EVALUATING RELATIVE EFFICIENCY OF INSURED BANKS IN NIGERIA *

T.P. Fadiran *, F. O. Ogwumike * and K. O. Adenegan *

ABSTRACT

High level of relative inefficiency among insured banks in the country has serious implications in that the relatively inefficient banks may pose additional risk to the system's safety net. Also, other sectors of the economy may continue to pay for the banking system's inefficiency through high lending rates. Assessment of banks' performance poses some difficulties which include: (i) the nature of bank objectives which are often conflicting and against which an assessment has to be made; (ii) assessment of a bank's performance involves both quantitative and qualitative factors; (iii) there is the problem of identifying banks' inputs and outputs; and (iv) the existence of several heterogeneous inputs and outputs that cannot be easily compared. The study makes use of Data Envelopment Analysis in an attempt to measure the relative efficiency of

* Fadiran is of the Department of Accounting, Adekunle Ajasin University Akungba-Akoko, Ondo State, Nigeria.

* Ogwumike is of the Department of Economics, University of Ibadan, Oyo State, Nigeria.

* Adenegan is a Lecturer, Department of Agricultural Economics, University of Ibadan, Oyo State, Nigeria.

commercial banks. It was observed that inefficiencies link more to inefficient resource utilisation rather than production scale. Also, Nigerian Banks were noted to be highly operationally inefficient. Hence, it is not sufficient to increase the capital base but it is important to make the environment more competitive, and to improve the absolute efficiency of the industry.

1.0 INTRODUCTION

In Nigeria, the financial sector is dominated by the banking sub-sector. In the absence of strong competition from non-banking firms, the sub-sector may harbour inefficient banks that could be surviving on economic rent created by a protective environment characterised by restrictions on entry. A high level of relative inefficiency among some insured banks has two major implications. First, the relatively inefficient banks may pose additional risk to the system's safety net. This is because these banks may not be able to withstand the competitive pressure created by a fast-changing environment. Second, the presence of significant levels of inefficiency may allow the worrisome high lending rates to persist, thereby making other sectors of the economy to continue to pay for the banking system's inefficiency. Because of their dominant position in the financial sector, banks' efficiency in the use of inputs would affect the price(s) other sectors of the economy pay for financial services. One such price is the lending rate.

Since the introduction of Structural Adjustment Programme (SAP), which resulted in the deregulation of the financial system, the banking sector, has witnessed very rapid changes and transformation. Some people are of the view that, despite the hardship brought about by SAP, the banking sector, when compared to other sectors of the economy, performed relatively well (Oluyemi, 1995 and Alashi, 2002). Others have argued that deregulation brought about the failure of some banks, as they could not perform well (Onwu, 1994; Ekezie, 1994; Oluyemi, 1995; Ebhodaghe, 1996, 1997; and Donli, 2003). Thus, it can be said that deregulation brought out the sweet and sour aspects of banks in the country. Sweet in the sense that new players, in what used to be a highly protected and regulated industry, brought dynamism, challenges, competition and growth to the sector. On the other hand, not only have some banks fallen

by the wayside (with the liquidation of 4 banks in 1994), quite a reasonable percentage of the existing ones are in distress. In 1989 for example, 7 banks were identified as being distressed, 9 in 1990, 8 in 1991, 13 in 1992 and 24 in 1993 (NDIC, Annual Reports).

The rate of failure of the banks has been on the increase since then and the problem has reached an unprecedented level, with the number of banks in liquidation from 1994 to 2004 standing at 36. It has assumed a generalised dimension, thereby making it an issue of concern to the government, the regulatory authorities, the bankers, the general public and the international financial institutions. This is more so because of the implications on the economy as a whole.

Regulatory authorities' report as at 2004 still have it that there was deterioration in the level and extent of distress in the banking sector in the year, even though no bank was closed during the year. As a result of the implications of banks' inefficiency, both the regulatory authorities and the operators would be interested in assessing the differences in operational efficiencies among insured banks in the country. The regulatory authorities would be interested in determining the presence of operationally inefficient banks and the risk they pose to the safety net. The operators, on the other hand, would like to evaluate their respective institution's ability to withstand increased competitive pressure by comparing their operational efficiencies with those of their competitors. Therefore, we evaluate relative efficiency of commercial banks.

The paper is divided into five sections. The first section is the introduction; section two covers the literature review where the theoretical and the empirical literature are contained. Section three discusses the methodology and model specification. Presentation of results and analysis is the focus of section four while the paper ends with summary and conclusion in section five.

2.0 LITERATURE REVIEW

2.1 Theoretical Literature

In economic literature, there are two main types of efficiency, namely: allocative (scope and scale) and operational efficiency (also called X-efficiency). *Allocative* efficiency refers to the relationship between a firm's average cost and output as well as the economies of joint production. It is based on the assumption that inputs have a fixed specification and yield a fixed output. For example, in scale efficiency, the average cost curve is assumed to be U-shaped which suggests that, given a level of technology, there is an optimal output which minimises cost. Scope efficiency refers to the economies of scale arising from optimal diversification of outputs (Kwan and Eisenbeis, 1996). It posits that cost of joint production (of two or more outputs) is less than the sum of their stand-alone production costs.

The concept of operational efficiency was introduced by Harvey Leisbenstein in 1966. It refers to the efficiency in the use of inputs. It is measured as the difference between a firm's or an individual's actual output, given existing technology and incentives, and what the same firm or individual could have produced if they had worked as hard and as effectively as they could. The theory assumes that firms do not operate on an outer-bound production possibility surface which is consistent with their resources. Rather, they actually work on a production frontier that is well within that outer band. The deviation from the efficient production frontier, which represents the maximum output level for given level of input, is called X-inefficiency or operational inefficiency.

Leibenstein (1966) notes that, given a quantity of inputs, it is not feasible to accurately predetermine the output into which it could be transformed as there is a "great variation in output for similar amounts of capital, labour and technology". In other words, the assumption that inputs have fixed specifications and yield fixed output under allocative efficiency does not often hold. The variations in output were based on the fact that "neither individuals nor firms work as hard nor search for information as effectively as they could".

The theory therefore presupposes that there is more to the determination of output than the observable inputs; the nature of management, the environment in which it operates, and incentives given to employees, all these determine the efficiency with which observable inputs are transformed into outputs. Under proper motivations, managers and workers could put in their best to produce closer to optimality, and under other conditions, farther away from optimality.

According to him, the unit cost of product depends, in the final analysis, on the degree of operational efficiency, which in turn depends on the degree of competitive pressure as well as other motivational factors.

2.2 Empirical Literature

There are several problems associated with the measurement of banks' operational efficiency. First, there is the problem of identifying banks' inputs and outputs. For example, while demand and savings deposits are important sources of loanable funds (inputs), banks devote a lot of resources providing these services, thereby qualifying them as outputs. To solve this problem, Berger and Humphrey (1991) suggest that the choice of which banking activity to include as outputs should be based on value added. Earning assets, in addition to banking functions, which are provided through liquidity, transaction, and payment services to customers could be treated as outputs. Thus, loans and produced deposits (i.e. demand and savings deposits) could be considered as outputs while purchased funds (i.e. fixed /time deposits) are considered inputs.

Berger and Humphrey argue that, unlike produced deposits (deposits generated through the provision of liquidity, transactions and payment services to depositors), purchased funds are acquired almost exclusively through interest payments. However, the classification of demand and savings deposits as bank outputs has been contested. Osota (1995) contends that bank outputs should be measured by the value of their earning assets while other assets and liabilities are treated as inputs. After all, deposits (purchased or produced) are the sources of banks' loanable funds.

The second problem is the existence of several heterogeneous inputs and outputs that cannot be easily compared. For instance, inputs and outputs include loans, demand deposits, leasing services, securities services, labor, equipment and machinery whose units of measurement differ. Analysts have overcome this problem by measuring bank inputs and outputs in terms of their monetary values. Thus, given the duality between a production function and its corresponding cost function, the efficiency of a firm can be measured in relation to its minimum input\output ratio as reflected in its costs (Osota, 1995). In other words, efficiency can be measured relative to some cost or production "frontier".

Thirdly, it is difficult to objectively determine the minimum input output ratio against which a particular bank's efficiency could be gauged. According to Tannewald (1995), "no laws of bank operations exist, parallel to laws of mechanics and physics, to enable an expert deduce a bank's maximum attainable performance".

An assessment of banks' performance, as noted by Ojo (1992), poses some difficulties because of the nature of bank objectives which are often conflicting and against which an assessment has to be made. Assessment of a bank's performance involves both quantitative and qualitative factors.

In evaluating the performance of banks, there are some basic indicators that can be used. Typical examples are the use of ratios and trend analysis, Capital Adequacy, Asset Quality, Earnings and Liquidity. Apart from these quantitative factors, there are also some qualitative indicators which include the quality of management, the degree of compliance by banks with applicable banking laws and regulations (e.g. Monetary and Credit Policy Guidelines), as well as provision of banking services to the local economy.

The regulatory/supervisory agencies approach is the CAMEL parameters. Generally, examiners give banks a CAMEL rating, which is an overall evaluation of a bank's health and is an acronym based on the following factors:
Capital adequacy,
Asset quality,
Management quality,

Earnings ability, and
Liquidity.

Capital adequacy: This, in simple words, is the rules and regulations which require banks to hold sufficient capital to cover the risks they undertake. It is the amount of money invested by the owner into the business. Capital is the money made available by owners for the procurement of income-generating assets. It is measured by the excess of assets over liabilities. The quality of the capital base or structure of the bank is very important. Sometimes, losses and bad debt provisions may erode or deplete the capital base completely. This is a symptom of distress, which calls for immediate action of the management or board of directors to plan and inject money as capital funds to salvage the bank from an impending distress situation.

In assessing capital adequacy, different capital ratio concepts could be used. Examples are: Net worth/Total Asset and Gearing/Leverage ratios. A key aspect of the 2004 reform agenda was the upward review of the minimum shareholders' fund for insured banks to #25 billion by 31st December, 2005, while the prescribed minimum liquidity ratio remained as 40% in 2004.

Asset quality: Assets comprise fixed assets and current assets. The quality of these assets, especially loans and advances in the case of a banking organisation is the main focus. The degree of realisability of these loans and other advances is the major concern. When a bank is burdened with much of her risk assets portfolio on problem loans, then it is in serious trouble.

The bank's ability to properly manage her risk assets portfolio in line with the principle of liquidity, profitability and safety is very important. Assets should be managed to avoid accumulating poor-quality risk assets portfolio and hence declare paper profits.

Prudential guidelines are often used to detect loans that are either performing or non-performing loans. Therefore, it is the task of management to prevent bank failure by identifying these problems at an early stage to allow for corrective actions before the situation gets out of hand. Different asset ratios

exist that measure the quality of asset. Examples are: Total Assets Turnover ratio and Working Capital Turnover ratio.

Management: This is the most important of the organisation's resources. It is a name given to managers or officers entrusted with the day-to-day running of the organisation as approved by a representative of the shareholders called board of directors. The quality and credibility of the board of directors and Management is very essential for good performance, profitability, growth and stability of the organisation.

There is the need for a good quality management team that is creative, able to carry others along and execute sound policies and practices that will go a long way in improving the fortunes of the bank in such a way as to seek an optimum combination of liquidity, profitability and safety in the management of assets and liabilities' portfolio. Management ineptitude, quarrels, divide-and-rule tactics, boardroom politics, static and obsolete products, policies, practices and unnecessary red tape. Etc; are symptoms of poor management.

Earning: This means income or profit. Income increases the value of net worth and dividends that are to be paid to shareholders while consistent and continuous loss position will gradually deplete the value of shareholders' funds called equity capital and start eating deep into depositors' funds. Profit could be expressed in terms of Gross profit margin ratio or Net profit margin ratio.

Liquidity: This is the ability of the bank to meet up with her short-term maturing obligations. When a bank is not liquid, it is a dangerous signal and it could lead to erosion of confidence of the banking public and consequent bank run. Bank run is a state of panicky mass withdrawal of depositors' funds from an ailing bank.

The CBN stipulated that 30% of the total deposits of banks are to be kept in liquid form. Apart from this, Acid test and Current Ratios could be used as a measure of the liquidity state of a bank.

Alternative Approaches to Measuring Operational Efficiency

Researchers have suggested several approaches to measuring operational efficiency. Prominent among these are: Efficiency Ratio, Stochastic Econometric Frontier, Data Envelopment Analysis and Thick Frontier approaches. Efficiency ratio, which is defined as the ratio of total operating expenses to operating income (net interest income plus non-interest income), measures how optimally the resources of a bank are used in generating outputs from which income is derived. If one simply had a single input and a single output, one would define a measure of efficiency as:
Efficiency Ratio= output / input.

The Stochastic Econometric Frontier approach estimates cost functions under the assumption that the disturbance term (ε) is made up two independent components, a random noise (v_i), and x-inefficiency (u_i), of i.e. $\varepsilon_i = v_i + u_i$. Where: v_i is the error term with normal distribution, constant variance and zero mean, i.e. $v_i \sim N(0, \sigma^2)$ u_i is the additional cost from its minimal possible value (x-inefficiency). It is assumed to be non-negative and has a half-normal distribution.

This assumption reflects the fact that each firm's cost function must lie on or above the frontier. A major weakness of this approach is the assumption of a half-normal distribution of the inefficiency term. This implies that most of the observations are clustered near full efficiency, with higher degrees of x-inefficiency being less likely. Empirical studies have shown that this assumption is often violated in both banking and other industries. (Berger and Humphrey, 1991).

The Thick Frontier approach assumes that, on the average, banks with relatively low average cost set the standard for operational efficiency against which other banks could be measured. The approach estimates the cost functions for the lowest and highest average cost quartiles of the banks. The lowest average cost quartile may be thought of as a 'thick frontier' in which it may be assumed that the firms are of greater-than-average efficiency while firms in the highest average cost quartile are assumed to be of less-than-average efficiency. The differences between these two cost functions are

separated into "market factors" which are explained by differences in the exogenous variables and an "inefficiency residual" which cannot be explained.

The fundamental assumption in this approach is that the error terms within the lowest and highest cost quartiles reflect only random measurement error while the differences between the lowest and highest cost quartiles reflect only inefficiencies and market factors, (Berger and Humphrey. 1991). Thus, the major weakness of the approach is that it does not permit the evaluation of a particular bank's relative efficiency because, within the two quartiles, differences in x-efficiency are assumed away.

The Thick Frontier approach is simpler and requires less restrictive assumptions. Even if error terms within the quartile represent inefficiencies rather than random error as assumed, the approach remains a valid comparison of the average inefficiencies of high-and low-cost firms In other words, it provides an idea of the magnitude of inefficiency within a given set of banks.

2.3 Empirical Studies

Several studies have been conducted on X-efficiency in the banking industries of some countries, especially the United States. Prominent among these was the study by Berger and Humphrey (1991) which found a large dispersion of costs among banks in the US. They observed that, in some cases, banks had several times higher costs than others with similar scale and product mix. Using the Thick Frontier approach, they found that a substantial portion of the dispersion in costs was due to inefficiencies. Overall, inefficiency accounted for 25% or more of average costs.

Tannewald (1995) used the Thick Frontier approach as well as a hybrid of the Stochastic Econometric Frontier and Thick Frontier approaches to investigate the difference in operational efficiency among the banks in a Federal Reserve District in the United States pf America. He found a substantial dispersion in X-efficiency among the sample banks.

Another study on banking efficiency was conducted by Kwan and Eisenbeis (1996). Using the Stochastic Econometric Frontier approach, they found large X-inefficiencies among banks in the US. The inefficiencies were also found to be more prominent among small banks. In addition, the study found that inefficient firms tended to stay inefficient over time.

In their study of X-efficiency in Japanese banks, Altubas et al (2000) used the Stochastic Econometric Frontier approach while controlling for risk. However, they found that X-inefficiency scores were not sensitive to the risk. Larger banks were also found to be more X-inefficient in Japan.

Previous empirical studies have it that most Nigerian banks are highly operationally inefficient (Osota, 1995; Afolabi, and Osota. 2002, and Bwala, 2003). Bwala (2003) carried out an investigation of the operational efficiency of insured banks in Nigeria and discovered that the operational-inefficiency ratio (X-inefficiency) among insured banks is more than three times the highest figure (51%) reported by Tannenwald (1995), and Berger and Humphrey (1991) in their separate studies of banks in the United States.

Several general conclusions emerge from this literature. First, inefficiency traces primarily to pure technical, rather than scale, effects. That is, if a bank has not fully exhausted economies of scale, or if it has gone too far and experienced diseconomies of scale, neither event contributes much to overall bank inefficiency. Inefficiencies link more to inefficient resource utilisation rather than production scale.

3.0 MODEL SPECIFICATION/METHODOLOGY

Data Envelopment Analysis (DEA), occasionally called frontier analysis, was first put forward by Charnes, Cooper and Rhodes in 1978. It is a performance measurement technique, which can be used for evaluating the *relative efficiency* of *decision-making units* (*DMUs*) in organisations.The Data Envelopment Analysis divides the sample banks into sub-samples that produce the same level and mix of outputs and face similar input prices. Banks that incur the least total cost in each sub-sample are regarded as the best practice or efficient banks. These banks form a "frontier" that envelops other banks in

the sample. This approach to measuring operational inefficiency uses the linear programming technique to estimate, piecewise, linear cost frontier that connects the costs of "efficient" firms. Firms on the vertices of the frontier are considered to be fully efficient and the inefficiencies of other firms are measured relative to this frontier.

Operational efficiency refers to the efficiency in the use of inputs. It is measured as the difference between a firm's or an individual's actual output, given existing technology and incentives, and what the same firm or individual could have produced if they had worked as hard and as effectively as they could. The model used in this study is stated as follows:

Efficiency ratio = $u' y_i / v' x_i$
Max u.v $(u'y_i/v'x_i)$,
Subject to $u'y_j/v'x_j \leq 0$, j = 1, 2..... N
$u, v \geq 0$
N = Number of DMUs = 20
K= Number of Inputs = 4
M=Number of Outputs=3
Output –Oriented
Variable Return to Scale

The four inputs used in the study are: Salaries and Wages, Value of Fixed Assets, Interest Expenses and Non-interest Expenses. The three Outputs are: Total Deposit, Total Interest Income and Total Earning Assets.

A total number of twenty commercial banks, out of the old banks, including surviving, distressed and failed banks, were used as samples. The study covered a period of five years from 2000 to 2004. With the upward review of the minimum shareholders' fund for insured banks to #25 billion effective from 31st December, 2005, the industry witnessed a lot of instability in 2005 with series of merger talks. Hence the year 2005 was excluded from the analysis as it is not a normal year in the industry.

The reform agenda resulted in a total number of twenty-five insured banks in Nigeria from year 2006. As data become available for these years we hope to

assess, as well, the impact of the reform agenda in the future, say from 2006-2010.

The basic limitation of the DEA method is its assumption that the entire deviation from the frontier is considered as inefficiency. Hence, measurement errors and other stochastic effects will be incorporated into DEA measure as inefficiency (Angelidis and Lyroudi, 2006).

4.0 PRESENTATION OF RESULTS AND ANALYSIS

The table below gives the result of the banks' efficiency ratio calculated.

Table 1: Efficiency Ratio for the Five Years

S/No.	Banks	2000	2001	2002	2003	2004
1	UNION	0.863	0.912	0.915	0.938	1.000
2	WEMA	1.000	1.000	1.000	0.828	0.703
3	CHARTERED	0.723	0.883	1.000	0.976	0.981
4	MAGNUM	1.000	1.000	1.000	1.000	0.953
5	TRANS INT.	1.000	0.962	1.000	1.000	1.000
6	TRADE	1.000	1.000	1.000	1.000	1.000
7	GULF	1.000	1.000	1.000	1.000	1.000
8	EKO INT	0.663	1.000	0.871	0.867	0.792
9	OCEANIC	1.000	1.000	1.000	1.000	1.000
10	CO-OP	1.000	0.954	1.000	1.000	1.000
11	GLOBAL	1.000	1.000	1.000	1.000	1.000
12	GTB	0.969	0.838	1.000	1.000	1.000
13	OMEGA	1.000	0.916	0.689	0.944	1.000
14	ACCESS	0.802	0.739	1.000	0.893	0.890
15	STB	1.000	0.987	1.000	1.000	1.000
16	LION	1.000	1.000	1.000	1.000	1.000
17	UBA	1.000	1.000	1.000	1.000	1.000
18	AFRIBANK	1.000	1.000	1.000	1.000	1.000
19	ZENITH	1.000	1.000	1.000	0.853	1.000
20	FIRST BANK	1.000	1.000	1.000	1.000	1.000
	Mean	0.951	0.960	0.974	0.965	0.966

In 2000, fifteen out of the twenty sampled banks were 100% efficient when compared with the others, as their efficiency ratio calculated is 1. One of them was 90% and above efficient, as the efficiency ratio is less than one but lies

between 0.900 and 0.999. Two of the banks were 80% and above efficient, having their efficiency ratio between 0.800 – 0.899, one is 70% and above efficient, while the last one is 60% and above efficient. The mean for the year is 9.51 and sixteen of the banks were above average and the remaining four performed below average.

When compared with one another, twelve out of the twenty sampled banks were 100% efficient in year 2001. Five of them were 90% and above efficient, two of them 80% and above efficient and one of them was 70% and above efficient. The mean for the year is 9.60, which is higher than the previous year and the number of efficient banks has dropped from fifteen to twelve. Also, six of the banks performed below average.

In year 2002, seventeen of the banks were 100% efficient, one of them 90% and above efficient , one of them 80% and above efficient and the last was 60% and above efficient. The mean for the year rose further to 9.74, with three of the banks below average. There is an improvement in the performance this year.

The performance dropped in 2003. Thirteen of the banks were 100% efficient, three of them 90% and above efficient and four were 80% and above efficient. The mean for the year is 9.65 and six of them performed below average.

In year 2004, fifteen of the banks were 100% efficient, two of them 90% and above efficient, one of them 80% and above efficient and two of them were 70% and above efficient. The mean for the year is 9.66 and four of the banks performed below this average.

From the analysis above, the performance of the banks fluctuates, rising and falling. In 2000, fifteen of them were fully efficient, in 2001, twelve were fully efficient, in 2002, seventeen were fully efficient, in 2003, thirteen of them were fully efficient and fifteen of them were fully efficient in 2004.

Comparing the banks with the average also reveals the same fluctuation in performance. In year 2000, four of them performed below average. In 2001, six of the banks were below average. Three banks performed below average in

2002. The number of banks below average increased to six in 2003 and in 2004, four of the banks performed below average.

5.0 SUMMARY AND CONCLUSION

Data Envelopment Analysis applied on banks' performance presents a measure of relative efficiency among the sampled banks. Many of the banks when compared to one another have efficiency ratio of one or close to one. This result reveals a level of keen competition within the banking industry in the allocation of resources.

We also observe fluctuations in the performance of the banks. The number of efficient banks increases and decreases over time. The number of banks performing below the mean also increases over time.

While some of the banks' efficiency ratios for the five years was one, indicating full efficiency in their use of inputs relative to outputs as used in this study, when compared to their peers, some of them performed below the mean for all or most of the years.

Previous empirical studies, (Osota, 1995; Afolabi, and Osota, et.al. 2002, and Bwala, 2003), show that most Nigerian banks are highly operationally inefficient. Hence, it is not sufficient to increase the capital base but it is important to make the environment more competitive, and to improve the operational efficiency of the industry.

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