

## **PERFORMANCE EFFICIENCY OF SELECTED QUOTED COMMERCIAL BANKS IN NIGERIA: A DEA APPROACH**

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### **Abstract**

*This study examines performance efficiency of nineteen selected commercial banks in Nigeria for the year 2009. The use of Descriptive Statistics and Data Envelopment Analysis (DEA) approach are employed to measure and evaluate the performance efficiency of the Nineteen sampled banks. The Data Envelopment Analysis (DEA) has been found to measure efficiency of banks with more precision and lower magnitude of inefficiency than other approaches. Three performance efficiency scores of constant returns to scale (CRS), variable returns to scale (VRS) and scale efficiency models are used, unlike previous studies, which concentrated on CRS or VRS alone. Overall, the results show that small and medium banks were more efficient than mega banks. The study therefore recommends amongst others that mega banks should adopt performance efficiency – enhancing strategies in order to make them contribute more to the national economy.*

*Keywords: Performance efficiency, DEA, CRS, VRS*

### **INTRODUCTION**

Banks play a central role in the economy. They keep the savings of the public and finance the development of business and trade. Furthermore, numerous studies argue that the efficiency of financial intermediation affects economic growth while others indicate that bank inefficiencies can result in systemic crises which have adverse consequences for the economy as whole (Duygun-Fethi and Pasiouras, 2009).

Thus, the performance of banks has been an issue of major interest for various stakeholders such as depositors, regulators, customers, and investors. Research on the performance efficiency of banks has occupied a central stage in empirical finance literature in recent times (Danesh, 2007; Akhtar and Sadqat, 2010). Previous research on bank performance efficiency has been traditionally evaluated on the basis of conventional financial ratios such as returns on asset (RoA) and Returns on equity (RoE). At other times many studies used various measures of performance which include financial index (Wu et al., 2006).

Given the inevitable role of banks in the growth process of Nigeria which has necessitated the reforms process of building a strong banking institution that can weather the storm in times of financial crises, the issue of efficiency of banks has become more important. It is therefore not surprising that their operations are perhaps the most heavily regulated and supervised of all businesses (Soyibo and Adekanye, 1991). Evaluating their overall performance efficiency and monitoring their financial health is important to all and sundry. The importance of performance efficiency in the financial sector is extremely vital because it has an extensive impact on the micro and macro levels of the economy. In order to properly allocate economic resources and carry out their intermediation function, the financial system; banks inclusive, needs to be efficient. Efficiency in banking then supports the fruitfulness of implemented macro economic policies generating durable development, economic growth and welfare (Alkhatlan and Malik, 2010).

Policy makers, economists and monetary authorities recognize that the ability of banks to achieve the desired results and to continue to play the role earmarked for them depends not only on the existence of an enabling (regulatory) environment and the number of operating banks (and perhaps, the spread of bank branches) but more on their performance efficiency (Olugbenga and Olankule, 1998).

Inefficiency of banks manifest in multifarious forms with adverse implications for the growth prospect of the domestic economy, ranging from inability for effectively perform the intermediation role, high cost of transactions and resultant inability for private investors to access loanable funds, financial crisis and the eventual loss of confidence in the banks due to financial distress. All these will negatively affect and obliterate any policy objective of steering economic growth of Nigeria to the desire threshold.

The Data Envelopment Analysis (DEA) has been found to measure efficiency of banks with more precision and lower magnitude of inefficiency than other approaches (Berger and Humphrey, 1997). Given the fact that the DEA has not been applied to Nigerian banks, this study intends apply the technique to examine varying efficiency patterns across selected quoted Nigerian Banks.

To this end, the rest of the paper is organized as follows. Section 2 briefly surveys the literature on bank efficiency and banking sector in Nigeria. Section 3 describes the methods and data sources. The results are presented in section 4 and section 5 concludes the paper.

## LITERATURE REVIEW

### Conceptual Issues and Empirical Evidence

Following the pioneering work of Charnes, Coopers and Rhodes (1978) on the Data Envelopment Analysis (DEA), the measurement of bank efficiency has become more analytical. The DEA is based on the application of economic production theory to the behaviour of a banking firm. It is a non-parametric linear programming technique for evaluating the relative efficiencies of multiple decision making units (DMU's). Essentially, banks are seen as attracting deposits and incurring interest expenses, salary expenses, premises and fixed assets as well as other non-interest expenses (as inputs) to generate loans and investments/earning assets and total interest income (as outputs). The use of DEA is predicated on how efficiently a bank transforms inputs into outputs as a good measure of management quality. This efficiency measure of a banks management quality is relative to the efficiency of its peers within the industry. The technique reflects the conversion of multiple inputs into multiple outputs and associates a scalar measure to reflect the efficiency in conversion. The conversion is accomplished by comparing the mix and volume of services provided and the resources used by each bank compared with all other banks (Olugbenga and Olankunle, 1998; Hassan, Mohammed and Bader, 2009).

Studies by Hassan et al, 2009; Alkathlan and Malik, 2010) regarded fixed assets, total funds, interest and non interest expenses; total deposits, labour and capital as bank inputs, while outputs included total loans, revenue, profit, interest income, investment, e.t.c

Siems (1992) applied DEA to assess the significance of management quality in distinguishing surviving from failed banks in the USA. Using a sample of 611 surviving banks and 319 failed banks, the study showed that management quality is vital for a bank's long term survival.

Yue (1992) applied the same DEA technique to analyse the efficiency of 60 Missouri banks for the period 1984 to 1990. The methodology provided for the evaluation of the relative efficiency of different banks at the same time and the assessment of inter temporal changes in the performance of individual banks.

A study of Indian commercial banks by (Das and Gash, 2009) suggests that average cost efficiency of Indian banks was quite low at 23%. Correlating the efficiency scores with RoA and RoE, it observes that profit efficiency and accounting measures have strong association. Moreover, correlation of the efficiency results with size of banks indicates that large size are

more profit efficient than their small counterparts. Thus, small banks in India may increase their size to be more profit efficient without major cost disadvantage (Das and Gosh, 2009).

A study of 139 banks in Turkey by Isik and Hassan (2002) uses DEA in order to determine the efficiency frontier to compare the relative efficiencies of these banks. The study finds technical inefficiency in Turkish banks higher than allocative inefficiency, which suggests that Turkish banks are good at selecting the cost efficient mix of inputs but are inefficient to utilize them resulting into waste of inputs. The correlation results between financial ratios and efficiency measures depict a strong association between them. Other findings are: the private banks are less technically efficient than public banks, also multinational domestic banks have almost same efficiency scores.

Johnes et al (2009) investigated the efficiency of Islamic and conventional banks in Gulf region over the period 2004 to 2007. The authors applied DEA in combination with financial ratio analysis. The financial ratio results depict that Islamic banks are less cost efficient but more revenue and profit efficient than conventional banks. The DEA results suggest that conventional banks are, on the average, more efficient than Islamic banks. Moreover, the study finds significant correlations between DEA and ratio results in cost only contrary to these results, Islamic banks are reported to be more efficient than their counterparts from 2000 – 2005. Despite their large size, conventional banks did not surpass Islamic banks in efficiency scores (Grigorian and Manole, 2005).

Sufian (2007) in a study on “Trends in the efficiency of Singapore’s commercial banking groups” use window and analysis approach of DEA to measure the efficiency of six banks in Singapore. The decomposition of overall technical efficiency into pure technical and scale efficiencies suggests that banks in Singapore are increasing their size with mergers and acquisitions resulting in their decreasing returns to scale despite large sizes and assets. The findings also reveals that there is strong association between the efficiency scores and accounting measures of bank performance.

Al-Delaimi and Al-Ani (2006) used Charnes, Cooper and Rhodes (CCR) model for constant returns to scale (CRS) with window analysis approach to analyse 24 Islamic banking institutions in Iraq. The results show that the number of banks on efficiency frontier increases overtime from 9 to 16 from 1999 to 2001.

Rizvi (2001) used both input and output oriented models of DEA to analyse the past liberalization efficiency and productivity of conventional banks in Pakistan. Results indicates no improvement in productivity and efficiency.

Another study by Burki and Niazi (2003) on the efficiency of banks in Pakistan foreign banks to be more efficient in resource utilization and identifies allocative inefficiency as a major cause of cost inefficiency for domestic banks.

In a study of 37 Pakistani commercial banks for the years 2001 – 2004 by Ahmed (2008) suggests that they should increase their assets and interest earnings to improve efficiency; and cut down their non-interest expenses and liabilities to have a positive impact on efficiency. However, it argues that the government should not promote the merger activity of commercial banks, rather the banks should focus to enhance their efficiency to increase their profits.

Mostafa (2008) evaluated the performance of top 100 Africa banks using DEA analysis to measure their relative efficiency. He used a cross-sectional data for the year 2005 and found that the performance of several banks is sub-optimal, suggesting the potential for significant improvements.

Kablan (2007) examined the efficiency of West African Economic Monetary Union (WAEMU) banks after the period of banking crisis (1993 – 1996). The study used Data Envelopment Analysis (DEA) for assessing technical efficiency and stochastic frontier analysis (SFA) with cost functions. The study found that WAEMU banks efficiency is responsive to variables like financial soundness, the ratio of bad loans per country, the banking concentration and the GDP per capita. Detailed Analysis revealed that local private banks are most efficient, followed by foreign banks.

Frimpong (2010) examined the relative efficiency of 22 banks in Ghana during the year 2007. It also investigates the efficiency and profitability linkage. Adopting input oriented intermediation-based approach, the study highlights the average efficiencies of Ghana banks during 2007, both overall and by group, as determined by ownership and size. Only four (out of 22) banks were found to be efficient. The 18 inefficient banks had their efficiencies ranging from 33% to 89%. The average technical efficiency for the banking sector was 74%. Domestic private banks were the most efficient group of banks in Ghana, their average efficiency level being 87%. They were followed by foreign banks (average of 72%) and lastly, the state-owned banks with an average score of only 51%.

Back home in Nigeria, (Olugbenga & Olakunle, 1998) examined the effect of gradual deregulation on the performance efficiency of banks and the banking sector. It also assess whether policy package results in an improvement in the technical efficiency of the industry. Using the DEA approach, the study found that banking industry efficiency decline significantly during the years immediately following the adoption of deregulation with slight improvements noticed only in recent times. The study concludes that this may be due to the effect of inconsistent policies to which the sector was subjected during this period.

## Banking Sector in Nigeria

Banking operations in Nigeria began in 1892 under the control of foreigners during the colonial rule. By 1945, some Nigerians and Africans had established their own banks. The first era of consolidation ever recorded in the Nigerian banking industry was between 1939 – 1969. The consolidation became necessary on account of the massive failure of banks during 1953 – 1959, due mainly to liquidity problems (Somoye, 2008). The failed banks consisted then of many private initiatives that had adopted overzealous credit expansion policies in an attempt to increase what was observed as restricted access to credit by existing foreign banks. The latter years of the 1960s witnessed the gradual return of normalcy an attempt to forestall more failures by the introduction of basic regulatory policies to ensure that banks were adequately capitalized and liquid and that they expanded moderately in their credit portfolio. This was made possible through the establishment of the Central Bank of Nigeria (CBN) in 1959 to regulate and supervise banking institution, thus institutionalizing the policy and regulatory environment (Olugbenga and Olakunle, 1998; Somoye, 2008).

With the adoption of SAP in 1986, the regulatory framework guiding the operations of banks changed. Interest and lending rates were liberalized and competition increased among banks. The period 1990 to 1992 was an interesting one in our deregulation experience of the Nigerian economy and the financial system. During these years very bold and decisive steps were taken by the monetary authorities to monitor and safeguarding the quality of assets of the banking industry as well as ensure that the sector was adequately capitalized, thus promoting safety and soundness of the system. As a result, between 1991 to 1996, the minimum paid-up capital of commercial banks was raised to N50 million from N30 million. Earlier in the 1990s, the proliferation of banks which resulted in the failure of banks led to another recapitalization exercise that saw the increase of bank's minimum capital from N50 million to N500 million and subsequently N2 billion in July, 2003.

In terms of head count for instance, the number of banks increased from 42 in 1986 to 107 in 1990. This was due to the increased competition which saw new banks entering the industry after the deregulation of the financial sector. According to Ebong (2008), the number of banks further increased by 12% to 120 in 1992. By 2004, however, the number of banks had reduced to 89. This was because some banks had to be liquidated on account of their dwindling fortunes.

The number of banks dropped significantly from 89 to 25 in December, 2006 following a colossal increase in the minimum paid-up capital from N2 billion to N25 billion; a recapitalization exercise that was occasioned by the financial reform process necessary to ensure safety and soundness of the system.

**METHOD**

Data envelopment analysis (DEA) is a linear programming based technique for measuring the relative performance of organizational units where the pressure of multiple inputs and output makes comparisons difficult. It involves constructing a non-parametric piecewise frontier over data so as to calculate efficiency relative to this frontier. DEA calculates the relative efficiency scores of various decision making units (DMU) in a particular sample.

The DEA measure compares each of the banks or branches of banks in that sample with the best practice in the sample. It tells the user which of the DMUs in the sample are efficient and which are not. The ability of the DEA to identify possible peers or role models as well as comparative efficiency scores gives it an edge over other methods.

In multiple case relative efficiency approach, efficiency is defined as the ratio of weighted sum of output to weighted sum of inputs. The weights for the ratio are determined by the restriction that the similar ratios for every DMU has to be less than or equal to unity (ie.1), thus reducing multiple inputs and output to a single “virtual input and single “virtual” output without requiring pre-assigned weights (Frimpong, 2010).

The mathematical representation of the basic DEA model is traceable to Charnes Cooper and Rhodes (1978) and is referred to as the CCR model. If n banks (as DMUs) convert the same m inputs into the same s outputs and the j th bank uses an m-dimension input vector,  $x_{ij}$  ( $i = 1,2; \dots, m$ ) to produce an s-dimensional output vector,  $Y_{rj}$  ( $r = 1, 2 \dots, s$ ), and denoting the bank under evaluation by subscript 0, the optimization problem solved for each bank is expressed as;

$$\text{Maximize } \frac{\sum_r U_r Y_{rc}}{\sum_{i=1} V_i X_{i0}} \dots\dots\dots(1)$$

Subject to the constraints

$$x_j / \sum_{i=1} V_i X_{ij} \leq 1 \text{ for } j = 1, 2, \dots 0 \dots\dots\dots(2)$$

$$\text{for } r = 1, 2, \dots s \dots\dots\dots(3)$$

$$\text{for } r = 1, 2, \dots m \dots\dots\dots(4)$$

Where,

$U_r$  denote the weighted outputs and  $V_i$  denote the inputs weight and both must be non-negative.

The sum  $x_j$  is referred to as the virtual (weighted) output.



The objective function defined by  $h_0$  is the ratio of weighted output to weighted inputs, which is the relative efficiency ratio. The maximum value  $h_0$  can assume is 1. If this efficiency score is 1, bank  $h_0$  satisfies the necessary condition to be DEA efficient, otherwise, it is inefficient. This implies that for any group of banks, one or more must be the most efficient (having efficiency score  $h_0 = 1$ ), while others (with efficiency score  $h_0 < 1$ ) will be relatively inefficient compared with the efficient ones.

Furthermore the efficiency scores makes for a ranking of the banks in the population from the least efficient to the most efficient. While the most efficient bank(s) must (each) have an efficiency score of unity (i.e 1), the least efficient bank need to have a score of zero. While the Charnes – Cooper – Rhodes (CCR) model ground itself on the assumption of constant returns to scale and optimal scale operations, the Banker – Charnes – Cooper (BCC) (introduce in 1984), an extension to Charnes – Cooper – Rhodes (CCR) model, assumed variable returns to scale and adds a convexity condition to CCR model. Thus, the efficiency estimated using BCC refers to the pure technical efficiency (PTE) while he efficiency score using CCR refers to the technical efficiency (TE). This study uses the output oriented approach as it assumes that firms can maximize their outputs by whatever resources they have.

## Data Sources

A sample of Nineteen (19) banks in Nigeria is used and the data for this study is obtained from CBN 2009 audit of Nigerian Bank as contained in BGL Banking sector report. The study period covers 2006 – 2010. The choice of banks was largely informed by the availability of data as well as taking consideration of the banks that had positive net interest income in CBN 2009 audit of Nigerian Banks for the purpose of this study, two inputs and outputs to measure the relative bank performance efficiency of the sample banks are used. These are:

*Output* – Interest income and Gross earnings

*Input* – Total Assets and Equity (share capital)

## EMPIRICAL RESULTS AND DISCUSSIONS

### Descriptive Statistics Results

The input and output adopted in this study clearly shows that our focus is on the performance efficiency of Nigerian banks in terms of how well the banks can convert total asset and equity inputs into profit measured as gross earnings and net interest income. The choice of the above outputs was based on the assumption that they are not subject to management earnings manipulation. The descriptive statistics of the selected banks output and input variables is presented in table 1.



Table 1. Descriptive Statistics for DEA Input &amp; Output Variables

| STATISTIC    | TOTAL ASSET | EQUITY | NET INTEREST INCOME | GROSS EARNINGS |
|--------------|-------------|--------|---------------------|----------------|
|              | INPUT       |        | OUTPUT              |                |
| Mean         | 706,408     | 10,230 | 32,740              | 87,342         |
| Standard Dev | 546,642     | 8,881  | 27,007              | 62,538         |
| Minimum      | 75,696      | 3,010  | 3,473               | 18,561         |
| Maximum      | 2,033,204   | 44,722 | 98,435              | 214,400        |
| SAMPLE       | 19          | 19     | 19                  | 19             |

Given the descriptive statistics, the sampled mean of the 19 banks as at 2009, in terms of total asset was N706,408 million, equity was N10,230, Gross earnings was N87,342, while net interest income stood at N32,740 million. The sample mean results show that as at 2009, only five banks were mega banks. Their asset base were First bank (N601448 billion), GTB (685887 billion), UBA (1022591 billion). Union Bank (N334564 billion) and Zenith (1248835 billion). These asset base were far above the sampled peer banks average of 14,706,408 million.

Table 2. Constant Return to Scale Model Target

| DMU No. | DMU Name              | Efficient Input Target |             | Efficient Output Target |              |
|---------|-----------------------|------------------------|-------------|-------------------------|--------------|
|         |                       | ASSET                  | EQUITY      | INCOME                  | GROSS        |
| 1       | ACCESS                | 313496.47279           | 3923.95754  | 27713.00000             | 81062.94274  |
| 2       | AFRIBANK              | 219015.64017           | 3521.31524  | 19749.65898             | 64238.00000  |
| 3       | DIAMOND               | 276577.95994           | 3074.25411  | 23203.00000             | 60733.01727  |
| 4       | ECOBANK               | 220566.71888           | 2333.17707  | 18123.00000             | 45137.00000  |
| 5       | FIDELITY              | 79295.30139            | 3430.17550  | 7699.00000              | 23621.90709  |
| 6       | FIRST BANK            | 601447.75688           | 6544.30566  | 50004.00000             | 128148.00000 |
| 7       | FCMB                  | 140632.87846           | 3036.94991  | 13150.00000             | 41228.84703  |
| 8       | GTB                   | 685887.68859           | 6792.22834  | 54867.00000             | 127475.00000 |
| 9       | INTERCONTINENTAL BANK | 410956.90210           | 5629.30173  | 37889.55233             | 119770.00000 |
| 10      | SKYE                  | 607246.00000           | 5792.00000  | 47864.00000             | 106698.00000 |
| 11      | STANBIC IBTC          | 200883.59053           | 5752.55714  | 19018.00000             | 59201.27500  |
| 12      | UBA                   | 1022591.31534          | 10417.52008 | 82737.00000             | 198148.00000 |
| 13      | UNION                 | 334564.27900           | 4582.87296  | 30846.27778             | 97506.00000  |
| 14      | UNITY                 | 118802.12182           | 3299.73028  | 9531.27419              | 35932.00000  |
| 15      | WEMA                  | 75696.00000            | 5160.00000  | 3473.00000              | 25286.00000  |
| 16      | ZENITH                | 1248835.45062          | 11911.57279 | 98435.00000             | 219430.42015 |
| 17      | BANKPHB               | 735653.00000           | 10077.00000 | 67826.00000             | 214400.00000 |
| 18      | FINBANK               | 172558.00000           | 44722.00000 | 22923.00000             | 59542.00000  |
| 19      | STANDARD CHARTERED    | 117265.74270           | 1544.20561  | 10612.00000             | 32448.30164  |

Source: BGL Securities 2010

Thus, any slack or underutilization of their total asset would seriously impair their ratings compared to their peers in the industry. The minimum and maximum values indicates that First Bank has the highest total asset as at 2009, while WEMA bank had the lowest. In terms of Equity input, FinBank (N44,722 million) was the highest, while Standard Chartered Bank had the lowest (3,010 million) equity input. On the output side, the average net interest income of the sampled 19 banks stood at N32,740, with Zenith having the highest (N98,435 million) and WEMA recording the lowest (3,473 million). In terms of gross earnings, Fidelity bank (N23,621.907 million) recorded the lowest, while Bank PHB had the highest (N214,440 million). In order to ascertain the efficiency of these banks, we resort to the DEA results.

### Discussion of DEA Results

The DEA results is based on three efficiency measures of (1) DEA overall technical efficiency score – which is based on constant returns to scale (CRS). (2) DEA pure technical efficiency score – which is based on variable returns to scale (VRS), and (3) Scale efficiency score (SCALE) – which is the ratio of constant returns to scale to variable returns to scale (CRSE/VRSE).

### CRS DEA Results

Table 2: Technical efficiency scores of the 19 sampled banks based on CRS DEA model

| DMU No | COMPANIES          | TEcrs   | RTS | CRS Peer | Frequency |
|--------|--------------------|---------|-----|----------|-----------|
| 1      | ACCESS             | 0.48402 | IR  | 10,17    | 0         |
| 2      | AFRIBANK           | 0.51876 | IR  | 15,17    | 0         |
| 3      | DIAMOND            | 0.42474 | IR  | 10,17    | 0         |
| 4      | ECOBANK            | 0.64649 | IR  | 10,17    | 0         |
| 5      | FIDELITY           | 0.23687 | IR  | 17,18    | 0         |
| 6      | FIRST BANK         | 0.52645 | IR  | 10,17    | 0         |
| 7      | FCMB               | 0.37327 | IR  | 17,18    | 0         |
| 8      | GTB                | 0.72823 | DR  | 10,17    | 0         |
| 9      | INTERCONTINENTAL   | 0.57837 | IR  | 17       | 0         |
| 10     | SKYE               | 1.00000 | CR  | 10       | 9         |
| 11     | STANBIC IBTC       | 0.61361 | IR  | 17,18    | 0         |
| 12     | UBA                | 0.96646 | DR  | 10,17    | 0         |
| 13     | UNION              | 0.79138 | IR  | 17       | 0         |
| 14     | UNITY              | 0.45507 | IR  | 15,17    | 0         |
| 15     | WEMA               | 1.00000 | CR  | 15       | 3         |
| 16     | ZENITH             | 0.94845 | DR  | 10       | 0         |
| 17     | BANKPHB            | 1.00000 | CR  | 17       | 16        |
| 18     | FINBANK            | 1.00000 | CR  | 17       | 3         |
| 19     | STANDARD CHARTERED | 0.51303 | IR  | 10,17    | 0         |

The technical efficiency scores of the 19 sampled banks based on CRS DEA model (TECRs) show that only four (4) out of the 19 sampled banks are efficient, while 15 banks are found to be inefficient. The four (4) efficient banks that were able to use their inputs (total asset and equity) to generate better outputs (ie gross earnings and net interest income) are; Skye Bank Plc, Wema Bank Plc, Bank PHB and FinBank Plc. This means that they were able to use fewer inputs to produce relative better output compared to other sampled banks as at 2009. It is also instructive to note that the five big banks (first bank, GTB, Union Bank, UBA and Zenith were found to be technically inefficient. The CRS peers and frequency results in table 4 also show that Skye Bank (9) and Bank PHB (16) as at 2009 operated banking business models that generated tremendous income with relatively fewer inputs compared to their peers in the data set. Thus, both bank are regarded as good example of “best practice”.

In terms of input and output, slack of the inefficient banks, as shown in table 3, we found that all the mega banks in Nigeria as at 2009 had serious total asset under-utilization and this was largely responsible for their relative poor performance in generating better income compared to their peer banks. As seen from the table, among the mega banks, Union Bank had the highest total asset slack of N469,103 million, while Zenith had the least asset slack of N351,118 million.

Table 3: Inputs and outputs slacks of the sampled banks based on CRS DEA model

| DMU No. | DMU Name         | Input Slacks |         | Output Slacks |          |
|---------|------------------|--------------|---------|---------------|----------|
|         |                  | TOTAL ASSET  | EQUITY  | NET           | GROSS    |
| 1       | ACCESS           | 0.00000      | 0.00000 | 0.000000      | 16737    |
| 2       | AFRIBANK         | 0.00000      | 0.00000 | 655           | 0.000000 |
| 3       | DIAMOND          | 0.00000      | 0.00000 | 0.00000       | 7549     |
| 4       | ECOBANK          | 44028        | 0.00000 | 0.00000       | 0.000000 |
| 5       | FIDELITY         | 0.000000     | 0.00000 | 0.00000       | 5061     |
| 6       | FIRST BANK       | 468933       | 0.00000 | 0.00000       | 0.000000 |
| 7       | FCMB             | 0.000000     | 0.00000 | 0.00000       | 6023     |
| 8       | GTB              | 95042        | 0.00000 | 0.00000       | 0.00000  |
| 9       | INTERCONTINENTAL | 52675        | 0.00000 | 6775          | 0.00000  |
| 10      | SKYE             | 0.000000     | 0.00000 | 0.00000       | 0.00000  |
| 11      | STANBIC IBTC     | 0.000000     | 0.00000 | 0.00000       | 16402    |
| 12      | UBA              | 487134       | 0.00000 | 0.00000       | 0.00000  |
| 13      | UNION            | 469103       | 0.00000 | 13589         | 0.00000  |
| 14      | UNITY            | 0.000000     | 0.00000 | 2592          | 0.00000  |
| 15      | WEMA             | 0.000000     | 0.00000 | 0.000000      | 0.000000 |
| 16      | ZENITH           | 351118       | 0.00000 | 0.00000       | 20430    |
| 17      | BANKPHB          | 0.00000      | 0.00000 | 0.00000       | 0.00000  |
| 18      | FINBANK          | 0.00000      | 0.00000 | 0.00000       | 0.00000  |
| 19      | STANDARD         | 0.00000      | 0.00000 | 0.00000       | 8297     |

**VRS DEA Results**

Recall that the “pure” technical efficiency score (i.e technical efficiency relative to the VRS DEA model) is based on the assumption of variable returns to scale (VRS). It implies increases in bank input (total asset and equity) by 1% can lead to a more than 1% increases in it’s output (gross earnings and net interest income). The VRS DEA results are presented below;

Table 4: Technical efficiency scores of the sampled banks based on VRS DEA model

| DMU No | COMPANIES         | TEvrs   | VRS Peer | Frequency |
|--------|-------------------|---------|----------|-----------|
| 1      | ACCESS            | 0.59609 | 10,15,19 | 0         |
| 2      | AFRIBANK          | 0.72295 | 15,17,19 | 0         |
| 3      | DIAMOND           | 0.55167 | 10,17,19 | 0         |
| 4      | ECOBANK           | 1.00000 | 4        | 2         |
| 5      | FIDELITY          | 0.36813 | 10,15,17 | 0         |
| 6      | FIRST BANK        | 0.53458 | 10,17    | 0         |
| 7      | FCMB              | 0.56449 | 10,15,19 | 0         |
| 8      | GTB               | 0.73505 | 10,12,17 | 0         |
| 9      | INTERCONTINETAL   | 0.66504 | 10,17,19 | 0         |
| 10     | SKYE              | 1.00000 | 10       | 9         |
| 11     | STANBIC IBTC      | 0.71522 | 15,17,18 | 0         |
| 12     | UBA               | 1.00000 | 12       | 2         |
| 13     | UNION             | 0.94389 | 4,10,19  | 0         |
| 14     | UNITY             | 0.64584 | 15,17    | 0         |
| 15     | WEMA              | 1.00000 | 15       | 7         |
| 16     | ZENITH            | 1.00000 | 16       | 1         |
| 17     | BANKPHB           | 1.00000 | 17       | 9         |
| 18     | FINBANK           | 1.00000 | 18       | 2         |
| 19     | STANDARD CHARTRED | 1.00000 | 19       | 7         |

In the VRS DEA results shown, it can be observed that on the basis of VRS technical efficiency scores (TEVrs), eight (8) banks out of the 19 sampled banks are efficient while eleven (11) banks are inefficient. The eight (8) efficient banks that were able to use their inputs (total asset and equity) to generate better outputs (ie gross earnings and net interest income) are Skye Bank, Wema Bank, Ban PHB, FinBank, EcoBank, UBA, Zenith and Standard Chartered Bank Plc. Thus, these banks used power inputs to produce relative better outputs compared to other sampled banks as at 2009. The VRS peer and frequency column in the VRS DEA results also show that big banks like UBA and Zenith were found to be technically efficient when compared to the remaining three (3) mega banks of first Bank, GTB and Union bank. The result in table 4 show that Skye Bank (9), Wema bank (7), Ban PHB (9) and Standard Chartered bank (7) as at 2009 operated banking business models that generated tremendous income with relative small

inputs compared to other bank. Thus, these banks are regarded as a good example of “best practice” or “well-rounded income generation performer” which the inefficient banks should learn from.

In terms of asset slack (or under-utilization), a look at table 4 shows that only a few of the mega banks in Nigeria as at 2009 still had serious total asset underutilization under the VRS DEA assumption. This can be attributed to the poor resource management policies of such banks. These banks include union bank, GTB and first Bank.

Table 5: Inputs and outputs slacks of the sampled banks based on VRS DEA model

| DMU No. | DMU Name          | Input Slacks |         | Output Slacks       |               |
|---------|-------------------|--------------|---------|---------------------|---------------|
|         |                   | TOTAL ASSET  | EQUITY  | NET INTEREST INCOME | GROSS EARNING |
| 1       | ACCESS            | 0            | 0.00000 | 0                   | 1166          |
| 2       | AFRIBANK          | 0            | 0.00000 | 2124                | 0             |
| 3       | DIAMOND           | 0            | 0.00000 | 313                 | 0             |
| 4       | ECOBANK           | 0            | 0.00000 | 0                   | 0             |
| 5       | FIDELITY          | 0            | 0.00000 | 0                   | 16444         |
| 6       | FIRST BANK        | 454097       | 0.00000 | 1836                | 0             |
| 7       | FCMB              | 0            | 0.00000 | 0                   | 3372          |
| 8       | GTB               | 7467         | 0.00000 | 0                   | 0             |
| 9       | INTERCONTINETAL   | 0            | 0.00000 | 12144               | 0             |
| 10      | SKYE              | 0            | 0.00000 | 0                   | 0             |
| 11      | STANBIC IBTC      | 0            | 0.00000 | 0                   | 27954         |
| 12      | UBA               | 0            | 0.00000 | 0                   | 0             |
| 13      | UNION             | 380856       | 0.00000 | 26166               | 0             |
| 14      | UNITY             | 0            | 0.00000 | 2832                | 0             |
| 15      | WEMA              | 0            | 0.00000 | 0                   | 0             |
| 16      | ZENITH            | 0            | 0.00000 | 0                   | 0             |
| 17      | BANKPHB           | 0            | 0.00000 | 0                   | 0             |
| 18      | FINBANK           | 0            | 0.00000 | 0                   | 0             |
| 19      | STANDARD CHARTRED | 0            | 0.00000 | 0                   | 0             |

### **Scale Efficiency DEA Results**

The scale efficiency is the ratio of overall technical efficiency (TECRs) to pure technical efficiency (TEVrs) (i.e CRSE/VRSE). It measures the ability of a bank to improve its efficiency irrespective of whether it operates at the right returns to scale or not for a bank to become scale efficient. It should increase its output further to reach the most productive size of scale. The results of the scale efficiency are presented in table 6 .

Table 6: Scale efficiency scores of the 19 sampled banks based on DEA model

| DMU No | COMPANIES       | Overall technical | Pure technical | Scale efficiency |
|--------|-----------------|-------------------|----------------|------------------|
| 1      | ACCESS          | 0.48402           | 0.59609        | 0.812            |
| 2      | AFRIBANK        | 0.51876           | 0.72295        | 0.718            |
| 3      | DIAMOND         | 0.42474           | 0.55167        | 0.770            |
| 4      | ECOBANK         | 0.64649           | 1.00000        | 0.646            |
| 5      | FIDELITY        | 0.23687           | 0.36813        | 0.643            |
| 6      | FIRST BANK      | 0.52645           | 0.53458        | 0.985            |
| 7      | FCMB            | 0.37327           | 0.56449        | 0.661            |
| 8      | GTB             | 0.72823           | 0.73505        | 0.991            |
| 9      | INTERCONTINETAL | 0.57837           | 0.66504        | 0.870            |
| 10     | SKYE            | 1.00000           | 1.00000        | 1.000            |
| 11     | STANBIC IBTC    | 0.61361           | 0.71522        | 0.858            |
| 12     | UBA             | 0.96646           | 1.00000        | 0.966            |
| 13     | UNION           | 0.79138           | 0.94389        | 0.838            |
| 14     | UNITY           | 0.45507           | 0.64584        | 0.705            |
| 15     | WEMA            | 1.00000           | 1.00000        | 1.000            |
| 16     | ZENITH          | 0.94845           | 1.00000        | 0.948            |
| 17     | BANKPHB         | 1.00000           | 1.00000        | 1.000            |
| 18     | FINBANK         | 1.00000           | 1.00000        | 1.000            |
| 19     | STANDARD        | 0.51303           | 1.00000        | 0.513            |

An examination of the scale efficiency results in table 6 above shows that only four out of the 19 sampled banks were scale efficient while 15 banks were found to be scale inefficient. The scale efficient banks that were able to use their resource inputs to generate better outputs under the VRS and CRS assumption are Skye bank Plc, Wema Bank Plc, Bank PHB Plc, and FinBank Plc. In the same results, we also found out that big banks like UBA and Zenith banks that were found to be technically efficient in converting inputs to outputs under the VRS DEA model became scale inefficient due to decreasing returns to scale in their operations.

## CONCLUSION AND RECOMMENDATIONS

Given the centrality of banks to the growth process of Nigeria, the evaluation of their performance efficiency becomes more important. It can be argued in this regard therefore that the development of a more robust and stable financial system which is able to facilitate growth rests on sound performance efficiency.

Efficiency of Banks should be considered important by regulatory authorities as identification of an industry wide decline in efficiency may also served to alert policy makers early enough on the adverse effect of their policies. There is an intuitively appealing argument that categorizing banks by health status through performance efficiency would serve as an early signal to bank distress and eventual liquidation.

In view of the above, the following recommendations are made;

- (i) The supervision and regulation of banks towards set performance efficiency targets should be put in place by the monetary authorities;
- (ii) Monetary authorities should ensure that banks are made to face sanctions should they engage in performance efficiency retarding activities; and
- (iii) Banks management should institute cost effective and efficient strategies as part of their strategic decisions. In this way, performance efficiency becomes a critical focus area that cannot be toyed with.

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