that accrue in the process of carrying out banking operational activities and which eventually makes them to have enough capital bases to back up their activities. This increases their services to their customers in form of loans, advances and investments which in return accrue profits to the banks. In the banking system, the concept of recapitalization deals with restructuring the capital base to better positions. It is a measure adopted by the regulatory authorities in Nigerian context. Capital has been a major factor in any business as it indicates how favorable any business will operate in maintaining efficiency and stability. According to Ebhodaghe (1996), capital inadequacy is a strong indicator of distress situation in any business. It is a big problem that has affected Nigerian banking system in the past years before recapitalization policy in December, 1996. He declares further that inadequate capital reduces the ability of the banks to absorb losses accruing in business undertakings due to changes in the economic environment such as inflationary measures leading to deterioration in asset quality. He adds that the problem became compounded by the huge amount of non-performing loans which eroded the bank's capital base. It is Government that generally dictates the level of capital adequacy for banks, although it varies. This ensures that banks maintain adequate capital to boost efficiency in the system by adhering strictly to the prescription. Capital adequacy performs many functions in the banking system: it determines and affects the level of performance of banks, for example, capital serves as a cushion for operational loss absorption; it creates shareholders' confidence in the bank, it exposes the bank's ability to finance its long term projects and capital expenditure. To crown it all, the existence of adequate capital also helps to minimize depositors' risk.

According to Reserve Bank of New Zealand (2004), capital adequacy ratio serves as a measure of the bank's capital expressed as a percentage of its total risk weighted assets. This ratio was set by an international standard to ensure that banks can absorb fractional losses before becoming distressed. This serves as a huge protection of

banks' depositors by reducing the likelihood of bankruptcy as when a bank becomes insolvent. Bank insolvency usually sends a bad signal to the financial market and this may lead to loss of confidence in the financial system. This has made the imposition of minimum capital standards in financial institution by Basel committees an important development in the 20<sup>th</sup> century because it is a means of strengthening the safety and soundness of the banking industry.

In essence, this research paper seeks to examine the various factors (both bank-specific and time-specific) that determine capital adequacy in Deposit Money Banks' context. This paper focuses on the time and cross-section heterogeneity and thereby, contributes to existing knowledge by adding a unique variable, (credit risk), which serves as the commonest risk banks incur. However, to the best of my knowledge, no research on banking sector has employed fixed effect panel regression model to examine both the cross sectional and periodic impact of bank's capital adequacy determinants in Nigerian context. It is this gap in the literature that the current study wishes to fill. The study will examine the link between credit risk (which is the commonest risk undertaken by banks) and bank's capital adequacy which is a new variable introduced to the previous determinants used by past researchers. The impact of credit risk on capital adequacy will be determined and its heterogeneity effect on banks across various years will also be established.

### *1.1 Research Objectives*

This paper seeks to examine the major determinants of capital adequacy and their relationship to each of the deposit money banks across each period of the study so as to determine the extent to which these determinants affect each bank and the year under consideration in Nigeria.

This paper is structured into five (5) sub-sections for clarity and logic of presentation. They are discussed one after the other below.

## **2. Review of Related Literatures**

### *2.1 Conceptual Issues*

#### *2.1.1 Arguments for Capital Adequacy Regulation*

There have been various arguments in support of Capital Adequacy. The first argument shows that capital adequacy regulation encourages prudential compliances but the argument did not go further to explain the reasons why there is the need for prudential capital adequacy regulation and its compliance. This brought about the second argument that capital adequacy regulation is a measure to counter moral hazard problems by the regulators (Bentson & Keufman, 1999). The third and final argument is that capital adequacy regulation protects the small depositors in the banks as they form the larger proportion of banks' customers. According to Kishore (2005), Capital adequacy is a minimum fund a financial institution should have in order to run its business in a more economical and prudent manner so as to be able to meet depositors' demands for their money. With capital adequacy, banks will be able to meet their demands and at the same time, have enough liquid to maintain their asset base. Pandey (2005), in his argument, makes it known that adequate capital is a regulated amount of capital base used by banking industries to effectively discharge its primary function by preventing failure via absorption of losses. It was seen as an ultimate protection against insolvency culminating from the unavoidable market risk in the banking sector. It is the minimum amount required by banks: to inspire and sustain banks' confidence, to ensure that time and earning will be able to absorb losses without being involved in an avoidable liquidation and also to enable banking industry to maximize full advantage of its profitable growth opportunities.

#### *2.1.2 Reasons for Capital Regulation*

Over the years, setting capital ratio has been a controversial issue in banking industry in respect of how much capital should be the minimum required for banks. The reasons for this controversy centers around two things which are: first, who should set the required capital standard for banks, that is, is it the market or the regulatory agencies? And second: what should be the reasonable minimum standard for banks' capital? Banks' capital requirement has been closely regulated for decades. Minimum capital requirements have been one of the listing requirements of banks and they must hold at least the minimum required level of capital all over their corporate life in the prescribed form by the regulatory agencies. As identified by Wall (1985), supervisors purposely regulate bank capital so as to minimize banks' failure, stabilize the public confidence in banking services and limit losses accruing to the federal government through deposit insurance claims because there has been an underlying assumption that private market place will not be able to accomplish all those aforementioned objectives simultaneously because financial market shifts bank's failure on the activities of the banking systems and not to the financial market.

Banks are unique and flexible in their activities in that they trade with short term liabilities commonly known as

demand deposits which can be withdrawn by depositors immediately they lose confidence in the banking activities. It is only few banks that can instantly liquidate their loan portfolios in times of massive deposit withdrawals. Moreover, most managers of banks do not take into consideration the possibility of the risk taken by them affecting other banks in the industry or neighboring institutions. Large bank failures are a crucial problem that needs urgent attention. The failure of a big bank is so significant that it attracts public attention and calls into question the soundness of the bank because larger banks have a high proportion of non-deposit liabilities which are not adequately covered by insurance. It is wise for banks to know that the big banks' failure will pose a great effect on governments' deposit insurance funds than the small banks because it lowers the normal level of vigilance among depositors over bank safety and risk tolerance. Most depositors feel fully protected, hence, refuse to monitor the risk appetite of the bank they use which would have made them to raise alarm on any bank taking excessive risk so that they can transfer their funds into other low-risk tolerant banks. This 'moral-hazard' concept of government sponsored insurance business encourages banks to maintain a low capital ratio; hence, government insurance funds are exposed to greater risk of generating loss.

## 2.2 Theoretical Review

Capital structure has long been an interesting research area of finance. However, it has not reached a compromise. Finance still lacks a comprehensive theory that will explain how companies should set their capital base to make it adequate. The famous Miller and Modigliani theory only affirms that dividend and financing decisions have no influence on a firm's value under a perfect market condition, but this theory is flawed because it focuses on the effect of capital structure on firm value rather than explaining what makes the capital adequate for each firm. The Modigliani-Miller irrelevance theorem (M & M theory, 1958) is the base for all other theories on capital. The theory avers that a firm's financing decision has no significant effect on its value, that it is irrelevant. This could mean that the value of the firm is determined by the income generated by its assets' composition, and not by how the assets are being financed or how the income from the asset utilisation is derived. This theory could only be applicable in the perfect world, that is, where there is asymmetry information, no taxation, no bankruptcy costs, no transaction costs, there is equivalence in borrowing cost for companies and investors, no agency costs and no effect of debt on firms' earnings and lots more. The theorem is considered inapplicable to a country like Nigeria where imperfect market condition exists. This prompted the improvement on the theory in 1963 and some other theories to consider corporate taxes with the intention to enjoy tax shields. Also, static trade-off theory incorporates the influence of tax and the benefits of tax shield against bankruptcy costs among others. Bank is a very special firm, being the only financial institution which stands as an intermediary between the surplus and the deficit unit of an economy and it is commonly known for the receipt and issue of deposit. But being a firm, all capital structure related theories are applicable to banks as well.

Berger (1995) examines capital theory in financial institutions in detail and was able to give reasons for financial markets not being frictionless in detail. He enumerates some of the reasons as follows: a) Taxes and cost of financial distress, b) Transaction costs and c) asymmetric information. He posits that in evaluating a bank's capital position, the bank must consider both the fixed costs attached with any capital gains and the variable costs attached with the process of changing it. All these costs are considered by the regulators setting the adequate capital ratios. Banking sectors are similar to other sectors, in that they are committed to a number of non regulatory costs associated with their capital adequacy level and bank regulators have long viewed the maintenance of adequate capital as a crucial element for maintaining banks' safety and soundness. Therefore, it is mandatory for all banks to adhere to the required ratio and the ones that violate the ratio should be liable to sanctions depending on the degree of the incompliance. Among these penalties are; more frequent and longer examinations; moral suasion; denial of applications to acquire other banks, and formal agreements with the regulators to raise other capital or any other sanction.

The regulatory pressure on banks to maintain capital is asymmetric in that regulators only raise alarm when capital ratios are too low, but often have little or no query when capital ratios are too high. Berger (1995) determines factors that affect the financing structure of all companies both financial and non-financial and he identifies "safety cap" as a factor that is peculiar to the capital structure of all financial institutions. Financial institutions are different from non-financial because they are under a safety cap (such as deposit insurance system, payment guarantees, liquidity window that they are liable to use on the occasion of sudden liquidity challenge and distress). This enables them to operate more soundly. It is important to note that safety-cap can vary across financial institutions and industries due to their discrepancy as to the minimum required capital which could also be called "capital adequacy ratio". Capital adequacy regulations are the most crucial quantitative measure used by supervisory authorities to solely protect customers' right and to enhance financial system stability and as a result of this; these bodies are keen on the interest of the customers than the banking institution itself. They cover and

minimize unexpected losses from the bank, increase credibility of banking system, reduce the systemic risk impact and create a competitive environment for the banking sector. Following this, Basel Committee on Banking Supervision (BCBS), a sub-section of the Bank for International Settlements (BIS), evaluates the risks (both systematic and unsystematic) of banks that are active in international financial market. They focus on the minimum capital ratio of a bank which is currently 8% capital ratio and 2.5% capital conservation buffer ratio so as to minimize the depositor's loss in case of bankruptcy, distress and liquidation. This regulation created room for international comparison of standards for capital adequacy.

### 2.3 Empirical Review

Determinants of capital adequacy have been examined in various economies and this study finds it necessary to re-examine the factors in Nigeria's economy. Dreca (2013), using OLS regression, evaluates this subject matter in Bosnian banks and found that loan, ROA, deposit, size, ROE and leverage significantly influence capital adequacy ratio while loan loss ratio and net interest margin were insignificant. Similarly, Allen, Nilapornkul and Powell (2013) using mixed factors found profitability, bad loan and GDP posing negative effects on leverage in Thai banks. Also, in the study of Turkish banking sector, Buyuksalvarc and Abdioglu (2012) discover the negative effect of loan to asset ratio; Return on Equity and leverage ratio on capital adequacy ratio. While Liquidity ratio and Return on Assets was found to be positive but significant, size, Deposit structure, Liquidity ratio and NIM have no significant effect on CAR. Alsabbagh (2004) examines capital adequacy determinants in Jordanian banks and found that most Jordanian banks had adhered to the required Basel I capital accord minimum 8% capital ratio and also revealed that CAR was directly affected by ROA, loan to assets ratio, risky assets ratio and dividends payout ratio of the bank while deposits assets ratio, loan provision ratio and size of bank negatively affect CAR. In 2008, Gropp and Heider use both internal and external factors and found that profitable banks possessed more equity and it was the major determinant of capital in the United States and Europe large banks. This finding was consistent with the postulations of the pecking order theory. Similarly, Kleff and Weber (2008) aver that the capital level of banks is positively correlated with the profit of banks, therefore, profit accumulation generates a higher level of growth in capital which is contrary to the findings of the study carried out by Aremu, Ekpo, Mustapha, and Adedoyin (2013) on Nigerian banking sector in which they found profitability, growth and banks' risk level to pose significant but indirect relationship with capital level. They also discover the inverse relationship of tangibility and tax charged with capital, but dividend payout and size of the banks were found to be positively and significantly related to their capital. However, Ahmad, Ariff, and Micheal (2008) also confirm in Malaysian banking sector the negative effect of earnings on their capital ratio. Comparatively, Bokhari and Ali (2009) analyze the capital adequacy determinants of Pakistan banking sectors employing deposits, GDP, portfolio risks and profitability as bank-specific factors affecting capital ratio. They found that profitability proxied by Return on Asset was inversely related to capital ratio but highly significant. However, deposit, portfolio risk and GDP have negative but significant effect on capital adequacy ratio. Finally, Williams (2011) examines the impact of the macro-economic variables on capital base in Nigerian banks and discovers that macro-economic variables such as inflation, real exchange rate, return on investment, money supply and political stability are the robust predictors of capital adequacy. He concludes that Inflation has negative relationship with bank capital base and political instability also impedes financial health and stability in Nigeria which is the situation of Nigerian banking sector as of today.

### 2.4 Conceptual Framework on Determinants of Capital Adequacy

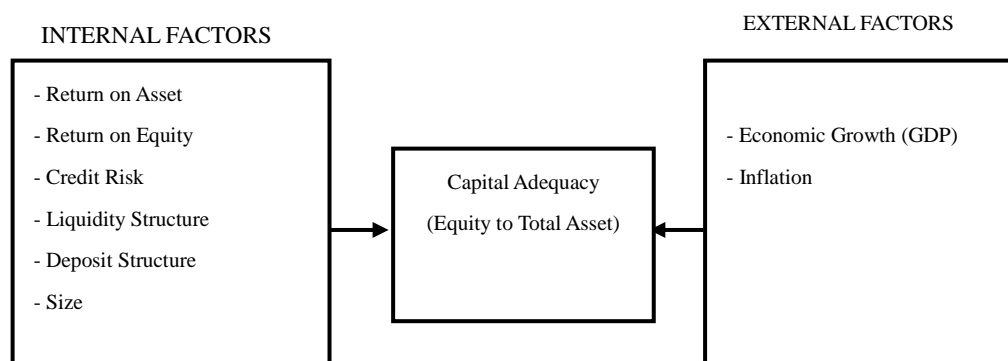


Figure 1. Determinants of capital adequacy ratio

Source: Authors' Design (2016).

The independent variables that represent profitability in Figure 1 are: Return on Asset (ROA) and Return on Equity (ROE). These variables are expected to positively influence banks' capital because profitability is expected to increase capital relative to assets. Deposit money banks in Nigeria need more effort to improve their profitability in order to maintain stability in their capital. Buyuksalvarc and Abdioglu (2011) aver that profitability tends to increase capital relative to assets in Turkish banking sector. In Nigeria, bank deposits are classified into demand deposits, saving deposits and time deposits and this deposit constitutes a substantial proportion of banks' resources and capital, hence, the more deposit a bank is able to mobilize, the more capital that will be made available. The capacity of banks to meet short-term obligations and occasional withdrawals is measured by their level of liquidity and it is expected to positively affect and determine the level of banks' capital. Liquidity is like the blood flowing through the nervous system of any bank. It is the ability of a bank to respond to short term obligations. Therefore, high liquidity ratio reduces liquidity risks and increases capital of a bank. In banking, one of the most important determinants of capital is the risk that banks have taken. Legal regulations relate the level of capital that banks must maintain with the level of risks that they carry. The main reason for this is that capital is viewed as a shield against unexpected losses and bankruptcy. However, high level of these risks is believed to erode the level of banks' capital. Lastly, Bank size (total asset) is a strong determinant of capital in banks. The bigger a bank, the higher the base on which it operates. Large banks are usually better diversified, and have higher capital ratios to trade with.

### 3. Methodology

This study, being a pure quantitative research, falls under the positivist paradigm and deductive approach. The paper considers the 15 quoted banks on Nigerian Stock exchange for a period of 10 years. Secondary data are used in this work and they are sourced from annual reports and accounts of these banks while the macro economic data are sourced from the Central Bank of Nigeria Statistical Bulletin. Only panel fixed effect analysis (cross-sectional specific and period specific) is conducted in this research paper.

#### 3.1 Model Specification

In measuring the factors that determine capital adequacy in Nigeria, the following model is specified.

The general form will be:

$$Y_{it} = \beta_0 + \sum \beta_i X_{it} + \varepsilon_{it} \quad (1)$$

The functional form:

$$CA = f(ROA, ROE, CR, DEP, LIQ, SIZ, GDP, INF) \quad (2)$$

Explicitly,

$$ETA_{it} = \beta_0 + \beta_1 ROA_{it} + \beta_2 ROE_{it} + \beta_3 CR_{it} + \beta_4 DEP_{it} + \beta_5 LIQ_{it} + \beta_6 \ln TA_{it} + \beta_7 \ln GDP_{it} + \beta_8 INF_{it} + \varepsilon_{it} \quad (3)$$

$i$  stands for the cross-section (15 banks) and  $t$  ranges from 1.....10 years.

ETA is the measure of capital adequacy; it is the ratio of total equity to total asset; ROA and ROE are measures of profitability that stands for Return on Asset and Return on Equity. CR is the credit risk. It is the ratio of non-performing loans to total loans; DEP is the deposit structure measured by total deposit to total asset; LIQ is the banks' liquidity measured by the ratio of total loans to total deposit; SIZ stands for the bank size, it is measured by the natural logarithm of banks' total asset; GDP is the natural logarithm of nominal GDP growth and INF is the inflation rate in Nigeria for the periods under consideration.

#### 3.2 A Priori Expectation

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$  and  $\beta_7 > 0$ , but  $\beta_8 < 0$

The a priori expectation follows the study of Abusharba *et al.* (2013); Bokhari and Ali (2009); Williams (2011); Buyuksalvarc and Abdioglu (2011) and Dreca (2013).

#### 4. Data Analysis and Results Discussion

Table 1. Descriptive analysis

Variable	Total Sample	Mean	Std. Dev.	Min	Max
ETA	150	0.1457867	0.0889667	-0.319	0.413
ROA	150	0.0133367	0.0502928	-0.448	0.14
ROE	150	0.0686747	0.5889905	-3.943	2.675
CR	150	0.18318	0.3094857	0.008	2.441
DEP	150	0.68419	0.1473379	0.0315	1.499
LIQ	150	6.254529	11.38633	-4.754	136.92
LSIZ	150	19.77145	1.234003	16.87619	22.07678
LGDP	150	17.0219	0.4253775	16.25009	17.56256
INF	150	0.1153	0.0348122	0.054	0.179

Source: Authors' Computation, 2016.

Table 1 shows the descriptive analysis of pooled observations of variables used to investigate the major determinants of capital adequacy. The descriptive characteristics considered include: mean, median, standard deviation, minimum values as well as maximum values. The Table shows the average value of ETA, ROA, ROE, CR, DEP, LIQ, SIZ, GDP and INF of the pooled observations for both years and banks under consideration as 14.6, 1.3, 6.9, 18.3, 68.4, 6.3, 19.8, 17.0, 11.5 percent respectively, out of which DEP has the highest value and ROA has the least among all the determinants of capital adequacy. The minimum and maximum values of ETA stood at -31.9 and 41.3 respectively while for the likes of ROA, ROE, CR, DEP, LIQ, SIZ, GDP, INF, the minimum and maximum values of -44.8 and 14.0, -394.3 and 267.5, 0.8 and 244.1, 3.15 and 149.9, -4.8 and 136.9, 16.9 and 22.1, 16.3 and 17.6, 5.4 and 17.9 percent respectively are reported. The standard deviation in percentage stands at 8.9, 5.0 58.9, 30.9, 14.7, 11.4, 1.2, 0.4 and 3.5 for ETA, ROA, ROE, CR, DEP, LIQ, SIZ, GDP and INF respectively.

Table 2. Correlation matrix

	ETA	ROA	ROE	CR	DEP	LIQ	LSIZ	LGDP	INF
ETA	1.000								
ROA	0.357	1.000							
ROE	0.225	0.588	1.000						
CR	-0.482	-0.387	-0.241	1.000					
DEP	-0.622	-0.278	-0.148	0.390	1.000				
LIQ	-0.249	-0.123	-0.544	-0.011	0.114	1.000			
LSIZ	-0.019	0.116	0.094	-0.215	0.115	-0.027	1.000		
LGDP	-0.062	-0.009	-0.119	-0.079	0.126	0.099	0.726	1.000	
INF	0.042	-0.033	-0.012	0.045	-0.159	-0.004	-0.337	-0.351	1.000

Source: Authors' Computation, 2016.

Table 2 shows the correlation matrix of ETA and its determinants of capital adequacy. From the Table, there is a weak positive correlation among ETA, ROA, ROE and INF. However, a negative correlation is found among ETA, CR, DEP, LIQ, SIZ and GDP with only DEP showing a strong negative correlation. Also, a positive correlation is revealed among ROA, ROE and SIZ where only ROE shows a strong positive correlation. However, a weak negative correlation exists among ROA, CR, DEP, LIQ, GDP and INF. ROE has a weak but positive correlation with SIZ while a weak negative correlation exists among ROE, CR, DEP, GDP and INF with only LIQ having a strong negative correlation with ROE. An examination of correlation further shows that CR, DEP and INF are positively correlated but weak, while a weak negative correlation is observed among CR, LIQ, SIZ and GDP. DEP shows a weak positive correlation with LIQ, SIZ and GDP but a weak negative correlation with INF. The result output reveals a weak positive correlation between LIQ and GDP while it is shown that a weak but negative correlation exists among LIQ, SIZ and INF. The positive correlation between SIZ and GDP is strong whereas, a weak negative correlation exists between SIZ and INF as well as GDP and INF. Above all, this study reveals that capital adequacy is negatively correlated with the determinants such as: CR, DEP, LIQ, GDP

and INF are positively correlated with SIZ. The correlation analyses presented in Table 2 only shows the degree of relationship among the variables in the model and the negative or positive correlation coefficients only reveal the extent of the linear relationship among them.

#### 4.1 Fixed Effect Analysis

Fixed effect estimator recognizes subject and/or time heterogeneity or uniqueness that may exist in the model. Thus, such heterogeneity effect is incorporated in the model as an intercept term for each of the corresponding subject units and/or time period. Employed in this study are the least square dummy variables (LSDV) fixed effect estimator in which each subject unit and/or time period is represented with (n-1) and/or T-1 series of dummy variables to avoid the problem of dummy variable trap. Thus, the model recognizes and creates avenue to trace subjective characteristics that may exist in each of the banks over time.

Table 3. Fixed effect parameter estimates (cross-sectional specific)

SERIES: ETA ROA ROE CR DEP LIQ LSIZ LGDP INF

Variable	Coeff. Values	S. Error	T-Test Values	P-Values
C	.5060582	.2596244	1.95	0.053
ROA	.3955119	.1437418	2.75	0.007*
ROE	-.0301942	.0158656	-1.90	0.059
CR	-.0485729	.0236622	-2.05	0.042*
DEP	-.3513488	.0509194	-6.90	0.000*
LIQ	-.0021264	.0006786	-3.13	0.002*
LSIZ	.0050357	.009819	0.51	0.609
LGDP	-.0126324	.0236112	-0.54	0.594
INF	-.0915169	.1578584	-0.58	0.563
<b>Cross-sectional effects</b>				
ZENITH BANK	.0343668	.0278566	1.23	0.220
STERLING BANK	.0427664	.0305698	1.40	0.164
SKYE BANK	.0092921	.0279149	0.33	0.740
FIRST BANK	.037444	.0279549	1.34	0.183
ACCESS BANK	-.0034404	.0276968	-0.12	0.901
DIAMOND BANK	.0217053	.0275567	0.79	0.432
FCMB BANK	.0591263	.0284232	2.08	0.040*
IBTC BANK	.0052829	.0309043	0.17	0.865
UNITY BANK	.0241766	.0311192	0.78	0.439
UBA BANK	.0238583	.0287764	0.83	0.409
FIDELITY BANK	.0924569	.028572	3.24	0.002*
WEMA BANK	.0148516	.034532	0.43	0.668
UNION BANK	-.0342231	.0279245	-1.23	0.223
ECOBANK	.0493012	.028978	1.70	0.091

R-square=0.6103, F-statistics= 9.04, Prob (F-stat) n =0.0000.

(\*) 5% significant level. Source: Authors' Computation, 2016.

The cross-sectional specific fixed effect result is shown in Table 3. The table shows that there is a positive relationship among ETA, ROA and SIZ while a negative but linear relationship exists among ETA, ROE, CR, DEP, LIQ, GDP and INF. The result reveals that one percent change in ROA and SIZ respectively will cause an increase of 40 and 1 percent respectively in ETA. However, one percent change in ROE, CR, DEP, LIQ, GDP and INF will lead to 3, 5, 35, 0.2, 1.3 and 9 percent decline or reduction in ETA during the period under investigation. The test for the significance of the estimated parameters of the model using the probability value test shows that the probability value of ROA, CR, DEP, LIQ which are 0.007, 0.042, 0.000, 0.002 respectively are statistically significant because all these probability values are less than the probability value of the error margin allowed in the estimation of the model parameters. The implication of this is that ROA, CR, DEP AND LIQ are good, reliable, and appropriate and their estimates are unbiased, consistent, sufficient and efficient determinants of capital adequacy. On the other hand, the probability value of ROE, SIZ, GDP and INF which are 0.059, 0.61, 0.594 and 0.563 respectively are less than the probability of the error margin allowed for the estimation of the parameters. This implies the statistical insignificance of the ROE, SIZ, GDP and INF as good,

reliable and acceptable determinants of capital adequacy. Thus, the estimates are biased, inconsistent, insufficient and inefficient to be used as capital adequacy determinants in Nigerian banks. It is discovered from this analysis that 61 percent changes in capital adequacy ratio of Nigerian banks are explained using the identified determinants in this paper. The probability of F-statistic (0.000) which is a determinant of goodness of fit of a model shows that the fitted model is also appropriate, valid, reliable and acceptable for determining the level of capital adequacy among the deposit money banks in Nigeria.

An examination of this result on cross sectional basis reveals that ETA for Zenith Bank, Sterling Bank, Skye Bank, First Bank, Diamond Bank, FCMB, IBTC, Unity Bank, UBA, Fidelity Bank, Wema Bank and Ecobank will increase by 3.4, 4.3, 0.9, 3.7, 2.2, 5.9, 0.5, 2.4, 2.4, 9.2, 1.5 and 4.9 percent respectively. However, it is also discovered from the analysis that ETA for Access Bank and Union Bank will decline by 0.3 and 3.4 percent respectively for the period under investigation. The implication of this revelation is that all the aforementioned deposit money banks except Access Bank and Union Bank in Nigeria enjoyed a great deal of capital adequacy during this period. The investigation reveals that Fidelity Bank has the highest growth of capital adequacy and Union Bank has the least or limited growth capital adequacy. The statistical significance of this cross sectional parameters for this study using probability values shows that the capital adequacy of the Fidelity and FCMB are positively impacted which will greatly enhance their stability and continuity in the market in the long run. Also, it is discovered that the capital adequacy of the Zenith Bank, Sterling Bank, Skye Bank, First Bank, Diamond Bank, IBTC, Unity Bank, UBA, Wema Bank, Ecobank, Access Bank and Union Bank are not significant statistically meaning they are not yet adequately capitalized compared to their size and various dealings they do in the financial market. Thus, it is important for all these affected banks to gear up and invest more on stock and market products that can lead to improvements in their capital adequacy in order to achieve viability, sustainability and stability that will enhance their continuity in the market in the long run.

This divergence might stand in the gap to explain why the banking industry hither-to has been experiencing myriad of problems such as critical system weakening, lack of viable investors, few reliable and credit worthy customers, fake disclosure and lack of transparency about financial positions, uneven supervision and enforcement, and inability of the banks to implement the assessment criteria for granting bank credit to clients (Teryima, Victor, & Isaac, 2014). However, this has necessitated several reforms and bail out policies in the sector over the years.

Table 4. Fixed effect (time-specific) estimations

SERIES: ETA, ROA, ROE, CR, DEP, LIQ, LSIZ, LGDP, INF

Variables	Coeff Values	S. Error	T-Test Values	P-Values
C	-0.1617457	0.5387897	-0.30	0.764
ROA	0.3996431	0.1491614	2.68	0.008*
ROE	-0.0293052	0.0162741	-1.80	0.074
CR	-0.1030454	0.0202	-5.10	0.000*
DEP	-0.256878	0.0406435	-6.32	0.000*
LIQ	-0.0022997	0.0006821	-3.37	0.001*
LSIZ	-0.0115212	0.006883	-1.67	0.096
LGDP	0.0395834	0.0315601	1.25	0.212
INF	0.339177	0.5684157	0.60	0.552
<b>Time specific effects</b>				
2006	.0124352	.0303464	0.41	0.683
2007	.0725784	.0342656	2.12	0.036*
2008	.0518958	.0459755	1.13	0.261
2009	.040766	.0201967	2.02	0.046*
2010	.0597258	.0204022	2.93	0.004*
2011	.0233118	.0253369	0.92	0.359
2012	.0205647	.0191565	1.07	0.285
2013	.0368791	.0216384	1.11	0.299
2014	.0233342	.0423111	0.97	0.321

R-square=0.5738, F-statistics=12.03, P (F-stat) = 0.0000.

(\*) 5% level of significance; Source: Authors' Computation, 2016.



Table 4 shows the results of the fixed effect (time-specific) estimation with the time-specific heterogeneity effect for the period covered. The table reports that determinants including Return on Equity (ROE), Credit Risk (CR), Deposit (DEP), Liquidity (LIQ) and Bank Size (LSIZ) exert negative influence on capital adequacy while, Return on Asset (ROA), Gross Domestic Product (LGDP) and Inflation (INF) have positive impact on capital adequacy of Deposit Money Banks. The result further reveals that one percent increase in ROE, CR, DEP, LIQ and SIZ, will cause the capital adequacy to decline by 2.9, 10.3, 25.7, 0.2 and 1.2 percent respectively. Meanwhile, one percent increase in ROA, GDP and INF will lead to 40, 4 and 3.4 percent increases in capital adequacy. The test for the significance of the estimated parameters using the probability value shows that ROA, CR, DEP and LIQ are statistically significant in determining the level of capital adequacy among the deposit money banks in Nigeria. It is discovered from this analysis that 57 percent changes in the level of capital adequacy are explained using the identified determinants in this paper. The fitted model is also appropriate, valid, reliable and acceptable for determining the level of capital adequacy among the deposit money banks in Nigeria based on the probability of F-statistic (0.000) which is a determinant of goodness of fit of a model. This result conforms with the studies of Kleff and Weber (2008); Dreca (2013) and Ekpo et al. (2013). An examination of this result on the basis of time series shows that the capital adequacy of the deposit money banks is significantly affected by the aforementioned determinants in 2007, 2009 and 2010 being the period when there was global financial crisis, implementation of banking consolidation reform, banking capitalization, Central Bank stress test and re-capitalization as well as implementation of financial risk management reform by the regulatory authority of banks in Nigeria.

In conclusion, from the Table, it is discovered that among all the identified determinants, only Return on Asset, Credit Risk, Deposit and Liquidity have significant impact on capital adequacy. Hence, they could be identified as major determinants of capital adequacy of deposit money banks and evaluating the result on the ground of a priori expectations, the direction of the impact of some determinants such as Return on Equity, Gross Domestic Product, Liquidity, Bank Size and Inflation does not align.

## 5. Conclusion

Based on our findings, capital adequacy of deposit money banks is significantly determined by net income generated per one naira of asset-owing to the managements' ability to acquire deposits at a minimum cost and get them invested in viable and positive NPV investments (that is, Return on Asset), quantity of deposits (demand, saving and time) that a bank can mobilize (that is, total deposit), the banks' ability to finance its obligations instantaneously and effectively (that is, liquidity) and banks' proportion of non-performing loan to total loan (that is, Credit Risk). Thus, the credit risk introduced is found to have negatively and significantly impacted bank's capital adequacy which is in tandem with the high rate of loan default in Nigerian banks. Based on the above, 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. Finally, all the affected banks 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.

Since this paper cannot claim to have covered all aspects relating to the topic, further studies can examine the main causes of credit default in Nigerian banks as it affects all other activities of the banks since loans and advances constitute higher proportion of their assets.

## References

- Abusharba, M. T., Triyuwono, I., Ismail, M., & Rahman, A. F. (2013). Determinants of capital adequacy ratio (CAR) in Indonesian Islamic commercial banks. *Global Review of Accounting and Finance*, 4(1), 139-170. Retrieved from <http://www.wbiaus.org/11.%20Mohmad.pdf>
- Ahmad, R., Ariff, M., & Skully, M. J. (2008). The determinants of bank capital ratios in a developing economy. *Asia-Pacific financial markets*, 15(3-4), 255-272. <http://dx.doi.org/10.1007/s10690-009-9081-9>
- Allen, D. E., Nilapornkul, N., & Powell, R. (2013). The Determinants of Capital Structure: Evidence from Thai Banks. *Journal of Monetary Economics*, 32(1), 513-542.
- Al-Sabbagh, N. (2004). Determinants of capital adequacy ratio in Jordanian and Evidence. *Journal of Monetary Economics*, 32(1), 513-542.
- Aremu, M. A., Ekpo, I. C., Mustapha, A. M., & Adedoyin, S. I. (2013). Determinants of Capital Structure in Nigerian Banking Sector. *International Journal of Academic Research in Economics and Management*

- Sciences*, 2(4), 27-37. <http://dx.doi.org/10.6007/IJAREMS/v2-i4/50>
- Arua, N. (2006). Risk- Based Capital Standards for Banks: A critique. *Central Bank of Nigeria' Economic and Financial Review*, 44(3), 201-216. Retrieved from [http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.588.3725&rep=rep\\_type=pdf](http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.588.3725&rep=rep_type=pdf)
- Aspal, P. K., & Nazneen, A. (2014). An empirical analysis of capital adequacy in the Indian private sector banks. *American Journal of Research Communication*, 2(11), 28-42. Retrieved from [http://www.usa-journals.com/wp-content/uploads/2014/10/Aspal\\_Vol211.pdf](http://www.usa-journals.com/wp-content/uploads/2014/10/Aspal_Vol211.pdf)
- Basel, I. I. (2004). *International Convergence of Capital Measurement and Capital Standards: A Revised Framework Basle Committee on Banking Supervision*. Retrieved from <http://www.bis.org/publ/bcbs107.htm>
- Benston, G. J., & Kaufman, G. G. (1996). The appropriate role of bank regulation. *Economic Journal*, 106(1), 688-697. Retrieved from <http://www.jstor.org/stable/2235577>
- Berger, A. N. (1995). The relationship between capital and earnings in banking. *Journal of Money, Credit and Banking*, 27(2), 432-456. <http://dx.doi.org/10.2307/2077877>
- Berger, A. N., & Di Patti, E. (2006). Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. *Journal of Banking and Finance*, 30(4), 1065-1102. <http://dx.doi.org/10.1016/j.jbankfin.2005.05.015>
- Berger, A. N., Herring, R. J., & Szegö, G. P. (1995). The role of capital in financial institutions. *Journal of Banking & Finance*, 19(3), 393-430. [http://dx.doi.org/10.1016/0378-4266\(95\)00002-X](http://dx.doi.org/10.1016/0378-4266(95)00002-X)
- Bokhari, I. H., Ali, S. M., & Sultan, K. (2012). Determinants of Capital Adequacy Ratio in Banking Sector: An Empirical Analysis from Pakistan. *Academy of Contemporary Research Journal*, 2(1), 1-9. Retrieved from <http://www.aocrj.org/wp-content/uploads/2012/v1/n1-oct/5-17.pdf>
- Büyüksalvarcı, A., & Abdioglu, H. (2011). Determinants of capital adequacy ratio in Turkish Banks: A panel data analysis. *African Journal of Business Management*, 5(27), 11199-11209. <http://dx.doi.org/10.5897/AJBM11.1957>
- Dreca, N. (2013). Determinants of Capital Adequacy Ratio in Selected Bosnian Banks. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi EYİ*, 12(1), 149-162. Retrieved from [https://birimler.dpu.edu.tr/app/views/panel/ckfinder/userfiles/17/files/DERG\\_EYZELSAYI/11\(1\).pdf](https://birimler.dpu.edu.tr/app/views/panel/ckfinder/userfiles/17/files/DERG_EYZELSAYI/11(1).pdf)
- Ebhodaghe, J. U. (1996). The impact of failed banks on the Nigerian economy. *NDIC Quarterly Reports*, 6(1&2).
- Gropp, R., & Heider, F. (2010). The determinants of bank capital structure. *Review of Finance*, 30(1), 1-17. <http://dx.doi.org/10.1093/rof/rfp030>
- Ikpefan, O. A. (2013). Capital adequacy, management and performance in the Nigerian commercial bank (1986-2006). *African Journal of Business Management*, 7(30), 2938-2950. <http://dx.doi.org/10.5897/AJBM09.258>
- Kishore, R. M. (2007). *Taxmann financial management*. New Dehli: Taxmann Allied services Ltd.
- Kleff, V., & Weber, M. (2008). How do banks determine capital? Evidence from Germany. *German Economic Review*, 9(3), 354-372. <http://dx.doi.org/10.1111/j.1468-0475.2008.00437.x>
- Mbizi, R. (2012). An analysis of the impact of minimum capital requirements on commercial bank performance in Zimbabwe. *International Journal of Independent Research and Studies*, 1(4), 124-134. Retrieved from <http://ssrn.com/abstract=2163954>
- Pandey, A. (2005). Volatility models and their performance in Indian capital markets. *Vikalpa*, 30(2), 27-38. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.2062&rep=rep1&type=pdf>
- Reserve Bank of New Zealand. (2004). Capital adequacy ratios for banks-simplified explanation & examples for calculation.
- Teryima, S. J., Victor, U., & Isaac, K. (2014). Achieving organizational goals through successful strategic change implementation in business organizations: A survey of selected banking firms in Nigeria, West Africa. *The Business & Management Review*, 4(4), 66-79.
- Wall, L. D. (1985). Regulation of banks' equity capital. *Economic Review-Federal Reserve Bank of Atlanta*. Retrieved from <http://www.nal.usda.gov/>
- Williams, H. T. (2011). Determinants of capital adequacy in the Banking Sub-Sector of the Nigeria Economy:

Efficacy of Camels: A Model Specification with Co-Integration Analysis. *International Journal of Academic Research in Business and Social Sciences*, 1(3), 233-248. <http://dx.doi.org/10.6007/ijarbss.v1i2.36>

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