



## EFFICIENCY OF COMMERCIAL BANK INTERMEDIATION

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### Abstract

The role of the financial institution in intermediating between the surplus economic unit and deficit economic unit in ensuring productivity and soaring investment capability cannot be underestimated. Hence, this study seek to analysis how bank characteristics and overall banking environment affect bank function as reflected in interest margins and bank profitability between the periods 2008 to 2016 (9years) Using bank level data in Nigeria. This study employed pooled and panel data sourced and computed from the commercial banks annual reports. The study employed panel regression, panel co-integration, stationarity test, fixed effect estimate, random effect estimate and husman test to ascertain the appropriate model. Report showed that random estimate is the most appropriate model. From the report of the estimation, Equity/ Lagged Total Assets E/TA t-1, Loans/Total Assets and Customer and Short Term Total Funding/Total Assets seems to exhibit a positive and significant association to bank efficiency and profitability in Nigeria while among the macroeconomic indicators, only the gross domestic product exhibited a positive relationship to bank profitability with causality flowing from the economy to bank efficiency. This therefore suggests that economic advancement is a prerequisite for bank efficiency and profitability and that the choice of bank capital structure also determines her profitability and efficiency strength.

**Key Words:** financial institution, economic unit, banking

### 1.0 Introduction

As financial intermediaries, bank plays an important role in the operation of most economics. Researches as surveyed by Levine [1], showed that the usefulness of financial intermediation can affect economic growth. Crucially, financial intermediation affect the net returns to savings and the gross returns to investment. The spread between these two returns, mirrors bank interest margin in addition to transaction cost and taxes borne directly by savers and investors. This bank interest spread could be interpreted as an indicator of the efficiency of the banking system. In

this paper, we tend to examine how bank interest spreads are affected by taxation the structure of the financial system and financial regulations, such as deposit insurance.

A comprehensive review of the determinants of interest spread is offered by Hanson and Rocha [2], summarised the role that implicit and explicit taxes play in raising spreads and discussed some of the determinants of bank costs and profit such as inflation, scale economics and market structure.

Barth, Caprio and Levine [3], used 1993 data from 19 industrial countries to further examined the impact of banking power on bank return on equity, controlling for several bank and market characteristics. The study opines that variation in banking powers, bank concentration and the existence of explicit deposit insurance do not significantly affect the returns on bank equity.

This paper will be considering the 24 deposit money banks in operation in Nigeria by looking at the determinants of interest margins and profitability. These determinants include a comprehensive set of bank characteristics (such as size, leverage, type of business, foreign or domestic ownership) macroeconomic indicators, taxation and regulatory variables, financial structure variables and legal and institutional indexes. Among these are the ownership variables, the tax variables, some of the financial structure variable, the legal and institutional indicators have rarely been included in many previous study in this area. Hence, this study seek to incorporate these variables to ascertain the efficiency of commercial bank intermediation in Nigeria.

## **2.0 Theoretical Framework**

With both ex ante and ex post spreads, we can measure the efficiency of bank intermediation. While the ex-ante spread is the different between the contractual rate charged on loans and rate paid on deposits, the ex post spread is the different between banks actual interest revenues and their actual interest rate expenses. The ex post spread differs from the ex-ante spread by the amount of loan defaults. However, the ex post spread is a more useful measure because it controls for the fact that banks with high yield, risky credits are likely to face more defaults. An additional problem with using the ex-ante spread is that data are generally available at the aggregate industry level and are put together from a variety of source, which make them not completely consistent on ex post interest spreads.

As a measure of what we call bank “efficiency”, we consider the accounting value of a bank’s net interest income divided by total assets (TA), or the net interest margin (NIM). Bank “profitability” is a bank’s before-tax profit (BTP) divided by total assets. Profitability could also be measured by the return on equity as opposed to returns on assets. It is well known that ceteris paribus, a bank with a high equity ratio will have a higher return on assets and a lower return on equity than a bank with a lower equity ratio. A problem with banks in Nigeria before now is that most banks operated with extremely low equity capital with support Guarantees from the government. But whether the banks have overcome that situation with the last exercise of mandatory recapitalisation is yet to be seen.

Therefore, using unadjusted returns on equity which has been inflated may be more distortionary than using returns on equity. Otherwise, we should be comfortable analysing returns on assets after controlling for bank’s equity ratio. We do this by entering the equity ratio as an independent variable in the profit regression. That is, by straightforward accounting.

$$\frac{BTP}{TA} = \frac{ATP}{TA} + \frac{TX}{TA} \text{-----(1)}$$

Where

BTA = banks before tax profit

TA = Total assets

ATP = after tax profit.

TX = Tax Rate

From the bank's income statement, before tax profit divided by total assets further satisfies the following accounting identity.

$$\frac{BTP}{TA} = NIM + \frac{NII}{TA} - \frac{OV}{TA} - \frac{LLP}{TA} \text{-----(2)}$$

Where,

NIM = Non Interest Rate Income

OV = Overhead

LLP = Loan Loss Provisioning.

NII = Non Interest Income

Although, the net interest margin can be interpreted as a rough index of bank efficiency, this does not mean that its reduction always signals improved efficiency. A reduction in the net interest margin can, for example, reflect a reduction in bank taxation or alternatively, a higher loan default rate. In the first instance the reduction in the net interest margin may reflect the improved functioning of the banking system, while in the second case the opposite may be true. Also, variation in an accounting ratio, such as net interest margin, may reflect difference in net interest income or differences in say, non-lending assets- a component of the denominator.

In the data set, the accounting data are usually organised so as to be comparable globally. With differences in accounting conventions regarding the valuation of assets, loan loss provisioning, hidden reserves and so on retained. Vallascas and Keasey [4], reviewed the pit falls in interpreting bank operating ratios. In addition, accounting data also tends to reflect economic realities with a long lag so that they are notable to flag pending banking crises, such as those that have recently occurred in this country.

This paper focuses on accounting measures of income and profitability as investors equitize (risk-adjusted) financial returns on bank stocks. Gordon and Rosen [5] and Schranz [6], also focused on accounting measure of profitability when examining managerial entrenchment and bank take overs.

Our second equation suggest a useful decomposition of the realised interest spread- the net interest margin- into its component parts:

Non-interest income, overhead, taxes, Loan loss provision and after tax bank profit. Hanson and Rocha [2], took this approach with some modifications. As a first step to analysing our data, we provided an accounting breakdown of net interest margin for individual banks and for selected aggregates. Next, controlling for bank characteristics and the macroeconomic environment, we provided an economic analysis of the determinant of the interest and profitability variables, the net interest margin and before tax profits divided by total assets. This work will provide insight into how banks and their customers are affected by these variables. The net profit interest margin regression tells us how the spread determinants affect the combined welfare of depositors and lenders. The relationship between the interest spread and bank's corporate taxes, for instance revealed the extent to which a bank is able to shift its tax bill forward to its depositors and lenders.

Generally, taxes and other variables can affect interest rates as well as the volume of loans and deposits. In the short term, the major effect may come through pricing changes, in which case the net interest margin and before tax profits as a share of total assets immediately reveal easily interpreted welfare consequences for banks and their customers. With market imperfections in the form of credit rationing or imperfect competition in credit markets, changes in quantities generally have first-order welfare implications independent of changes in prices. In this paper, we do not evaluate changes in quantities. Lastly, the before tax profit regression showed how spread determinants affected bank shareholders. The regression analysis starts from the following equation;

$$I_{it} = \beta_0 + \beta_1 B_{it} + \beta_2 X_{it} + \beta_3 T_t + \beta_4 C_t + U_{it} \dots \dots \dots (3)$$

Where;

$I_{it}$  = Dependent variables (either the NIM or BTP/TA) for bank I at time t.

$B_{it}$  = Characteristics of Banks ii at time t

$X_{it}$  = Macroeconomic Characteristics at time t

$T_t$  = Financial Structure Variables

$C_t$  = Dummy

$U_{it}$  = White-noise error term.

**Review of Related Literature**

Abdulraheem and Fatima [7], used an advocacy paper approach in analysing how the administration of the deposit money bank in Nigeria stimulate bank credit. The study made references to some central bank laws and ordinances of the NDIC alongside some hypothetical examples of the previous credit created in the Nigerian banking sector. The study finally concluded that, the implementation of increase in capital base by the central bank on deposit money bank as guaranteed efficiency in credit creation and thus boost the administrative strength of banking firm generally. To this extent, study recommended that the credit risk management squared of deposit money bank must be holistic and that the environment should be stabilized to enable prompt payment of borrowed fund from the money institution.

Oluitan [8], statistically examined the influence of deposit money bank credit on the output level of the Nigerian economy between the periods 1970 through 2005 using a restrictive approach of the vector auto correction model alongside the preliminary econometrics techniques. The study developed three different models to capture the intermediation activities of this deposit money bank on the aggregate output of the nation. Findings showed that trade variables measured with total export and total import is capable of boosting the economy and that the intermediation function of the deposit money bank through credit creation can only grow when appropriate loan request strategy is design in such a way that the customer will not be at the tight corner and also the lender of fund.

Rafael, Horacio and Jesus [9], empirically examined the influence of banking concentration on bank efficiency in European Union using a secondary data of three thousand, nine hundred and fifty- two (3,952) bank size. Findings revealed that the efficiency ratio of banks whose total asset is over \$25billion failedto appreciate. Furthermore, their study reported that lending diversification and competition are also some of those factors that affect banks efficiency in the European nation.

Odunga, Nyangweso and Nkobe [10], empiricallyexamined the relationship between bank liquidity ratio and capital adequacy as a catalyst for bank efficiency in Kenya. The study employed time series data where ordinary least regression technique were employed. Findings revealed that banking efficiency can be positively affected by liquidity asset to short term liability and total capital ratio. The study thus recommended that banks liquidity asset to deposit ratio and total capital ratio should be improved on so as to ensure operating efficiency healthy competition in the market.

In another related Kenyan study, Peter, Willy and Patrick [11], examined asset quality and intermediation efficiency of deposit money banks in Kenya. The study carried out a field survey on about 135 licenced banks in Kenya alongside a mixed method of econometrics analysis. The study employed descriptive statistics, diagnostic test, correlation matrixes and fixed and random effect. Findings revealedthat there exist a direct relationship between financial intermediation efficiency and asset quality in Kenya such that rise in assert quality will bring about further increase in bank efficiency. The study therefore recommended that a review of the credit process to ensure thorough credit evaluation and monitoring.

In another Kenyan study, Anne [12], statistically examined how intermediation efficiency has influenced the productivity output of the deposit money bank in Kenya where about forty banks were examined between the periods 1997 to 2009. The rationale behind the study was that most of the deposit money bank in Kenya were liquidly trapped which has result into inefficiency in their performance over the years. The study employed Non-parametric data envelopment and the report showed that though the efficiency of the banking sector via there intermediation process is little yet, there is a room for improvement through capital intensive and digital strategy.

Beck [13], empirically investigated efficiency in financial intermediation and thus reported that less advanced bank are encompasses with high overhead cost and banking spread compared to developed financial system. The study further highlighted those factors that truncate inefficiencies in the intermediation function of commercial banks thus; general institutional framework and the banking competitive environment. The study thus concluded that the efficiency capacity of financial institution depends largely on the competitive strength of such bank.

Nyong [14], empirically examined the relatively efficiency of commercial bank in Nigeria using Parametric and Non-parametric approach. The study revealed that a high level of inefficiency was reported among the banking institution during the pre-regulatory era which occur due to poor utilization of available resources thus amounting to resource wastage. The sources of inefficiency was tagged to low capital asset ratio, poor returns on equity and high cost of operation amongst the Nigerian banking institute.

Monogbe, Nduka and Needam [15], empirically examined the intermediation function of the financial institution in Nigeria with credence to their contribution to economic development over the years. The study employed time series data from the CBN statistical bulletin between the periods 1986 to 2014 where credit to the private sector, broad money supply, insurance intermediation ratio and market capitalization ratio were proxies for financial development while per capital gross domestic product was proxy for economic development. The study employed unit root test, co-integration test multiple regression among others. Findings confirmed the stationarity of the time series employed in the study while four co-integrating equation were found. The report from the error correction model suggested that credit to the private sector exhibit a positive and significant relationship to economic development while interest rate exhibit a negative and significant influence on economic development. The study finally concluded that the intermediation function of the Nigerian financial institution has significantly hobnobs the economy in the long run.

Edori, Edori and Needam [16], examined financial intermediation and economic growth nexus in Nigeria using time series data between the periods 1986 to 2014. The result showed that economic growth of a nation determines how adequate the financial intermediation function of a nation could go. The study further concluded that the financial intermediation service of financial institution is demand following in Nigeria.

### **3.0 Data**

In this paper, we used income statement and balance sheet data of commercial banks. We began by breaking down net interest income into its four component parts: overhead minus non-interest income, loan loss provisioning and net profit. Taxes as share of net interest profit reflected the explicit taxes that banks pay (mostly corporate income taxes). Banks also face implicit taxation because of reserve and liquidity requirement and other restriction on lending that come through direct or subsidized credit policies. This indirect form of taxation directly lower the net interest income rather than the tax variable. The tax variable will slow variation in the explicit taxation of commercial banks.

Loan loss provisioning as a share of net interest income is a direct measure of differences in a credit quality across banks. The fourth component of net interest income is net profits, as a residual net profit, as a share of net interest income reflect the extent to which the net interest margin translates into net- of- tax profitability. The remaining column in the table tabulated the various accounting ratios (relative to total asset) in the accounting identity of equation 2. Non-interest income as a share of total assets revealed the importance of fee-based services of banks.



**Table 1 Breakdown of Net Interest Income into Its Four Component Parts and Banks Characteristic**

Years	Net Interest Margin	Net Interest Income (as a % of net interest income)	Non-Interest Income (as a % of net interest income)	Overhead (as a % of total assets)	Taxes	loan loss Provision (as a % of total assets)	Net Profit
2008	0.037486	0.006249	0.027331	0.515213	16,553,441	0.094762	116,017,406
2009	0.037333	0.002578	0.034579	0.925193	6,253,169	0.059073	90,045,956
2010	0.044737	0.006407	0.027963	0.815159	6,201,296	0.062372	88,667,121
2011	0.039132	0.008085	0.033195	0.431491	5,153,552	0.007775	66,685,119
2012	0.056075	0.005097	0.080027	0.365885	674,504	0.013092	84,996,482
2013	0.053451	0.001122	0.074862	0.517049	6,892,596	0.018258	50,745,459
2014	0.057947	0.000872	0.028795	0.483989	1,535,172	0.537254	96,336,621
2015	0.064812	0.000555	0.033765	0.515213	16,553,441	0.094762	116,017,406
2016	0.069241	0.004567	0.054382	0.632208	13,374,531	0.064535	123,098,123

Source: Financial summary of the 23 Deposit Money Banks in Nigeria alongside author's computation

### **Bank interest spread and profitability**

Overhead as a share of total assets revealed variation in operating cost of banks. These variables reflected variation in employment and in basis as wage levels.

Table 2 provided information on some of the macroeconomic and institution variables used in the regression analysis. The data are for the period under study. The tax rate is completed on a bank- by- bank basic as taxes paid divided by before tax profits. Reserve divided by deposits are the banking systems aggregate. CBN reserve divided by aggregate banking system deposits. Since reserve are generally remunerated at less- than- market rates, actual reserves may be a reasonable proxy for required reserve as average over the different deposit categories.

The deposit insurance variable is a dummy variable that takes on a value 1 if there is an explicit deposit insurance scheme (defined insurance premium and insurance coverage) and a value of 0 otherwise. Even if there is an explicit deposit insurance scheme. However, the ex post insurance coverage many prove to be higher than the jure coverage, if the deposit insurance agency chose to guarantee all depositors. With a value of 0 there is no explicit deposit insurance, even if the authorities offer some type of implicit insurance.

In the same table 2, we presented some indicators of the structure of financial market. The concentration variable is defined as the ratio of the assets of the six largest banks to the assets of the total banking sector. The ratio of bank asset to gross domestic product is defined as the total assets of the deposit money bank divided by gross domestic product. The ratio reflect the banking sector overall level of development. The ratio of stock market capitalisation to gross

domestic product measures the extent of stock market development. Developing countries tend to have lower bank- to- GDP and capitalization – to – GDP ratio with few notable exceptions.

The final column in the table provide an index of law and order, which one of the crucial institutional variables used in the regression analysis. These variables are scaled from 0-6, with high score indicating sound political institutions and the strong court system. Lower score reflected a tradition in which brute or physical force or illegal means are used to settle claims.

**Table 2: Macroeconomic and Institution Variables**

Tax Rate = aggregate bank tax/before tax profit	Banking system Aggregate = CBN reserve divided by aggregate banking deposits	Deposit Insurance = Dummy variable	Banking Sector Development Level = total asset of the deposit money bank divided by gross domestic product	Stock Market Development Level = ratio of stock market capitalisation to gross domestic product	Index of Law and Order = This variables are scaled from 0-6, with high score indicating sound political institutions
0.815159	45.01737791	1	53.16127	63.81123	6
0.431491	39.70488013	1	65.52249	39.35973	6
0.365885	16.5794119	1	70.67310	28.35675	5
0.517049	18.58843161	1	31.73566	18.16114	4
0.483989	45.19340941	1	30.79789	16.31515	4
0.417296	55.68538083	0	29.68481	20.63887	3
0.406831	112.6180165	0	30.34141	23.81921	3
0.438939	93.2073579	0	30.86300	26.22747	2
0.496731	98.02451478	0	29.86630	29.34875	1
0.487467	78.46024379	0	29.90770	31.33874	2

Source: Financial summary of the 23 Deposit Money Banks in Nigeria alongside author's computation

### **Bank Characteristics and Macroeconomic Indicators**

We regressed the net interest margin and before- tax- profits as a share of total assets respectively;

We measured profitability using returns on equity as opposed to using return on assets and control for equity ratio.

Determinant for net interest margins

Independent variables, the independent variables and their components are stated thus;



### **Bank Characteristics;**

Net Interest Margin

Equity/ Lagged Total Assets  $E/TA_{t-1}$

Loans/Total Assets

Non-interest Earning Asset/Total Assets

Overhang/Total Assets

Customer and Short Term Total Funding/Total Assets

### **Macroeconomic indicators**

Net Interest Income

Gross Domestic Per Capita

Growth Rate

Inflation Rate

Real interest Rate

### **Financial Structure**

Net Interest Income

Bank Assets/Gross Domestic Product

Stock Market Capitalisation/Bank Assets

Tax rate

### **Dummy Variable**

Deposit Insurance

### **Model Specification**

This research work employed fixed effect and random effect model techniques following the financial stability review of Pakistan (2006) and classical linear regression model assumption. The model is stated in a functional form thus;

$$I_{it} = f(B_{it}, X_{it}, T_t, C_t) \text{-----(4)}$$

Therefore, the model is recasted into the mathematical form thus;

$$I_{it} = \beta_0 + \beta_1 B_{it} + \beta_2 X_{it} + \beta_3 T_t + \beta_4 C_t \text{-----(5)}$$

We further convert the model into econometrics form thus

$$I_{it} = \beta_0 + \beta_1 B_{it} + \beta_2 X_{it} + \beta_3 T_t + \beta_4 C_t + U_{it} \text{-----(6)}$$

The Econometric Model

**Fixed Effect Model**

$$I_{it} = \beta_0 + \beta_1 B_{it} + \beta_2 X_{it} + \beta_3 T_t + \beta_4 C_t + \theta_{it} + U_{it} \text{-----(7)}$$

Where,

$I_{it}$  = Dependent variables (either the NIM or BTP/TA) for bank I at time t.

$B_{it}$  = characteristics of banks ii at time t

$X_{it}$  = macroeconomic characteristics at time t

$T_t$  = Financial structure variables

$\theta_{it}$  = The specific fixed effect

$C_t$  = Dummy

$U_{it}$  = White-noise error term.

**Random Effect Model**

$$I_{it} = \beta_0 + \beta_1 B_{it} + \beta_2 X_{it} + \beta_3 T_t + \beta_4 C_t + (X_{it} + \mu_{it}) \text{-----(8)}$$

Where;

$X_{it}$  is the unobserved random effect that varies across the various selected variables.

**A priori Expectation**

$\beta_1, \beta_2, \beta_3, \beta_4 > 0$

**4.0 Presentation of Data and Analysis**

We subjected our data to reliability test using Fisher’s Dick Fuller test. To explore the unit root test, the Fisher’s Dick Fuller test statistics was employed to determine the stationarity or equilibrium bond between the variables in the model; the Fisher’s Dick Fuller test statistics follows the chi square distribution and are asymptotic in normality, (23 deposit **money** banks were considered in this study between the periods 2008 to 2016).

**Table 3 Presentation of Fisher Unit Root Test**

Variables	ADF-choi Z-stat	Prob	Ranking
NIM	-5.66215	*0.0000	1(1)
CSTTA	-5.3479	*0.000	1(1)
BATGDP	-9.61498	*0.0000	1(1)
DU	N/A	N/A	1(1)
EQTITA	-4.16846	*0.0000	1(1)
GDPC	-10.7099	*0.0000	1(1)

INFLR	-6.56761	*0.0000	1(1)
LTA	-3.92307	*0.0000	1(1)
NIETA	-6.77224	*0.0000	1(1)
NIIC	-3.75945	*0.0001	1(1)
OVHTA	-5.32798	*0.0000	1(1)
RINTR	-4.69002	*0.0000	1(1)
SMCPTBA	-4.71049	*0.0000	1(1)
TART	-2.73836	*0.0031	1(1)

Extraction from E-view 9.

The result from both the Fisher's chi square probability and the Choi Z statistic revealed that the variables are stationary at order 1 or better called first differencing, thereby rejecting the null hypothesis. However, the above test statistics follows the asymptotic distribution while the NA in the column shows that the probability has a value of one or zero.

### Panel Co-integration Test

While exploring the long run equilibrium test, the Kao (Engle Granger) based co-integration econometric technique was used to vividly determine the bond. The output is display in the table below;

**Table 4: Presentation of Kao Co-integration Test**

Kao Residual Cointegration Test		
Series: NIM CSTTA BATGDP GPDC DU		
EQTITU INFLR LTA NIETA NIIC		
OVHTA RINTR SMCPTBA TART		
Date: 08/17/17 Time: 10:59		
Sample: 2008 2016		
Included observations: 207		
Null Hypothesis: No cointegration		
Trend assumption: No deterministic trend		
User-specified lag length: 1		
Newey-West fixed bandwidth and Quadratic Spectral kernel		
	t-Statistic	Prob.
ADF	-2.240746	0.0125
Residual variance	2.632974	
HAC variance	1.547221	

Source: Extraction from E-views

The result of Kao (Engle Granger) based co-integration probability shows a statistical optimistic at 5%, thereby rejecting the null hypothesis and concluding that the series in the model has a long run equilibrium bond.

However, since we are now cleared that the series are stationary and all have long run equilibrium bond; we therefore proceeded to conduct Fixed and Random effect on the different sector while Husman test was used to choose the appropriate model between the two. But before that, we estimated a panel Least Square thus to ascertain the short run dynamics of the time series under investigation thus;

**Table 5 Presentation of Panel Least Square Result**

Dependent Variable: NIM				
Method: Panel Least Squares				
Date: 08/17/17 Time: 12:01				
Sample: 2011 2016				
Periods included: 6				
Cross-sections included: 23				
Total panel (unbalanced) observations: 207				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.121200	0.127271	0.952292	0.3422
<b>Bank Characteristics</b>				
CSTTA	0.018703	0.000769	24.31660	0.0000
LTA	0.000123	2.94E-05	4.200640	0.0000
DU	0.013290	0.176267	0.075399	0.9400
EQTITA	0.092490	0.017277	5.353304	0.0000
NIETA	0.282227	0.160286	1.760767	0.0800
OVHTA	-0.000725	0.004036	-0.179492	0.8578
<b>Macroeconomic indicators</b>				
GDPC	1.12E-10	5.39E-10	0.207383	0.8359
RINTR	3.58E-09	4.24E-09	0.844226	0.3997
INFLR	-3.01E-08	3.36E-08	-0.895684	0.3716
<b>Financial Structure</b>	-1.07E-08			
BATGDP	0.000000	1.05E-08	-1.0243660	0.3070
SMCPTBA	-6.74E-10	9.29E-10	-0.725863	0.4689
TART	3.85E-09	3.76E-09	1.023858	0.3073
NIIC	2.12E-10	2.60E-09	0.081595	0.9351
R-squared	0.903360	Mean dependent var	1.117913	
Adjusted R-squared	0.896380	S.D. dependent var	3.022511	
S.E. of regression	0.972946	Akaike info criterion	2.852453	
Sum squared resid	170.3925	Schwarz criterion	3.088278	
Log likelihood	-262.6880	Hannan-Quinn criter.	2.947945	
F-statistic	129.4293	Durbin-Watson stat	1.797762	
Prob(F-statistic)	0.000000			

Extraction from E-views

The report of the panel regression showed that all things been equal, bank efficiency which was proxies by (NIM) will increase to the tune of 12%. This shows the extent to which operating cost of banks, macroeconomic and institution variables could stimulate bank efficiency alongside their intermediation function.

### **Bank Characteristics;**

#### **Customer and Short Term Total Funding/Total Assets and Bank Efficiency**

From the result of the panel regression above, the estimation shows that customer and short term total funding to total asset exhibited a positive coefficient of 0.018703 and a significant P-value of 0.0000 signifies the existence of positive and significant relationship between CSTTA and bank efficiency in Nigeria. This further specifies that the intermediation function of deposit money banks through channelling of fund to customer has enhance bank efficiency and profitability. The profitability is made possible through the window of bank charges on such allocation. Report has shown from the previous studies that short term credit to customers has significantly enhanced the efficiency of commercial banks while issuing of long term loan to customer became a mirage due to the long nature of loan recovery Anne, [12]. The result here thereby conclude that increase in customer and short term total funding is capable of stimulating bank efficiency in Nigeria to the tune of 0.18% all things been equal.

#### **Loans/Total Assets and Bank Efficiency**

The result presented in table 5 above revealed that the percentage of loan to total asset seems to exhibit a positive coefficient of 0.000123 with a corresponding significant P-value of 0.0000 with respect to bank profitability. From a priori, we expect that the ratio of total loan will promote bank efficiency, to a reasonable extent, the result justified this and thus further suggested that the choice of capital structure of a bank matter when considering the efficiency and profitability of the bank. The quantum of loan and equity exhume by the bank most time determines how efficient such bank could be. The report here is in consonant with the empirical findings of (Aikaeli, [17]; Banker & Cooper [18]; Kiyota, [19]; Sufian, [20]) whose studies showed the existence of positive relationship between bank loan to asset quality and efficiency of deposit money banks in Kenya. Although the coefficient is low at 0.000123 which suggest that to further record efficiency in banking intermediation services, adequate monitoring must be done on bank loan to ensure prompt loan recovery as at when due. The Interest on loan will lead to reduction in payment of tax which might lead to increase in equity, hence banks net worth (total asset) will be higher compare to the firm lowly gear. This result is in line with the M&M theory proposition 3 which state that a highly geared company is prone to experience expansion and investment

#### **Equity/ Lagged Total Assets E/TA<sub>t-1</sub> and Bank Efficiency**

In alignment with bank loan, the ratio of equity to total asset also exhibit a positive coefficient of 0.092499 and a corresponding significant P-value of 0.00000, thereby suggesting the existence of positive and significant relationship between equity to asset and bank efficiency and profitability in Nigeria. This further implies that the choice of firm capital structure is a key determinant of firm profitability. The economic implication of this is thatbanks with a high equity ratio will have a higher return on assets and a lower return on equity than a bank with a lower equity ratio. This thus reflect that higher liquidity is capable of enhancing bank

profitability and efficiency. The negative implication of this could be that the firm will be paying higher income tax on provision.

### **Non-interest Earning Asset/Total Assets and Bank Efficiency**

The report shows that the ratio of Non-interest earning asset to bank total asset exhibit a positive correlation to bank efficiency though the P-value is insignificant. This also suggest that Non-interest earning asset must not be excessively much if a bank wishes to undertake efficiency and profitability.

### **Overhang/Total Assets and Bank Efficiency**

The report from these findings showed that the contribution of overhang to bank efficiency is insignificant and negative. The study shows that OVHTA exhibited a negative coefficient of -0.000723 and in insignificant P-value of 0.8578, thereby suggesting the existence of negative and insignificant relationship between overhang and bank efficiency between the periods under study.

### **Macroeconomic indicators**

#### **Gross Domestic Per Capital, Inflation Rate and Real Interest Rate**

The result of the macroeconomic indicators are discuss thus;

Gross domestic product which represent the growth rate exhibits a positive coefficient of 1.12000 and an insignificant P-value of 0.8359. This therefore suggest that there exist a positive and insignificant relationship between economic growth rate and bank efficiency. This result further negate the notion of Mackinnon and Shaw [21] whose study attributed the role of economic development to financial market. This result shows that the economy as contributed to financial institution efficiency and not the order way round. In other words, high gross domestic product do not only contributes toward deposit growth of the bank, but also promote the quest for advances and energize the ability of the fund borrower to pay back which further promotes bank profitability and thus enhance efficiency. Another important macroeconomic indicator considered in this study is Inflation Rate and Real interest Rate. On a priori, we expect that clustering in inflation rate could negatively affect bank profitability and thereby result into reduction of bank profitability. The report shows that inflation rate exhibit a negative contribution to bank efficiency as it possesses a negative coefficient of -3.85000 and an insignificant P-value of 0.3716. This thereby suggest that rise in inflation rate is harmful to bank profitability and creditors loss and debtors gain through the window of valueless worth of money. Finally, interest rate exhibit a positive association to bank efficiency and it coefficient stood at 3.8500 and also a positive P-value of 0.3997. The report here is in consonant with the financial stability review [22] whose study suggested that the liquidity position of the banking sector and monetary policy changes affect the variability of interest rates hence, interest rate volatility increases during the transition periods and positively affects the banking efficiency.

### **Financial Structure indicators**

Bank Assets/Gross Domestic Product exhibit a positive coefficient of 0.0708 and a P-value of 0.3070, suggesting the rise in bank asset as a ratio of gross domestic product is capable of

promoting bank efficiency and profitability. Meanwhile, Stock Market Capitalisation/Bank Assets seems to be negative and insignificant in promoting bank efficiency. Net Interest Income and Tax rate exhibit a positive correlation to bank efficiency and profitability.

### Random Effect or Pooled Least Square

We employed the LM test in ascertaining which of this model is appropriate. The decision rule here states that if the Breusch Pagan LM test is greater and 5% alpha level, it means that the variance across entities are not zero which suggest that the pooled ordinary least square is appropriate and viz versa. The report in this study shows that the LM Breusch Pagan coefficient stood at 0.002 which suggest that the variance across the entities is not zero hence, the pooled effect Ols is not enough for this study. Thus we proceeded to the random effect model.

### Random Effect Model

**Table 6 Presentation of Random Effect Model**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.093694	0.151725	0.617522	0.5377
<b>Bank Characteristics</b>				
CSTTA	0.018975	0.000765	24.80657	0.0000
LTA	0.000126	2.94E-05	4.251855	0.0000
DU	0.053109	0.210697	0.252062	0.8010
EQTITA	0.091884	0.017163	5.353597	0.0000
NIETA	0.282409	0.160959	0.296099	0.0710
OVHTA	0.000285	0.004137	0.068988	0.9458
<b>Macroeconomic indicators</b>				
GDPC	1.12E-10	5.39E-10	0.207383	0.0359
RINTR	3.58E-09	4.24E-09	0.844690	0.3988



INFLR	-3.01E-08	3.36E-08	-0.895684	0.3716
<b>Financial Structure</b>				
BATGDP	-1.07E-08	1.09E-08	-0.9611480	0.3378
SMCPTBA	-7.78E-10	9.81E-10	-0.792664	0.4290
TART	3.85E-09	3.76E-09	1.023858	0.3073
NITC	1.27E-10	2.60E-09	0.993833	0.3216
Effects Specification				
			S.D.	Rho
Cross-section random			0.318101	0.1042
Idiosyncratic random			0.932613	0.8958
Weighted Statistics				
R-squared	0.904197	Mean dependent var	0.859392	
Adjusted R-squared	0.897278	S.D. dependent var	2.895716	
S.E. of regression	0.928249	Sum squared resid	155.0963	
F-statistic	130.6807	Durbin-Watson stat	1.952494	
Prob(F-statistic)	0.000000			

Source: Extraction from E-views

Since, the LM test suggest that the pooled ordinary least square is not an appropriate model for the study judging by its P-value which is within the preferred alpha level, we proceed to the random effect estimation thus, the result above slightly validates the report of the pooled OLS as three of the five explanatory variables for bank characteristics indicators exhibit a positive and significant relationship to bank profitability and efficiency. The proportion of loan to total asset, equity to total asset and Customer and Short Term Total Funding/Total Assets exhibit a positive correlate to Bank Efficiency. The macroeconomic indicator also proved to be insignificant in stimulating bank performance except for gross domestic product which exhibit a positive coefficient and a significant P-value of 0.003849, thereby suggesting that increase in economic growth process is a prerequisite to increase bank performance and profitability. Finally, all indicators from the financial structure does not seems to be significant in boosting bank performance in Nigerian banking industry as the case may be. The global statistics revealed that the explanatory variables jointly explained about 90% variation in the dependent variables.

### Fixed Effect Model

In order to analyze the fixed effect on 23 quoted banks in the Nigerian banking sector, the Panel Engle Granger least square (EGLS) technique was used to show the time fixed effect or heterogeneity across the various firms in the sector. The output is display in table 7 below;

**Table 7 presentation of Fixed Effect Estimation**

Dependent Variable: NIM
Method: Panel Least Squares
Date: 08/17/17 Time: 12:01
Sample: 2011 2016

Periods included: 6				
Cross-sections included: 33				
Total panel (unbalanced) observations: 207				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.207350	0.638532	-0.324729	0.7458
<b>Bank Characteristics</b>				
CSTTA	0.018703	0.000820	23.69123	0.0000
LTA	0.000127	3.22E-05	3.938404	0.0001
DU	0.013290	0.176267	0.075399	0.9400
EQTITA	0.092668	0.017407	5.033397	0.0000
NIETA	0.282227	0.160286	1.760767	0.0800
OVHTA	-0.000725	0.004036	-0.179492	0.8578
<b>Macroeconomic indicators</b>				
GDCP	1.12E-10	5.39E-10	0.207383	0.0059
RINTR	3.58E-09	4.24E-09	0.844226	0.3997
INFLR	-3.01E-08	3.36E-08	-0.895684	0.3716
<b>Financial Structure</b>				
BATGDP	-1.07E-08	1.05E-08	-1.0243660	0.3070
SMCPTBA	-6.74E-10	9.29E-10	-0.725863	0.4689
TART	3.85E-09	3.76E-09	1.023858	0.3073
NIIC	2.12E-10	2.60E-09	0.081595	0.9351
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.926992	Mean dependent var	1.117913	
Adjusted R-squared	0.904793	S.D. dependent var	3.022511	
S.E. of regression	0.932613	Akaike info criterion	2.901929	
Sum squared resid	128.7256	Schwarz criterion	3.676782	
Log likelihood	-235.4871	Hannan-Quinn criter.	3.215689	
F-statistic	41.75929	Durbin-Watson stat	2.306446	
Prob(F-statistic)	0.000000			

Source: Extraction from E-view

The result above is also in line with that of the random effect where the ratio of loan to total asset, equity to total asset and Customer and Short Term Total Funding/Total Assets exhibit a positive correlate to Bank Efficiency. While the structure indicators and macroeconomic indicator proved to be insignificant in promoting bank performance and efficiency in Nigeria. The global statistics also reported a pleasant result as the Adjusted R<sup>2</sup> stood at 0.904793 thereby suggesting that about 90% variation in bank efficiency is projected by the explanatory variables while the value of the Durbin Watson shows the absence of autocorrelation. In choosing which of these models is appropriate, we employed Hausman Test to checkmate the differences and the most appropriate model for decision making.

## Hausman Test

The Hausman test statistic is incorporated to choose the appropriate model between the fixed and random effect conducted above; the null hypothesis states that the random effect is preferred while the alternative hypothesis is that the fixed effect is at least as consistent and preferred. The output is displayed below

**Table 8 Presentation of Hausman Test**

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	11.35034 9	13	0.5815

Source: Extraction from E-view

The test result follows the chi square distribution, from the result, the probability figure is statistically insignificant (0.5815); therefore, the random effect model is most appropriate. Hence, is not rejected. Based on this justification, the interpretation of the random effect is valid and adequate in this study.

## Panel Granger Causality Test for pooled sector

The granger result shows the cause effect bond between the variables in the model.

**Table 9 Presentation of Granger Causality Test**

Pairwise Granger Causality Tests			
Date: 08/22/17 Time: 22:03			
Sample: 2011 2016			
Lags: 2			
Null Hypothesis:	Obs	F- Statistic	Prob.
CSTTA does not Granger Cause NIM	129	0.4741 8	0.6235
NIM does not Granger Cause CSTTA		0.3780 9	0.6860
BATGDP does not Granger Cause NIM	126	0.1074 0	0.8983

NIM does not Granger Cause BATGDP		1.1267 0	0.3275
DU does not Granger Cause NIM	129	NA	NA
NIM does not Granger Cause DU		NA	NA
EQTITA does not Granger Cause NIM	129	0.1940 5	0.0039
NIM does not Granger Cause EQTITA		0.0751 6	0.9276
GDPC does not Granger Cause NIM	126	0.0095 0	0.0005
NIM does not Granger Cause GDPC		1.3634 9	0.2597
INFLR does not Granger Cause NIM	124	0.0579 5	0.9437
NIM does not Granger Cause INFLR		0.1513 0	0.8598
LTA does not Granger Cause NIM	129	0.1892 4	0.0078
NIM does not Granger Cause LTA		0.1734 8	0.8409
NIETA does not Granger Cause NIM	129	0.1585 3	0.8536
NIM does not Granger Cause NIETA		0.1567 0	0.8551
NIIC does not Granger Cause NIM	126	1.4510 3	0.2384
NIM does not Granger Cause NIIC		0.5671 4	0.5686
OVHTA does not Granger Cause NIM	129	1.7262 5	0.1822
NIM does not Granger Cause OVHTA		2.5397 3	0.0830
RINTR does not Granger Cause NIM	126	0.0259 0	0.9744
NIM does not Granger Cause RINTR		1.7717 6	0.1744
SMCPTBA does not Granger Cause NIM	129	0.0540 1	0.9474
NIM does not Granger Cause SMCPTBA		0.0726 6	0.9300

		0.0840	
TART does not Granger Cause NIM	129	4	0.9194
		0.2951	
NIM does not Granger Cause TART		9	0.7449

Source: Extraction from E-view

The report above slightly validated the output of the pooled lease square. The result shows the existence of unidirectional relationship between equity, loans, gross domestic product and bank profitability and efficiency. The result therefore justifies that the capital structure choice of a firm determines the profitability strength and efficiency speed of the Nigerian banks. The result further suggest that the economic most time determines and promote the profitability of the banks. In other words, the intermediation function of the Nigerian commercial banks pest on the economy for efficiency function, operation and profitability as the case may be. This result is inconsonant with the empirical findings of Monogbe [23,] Nnamdi and Torbira [24], whose studiesreported that the operation of conventional banking in Nigeria is parasitic to economic growth.

### **5.0 Conclusion and Policy Implication**

The role of the financial institution in intermediating between the surplus economic unit and deficit economic unit in ensuring productivity and soaring investment capability cannot be underestimated. Hence, this study seek to examine the efficiency of commercial bank intermediation putting into consideration the 23 quoted banks in the Nigeria stock exchange between the periods 2008 to 2016 (9years). This study employed pooled and panel data sourced and computed from the commercial banks annual reports.

The study employed panel regression, panel co-integration, stationarity test, fixed effect estimate, random effect estimate and husman test to ascertain the appropriate model. Report showed that random estimate is the most appropriate model. This study proxy bank efficiency with net interest margin where three explanatory variables were considered. Banking characteristics variables comprises of Equity/ Lagged Total Assets  $E/TA_{t-1}$ , Loans/Total Assets, Non-interest Earning Asset/Total Assets, Overhang/Total Assets and Customer and Short Term Total Funding/Total Assets, Macroeconomic indicators were also considered and there includes, Gross Domestic Per Capita, Inflation Rate and Real interest Rate. Finally, the financial sector indicators were also considered and there includes, Net Interest Income, Bank Assets/Gross Domestic Product, Stock Market Capitalisation/Bank Assets and Tax Rate.

From the report of the estimation, Equity/ Lagged Total Assets  $E/TA_{t-1}$ , Loans/Total Assets and Customer and Short Term Total Funding/Total Assets seems to exhibit a positive and significant association to bank efficiency and profitability in Nigeria while among the macroeconomic indicators, only the gross domestic product exhibited a positive relationship to bank profitability with causality flowing from the economy to bank efficiency. This therefore suggests that economic advancement is a prerequisite for bank efficiency and profitability and that the choice of bank capital structure also determines her profitability and efficiency strength.

### **Policy Implication**

Using bank level data in Nigeria, this paper analysis how bank characteristics and overall banking environment affect bank function as reflected in interest margins and bank profitability.

Reasonably, we can confirm some finding of earlier studies: for instance, a positive relationship between capitalization and a negative relationship between reserves and profitability. As observed, other important determinant of bank margins and profitability, such as ownership, corporate taxation, financial structure, legal and institutional settings have not gotten wide coverage.

Difference in the mix of bank activities also have an impact on spread and profitability. Our result also shows that banks with relatively high non-interest earning assets are less profitable along with banks that relay largely on deposit for their funding because deposits apparently entails high branching with all the attendant expenses. In addition, variation in overhang and other operating cost is reflected in variation in bank interest margins, because bank pass on their operating cost to their depositors and lenders.

From the macroeconomic factors, we discover also explained variation in interest margins. The positive relationship between inflation and bank profitability implies that bank income increase more with inflation bank cost. Further, high real interest rate are associated with higher interest margins and profitability which may reflect the fact that in Nigeria, demand deposit frequently pay below market interest rates.

As a related issue, it will be healthy to consider what determine the foreign bank entry, and FDI generally, may be driven by the taxation of domestic and foreign firms rather than simply by country's comparative advantage in providing financial services.

It was also discovered that government regulations such as design of deposit insurance schemes, have an impact on bank margins. However, it also shows that official reserve depress bank profit. Prima facie, this suggest that reserve requirement are a better instrument with which to tax bank profits than the corporate income tax. Variability in the reserve tax can go a long way towards explaining the responsiveness of bank profit to this tax.

### **Suggestion for Further Study**

To further enhance the debate around the literature, this study suggest that other researchers should extend the time frame and study scope to cover the post SAP era as this will further create more potent result. Further, other estimation tools like generalized method of movement GMM, Two step least square (TSLS) and Dynamic least square should be adopted by other researcher as this will also help in enriching the argument around the literature.

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## Appendix

Random Effect

Dependent Variable: NIM

Method: Panel EGLS (Cross-section random effects)

Date: 08/20/17 Time: 17:05

Sample: 2011 2016

Periods included: 6

Cross-sections included: 33

Total panel (unbalanced) observations: 194

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.093694	0.151725	0.617522	0.5377
CSTTA	0.018975	0.000765	24.80657	0.0000
BATGDP	-1.04E-08	1.09E-08	-0.961148	0.3378
DU	0.053109	0.210697	0.252062	0.8013
EQTITA	0.091884	0.017163	5.353597	0.0000
GDPC	-1.62E-10	5.48E-10	-0.296099	0.7675
INFLR	-3.35E-08	3.49E-08	-0.960175	0.3383
LTA	0.000126	2.96E-05	4.251855	0.0000
NIETA	0.288409	0.158959	1.814357	0.0713
NIIC	-8.76E-11	3.08E-09	-0.028428	0.9774
OVHTA	0.000285	0.004137	0.068988	0.9451
RINTR	3.59E-09	4.25E-09	0.845690	0.3988
SMCPTBA	-7.78E-10	9.81E-10	-0.792664	0.4290
TART	4.27E-09	4.30E-09	0.993833	0.3216
Effects Specification				
			S.D.	Rho
Cross-section random			0.318101	0.1042
Idiosyncratic random			0.932613	0.8958
Weighted Statistics				

R-squared	0.904197	Mean dependent var	0.859392
Adjusted R-squared	0.897278	S.D. dependent var	2.895716
S.E. of regression	0.928249	Sum squared resid	155.0963
F-statistic	130.6807	Durbin-Watson stat	1.952494
Prob(F-statistic)	0.000000		

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Unweighted Statistics

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R-squared	0.903047	Mean dependent var	1.117913
Sum squared resid	170.9442	Durbin-Watson stat	1.771483

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### Fixed Effect

Dependent Variable: NIM  
Method: Panel Least Squares  
Date: 08/20/17 Time: 17:10  
Sample: 2011 2016  
Periods included: 6  
Cross-sections included: 33  
Total panel (unbalanced) observations: 194

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.207350	0.638532	-0.324729	0.7458
CSTTA	0.019431	0.000820	23.69123	0.0000
BATGDP	-2.51E-09	1.36E-08	-0.184179	0.8541
DU	0.495091	1.042851	0.474748	0.6357
EQTITA	0.092668	0.018407	5.034395	0.0000
GDPC	-4.59E-10	6.35E-10	-0.722410	0.4712
INFLR	-5.78E-08	4.34E-08	-1.331784	0.1850
LTA	0.000127	3.22E-05	3.938404	0.0001
NIETA	0.295828	0.170823	1.731779	0.0854
NIIC	-6.71E-09	7.83E-09	-0.857573	0.3925
OVHTA	0.001291	0.005045	0.255918	0.7984
RINTR	4.13E-09	4.73E-09	0.873282	0.3839
SMCPTBA	-1.82E-09	1.35E-09	-1.353469	0.1780
TART	1.72E-08	1.07E-08	1.607394	0.1101

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Effects Specification

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Cross-section fixed (dummy variables)

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R-squared	0.926992	Mean dependent var	1.117913
Adjusted R-squared	0.904793	S.D. dependent var	3.022511
S.E. of regression	0.932613	Akaike info criterion	2.901929
Sum squared resid	128.7256	Schwarz criterion	3.676782
Log likelihood	-235.4871	Hannan-Quinn criter.	3.215689
F-statistic	41.75929	Durbin-Watson stat	2.306446
Prob(F-statistic)	0.000000		

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### Hausman Test

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	11.350349	13	0.5815

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
CSTTA	0.019431	0.018975	0.000000	0.1234
BATGDP	-0.000000	-0.000000	0.000000	0.3381
DU	0.495091	0.053109	1.043145	0.6652
EQTITA	0.092668	0.091884	0.000044	0.9061
GDP	-0.000000	-0.000000	0.000000	0.3555
INFLR	-0.000000	-0.000000	0.000000	0.3463
LTA	0.000127	0.000126	0.000000	0.9218
NIETA	0.295828	0.288409	0.003912	0.9056
NIIC	-0.000000	-0.000000	0.000000	0.3572
OVHTA	0.001291	0.000285	0.000008	0.7277
RINTR	0.000000	0.000000	0.000000	0.7963
SMCPTBA	-0.000000	-0.000000	0.000000	0.2573
TART	0.000000	0.000000	0.000000	0.1870