International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: (Print): 2545-5907 (Online): 2545-5885
Volume 3, Number 2, June 2018
http://www.casirmediapublishing.com

SIZE – PERFORMANCE NEXUS IN THE NIGERIAN BANKING INDUSTRY: A CAUSAL ANALYSIS

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ABSTRACT
This study examined the relationship between bank size and the performance of some selected commercial banks in Nigeria. The study examined the causal effects that exist between size and the performance of these banks using four major bank size variables. The study employed panel data econometric techniques to examine the significance of various size variables on bank performance in Nigeria. The techniques employed include pooled OLS regression, fixed and random effects models as well as Hausman test to examine the effects of four size variables (total assets, deposit volume, number of employees and branch network) on banks' profitability (profit after tax) in Nigeria. The study further employed the use of Granger causality test to examine if there exist any causal relationship among the variables studied and the direction(s) of such effect/ relationship. The results of the analysis reveal that while total assets and banks' profitability Granger cause each other, deposit volume Granger causes banks' profitability whereas, neither branch network nor number of employees Granger causes banks' profitability in that there exists no directional causality among them. The study recommends that bank managers be more pragmatic in their size management efforts such that size variables exert positive and significant impact on bank performance and a need for more cost effective human resource practices by banks.
Key words: *Bank size, Bank Performance, Granger causality, Optimal Bank Size*

INTRODUCTION
The banking system in any economy play a critical intermediation role of transferring funds from the surplus units to deficit units of the economy, hence examining the relevance of size to their performance will be of paramount importance for bank managers, owners and policy makers. The importance of the banking industry to national economic development cannot be overemphasized. This necessitates that a great attention is placed on the industry by all stakeholders. Omet, Hadhoud and Abdel-Halim (2015) observed that financial institutions form a critical part of the financial system of any country. The intermediation function of banks is crucial for economic development. Levine (2005) argued that if run efficiently, banks promote and mobilize savings, and improve the effective allocation of resources through their credit allocation systems. Indeed, banks have existed since ancient times taking deposits from households and making loans to economic agents requiring capital. An understanding of the role or roles played by these in the financial sector is found in the many and varied models in the area known as intermediation theory. The theories of intermediation have been built on the models of resource allocation based on perfect and complete markets by suggesting that it is frictions such as

transaction costs and asymmetric information that are important in understanding intermediation (Allen & Santomero, 1998).Although, big sized banks have greater access to large wholesale deposits and have greater power to control cost of deposits and lending rates, these advantages can only be translated into good financial performance with accompanying cost efficiency. Also, the existence of branch networks affords nearness and convenience to customers. This may still translate to higher deposits but not without the cost of operating such many branch networks. When a bank fails to exploit the expected economies of scale, branch networks may impact negatively on financial performance.

The research gap is based on the observation that apart from the fact that there exists conflicting evidences on the relationship between size and bank performance in Nigeria, studies that directly address the causal relationship between specific bank characteristics such as assets volume, deposit volume, number of employees and branch network are rare. The broad objective of this study is to examine the size-performance nexus of selected commercial banks in Nigeria. Specifically, the objectives of the study are:

1. To examine the effects of size on the performance of selected commercial banks in Nigeria.
2. To examine the direction(s) of causal effects between size and bank performance and among the size variables themselves.

Thus the null hypothesis to be tested in the study is that there is no causal relationship between size and bank performance in the Nigerian banking industry.

CONCEPTUAL LITERATURE

Evolution of the Nigerian Banking Industry

The Nigerian banking sector has experienced a" boom burst" cycle in the past 20 to 25 years. After the implementation of the Structural Adjustment Programme (SAP) in 1986, and the deregulation of the banking sector, new banks proliferated, which were mainly driven by attractive arbitrage opportunities in the foreign exchange market (Hesse, 2007). But prior to the deregulation period, effective financial intermediation never took off, with a decline in the 1980s (Capino and Kligbiel, 2008). The sector was highly oligopolistic with remarkable feature of market concentration and leadership. Lemo (2007) noted that there were ten banks that controlled more than 50% of the aggregate assets of the banking sector. The sector was characterized by small scale banks with high overheads, low capital base averaging less than $10 million, heavy reliance on government patronage and loss making. The Nigerian banking sector was still characterized by a high degree of fragmentation and low level of financial intermediation up to 2004. Hesse (2007) pointed out that due to the high fragmentation and low financial

intermediation of the banks, the government in 1991 outlined some prudential guidelines through the promulgation of the Banking and Other Financial Institutions Decree (BOFID) and placed an embargo on issuing new bank licences. Twenty four of the banks became insolvent and by 2004, the number of banks had reduced to 89. However, these 89 banks were characterised by a low capital base, insolvency and illiquidity, overdependence on public sector deposits and foreign exchange trading, poor asset quality and weak corporate governance (Soludo, 2006). This made the Central Bank of Nigeria to direct commercial banks to recapitalize up to the tune of Twenty Five billion (₦25bn) naira before the end of 2005. The number of commercial and merchant banks in Nigeria has reduced to 18 as at September, 2015 (The Stalwart Report, 2016).

Bank Size and Performance

In Nigeria, bank size is mostly described in the context of its asset size, deposit volume, number of branches, size of board of directors and number of employees (Ifiobong, 2014; Onakoya, Ofoegbu & Fasanya, 2012; Nwakama, Okeke & Arewa, 2012). It has been argued by Ghemawat and Khanna (1998), Khanna and Palepu (2000) and Alvarez and Crespo (2003) that large banks might be more efficient, because they can use more specialised inputs, coordinate their resources better, reap the advantages of economies of scale and make up for external market failures. Other studies also showed that bank size has a positive impact on efficiency and decreases costs (Berger & Humphrey, 1991, Alvarez & Arias, 2003, all cited in Barros and Caporale, 2012). Regehr and Sengupta (2016) noted that size is not the only factor that affects a bank's long-run profitability and that; in fact, profitability depends on the characteristics of both individual banks and the markets in which they operate. For example, bank-specific factors such as business strategies, reflected in the composition of banks' assets and liabilities, can affect profitability. Again, market-specific factors, such as growth in the markets in which banks operate, can affect banks' long-run profitability. Any analysis that thoroughly examines the relationship between bank profitability and bank size must account for such bank-specific and market-specific factors.

Mester (2010) argued that increasing bank size can increase bank profitability by allowing banks to realize economies of scale. For example, increasing size allows banks to spread fixed costs over a greater asset base, thereby reducing their average costs. Increasing banks' asset size can also reduce risk by diversifying operations across product lines, sectors, and regions. The author noted that lower risk can promote profitability directly by reducing losses or indirectly by making liability holders willing to accept lower returns, thereby reducing banks' funding costs. Furthermore, as the scale of operations increases, banks may be able to better use specialized inputs such as loan officers with expertise in commercial and industrial business lines, resulting in greater efficiency. Realizing economies

of scale may lead to a healthier banking system by eliminating inefficiencies and reducing risks. The effect of a growing size on profitability has been proved to be positive to certain extent (Athanasoglou, Brissimis & Delis (2005). The authors also opined that for banks that became extremely large, the effect of size could be negative due to bureaucratic reasons. The deposits of banks constitute a cheap and stable financial resource when placed side-by-side with other financing alternatives and this engenders a positive relationship between the banks' performance and customer deposits for the Latin American context (Trujillo-Ponce, 2013). The factors that influence the profitability of banks are the determinants of banks' profitability. Gul, Irshad and Zaman (2011) dichotomized the determinants of banks' profitability into two: internal and external factors. According to the authors, the determinants of bank performance from internal sources are size. Capital, loan and deposit while those from external sources are macro in nature and include the Gross Domestic Product, Rate of Inflation and Market Concentration.

THEORETICAL LITERATURE

Optimal Bank Size Theory

Krasa and Villamil (1993, 2003) developed a theory of optimal bank size. This theory posits that to choose an optimal portfolio size (i.e. scale of operation) a bank faces some trade-offs for most monitoring cost structures.
Graphically,

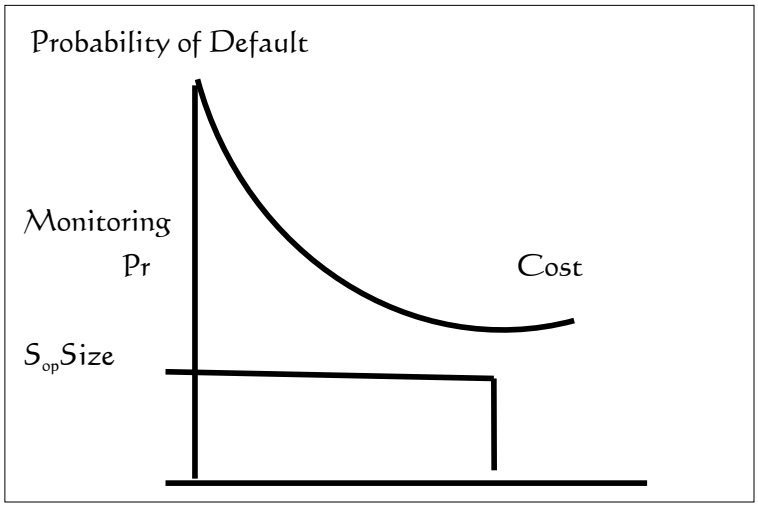

Fig 1: Determination of Optimal Bank Size
Source: Author's design (2016).

Increasing the size of the bank's portfolio given some initial bank size, generally, will decrease the bank's default probability, but increase the lender's cost of monitoring the bank. The authors attempted to answer the question: under what circumstances do the gains from decreased default risks dominate the losses from

increased monitoring costs when the bank compares its current scale of operation with an increased scale of operation? In summary, the authors presented two theories in their proposition: Theorem 1 and Theorem 2. The first theorem, succinctly put, states that delegated monitoring with two-sided simple debt contracts (i.e., intermediated investment) dominates direct investment if the lender's cost of monitoring the intermediary is bounded and the variance of the non-diversifiable macroeconomic risk is sufficiently small. The second, Theorem 2 posits that both risks and cost considerations are essential determinants of bank size. The theory predicts three empirically testable principles. First, that bank will be of finite size with the precise scale dependent upon the structure of monitoring cost and the degree of portfolio diversification that the bank can attain. The second principle is that banks that are better able to diversify risk will be larger in size than banks which are less able to diversify risk. Thirdly, multiple banks with similar risk and cost characteristics may co-exist.

Panzar (1989, cited in Krasa and Villamil, 2003) posited that a bank's size is determined in large part by the cost function while the industry's (banking) size is determined by the market demand curve for banks' services. In 1999, Demirguc-Kunt and Huizinga (1999) presented analyzed the concept of bank size by constructing measures of bank's absolute size and its systemic size. The authors defined absolute size as the size of the bank as it relates to its individual firm's size variables while systemic size refers to a bank's size as it relates to the national economy. The authors argued that absolute size presents banks with a trade-off between risk and return, systemic size is an unmitigated bad, reducing return on assets without a reduction in risk. Should a bank continue to increase in size? Eichengreen and Gibson (2001) posited that the impact of growing banks size on profitability can be positive up to a certain limit, beyond which it becomes negative on profitability. The implication of this is that there is an optimal bank size beyond which a bank is not expected to operate if it wants to continue performing well.

Agency and Skill Uncertainty Theory

Milbourrn, Boot and Thakor (1999) attempted to answer the question why banks were so keen on getting bigger and expanding the scope of their operations? The authors offered two explanations for this practice. First, is the agency theory? This model is premised on the belief that bank managers may pursue size even at the detriment of shareholders. They can be more interested in building reputation incentives, acquiring other banks to become big and expanding their scale of operations. Second is the theory of skill uncertainty. The argument here is that if a bank anticipates that regulators will permit it to engage in a greater variety of activities in the future, but it is uncertain about whether it has the skills to

compete effectively in these markets; it may wish to make investments in these new activities early to resolve the skills uncertainty.

Market Power versus Efficient Structure

Jeon and Miller, (2005) examined two theories of bank performance. Their analysis was hinged on what determines bank performance: market power or efficient structure? They published a paper that considered market power versus efficient theories of correlation between banking concentration (size) and performance in the United States on a state-by-state basis. Jeon and Miller calculated the number of banks in each state, the average return on equity in each state, and the percentage of assets held by the top-5 and top-10 banks measure of size) as well as the Herfindahl-Hirschman index of concentration (a metric for measuring competition), another measure of size, in each state for 1976 to 2000, employing multiple regression in their analysis. The authors found that bank profitability does correlate positively with bank market concentration within a state, even after adjusting for the economic environment within that state. Also, it was discovered that temporal causality tests further showed that bank concentration causes bank profitability, supporting the market-power, rather than the efficient-structure theory of the positive correlation between bank concentration and performance.

Literature on the significance of employee size in the determination of banks' performance are scanty. Bourke (1989) opined that with the large size and the large differences in salaries and wages, the efficient use of labour is a key determinant of relative profitability. According to the author, staff expenses, as conventional wisdom proposes, is expected to be inversely related to profitability because these costs reduce the bottom line or the total operations of the bank. The level of staff expenses appears to have a negative impact on banks ROA. However, Molyneux (1993) found a positive relationship between staff expenses and total profits. The author suggested that high profits earned by firms in a regulated industry may be appropriated in the form of higher payroll expenditures. With respect to the effect of branch network on performance of banks, Jayaratne and Strahan (1998, cited in Gremi, 2013) posited that operating costs and loan losses decrease sharply after states permit state-wide branching and, to a lesser extent, interstate banking. The improvements following branching deregulation appear to occur because better banks grow at the expense of their less efficient rivals.

Empirical Literature

Empirical literature on the impact and significance of size on banks' performance yield no consensus, though subjectively we can expect a positive relationship as a result of economies of scale since larger banks are more able to develop technical,

financial, human and material resources to enhance their efficiency (Karray & Chisti, 2013). De-Bandt, Camara, Pessarossi and Rose (2014) examined the impact of the size of capital structure on the performance of banks in France. The authors performed fixed effects regressions at the bank level and found an unambiguous support of a positive effect of an increase in capital on banks' ROE. This effect does not depend on the way banks choose to increase their capital (specifically through raising equity).

Tomuleasa and Cocris (2014) investigated the major determinants of bank performance in the European banking sector, taking into consideration the most important financial groups from the region. The researchers applied two fixed-effects regression models to a panel of 20 European banks for a period 2004-2012. They found that a significant impact existed between internal factors such as capitalization, asset structure, asset quality, management quality, and bank size and bank profitability in most of the financial groups analyzed. Kristiansen (2012), using a dataset collected from 118 European banks for 2005-2011 investigated whether directors´ network size has effect on bank performance. The researcher used a fairly large (10 166) observations from 23 different countries found to be dependent at three levels (across time, between companies nested within countries and between countries) and applied a longitudinal multilevel model in the analysis. Against the usual thinking that the effect of board size on bank performance was expected to be negative, the researcher found that board size positively affects actual company performance (ROA). This suggests that there are some differences in the way the market values the size of the board and actual performance.

Mirzaei, Liu and Moore (2011) investigated the effects of market power, banking and bank-environment activities on profitability and stability (risk and returns) for a total of 1929 banks in 40 emerging and advanced economies over the sample period of 1999-2008. In the study, the authors incorporated the traditional structure-conduct-performance (SCP) and the relative market- power (RMP) hypotheses with the view to assessing the extent to which the bank performance can be attributed to non-competitive market conditions and pricing behaviour. Their findings are that: i) a greater market power leads to higher bank performance being biased toward the RMP hypothesis in advanced economies; ii) more concentrated banking systems in advanced economies may be more vulnerable to financial instability; iii) neither of the hypotheses seems to be supported for the returns in the emerging banking sector; and iv) higher interest rate spreads increase profitability and stability for both types of economies. However, for banks in emerging economies, this seems to be one of the key elements to increase their profitability. Other interesting findings include that off balance- sheet activities appear to present banks with a trade-off between risk

and returns in advanced economies, and the effects of bank age, bank ownership status and regulation on risk and returns, depend on market power.

Hariyama and Kondo (2012) examined the effects of branch expansion on the cost and profit efficiency among the Japanese regional banks over the period 1999-2009. The authors used the stochastic frontier analysis (SFA) to estimate the impact of branch expansion on bank performance. They found that local banks without branch expansion have improved cost efficiency while regional banks with branch expansion in certain level exhibit higher cost efficiency. On the other hand, regional banks with no branch expansion have lower profit efficiency. The summary of their findings was that adequate levels of branch expansion have positive impacts on both cost and profit efficiencies. On the significance of deposit size to bank's performance, Dietrich and Wanzeried (2009) used 1,919 observations from 453 banks to investigate the determinants of commercial banks profitability in Switzerland. Their results showed that the yearly growth in deposits did not affect profitability significantly. They found no empirical evidence that commercial banks in Switzerland were able to convert at an increasing amount of deposit liabilities into significantly higher income earning assets. There are ample literatures on the determinants of banks profitability in developing economies.

Nodeh, Anuar, Ramakrishman and Raftnia (2016) studied the effects of board structure determinants (board independence, board size) on banks financial performance in Malaysia. The study also investigated the role of bank size (taken as log of asset) as moderator on relationship between board size and board independence with banks financial performance using the data of 37 Malaysian banks (21conventional and 16 Islamic) using Ordinary Least Square regression method and Fixed Effect Method. They found that board size positively impacts on firm financial performance. Also, they concluded that size positively moderated the relationship between board structure determinants and bank financial performance.Saona (2016) examined the intra- and extra-bank determinants of Latin American banks' performance during the period 1995-2010. The researcher's empirical analysis combined intra-bank determinants of its performance (bank-based variables) and extra-bank variables (institutional-based exogenous variables) through the GMM system estimator. The study found an inverse U-shaped relationship between the capital ratio (a measure of size) and profitability, and also that asset diversification impacts positively the banks' performance.

Masud and Haq (2016) made an attempt to analyze the financial soundness and trend analysis of selected private commercial banks of Bangladesh for the period 2006 to 2014 using different statistical tools and financial indicators. They found

that a bank with higher deposits, loans & advances, investments, branches, employees does not always mean that it has better profitability performance.
Lelissa, (2014), in a study carried out on Ethiopian banks, observed that bank specific variables by large explain the variation in profitability (Return on Assets). According to the researcher, high performance is related to the ability of banks to control their credit risk, diversify their income sources by incorporating non-traditional banking services and control their overhead expenses. On the other hand, the paper finds that bank size has no significant impact on banks' profitability. However, inflation rate was discovered to be a significant driver to the performance of the Ethiopian commercial banks. Empirical works that directly address the relationship between bank size variables (such as branch network, number of employees, assets, deposit) and performance of Nigerian banks are scanty. Most of the studies available in this regard have concentrated on the effects of size on firm's performance generally as well as impact of board size, consolidation/recapitalization exercise and liquidity on the performance of Nigerian banks.

Ani, Ugwunta, Ezeudu and Ugwunanyi (2012) studied 15 Nigerian banks to investigate the determinants of bank profitability over 10 years. The author used a data set of 147 bank level observations over a 10-year period from 2001 to 2010 and employed the use of Pooled Ordinary Least Squares stated in a multiple regression form to estimate the coefficients. Their observation was that increase in size (higher total assets) may not necessarily lead to higher profits due to diseconomies of scale and that higher capital-assets ratio and loans and advances contribute strongly to bank profitability. However, we observe that all the determinants variables used are assets related, i.e. total loan to total asset ratio, total equity to total assets ratio and logarithm of total assets. It is our opinion that the effect of other variables apart from assets (such as deposits size, branch network and number of employees) on bank performance needs to be examined.
In a study conducted by Olaoye and Olanrewaju (2015) to examine the determinants of deposit money banks' profitability in Nigeria, the authors used pooled least square (cross section specific) on the data of 15 quoted banks in Nigeria for 9 years to find the relationship between profitability (performance) and capital adequacy, asset quality, deposit structure, loan/asset ratio, bank size (assets size), Gross Domestic Product and yearly inflation rate. The authors found out that there exists either positive or inverse relationship between return

RESEARCH METHOD

Theoretical Framework

This research method is based on the theory of optimal bank size by Eichengreen and Gibson (2001). The theory of optimal bank size posits that the impact of growing banks size on profitability can be positive up to a certain limit, beyond

which it becomes negative on profitability. The optimal size of a bank is primarily determined by economies of scale.

Model Specification

The research developed a panel data model by building upon the existing empirical models to investigate the relationship between size and performance of selected commercial banks in Nigeria. The study employed the panel data econometric technique to test the significance of various size indicator variables on performance. The model adopted in this study is a modification of Ani, Ugwunta, Ezeudu and Ugwunayi (2012) in their study on "An empirical assessment of the determinants of bank profitability in Nigeria: Bank characteristics panel approach". This study modified their model to accommodate three different size variables which are important determinants of bank performance: deposit volume, number of employees and branch network in addition to assets volume which is already included in their model. The model is specified as follows:

$$\Pi_{it} = f(TA_{it}, DV_{it}, NE_{it}, BN_{it}) \quad (1)$$

Specifying equation (1) as an econometric model, the model specification for this study is as follows:

$$\prod_t = \alpha_0 + \alpha_1 TA + \alpha_2 DV + \alpha_3 NE + \alpha_4 BN + \varepsilon_t \quad (2)$$

where:

Π	=	Profit After Tax
TA	=	Total Assets
DV	=	Deposit Volume
NE	=	Number of Employees
BN	=	Branch Network
α_i	=	Regression parameters
ε	=	Stochastic Error terms
t	=	Time

Data Sources

The data used in this study are from secondary sources. This study used the annual data of 15 selected commercial banks in Nigerian spanning year 2000 to 2015. The choice of years is to enable the researcher examine the pre- and post-consolidation effects of size on the performance of banks under study. The data was sourced from the Stock Exchange Fact book as well as the annual reports of the banks. Data were also retrieved from the websites of these banking firms.

ESTIMATION TECHNIQUES

Panel Data Analysis

A panel has the form:

$$n_{it}, i = 1,...,n \quad t = 1,...,t, \quad (3)$$

where i is the individual dimension and t is the time dimension. A general panel data regression model is written as

$$y_{it}, = \alpha + \beta' X_{it} + \mu_{it}. \quad (4)$$

Different assumptions can be made on the precise structure of this general model but two important models are the *fixed effects model* and the *random effects model.*

The fixed effects model is denoted as

$$y_{it}, = \alpha + \alpha' X_{it} + \mu_{it}, \quad (5)$$

$$\mu_{it} = \mu_i + v_{it}. \quad (6)$$

μ_i are individual-specific, time-invariant effects (for example in a panel of countries this could include geography, climate etc.) and because we assume they are fixed over time, this is called the fixed-effects model.

The random effects model assumes, in addition, that:

$$\mu_i \approx i.i.d.N(0, \sigma_\mu^2) \quad (7)$$

and,

$$v_{it} \approx i.i.d.N(0, \sigma_v^2) \quad (8)$$

that is, the two error components are independent from each other.

Granger Causality Modelling

In order to ascertain the causation between size and bank performance, and determine the direction of causation, the Granger causality test is performed as follows:

$$Y_t = \sum_{i=1}^{k} a_i X_{t-i} + \sum_{j=1}^{k} b_j Y_{t-j} + u_{1,t} \quad (9)$$

$$X_t = \sum_{i=1}^{k} c_i Y_{t-i} + \sum_{j=1}^{k} d_j X_{t-j} + u_{2,t} \quad (10)$$

X and Y in the equations are stationary time series.

The standard Granger causality test examines whether past changes in one stationary variable X_t help predict current changes in another stationary variable Y_t, beyond the explanation provided by past changes in Y_t itself (Granger, 1969; 1986). If not, then X_t does not "Granger cause" Y_t. Granger causality test is used because the evidence reported in Geweke and Hudak (1983) shows that it outperforms other causality tests in a series of Monte Carlo experiments. From Equations (9) and 10), the hypothesis that X does not Granger cause Y is rejected if a_t and d_t are jointly significant. The dimensionality of regressors in the Granger causality regressions are determined by the Akaike and Schwarz information criteria (AIC, SIC, respectively). The objective is to select a lag length that minimizes AIC or SIC or both.

Evaluation Techniques

The evaluation consists of deciding whether the estimates of the parameters are theoretically meaningful and statistically significant. For this purpose, various criteria are employed which includes; the economic *a-priori* criteria, the statistical criteria (coefficient of multiple determination /R^2/,test of overall significance /*F-test*/ and the Hausman test.

A-priori Expectation

This study hypothetically expects that there is a direct relationship between profit after tax (Π) and assets volume (TA), deposit volume (DV) and branch network (BN) while the number of employees (NE) is expected to have an inverse relationship with the profit after tax. Hence, the *a–priori* expected relationships are mathematically expressed below:

$$\frac{\partial \Pi_t}{\partial TA_t}>0,\ \frac{\partial \Pi_t}{\partial DV_t}>0,\ \frac{\partial \Pi_t}{\partial NE_t}<0,\frac{\partial \Pi_t}{\partial BN_t}>0. \qquad (11)$$

Hence, there is expected to be a positive affiliation between TA, DV, and BN (bank size) and bank Π(performance). Conversely, there is expected to be a negative relationship between NE (number of employees and profit after tax (performance).

RESULTS AND DISCUSSION

Pooled OLS Regression Model

In the pooled OLS regression model, the study pooled all the 240 observations and ran the regression model without cognisance of the cross section and time series nature of data. The result of the pooled OLS regression model is presented in Table 1.

Table 1: Extracts from the Pooled OLS Regression Models Result

Dependent Variable = Π				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	163252.4	17896.32	0.091221	0.9274
TA	0.015379	0.007787	1.975088	0.0497
DV	0.008401	0.011073	0.758732	0.4489
NE	-2809.98	13031.32	-2.156111	0.0323
BN	1199.848	801.2897	1.497395	0.1359
R-Squared	0.495989			
Adjusted R-Squared	0.485651			
F-Statistic	47.97413			
Prob(F-statistic)	0.000000			

Source: Author's Computation, 2017.

The first objective of this study is to examine the effects of size (TA, DV, NE and BN) on bank performance (Π). The null hypothesis to be tested here is that size does not have significant effect on bank performance. Table 1 shows the result of the pooled OLS regression model. It is evident from the estimated model that all the variables in the model depict positive relationship with the dependent variable except the Number of Employees *(NE)* variable which has a negative relationship. The parameter estimates of *TA, DV,* and *BN* variables conform to the expected *a-priori* expectation of positive relationship between size and bank performance while the estimated parameter of *NE* variable is in conformity with the *a-priori* inverse relationship between NE and Π. From the analyses, a billion naira (₦bn) change in total asset (TA) and deposit volume (DV) will bring about an increase of 1.5379% and 0.8401% respectively. An additional branch (BN) will bring about ₦1, 199.848 increases in the dependent variable *(Π)*. However, a unit increase in the Number of Employees *(NE)* will bring about a decrease of ₦28,096.98 in the bank's profitability. But based on the probabilities of the explanatory variables, that is TA (0.0497), DV (0.4489) and BN (0.1359), their effects, though positive, are not statistically significant at 5% level of significance. Only the effect of NE (with probability, 0,0323), which is negative, is statistically significant at 5% level of significance.

The R^2 value of 0.495989 connotes that about 49.59% (or 50% approx) of the degree of variation in the dependent variable is explained by the explanatory variables. Nonetheless, the estimated model is statistically significant in its overall assessment looking at the significance of the F-statistics from its probability value. However, as earlier pointed out, a major problem with this model is that it does not distinguish between the various banks that were studied in that it assumed that all the fifteen (15) banks are homogeneous in all its characteristics, which normally is not so. By pooling the fifteen (15) banks, the study denied heterogeneity or individuality that may exist among the fifteen banks selected for analysis in this study. Therefore, it was imperative to carry out the fixed and random effects analyses.

Fixed Effect or Least Square Dummy Variable (LSDV) and Random Effects Models

The fixed effect or LSDV model allows for heterogeneity or individuality among the fifteen banks by allowing each bank has its own intercept value. The term fixed effect is due to the fact that although the intercept may differ across banks, the intercept does not vary over time, that is, it is time invariant. Generally, the inclusion of the fixed effect is to identify the effect of some variables that are not captured in the original pooled OLS model. In the case of the random effect model, the fifteen banks used for the purpose of analysis in this study are assumed to have a common mean value for the intercept. The random effect

assumes that the heterogeneity is random rather than fixed and that the random effect is incorporated into the error term, thus forming a composite error term. The result of the fixed effects and the random effects models is presented in Table 5.

Table 2: Extracts from the Fixed Effects and Random Effects Model Regression Results

Fixed Effects Model					Random Effects Model				
Dependent Variable = Π					Dependent Variable = Π				
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	546820.3	2370363	0.230691	0.8178	C	233114.0	2198273	0.106044	0.9157
TA	0.006031	0.008329	0.724166	0.4699	TA	0.010953	0.007865	1.392605	0.1653
DV	0.022350	0.011995	1.863315	0.0640	DV	0.014938	0.011239	1.329178	0.1853
NE	-2508.08	15105.47	-1.66053	0.0985	NE	-26873.8	13481.29	1.993413	0.0476
BN	836.3533	907.7163	0.921382	0.3581	BN	1028.471	819.7034	1.254687	0.2111
R-Squared			0.563949		R-Squared			0.447623	
Adjusted R-Squared			0.520584		Adjusted R-Squared			0.436292	
F-Statistic			13.00493		F-Statistic			39.50494	
Prob(F-statistic)			0.000000		Prob(F-statistic)			0.000000	

Source: Author's Computation, 2017.

Presented in Table 2 are the fixed effects and the random effects regression estimates. It is shown that out of the four explanatory variables, three (TA, DV and BN) conform to the expected *a-priori* relationship of positive effects on the dependent variable in both the fixed effects and the random effects model estimates while the Number of Employees (NE) variable has a negative relationship with PAT all through. The specific effect of each of the explanatory variables on the dependent variable is shown in the coefficient column of Table 5. The R^2 values for both fixed effects and random effects model show the total variation in Profit after Tax (Π) as explained by the explanatory variables. In its overall, the models are statistically significant as revealed by the statistical significance of its *F*-statistic. However, in order to ascertain the appropriate choice of either of these estimated models, the study employed the use of Hausman Test.

THE HAUSMAN TEST

The Hausman Test is conducted to test if there is a substantial difference between the estimates of the fixed effect estimator and that of the random effect estimator. The null hypothesis underlying the test is that fixed effect estimates do not differ significantly from the random effect estimates. The test statistic developed by Hausman has an asymptotic chi-square distribution. Having estimated the models above, we shall have to decide which model is good to accept.

Hausman Test Hypothesis:

H_0: Random effect model is appropriate

H_1: Fixed effect model is appropriate

If the probability value of the Chi-Square Statistics is statistically significant, we shall use fixed effects model, otherwise, the random effects model is appropriate.

Table 3: Extract from the Hausman Test Result

Test Summary	Chi-square statistic	Chi-square d.f.	Prob.
Cross-section random	3.716237	4	0.4458

Source: Author's Computation, 2017.

Looking at the Chi-square values of the cross-section random in Table3, the probability values of the Chi-square statistics is 44.58%. This probability value is more than 5%, this implies that, we accept the null hypotheses (H_0) and we reject the alternative hypotheses (H_1), hence, we conclude that the random effects model is the appropriate model to accept for analytical purpose. Nonetheless, looking at the estimated random effects model accepted as the appropriate model as shown in Table 2, it is evident that the Total Assets (TA), Deposit Volume (DV) and Branch Network (BN) all have positive, but insignificant effects on the performance of the various banks examined while the Number of Employees (NE) variable has negative and significant effect on the performance of the banks. The positive effect of the total assets on profitability is expected. It should be noted that the two major types of banking assets are loans and securities held. Other assets include cash, premises, real estate and other fixed assets. All these are instruments the banks use to earn revenue. Of all these, the main income earning assets for a bank are loans. The positive effect of the total assets variable on bank performance can be ascribed to the fact that the banks examined have enough assets at hand to trade with. Conversely, the non-significance of this positive effect connotes that these assets are not earning optimal revenue that is significant enough to further enhance bank profitability. From the appropriate random effects model, it is evident that a billion naira increase in the total assets variable will bring about an insignificant increase of 1.084% in the performance of the banks. Based on this result, the null hypothesis that Total Assets as a size variable has no significant effect on bank profitability in Nigeria is accepted.

Furthermore, deposit volume consists of money and security deposits placed into banking institutions for safekeeping. Deposit is a liability owed by the bank to the depositor. Be that as it may, banks use these deposits to trade, acquire more assets and invariably influence their profits. Expectedly, effective deposit mobilization (at low cost) will positively affect profitability. Also, the positive effect of this variable can partly be ascribed to the reduction in holding of liquid cash by bank customers occasioned by the cashless policy. This policy makes cash flow in circle from banks to banks. Rather than the primitive cash at hand means of transaction on daily basis, money goes directly into the account of the recipient via mobile or internet banking. This has made it easier for banks to still be able to

hold the cash deposited with them in form of assets. Also, even though customers make cash withdrawals on the counter, the daily withdrawal limit as recently introduced by the Central Bank of Nigeria has offset the limitless withdrawals by customers so that banks can still have more for investment. This however, does not rule out the fact that depositors in both savings and current accounts still make withdrawals, especially through the ATM., hence the insignificant nature of the positive effect of deposit volume on banks' profitability. Thus, a billion naira increase in the deposit volume variable will bring about an insignificant increase of 1.49% in bank performance. Hence, the null hypothesis is accepted that deposit volume has no significant effect on the performance of commercial banks in Nigeria.

The number of employees (NE) refers the numbers of active staff of the various banks. The negative and significant effect of the number of employee variable is easily explainable as the fact that more workers mean more salaries and wages. Necessary hands should be on deck to boost efficiency through effective staff cost management and reduce the menace of overstaffing and redundancy. A unit increase in the number of employees' will bring about a decrease of 26.873% decrease in the banks' profitability. The null hypothesis that the number of employees has no significant effect on bank profitability is hereby rejected and the alternative hypothesis accepted. Also, this result conforms with the *a-priori* expectation of a negative relationship between number of employees and the profitability of commercial banks in Nigeria. Branch network denotes the number of branches of the various banks across the nation. Though this variable has a positive effect on the banking performance, the effect is not statistically significant. This connotes that having so many branches does not necessarily mean that such banks will outperform the ones with fewer branches. Opening up branches involves both sunk cost and operational costs. A unit change in the branch network variable will bring about an insignificant increase of 10.28.471% in the performance of the banks. The null hypothesis that branch network has no significant effect on banks' profitability is hereby accepted. The R^2 value of 0.447623 means that about 44.76% (approx 45%) of the degree of variation in the dependent variable (bank performance) is explained by the explanatory variables {Total Assets *(TA)*, Deposit Volume *(DV)*, Number of Employees *(NE)* and Branch Network *(BN)*}. This means that about 55% of the degree of variation in banks' profitability (Π) is explained by other characteristics not captured in the model of this study. The estimated model is statistically significant in its overall looking at the significance of the F-statistics from it probability value. These results and analyses sufficiently addressed the first objective as well as the first hypothesis of this study.

GRANGER CAUSALITY TEST

The second objective of this study is to ascertain the direction of causality between size and profitability of selected commercial banks in Nigeria. This is captured in the third null hypothesis: There is no causal relationship further between size and bank performance in Nigeria. Granger (1969) proposed that if causal relationship exists between variables, these variables can be used to predict each other. The author pointed out that in causality approach, a variable say Y, is caused by X if Y can be predicted better from past values of Y and X than from past values of Y alone. The causality test helps to ascertain whether a uni-directional or bi-directional (feedback) relationship exists between size and profitability of commercial banks in Nigeria. To achieve this, this study employed the Granger-causality statistic to test the causality between bank performance and bank size as well as to determine the predictive content of one variable beyond that inherent in the explanatory variable itself. This researcher's choice for the Granger procedure is because it consists the more powerful and simpler way of testing causal relationship. In order to carry out the Granger causality test, the following bi-variate model is estimated:

$$BP_t = \beta_0 + \sum_{k=1}^{M} \beta_k BP_{t-k} + \sum_{j=1}^{N} \alpha_1 BZ_{t-1} + \mu_t \quad \text{---------- (12)}$$

$$BZ_t = \gamma_0 + \sum_{k=1}^{M} \delta_k BZ_{t-k} + \sum_{j=1}^{N} \gamma_1 BP_{t-1} + v_t \quad \text{----------(13)}$$

where:

BP_t = the dependent in Equation (3) above which connotes Bank Performance

BZ_t = the explanatory variable which connotes Bank Size

u_t and v_t = mutually uncorrelated error terms (i.e. zero mean white noise error terms)

BZ_t = the dependent in Equation (4) above which connotes Bank Size

BP_t = the explanatory variable which connotes Bank Performance

'k' and 'l' = the number of lags

The null hypothesis is $\alpha_l = 0$ for all l's and $\delta_k = 0$ for all k's versus the alternative hypothesis that $\alpha_l \neq 0$ and $\delta_k \neq 0$ for at least some of the l's and k's. If the coefficients α_l's are statistically significant but δ_k's are not, then bank size Granger causes bank performance. In the reverse case, bank performance Granger causes bank size. If both α_l and δ_k are significant, then causality runs both ways.

The decision rule of the causality test states that if the probability value of the estimate is higher than the 5 percent (0.05) level of significance, we do not reject the null hypothesis, and vice versa. C.J. Granger (1969) proposed that if causal relationship exists between variables, they can be used to predict each other. Results from Granger causality test are given in Table 4

Table 4: Result of Granger – Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
TA does not Granger Cause Π	197	20.2370	1.E-11
PAT does not Granger Cause TA		4.13075	0.0175
DV does not Granger Cause Π	197	17.4661	1.E-10
PAT does not Granger Cause DV		0.99554	0.3700
NE does not Granger Cause Π	166	2.62150	0.0756
PAT does not Granger Cause NE		0.69184	0.5021
BN does not Granger Cause Π	179	2.24082	0.1092
PAT does not Granger Cause BN		0.04721	0.9539
DV does not Granger Cause TA	198	19.4636	1.E-11
TA does not Granger Cause DV		0.72487	0.4859
NE does not Granger Cause TA	166	1.78099	0.1717
TA does not Granger Cause NE		0.83897	0.4339
BN does not Granger Cause TA	179	0.63757	0.5297
TA does not Granger Cause BN		1.69421	0.1873
NE does not Granger Cause DV	165	0.59919	0.5503
DV does not Granger Cause NE		0.56851	0.5674
BN does not Granger Cause DV	178	1.07987	0.3420
DV does not Granger Cause BN		0.33027	0.7191
BN does not Granger Cause NE	169	1.87551	0.1562
NE does not Granger Cause BN		3.48100	0.0329

Source: Author's Computation from EViews 7.0 (2017)

The results of the Granger causality in Table 4 revealed that there is a bi-directional causality relationship bank performance and total assets. This means that both TA and Π propel each other. Conversely, there exists a uni-directional causality between deposit volume and profit after tax (bank performance), which runs from deposit volume to profit after tax. Both the number of employees and branch network has a nil causality with profit after tax. In addition, there exists a uni-directional causality between deposit volume and total assets which runs from deposit volume to total assets. Furthermore, number of employees and total assets; branch network and total assets; number of employee and deposit volume; and branch network and deposit volume all have nil causality. Finally, branch network and numbers of employees have a uni-directional causality which runs from numbers of employee to branch network. These results reveal that the third null hypothesis cannot be generalized for all the size variables as there exist

causal effects between Total Assets (TA) and Profit After Tax (Π) and Deposit Volume (DV) and Π. Hence, for these two size variables, the null hypothesis is rejected. However, for number of employees (NE) and branch network (BN), since there exists no causal relationship between them and the Π, the null hypothesis is accepted. These results have sufficiently addressed the third objective and hypothesis of the study.

CONCLUSION AND RECOMMENDATIONS

The general objective of this research is to examine the effects of size on the performance of selected commercial banks in Nigeria for the period of 2000 – 2015 using 15 different banks for cross-sectional analysis. The other objectives are to examine whether there exists a break in the effects of size between the pre- and post-consolidation eras in the Nigerian banking industry. The study employed panel data econometric techniques to test the significance of various size indicator variables on bank performance. In the panel data analysis, the Hausman test confirmed that the random effects model is the appropriate model for analytical purpose. In the random effects model, it was shown that bank size does affect bank performance. Specifically, while the banks' total assets, deposit volume and branch network have positive effects on the profit after tax, their number of employees have a negative effect on the profit after tax. An increase in the volume of total assets, deposit volume and branch network will increase the profit after tax, while an increase in the number of employees will lead to a reduction in the profit after tax.

However, majority of these effects (total assets, deposit volume and branch network) are not statistically significant. Only the effect of number of employees, which is negative, is statistically significant. The implication of these findings is that size affects banks' performance, though the effects can be positive or negative. When effectively managed, size should positively affect bank performance. Secondly, the empirical results of the Granger causality test conducted confirmed that there exists a significant causality between some bank size variables (total assets and deposit volume) and bank performance, while number of employees and branch network have no causal relationship with the profit after tax. It can be inferred from these results that while some banks' size variables Granger cause the profit after tax, others do not. This necessitates the need for bank managers to pragmatically manage the variables that Granger cause the profit after tax on one hand, and the variables that hitherto have no causal relationship with the profit after tax to positively and significantly do so on the other. The outcome of these analyses is in conformity with the theory of optimal bank size by Krasa and Villamil (1992, 2003) which posits that that the impact of growing banks' size on profitability can be positive up to a certain limit, beyond which it becomes negative on profitability. The study also confirms the

findings of Ani, Ugwunta, Ezeudu and Ugwuanyi (2012) that bigger size does necessarily lead to higher profitability and Athanasoglou, Brissimis and Delis (2005) that the effect of a growing bank size has been proved to be positive to certain extent beyond which it will be negative. The elementary theory of returns to scale is relevant as confirmed by the results of this study. Diseconomies of scale can arise as banks' size increases. The case of the impact of number of employees which has a negative effect on bank performance is of particular interest to this researcher. Banks cannot continue to increase their employees stock indefinitely else, they incur considerable cost which will deplete their profits after tax.

This study recommends the need for more pragmatic size management efforts by commercial banks in Nigeria: The size variables employed in this study (total assets, deposit volume, number of employees and branch network) are theoretically expected to exert positive and significant effects on the performance of the selected commercial banks. On the contrary, the study reveals that out of the four size variables, the positive effects of three among them (total assets, deposit volume and branch network) are not significant, while the number of employees have negative and significant effect on banks' performance. This calls for a more pragmatic approach to the management of the stated size variables by bank managers in order for banks to enjoy the advantage of scale economies that should ordinarily be inherent in increased size. Banks should effectively manage their assets (both fixed and liquid), volume of deposit available for investment, and branch network for optimal returns. In addition, there is the need for cost effective human resource practices by banks. This is sequel to the negative and significant effect of number of employees on the performance of banks under study.

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APPENDIXI: POOLED PANEL REGRESSION RESULTS

Pooled OLS Regression Result

Dependent Variable: Π
Method: Panel Least Squares
Date: 11/05/17 Time: 03:44
Sample: 2000 2015
Periods included: 16
Cross-sections included: 15
Total panel (unbalanced) observations: 200

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	163252.4	78963.20	0.091221	0.9274
TA	0.015379	0.007787	1.975088	0.0497
DV	0.008401	0.011073	0.758732	0.4489
NE	-28096.98	13031.32	-2.156111	0.0323
NB	11199.84	8801.289	1.273950	0.1359

R-squared	0.495989	Mean dependent var	80576.76
Adjusted R-squared	0.485651	S.D. dependent var	116847.8
S.E. of regression	51816.42	Akaike info criterion	25.09375
Sum squared resid	4.49E+10	Schwarz criterion	25.16011
Log likelihood	-2588.375	Hannan-Quinn criter.	25.12071
F-statistic	47.97413	Durbin-Watson stat	1.312185
Prob(F-statistic)	0.000000		

Source: Author's Computation from EViews 7, (2017).

Fixed Effect/LSDV Model Result

Dependent Variable: Π
Method: Panel Least Squares
Date: 11/05/17 Time: 03:45
Sample: 2000 2015
Periods included: 16
Cross-sections included: 15
Total panel (unbalanced) observations: 200

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	54820.32	37036.23	0.230691	0.8178
T	0.000603	0.000832	0.724166	0.4699
D	0.012350	0.011995	0.863315	0.0640
N	E-12083.08	15105.47	-1.660530	0.0985
B	N836.3533	907.7163	0.921382	0.3581

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.563949	Mean dependent var	80587.6
Adjusted R-squared	0.520584	S.D. dependent var	116847.8
S.E. of regression	46570.21	Akaike info criterion	23.91892
Sum squared resid	3.89E+10	Schwarz criterion	24.14216
Log likelihood	-3573.892	Hannan-Quinn criter.	24.00571
F-statistic	13.00493	Durbin-Watson stat	1.870444
Prob(F-statistic)	0.000000		

Source: Author's Computation from EViews 7, (2017)

Random Effect Model Result

Dependent Variable: Π

Method: Panel EGLS (Cross-section random effects)
Date: 11/05/17 Time: 03:46
Sample: 2000 2015
Periods included: 16
Cross-sections included: 15
Total panel (unbalanced) observations: 200
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2331114.0	1982730.0	1.060440	0.9157
TA	0.010953	0.007865	1.392605	0.1653
DV	0.014938	0.011239	1.329178	0.1853
NE	-2687.781	3481.29	-1.993413	0.0476
NB	1028.471	819.7034	1.254687	0.2111

Effects Specification

	S.D.	Rho
Cross-section random	4096105.	0.0724
Idiosyncratic random	14657021.	0.9276

Weighted Statistics

R-squared	0.447623	Mean dependent var	1861891.
Adjusted R-squared	0.436292	S.D. dependent var	1951985
S.E. of regression	4646160	Sum squared resid	1.10E+16
F-statistic	39.50494	Durbin-Watson stat	1.204381
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.494984	Mean dependent var	1805876.
Sum squared resid	4.50E+16	Durbin-Watson stat	1.118688

Source: Author's Computation from EViews 7, (2017)

Hausman Test Result

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	3.716237	4	0.4458

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
TA	0.006031	0.010953	0.000008	0.0713
TDV	0.012350	0.014938	0.000018	0.0770
NE	-1.51E-05	4.64E-03	1.4	-2.687378	0.7917
BN	836.3532	1028.477	52035.20	0.6212

Cross-section random effects test equation:

Dependent Variable: Π

Method: Panel Least Squares

Date: 11/05/17 Time: 03:46

Sample: 2000 2015

Periods included: 16

Cross-sections included: 15

Total panel (unbalanced) observations: 200

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	546820.3	237036	3.0	2.306910	0.8178
TA	0.006031	0.008329	0.724166	0.4699
TDV	0.012350	0.011995	1.029631	0.3040
NE	-2.50E-03	0.081051	-0.030847	0.9754
BN	836.3539	707.7163	1.181982	0.2389

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.563949	Mean dependent var	805876.0
Adjusted R-squared	0.520584	S.D. dependent var	1168478
S.E. of regression	465702.2	Akaike info criterion	29.01891
Sum squared resid	3.89E+12	Schwarz criterion	29.41216
Log likelihood	-2893.891	Hannan-Quinn criter.	29.17857
F-statistic	13.00493	Durbin-Watson stat	1.870442
Prob(F-statistic)	0.000000		

Source: Author's Computation from EViews 7, (2017)

Granger Causality Test Result

Pairwise Granger Causality Tests
Date: 12/05/17 Time: 10:31
Sample: 2000 2015
Lags: 2

Null Hypothesis:	F-Statistic	Prob.
TA does not Granger Cause PAT	10.1370	0.0001
PAT does not Granger Cause TA	4.13079	0.0175
DV does not Granger Cause PAT	17.4603	0.0001
PAT does not Granger Cause DV	0.09534	0.9114
NE does not Granger Cause PAT	12.6115	0.0015
PAT does not Granger Cause NE	0.69184	0.5211
BN does not Granger Cause PAT	11.1406	0.0024
PAT does not Granger Cause BN	0.04712	0.9541
DV does not Granger Cause TA	19.4634	0.0001
TA does not Granger Cause DV	0.71489	0.5117
NE does not Granger Cause TA	11.7809	0.0021
TA does not Granger Cause NE	0.63693	0.5444
BN does not Granger Cause TA	10.6377	0.0029
TA does not Granger Cause BN	1.69411	0.2161
NE does not Granger Cause DV	10.5999	0.0030
DV does not Granger Cause NE	0.56853	0.5774
BN does not Granger Cause DV	11.0798	0.0024
DV does not Granger Cause BN	0.33012	0.7240
BN does not Granger Cause NE	11.8755	0.0018
NE does not Granger Cause BN	3.48104	0.0551

Source: Author's Computation from EViews 7(2017)