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The Technical Efficiency of Nigerian Banks

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Abstract

This study provides an insight into the technical efficiency of Nigerian banks. The Data Envelopment Analysis (DEA) approach was employed to derive the efficiency scores of the various banks. A total of 67 banks, made up of commercial and merchant banks were used for the periods 1984/1985, 1994/1995, 1999/2000, and 2003/2004. This enabled us to investigate the efficiency of these banks pre- and- post liberalization. However, the periods were before the consolidation exercise of the Central Bank of Nigeria (CBN) headed by both Soludo and Sanusi. This enabled us compare the results with the outcome of those consolidation exercises. The result shows that on the average Nigerian banks were not efficient within the periods of study. However, it showed that liberalization improved the efficiency of banks in Nigeria, though the improvement did not last as some of the banks started sliding in efficiency with continued liberalization. This tends to support the consolidation exercises which were actions taken along with the liberalization exercise to save the banks. Furthermore, the study shows that some of the banks that collapsed during the 2006 consolidation exercise had their efficiencies continuously on the decline. Same with some of the banks that were declared problematic by Sanusi. It also showed that privately owned banks were found to be more efficient than publicly owned banks within the period of study. This suggests that continued privatization should be pursued in the banking industry.

Key words: Technical Efficiency, Data Envelopment Analysis, Financial Liberalization, Bank Consolidation

Introduction

One of the major issues among developing nations, and indeed all economies is how to achieve more with their scarce resources i.e. improving their technical efficiency. This has led to the adoption of various economic systems and policy options. The Nigerian economy in general and the banking sector in particular is not an exception to this. This is more so when banks, like most other production entities are profit oriented.

The role that banks play in the economic development process was demonstrated by McKinnon (1973) and Shaw (1973). They showed that the financial sector could be a catalyst for economic growth and development if it is efficiently managed. This role relates mainly to earnings, mobilization of surplus financial resources and efficient intermediation in general. In recent times, banks have received a lot of attention among macroeconomic policy makers. This is because apart from the traditional roles enumerated above, banks are channels through which monetary policies are transmitted to the economy. Thus, the efficiency with which banks discharge their duties and their level of technical efficiency may feedback into the economy.

The Nigerian banking sector has gone through a lot of reforms in recent times. Before 1986, the sector was repressed due to regulation of the system by the Central Bank of Nigeria (CBN). However, with the introduction of the Structural Adjustment Programme (SAP) and the recommendations of McKinnon and Shaw,

Nigeria embraced financial liberalization like most other nations. One of the rationales for financial liberalization is to improve the efficiency of the financial system. Chirwa (2001) notes that the McKinnon-Shaw hypothesis of financial liberalization has been popularized within the efficient financial system argument. This is because for the banking sector, studies have shown that the problems of inefficiencyy are more important than scale and scope issues (Berger, Humphrey, 1991; Berger, Hunter and Timme, 1993).Furthermore, Nyong (2005) attributes the various failures experienced by the Nigerian banks to technical inefficiency of these banks.

Most studies on banking ignore issues of technical efficiency. Lovell (1993) noted that for many years, the productivity literature ignored the efficiency component. In the case of banks, attempts at investigating efficiency issues boil down to looking at transaction and search costs in the process of intermediation and interest rate spreads. This is because efficiency in the banking sector includes reducing transaction and search costs in the process of financial intermediation, reducing interest rate spreads, etc. All these however, are efficiency indicators which at best , are approximations and introduce bias into the work (Eeckaut, Tulkens and Jamar, 1993).This is opposed to efficiency scores which gives direct measure of efficiency of a firm (i.e. quantify the efficiency of firms). There have been various attempts at quantifying the efficiency of the banking sector. Most are however done for the advanced economies, and for the banking industry as a whole. Furthermore, most studies on banking efficiency have been conducted by looking at the effect of liberalization on the efficiency of banks. Financial liberalization is expected to improve the efficiency of banks by making the environment competitive. The results of these studies have been inconclusive as regards the pre- and – post liberalization efficiency status of banks. Bhattacharyya, Bhattacharyya and Kumbahakar (1997) found that deregulation and liberalization had a major impact on productivity and efficiency increase in various industries and the banking sector in some Eastern and Central European countries as well as China. Berg, Forsund and Jansen (1991)

found that in Norway during 1980-89 the productivity of banks declined initially but eventually rose. Zaim (1995) reported efficiency gains in Turkish banks after the 1980 liberalization programme. In the case of Korea, Gilbert and Wilson (1998) found that most Korean banks experienced efficiency gains between 1980 and 1994 when government controls were lifted. It was however found that in the US and Spain, deregulation resulted in decline in efficiency (Humphrey and Pulley, 1997; Grifell-Tatje and Lovell, 1996).

In Nigeria, there have been some empirical attempts to assess the performance of the financial sector reforms (Ikhide and Alawode, 1994; Ikhide, 1998; Nyong, 2005). Most of the studies done for the Nigerian banking system, however, merely looked at the effect of liberalization on interest rate spread, transaction costs in assessing the impact of financial liberalization on the banking system. (Onwioduokit and Adamu (2005), Adeoye and Adewuyi (2005)). There was no effort at generating efficiency scores, which can be used as dependent variable against a set of explanatory variables.

Nyong (2005) however, went beyond these traditional ways of looking at the efficiency of the banking system. He used data for 18 banks to get efficiency scores for Nigeria for 2002/2003. However, the study looked at only one period which fell within the period of financial liberalization in Nigeria and used few banks.

This study is an attempt at investigating the level of efficiency of individual banks in Nigeria by quantifying the technical efficiency of these banks. It will use a cross section of 67 banks made up of commercial and merchant banks; and four periods that include pre- and-post financial liberalization era. This will provide insight into the level of resource utilization by these banks in the process of financial intermediation before and during liberalization. It will also provide further insight into the consolidation and reform policies of the CBN, and lend credence or otherwise to the present reforms in the Nigerian banking sector. It will show whether most of the banks declared problematic by the Sanusi-led CBN

were already showing signs of declining technical efficiency long before Soludo started the consolidation programme. Finally, the ability to quantify efficiency and productivity provides management with a control mechanism with which to monitor the performance of production units under its control: in this case the banks.

The rest of the paper is organized in five sections. Section II discusses the theoretical framework and literature review; section III is the analytical methodology, while section IV is the empirical results and analysis. Section V concludes the paper.

Theoretical Framework and Literature Review

There are four measures of efficiency as identified by Nyong (2005) and Lovell (1993) that gives the actual values of efficiency. These are technical efficiency, cost efficiency, scale efficiency and allocative efficiency. Cost efficiency according to Nyong (2005) is concerned with determining whether a decision-making unit (DMU) produces a given output with minimum cost. It is price dependent. Scale efficiency measures whether a DMU produces at an optimal size of scale; while allocative efficiency ascertains if the inputs are the best ones to be used or whether the outputs are the best ones to be produced. It is also called price efficiency. It refers to the ability of a DMU to choose optimal input combination at given input prices. Technical efficiency refers to the ability of a firm to produce maximum output given its inputs. A technically efficient producer could produce the same outputs with less of at least one input; or could use the same inputs to produce more of at least one output. The measurement of technical efficiency (TE) is based on deviations of observed output from the best production or efficient frontier. Thus, if a firm's actual production lies on the frontier, it is efficient; if it lies below the frontier, it is considered inefficient. The ratio of the actual to potential production is used to define the level of efficiency of the individual firm. For the purpose of this paper, efficiency is taken to mean TE. This is because it provides the common ground on which to compare performances of DMUs (in this case banks).

Banks are business entities or firms that combine capital, labour, and other financial inputs to produce financial outputs (Wheelock and Wilson, 1999).In analyzing the efficiency of banks, the issue of variable selection (that is the ability to identify the appropriate outputs which banks produce and their inputs) poses some problems. For instance, the variable may present different information although they carry the same label; or the same information may be reported under different labels.

Humphrey (1991) identified three measures of banking output. These are:

    a. The number of transactions processed in deposit and loan accounts. This is a flow measure.

    b. The real or constant naira value of funds in the deposit and loan accounts, which is a stock measure; and

    c. The number of deposit and loan accounts serviced by banks. This is also a stock measure.

He noted that the preferred measure is the flow measure because output is a flow. However, in some instance, stock measures are used. This is the situation where the flow measure is unavailable or because the stock measure might be proportional (on average) to a flow measure.

Humphrey (1991) also noted that there is less controversy on measuring bank inputs. He recognizes labour (number of workers or total hours worked) and the real or constant naira value of physical capital (usually the book value of premises, furniture, and equipment deflated by some price index) clearly represents inputs needed to produce bank output; treating the real or constant naira value of loanable funds – core deposits plus purchased funds – as an input.

Six different views on what constitutes banks' input and output are recognized. These are production approach (Shearman and Gold, 1985; and Frevier and Lovell, 1990), intermediation theory (Humphrey, 1985), asset approach which is related to financial intermediations theory (Nyong, 2005), user-cost approach (Humphrey, 1991), value-added

approach (Berger and Humphrey, 1991, 1992) and the modern approach (Ziorklui, 2001).

The Production Approach applied the traditional microeconomic theory of the firm to banking. It considers banks to be producers of bank deposits and loans. The actual output is specified as the number of bank deposit and loan transactions that are processed. Traditional production factors viz; land, labour and capital are used as inputs to produce outputs (Denizer, 2000), which are services for account holders. The output measure used is number of accounts or number of transactions (Nyong, 2005).

Ziorklui (2001) went further to break down the total cost under this approach to include cost of supplies, expenditure on materials, occupancy costs and expenditure on furniture and equipment. Under this approach, it is believed that an efficient banking system may lead to a lower transaction cost of providing banking services to the public. One major set back of this approach is the measurement of outputs. Another criticism is failure to account for financial intermediation of banks.

Intermediation Theory considers banks as mobilizers of surplus funds, which are then transformed, into loans and other assets. In other words, depository financial institutions are viewed as producers of services related directly to their role as intermediaries in financial markets (Clerk, 1988). In this approach, the deposits collected and funds borrowed from the financial markets are the inputs while the outputs are measured by the volume of loans and investments outstanding. Nyong (2005) adds labour employed as part of the inputs while Clerk (1988) recognizes both capital and labour as inputs. Proponents of this approach define the banks' various naira volumes of earning assets including securities investments as measure of output. Other outputs specified under this approach are interbank loans, loans and advances for customers (Berger et al, 1987; Mester, 1987). Costs are defined to include both interest expense and total costs of production. This approach complements the production approach. Mester, however, notes that the choice between production approach and intermediation approach often depends on available data.

The Asset Approach is related to the financial intermediation theory (Nyong, 2005). It considers banks as intermediating between liability holders and fund beneficiaries or debtors. Loans and other assets are considered as outputs while the various deposit categories are considered as inputs. The production of deposit services is viewed as merely payment in kind for the use of funds from which to make loans. In effect, Humphrey (1991) calls it a "reduced form" model of the banking firm. The main criticism of this approach is its inability to account for transaction services, which many small banks perform or deliver to their depositors (Nyong, 2005).

The User- cost Approach sees the net revenue generated by a particular asset or liability as the main determinant of whether a financial product is an input or output. If the financial returns on an asset exceed the opportunity cost of funds, then the financial instrument should be considered as an output. Thus demand deposits are seen as outputs while time deposits are inputs. Humphrey's identification of output categories with the exception of time deposit is consistent with that identified in this approach to differentiate bank inputs from outputs. These are five namely; payments and safekeeping output (associated with demand deposits and savings and small denomination time deposits) as well as intermediation and loan outputs (associated with real estate loans, consumer installments and credit loans, commercial, industrial and agricultural loans (Humphrey, 1991).

The shortcomings of this theory are as follows: First, interest rates vary from time to time so does the user cost. An item classified as input in one period may become an output in another period if the sign of its user cost changes (Grigorian, 2002). It is also difficult to measure marginal revenues and costs for each individual liability item. Thus, there are several measurement errors including changes in inputs or outputs overtime.

The Value Added Approach is an improvement over the asset or user-cost approaches (Berger and Humphrey, 1991, 1992), is based on actual operating cost data. It recognizes the output characteristics of both the asset and liability categories of bank portfolios.

Those categories that have substantial value-added are treated as outputs while others are treated as inputs. Activities of banks create high value-added such as loans and advances (demand deposits), time and savings deposits are classified as outputs while inputs include labour, capital and purchased funds.

The modern approach has different variants. It integrates risk management and information processing into the classical theory of the firm. It is ratio based. It is represented by the CAMEL approach which stands for capital adequacy, asset quality, management, earnings and liquidity. These variables are however used in performance analysis and the index does not emphasize the efficiency of banking institutions (Ziorklui, 2001)

Ziorklui (2001) went ahead to develop a comprehensive index of banking efficiency and performance. He integrates measures of efficiency and general performance of banking institutions as is used in Ghana. This he expressed as TARCSIMEL which means transaction cost, asset quality, risk exposure, capital adequacy, spread between deposit and borrowing rates, intermediation proxies of savings mobilization and credit allocation, management competence, earnings or profitability and liquidity. The problem with this approach is being able to develop proxies for each of the above instruments.

Bergendahl (1998) identified five main functions of commercial banking, which directly relates to the goals of efficient bank management. This includes profit maximization, risk management, service provision, intermediation and utility provision. However, Grigorian (2002) grouped them into two namely profit maximization and risk management, and service provision (combining elements of service provision, intermediation and utility provision)**.** However, this study in choosing the inputs and outputs of banks adopted the Grigorian (2002) Approach following (Nyong, 2005) which is a variant of the modern approach.

Many researchers have attempted to investigate the efficiency of the banking industry as mentioned earlier. Most of the studies were attempts to investigate the impact of the financial reforms on banking efficiency and the results are as shown in table 1 below. Aikaeli (2009) is among the few that examined firm level efficiency of banks in Tanzania using DEA. Aikaeli (2009) grouped the banks into three namely; large, domestic and small banks which is still restrictive as the technical efficiency levels of banks within a group may not be the same. The present study examines firm level efficiency of Nigerian banks. It examines the technical efficiency of individual banks directly, bearing in mind that the reforms in the Nigerian banking industry especially by the present CBN governor deals with the individual banks. Furthermore, his study was done for the liberalization period alone. The study shows that in terms of technical efficiency, foreign banks ranked highest followed by small banks and then large domestic banks. It therefore becomes necessary to examine the technical efficiency of Nigerian banks at firm level in order to compare with other studies; and the conclusions of the CBN about the some of the banks.

Table-1: Selected Studies on the Impact of Financial Liberalization on the Efficiency of the Banking Industry

Author	Country	Findings
Bhattacharyya, Bhattacharyya, and Kumbahakar (1997)	Eastern & Central European Countries including China	Increased efficiency
Berg, Forsund and Jansen (1991)	Norway	Efficiency declined and then rose
Zaim (1995)	Turkish Banks	Increased efficiency
Gilbert and Wilson (1998)	Korea	Increased efficiency
Humphrey and Pulley (1997), Grifell-Tatje and Lovell (1996)	US and Spain	Decline in efficiency
Denizer et al (2002)	Turkey	Did not improve efficiency

Ziorklui (2001)	Ghana	Improved efficiency
Hardy and Patti (2001)	Pakistan	Did not improve efficiency
Barajas, Steiner and Salazar (1999)	Columbia	Enhanced efficiency
Ikhide and Alawode (2001)	Nigeria	Bank's health deteriorated
Asogwa (2005)	Nigeria	Did not change the level of competition
Oyaromade (2005)	Nigeria	Had positive impact on financial savings mobilization
Adeoye and Adewuyi (2005)	Nigeria	No growth in savings, no improvement in the level of financial dependence
Koeva (2003)	Indian Commercial Banks	Increased competition, decline in bank spreads, reduction in cost of intermediary
Barajas, Steiner and Salazer (2000)	Colombian Banks	Increased competition, lower intermediation cost
Galindo A. et al (2001)	12 developing countries	Improved efficiency
Demirguc-Kuit and Detragiache (1998)	Panel of 53 developed and developing countries	Banking crises more likely to occur in a liberalized system
Nyong (2005)	Nigeria	No improvement in efficiency

Another observation made about most of these studies is that some of them (e.g. Denizer et al, 2002) relied on a narrow set of data – short time series of an industry before and after deregulation or privatization which may not be sufficient for any meaningful conclusion. Further observation is the use of performance indicators instead of calculated efficiency scores. Efficiency indicators are observable factors which seem to determine the level of efficiency. At best, they (performance indicators) are approximations and introduce bias in the work (Eeckaut, Tulkens, and Jamar 1993.)

Finally, most of the studies on banks examined the efficiency of the banking system, at the industry level, using time series. The present study will investigate firm level efficiency using cross-sectional data in pre- and post-liberalization eras in Nigeria.

Analytical Methodology

There are two approaches used to measure the efficiency of an entity. These are the parametric (econometric) approach and the non –

parametric (mathematical programming) approach. This study will use the non – parametric frontier approach to estimate the relative efficiency of banks in Nigeria. This approach also known as Data Envelopment Analysis (DEA), is a mathematical programming technique that measures the efficiency of a decision making unit (DMU) relative to other similar DMUs with the simple restriction that all DMUs lies on or below the efficiency frontier (Seiford and Thall, 1990).

For the DEA, a parametric functional form does not have to be specified for the production function and thus, allows variable returns to scale (VRS). The focus of this methodology is both on each individual DMU and the average of the whole body of DMUs. It calculates the relative efficiency of each DMU in relation to all the other DMUs by using the actual observed values for the inputs and outputs of each DMU. It constructs the production frontier as a convex envelop of the observed points in the input/output space. The efficiency frontier is the section of the envelope of the production possibility set with a non – negative slope.

Efficiency is measured as the vertical (output orientation) or horizontal (input orientation) distance of DMUs to the efficiency frontier. If a DMU is on the production possibility set, it is defined as efficient. DEA also identifies for inefficient DMUs, the level of inefficiency for each of the bank (Charnes, Cooper, Lewin and Seiford, 1994). This is because it is a strictly deterministic technique. It ignores the error term and treats the total deviation from the production frontier as inefficiency. The degree of inefficiency shows the potential output loss due to not utilizing available resources to the fullest extent.

It uses the programming model and to that extent the assumptions of the approach are similar to those of linear programming model (Nyong, 2000). The assumptions include linearity, additivity or proportionality, independence or non – interaction among the activities and certainty or deterministic decision – making. However, DEA can cope with multiple objectives and multiple constraints unlike linear programming.

Hirshberger et al (2001) submit that DEA is better suited to evaluating management performance because it is very flexible. In contrast to regression, DEA also identifies specific DMUs that serve as a benchmark. Thus, it seems more favourable to measure efficiency compared to other methods.

In quantitative terms, if the efficiency score is 1, then, the firm is considered efficient and lies on the production possibility frontier (PPF). But any score below I is considered inefficient, and the firm lying below the PPF; and the distance to the PPF showing the level of inefficiency. The degree of inefficiency shows the potential output loss due to not utilizing available resources to the fullest extent.

Four periods namely 1984/1985, 1994/1995, 1999/2000 and 2003/2004, 1984/1985 was chosen to examine the technical efficiency of banks. This is to enable us examine the technical efficiency of individual banks in Nigeria during periods of pre and post liberalization and democratization. This is intended to give us a broader understanding of the efficiency of banks bearing in mind

different policies and styles of government in Nigeria over-time. It will also shed light on the evolution of the degree of technical inefficiency over-time. Furthermore, considering that it is a study in retrospect, we chose years before the Soludo and Sanusi consolidation to enable further assessment of the banks and the actions taken.

A cross section of both commercial and merchant banks was used for each period. In selecting the banks, all the banks that have complete data for the four periods under review were selected. This is done in order to see the changes in efficiency of banks in the four periods. In order to select other banks, we used randomization. According to Ndiyo (2005;217) randomization gives "a more reliable and valid estimate of the population being studied than a sample which is composed by selection regardless of whether such selected sample is random or not".

In obtaining the data, we used the Annual Reports of the banks in the Nigeria Banking, Finance and Commerce Books compiled by Research and Data Services Limited (Redasel), Lagos Nigeria for the periods of the study.

The Data Envelopment Analysis Model

Following Nyong (2005), we adopt the Grigorian (2002) approach – a variant of the modern approach of bank production in choosing inputs and outputs. Thus, we assume that the labour (personnel management, X_1), fixed assets (computer hardware and premises) and also captured extensive branch network, X_2 and interest expenses (leverage funds) X_3. The outputs are revenues (emphasizes profit maximization, Y_1), loans and advances (service provision Y_2) and liquid assets including securities investments (liquidity services, Y_3). The model is adapted from Ali and Seiford (1993) and Nyong (2005).

DEA begins with a relatively simple fractional programming formulation. Assume that there are n decision making units (DMUs) to be evaluated. Each DMU consumes different amount of i different inputs and produces r different outputs (i.e., DMU_j consumes X_{ji} amount of inputs to produce Y_{jr} amounts of outputs). It is assumed that these inputs, X_{ji} and

outputs Y_{jr} are non-negative and each DMU has at least one positive input and output value. Mathematically, we say that the DMU_j consumes amount $X_{ji} > 0$ of input I, j = 1, 2, 3. . . k; and produces amount $Y_{jr} > 0$ of output r, where r = 1, 2, 3, . . . , m.

Based on this, DEA seeks to determine which of the DMU determines an envelope surface or efficient frontier.

Two types of envelopment surfaces are used in DEA. These are Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS) (Ali and Seiford, 1993). The VRS model will be utilized here. This is because it gives technical efficiency of DMUs under investigation without scale effect. In this model all the points (X_j, Y_j) lie on or beneath the hyper plane and the hyper plane passes through at least one of the points (Obersteiner, 1999; Ali and Seiford, 1993, 1994).

Let U_1 = virtual multiplier associated with output 1 for DMU_j.
Let U_2 = virtual multiplier associated with output 2 for DMU_j.
Let U_3 = virtual multiplier associated with output 3 for DMU_j.
Let Us = virtual multiplier associated with output s for DMUj
w = virtual multiplier associated with VRS.
The VRS multiplier problem is of the form;

$$VRS_m (X_j, Y_j)$$

Max $Z = y_{1j} u_1 + y_{2j} u_2 + y_{3j} u_3 + ... + y_{ks} u_s - x_{1j} v_1 - x_{2j} v_2 - x_{3j} v_3 + w$

Subject to : $y_{11} u_1 + y_{21} u_2 + y_{31} u_3 + ... + y_{k1} u_k - x_{11} v_1 - x_{21} v_2 - x_{31} v_3 + w \leq 0$ dmu 1
$y_{12} u_1 + y_{22} u_2 + y_{32} u_3 + ... + y_{k2} u_k - x_{12} v_1 - x_{22} v_2 - x_{32} v_3 + w \leq 0$ dmu 2
$y_{13} u_1 + y_{23} u_2 + y_{33} u_3 + ... + y_{k3} u_k - x_{13} v_1 - x_{23} v_2 - y_{33} v_3 + w \leq 0$ dmu 3
.
.
.
$y_{1n} u_1 + y_{2n} u_2 + y_{3n} u_3 + ... + y_{kn} u_k - x_{1n} v_1 - x_{2n} v_2 - x_{3n} v_3 + w \leq 0$ dmu n

$u_1 \geq 0$
$u_2 \geq 0$
$u_3 \geq 0$
.
.
.
$v_1 \geq 0$
$v_2 \geq 0$
$v_3 \geq 0$

The objective function indicates the distance of the DMU from the hyper plane. Maximization of the objective function selects a hyper plane, which minimizes this distance.

The DEA analysis requires solving a linear programming problems; one for each DMU. While 'x_{ij}' and 'y_{rj}' are the observed values for the DMUs and are constants, u, v, w are the variables. The latter gives the feasible solution.
In compact form, the VRS is:
$VRS_m (X_j, Yj)$ s m Max $= \Sigma y_r l u_r - \Sigma x_i l v_i + w$ (u_r, v_i, w) r =1 i =1 s m=Σ yrj $u_r - \Sigma x_{ij} v_i + w \leq 0$ for j = i… n.
r = 1 i = 1 $u_r \geq 0$ for r = 1,…, s
$v_i \geq 0$ for i = 1,…, m

The values u, v, w have been interpreted as virtual multipliers. Thus, the linear programming problem, VRS_m has been referred to as the multiplier side.

Empirical Results and Analysis

The technical efficiency of the banks is shown in table 2 below:
Table-2: Efficiency Scores of the Individual Banks, 1985-2003

S/N	Banks	1985	1995	2000	2003
1	Afribank	1.000	1.000	0.854	0.435
2	Bank of the North	0.521	0.383	1.000	
3	ACB	0.418	1.000	1.000	
4	Citi Bank	1.000	1.000	1.000	1.000

5	Co-operative Bank	1.000	0.549	0.795	0.302
6	First Bank	1.000	1.000	1.000	1.000
7	First City Monument Bank	0.291	0.975	0.704	0.489
8	Habib	0.284	0.672	0.653	0.740
9	IMB International	0.125	0.297	0.419	1.000
10	Indo-American Bank	1.000	1.000	1.000	1.000
11	Credit Lyonnais	0.597	5.38	0.412	0.447
12	MBC	1.000	0.626	0.401	0.391
13	NAL	1.000	0.962	0.502	0.477
14	National Bank	0.165			
15	Nigerian-American	0.318	0.574	1.000	1.000
16	Union Bank	1.000	1.000	0.764	0.764
17	UBA	1.000	1.000	1.000	1.000
18	WEMA BANK	0.191	0.435	0.489	0.489
19	Societie Generate	0.732	0.252		
20	Savanna	0.359			
21	Allied	0.309			
22	Co-operative & Commercial Bank	0.224			
23	Lobi	1.000			
24	Progress	0.536			
25	New Nigeria	0.197			
26	Nigeria Arab	0.240			
27	Icon	0.398			
28	Continental Merchant	0.348			
29	Owena	0.289	0.629		
30	Omega		0.599	0.654	0.222
31	Tropical		1.000	0.523	0.287
32	Universal Trust		0.928	1.000	0.372
33	Stanbic		1.000	0.663	
34	African International		1.000		
35	Lion		0.621	0.479	0.597
36	Citizen		0.852	0.794	0.365
37	Cooperative Development Bank		0.619	0.370	
38	Diamond		0.848	0.617	0.345
39	Eco Bank		1.000	0.511	0.497
40	Equitorial		0.457	0.838	0.629
41	Fountain Trust		0.771	0.620	0.629
42	Magnum		0.622	0.592	0.441
43	Marina		1.000	0.772	0.989
44	Pacific		0.467	1.000	1.000
45	Prudent		1.000	1.000	0.455
46	FBN (Merchant)		0.857	0.846	0.804
47	Investment Trust		1.000	1.000	1.000
48	Hall Mark		1.000	1.000	1.000
49	Inland		0.323	0.398	0.413
50	Trade		1.000	0.741	0.491
51	Zenith		0.290	0.874	0.768
52	Gulf		0.418	0.484	0.651

53	Guaranty		0.455	0.742	0.668
54	Oceanic			1.000	0.716
55	Standard Trust			1.000	0.721
56	Gateway			0.589	0.403
57	Access			0.519	0.497
58	Eko			0.403	0.448
59	Lead			0.943	0.822
60	Manny			0.739	0.417
61	Equity			0.499	0.520
62	Metropolitan			1.000	1.000
63	Intercontinental			0.446	0.337
64	NUB				0.407
65	Reliance				0.752
66	Regent				1.000
67	Devcom				0.802
	Total No. of Banks	29	40	50	50
	Percentage of efficient banks	34.48	35.71	26.00	22.00
	Average efficiency of banks	0.570	0.738	0.731	0.640

Source: Author's Calculation

Figure-1: Average Efficiency of Nigeria Banking Industry.
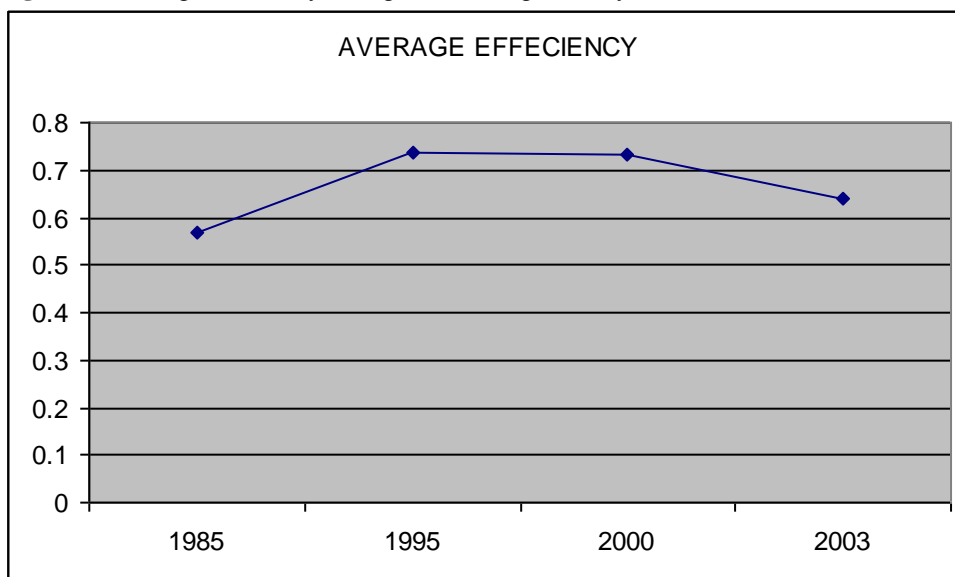
Prior to liberalization in 1985, the result indicates that ten banks of the 29 banks used for the analysis were efficient. This means that they lie on the efficient frontier and had efficiency score of 1.000 each. The banks are Afri bank, Citi bank, Co-operative Bank, First Bank, Indo, MBC, NAL, Union, UBA and Lobi banks. This represents 34.48% of the banks. It is interesting to note that Afribank, which was one of the banks declared problematic by Sanusi but survived the Soludo consolidation exercise was efficient prior to liberalization. The rest of the banks used in that period, (65.52%) exhibited various levels of inefficiency. This ranges from as high as 87.5% level of inefficiency by IMB merchant which is the worst, to as low as 26.8% by Societe Generale Bank.

Out of the inefficient banks, 89.47% have their efficiency level below the industry average of 57%, while 10.53% have their efficiency levels

above the industry average. These are Credit Lyonnas and Societe Generale banks. Furthermore, of the ten efficient banks three or 30% are merchant banks while the rest (70%) are commercial banks. The merchant banks are Indo, NAL and MBC.

With liberalization in 1995, the percentage of efficient banks increased to 35.71% leaving 64.28% of the banks as inefficient. The number of inefficient banks with efficiency level above the industry average is 25.93% as against 10.53% prior to liberalization. Furthermore, the level of inefficiency in 1995 ranged from as low as 2.5% for First City Monument Bank to as high as 74.8% for Societe General Bank. These results show improvements over the pre-liberalization era. The results suggest that liberalization did not only improve the average level of technical efficiency of the banking industry but also the technical efficiency of individual banks in 1995. Note that Afribank and Union banks were efficient during this period.

The 2000 efficiency result shows that 26% of the banks used for the study for that year were efficient. This is a decrease compared to the pre-liberalization era and the 1995 period. This gave the percentage of inefficient banks as 74% which is higher than the two previous periods. This may be due to the crisis in the banking industry in the 1990s which caused the liquidation of most banks such that the remaining ones were struggling to re-establish themselves in the financial system. Furthermore, poor management of the banks which persisted as noted by the CBN may have also contributed to these.

The banks that remained efficient even in the face of the crisis like First Bank, Citi Bank, Indo were either among the banks with high market share or private banks suggesting that ownership and market share may be important factors that determined efficiency within this period. However, when one observes that two of the three biggest banks viz Union Bank and UBA fell among the inefficient banks in 2000 with efficiency scores of 0.766 and 0.806 respectively, one begins to wonder whether market share actually plays a role in determining efficiency.

The worst of the inefficient banks (Co-operative Development Bank) has an efficiency score of 0.37 which is higher that the efficiency level of the worst bank in 1985 and 1995. Of the inefficient banks, 35% have their efficiency scores above the industry average of 73.1%. This result is higher than that of 1985 and 1995 suggesting that the continued liberalization had a positive impact on the technical efficiency of individual banks in 2000. Afribank was among the inefficient banks in this period.

In 2003, the percentage of efficient banks declined to 22% which is the lowest of the four periods used. The worst bank (Omega Bank) has an efficiency level of 22.2%. Of the inefficient banks, 28.21% have their efficiency scores above the industry average of 64%. The decline in the percentage of efficient banks in this period is surprising being that liberalization had been done for eighteen years. Probably, most of the emerging and old banks were under capitalized. May be most of the banks were affected by the low technological advancement evidenced by low capital labour ratio. This meant that liberalization alone may not be enough to positively affect the efficiency of the individual banks. Thus, the consolidation exercises are welcome developments.

Fifteen banks of the 67 banks used in the analysis were used in the four periods. Of these, three were consistently efficient in all the four periods. These are First Bank, Citi Bank and Indo Bank. UBA was consistently efficient in the first two periods but declined in efficiency in 2000. It however, picked up again in 2003 re-establishing its efficiency. Investment Trust, Hallmark and Metropolitan banks were also consistently efficient in the periods they were used.

Some banks were declining in their efficiency all through the four periods. In this category are Afri Bank which was efficient in 1985 but suffered 56.5% efficiency loss by 2003; and MBC which experienced 60.9% loss in efficiency by 2003. This suggests that with the competition occasioned by liberalization some banks that were efficient before liberalization could not cope with the competition. Other banks that experienced efficiency loss through out the periods are Tropical, Credit Lyonnas,

Citizen, Cooperative Development, Diamond, Eco Bank, Trade, Gate way, Access, Intercontinental, Magnum, Manny, and NAL. The surprising thing is that some of these banks are making waves in the banking industry today e.g. Access, Diamond and Eco Banks; while others could not survive the Soludo consolidation exercise e g Trade bank, Hallmark and Metropolitan banks.

Some banks which started out with very low efficiency level in 1985 showed continuous efficiency gain and were efficient by 2003. These include IMB International bank, Nigeria-American bank and Equity bank. Other banks in this category are Pacific, Inland, Gulf and Habib banks. Zenith also showed a lot of improvement in efficiency though its efficiency level was fluctuating. The rest of the banks had their efficiency level fluctuating throughout the period. These results suggest that banks as individual firms reacted differently to the liberalization programme. It also shows that banks are at different levels of efficiency in Nigeria.

Some banks that had collapsed by 1995 showed very low levels of efficiency in 1985. Infact, their efficiency scores were all below the industry average of 57% in 1985 except Lobi bank which was efficient.

Most of these banks were publicly owned suggesting that ownership of the banks may have affected their efficiency levels. Example of such banks and their efficiency levels are ACB (41.8%) National (16.5%), Progress (53.6%), Nigeria-Arab (24.0%), ICON (39.8%) Owena (28.9%), Allied (30.9%).   The result also shows that none of the consistently efficient banks was publicly owned. They are all privately owned banks. Of the efficient banks, two out of ten were publicly owned in 1985, all were privately owned banks in 1995, one out of thirteen were owned by government in 2000; while in 2003 none of the efficient banks was owned publicly. Infact, the public banks that did not collapse within the period are either having a continuously declining efficiency level e.g Trade and Gate way banks; or have efficiency levels below the industry average of the various periods. This result

suggests that privately owned banks are more efficient than publicly owned banks.

Conclusion

In this study we made an attempt to investigate the extent of resource use efficiency of a cross section of 67 Nigerian banks.   Data Envelopment Analysis, a non- parametric approach was used to evaluate the efficiency of the banks. Data for four periods namely 1984/1985,   1994/1995,   1999/2000 and 2003/2004 were used for the analysis.
It shows that liberalization had a mixed effect on the efficiency of individual banks in Nigeria. While some banks had their efficiency scores continuously on the increase, others had theirs on the decrease continuously; while a third group had fluctuating efficiency scores. Furthermore, there appears to be efficiency differentials among banks in Nigeria with the privately owned banks appearing more efficient than the publicly owned banks. The result also shows that the percentage of the efficient banks were on the decline within the periods of study. Finally, it seems that the big banks like First bank, Union bank showed higher levels of efficiency than the smaller banks.
The results show that there is a lot of output loss and underutilization of resources among Nigerian banks.

The findings suggest that it is important to encourage international banking as all the foreign banks were efficient in the periods they were used. Banks should harness their underutilized resources, which can be used in the production of new (non-traditional) variety of products.

Soludo and Sanusi (Central bank of Nigeria governors) may not after all be wrong in undertaking the various consolidation exercises. The 2006 consolidation exercise may nave succeeded in rooting out inefficient banks from the system thus, making sure that resources were better utilized by more efficient banks. The "one size fit all" type of banking should be discontinued as some banks may not cope with the level of competition required of them to remain in business. Thus, the present categorization of banks by CBN is a welcome development. The study also shows that almost

all the merchant banks used were inefficient. Thus, the reintroduction of merchant banking in Nigeria should be done with caution. Finally, the ability to quantify efficiency and productivity provides management with a control mechanism with which to monitor the performance of production units under its control: in this case the banks.

References

Adeoye, B. W. and A. O. Adewuyi (2005) "Benefits and Costs of Financial Reforms: Nigeria's Experiences" Paper Presented at the 46th Annual Conference of the Nigerian Economic Society (NES), August, Lagos.

Aikaeli, J (2009) "Commercial Banks Efficiency in Tanzania", AERC's CPP Graduates Class of 2002: A selection of Research papers drawn from Doctoral Theses African Economic Research Consortium, Nairobi, Kenya.

Ali, A.I. and L. M. Seiford (1993) "The Mathematical Programming Approach to Efficiency Analysis" in The Measurement of Productive Efficiency, Fried Harold, C.A.K.Lovell, and S.S. Schmidt eds Oxford University Press, London.

Asogwa, R. C. (2005) "Assessing the Benefits and Costs of Financial Sector Reforms in Nigeria: An Event Study Analysis" Paper Presented at the 46th Annual Conference of the Nigerian Economic Society (NES), August, Lagos.

Barajas, A., R. Steiner and N. Salazar (1999) Foreign Investment in Colombia's Financial Sector IMF Working Paper 99/150.

Barajas, A., R. Steiner and N. Salazar (2000) "The Impact of Liberalization and foreign Investment on Colombia's Financial Sector" Journal of Development Economics Vol. 63, No. 1.

Berg, S. A., F. Forsund, and E. Jansen (1991) "Technical Efficiency of Norwegian Banks: A Non-Parametric Approach to Efficiency Measurement" Journal of Productivity Analysis Vol. 2, pp. 127-142.

Bergendahl, G. 1998) "DEA and Benchmarks – An Application to Nordic Banks" Annals of Operation Research Vol. 82, pp. 233-249.

Berger, A. N. and D. B. Humphrey, (1991) "The Dominance of Inefficiencies Over Scale and Product Mix Economies in Banking" Journal of Monetary Economies Vol. 28, pp. 113-148.

Berger, A. N., W. C. Hunter, and D. B. Humphrey (1993) "Bank Efficiency Derived from Profit Function" Journal of Banking and Finance Vol. 17, pp. 313-343.

Bhattacharyya, A., A. Bhattacharyya and S. C. Kumbhakar (1997) "Changes in Economic Regime and Productive Growth: A Study of Indian Public Sector Banks" Journal of Comparative Economics Vol. 25, No.2, pp.196-201.

Chirwa, E. W. T. (2001) "Market Structure, Liberalization and Performance in the Malawian Banking Industry" AERC Research Paper, 108, Nairobi.

Clark J. A. (1988) "Economies of Scale and Scope At Depository Financial Institutions: A review of the Literature" Economic Review Federal Reserve Bank of Kansas City, Sept. /Oct.

Demirguc – Kuit, A. and E. Detragiache (1998) "Financial Liberalization and Financial Fragility" IMF Working Paper, WP98/83.

Denizer, C. A, M. Dinc and M. Tarimcilar (2000) "Measuring Banking Efficiency in the Pre-and Post-Liberalization Environment: Evidences from the Turkish Banking System" Policy Research Working Paper, World Bank.

Eeckaut, P.V., H. Julkens, and M. Jamar (1993) "Cost Efficiency in Belgian Municipalities" in The Measurement of Productive Efficiency Fried, H.O , C.A. knox Lovell and S.S. Schmidt Seed eds., Oxford University Press, New York; pp. 300 – 334.

Galindo, A et al (2001) "Does Financial Liberalization Improve the Allocation of Investment" www.weissasset.com.

Gilbert, R. A. and P. W. Wilson (1998) "Effects of Deregulation on the Productivity of Korean Banks" Journal of Economics and Business, Vol.50, pp.133-166.

Griefel - Taje, E. and C. A. K. Lovell (1997) "The Source of Productivity Change in Spanish Banking" European Journal of Operational Research Vol. 98, No. Pp.364-380.

Grigorian, D. (2002) "Determinants of Commercial Bank Performance in Transition: An Application of Nordic Banks" Annals of operation Research, Vol. 82, pp. 233-249.

Hardy, D.C. and E.B. Patti (2001) "Banking Efficiency in Pakistan" IMF Working Paper, WP/01/138.

Hirshberger, E. K., T. Osmonbekov, and N. Donthu (2001) "Benchmarking Marketing Performance" Working Paper January 21st, Georgia State University.

Humphrey, D. B. (1991) "Productivity in Banking and Effects from Deregulation" Economic Review Federal Reserve Bank of Richmond, Mar/April.

Humphrey, D. B. and L. B. Pulley (1997) "Banks Response to Deregulation: Profits, Technology and Efficiency" Journal of Money, Credit and Banking vol. 29, no. 4.

Iganiga,B. O. and F. N Obafemi (2006) The Dynamics of the Nigerian Financial System – Structure, Products and Reforms Amfittop Books, Lagos.

Ikhide, S.I. (1998) "On the Deregulation of Interest Rates in Nigeria – myths and Realities" Nigerian Financial Review vol. 3, no. 1. March.

Ikhide, S.I. and A. A. Alawode (1994) "Financial Sector Reforms, Macroeconomic Instability and the order of Economic Integration: Evidence from Nigeria" AERC Bi-annual Workshop, Nairobi, May.

Koeva, P. (2003) "The Performance of Indian Banks During Financial Liberalization" IMF Working Paper WP/03/150.

Lovell, C.A.K. (1993), "Production frontiers and productive Efficiency" in Measurement of Productive Efficiency, Fried Harold, C.A.K. Lovell, and S.S. Schmidt eds., Oxford University Press, London.

Mckinnon, R. (1973) Money and Capital in Economic Development Washington DC, Brooklyn's Institution.

Mester, L. J. (1987) "A multiproduction Cost study of Savings and Loans" Journal of Finance, 42, June.

Ndiyo, N. A. (2005) Fundamentals of Research in Behavioural Sciences and Humanities Wusen Publishers, Calabar, Nigeria.

Nyong, M.O. (2005) Management Science: An Operations Research - Emphasis in Economics and Business Clear Lines Publications, Calabar, Nigeria.

Onwioduokit, E. A. and P. A. Adamu (2005) Financial Liberalization in Nigeria: An Assessment of Relative Impact on the Economy"' NES Annual Conference, Lagos.

Oyaromade, R. (2005) "Financial Sector Reform and Financial Savings in Nigeria NES Annual Conference, Lagos.

Shaw, E. (1973) Financial Deepening in Economic Development New York, Oxford University Press.

Sherman, H.D. and F. Gold (1985) "Branch Bank Operating Efficiency: Evaluation with Data Envelopment Analysis" Journal of Banking and Finance vol. 9, no. 20, June: pp.297 – 315.

Wheelock, D. and P. Wilson (1999) "Technical Progress, Inefficiency and Productivity Change in U.S. Banking, 1984 – 1993" Journal of Money, Credit and Banking (May).

Zaim, O. (1995) "The Effect of Financial Liberalization on the Efficiency of Turkish Commercial Banks" Applied Financial Economics Vol.5, pp.275 - 64.

Ziorklui, S.Q. (2001) "The Impact of Financial Sector Reform on Bank Efficiency and Financial Deepening for Savings Mobilization in Ghana" African Economic Policy Discussion Paper, no. 81.