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Measuring the Technical Efficiency of the Banking Sector (Economic Growth in Ghana)

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Abstract

This study assesses the technical performance and overall productivity change factor after consolidation and the subsequent system of banking reforms to stabilize the sector before the effects of the financial crisis. The study uses both non-parametric data wrapping (DOS) and the Stochastic Boundaries (SFA) parametric approach using the Malmquist Productivity Index and the Fault Component Production Function to determine whether there has been a significant change in efficiency in a sample of 12 banks representing about 80 percent of Ghana's total bank assets. The theoretical approach of the remedy is used when selecting input and output variables. The input variables to be included are total deposits, total capital and operating costs, including staff costs, and production variables are loans and operating income that are responsible for weighted returns, such as interest income or cost-based revenues. The results suggest that the average technical efficiency within the SFA and the general change in production, per the factor of productivity at the DEA will decrease as bank production shifts to interest-only income or cost-based revenues. Although the size is different, both the SFA and DEA are managing in a similar direction for technical efficiency and overall factoring production. The impact of the study suggests that policymakers should be concerned about the bank's ability to arbitrarily generate cost-based revenues, which is a high long-term cost to the banking system.

Keywords: *Data Envelopment Analysis, Malmquist productivity index, technical efficiency*

1.0 Introduction

Community financial institutions can be at the heart of economic development for a number of reasons, such as: providing money for personal loans, financial entrepreneurship, government loans and other large projects that help assess and implement government monetary and economic policies by providing a wide range of financial services (Scott & Timothy 2006). A sound financial system is essential for a healthy and emerging market economy. The banking sector is the most important part of the financial system in any economy (Singh, 2010). The financial sector is crucial to the economies of different countries and banks remain part of the sector, especially in emerging economies where the capital market is not strong enough (Matthew & Laryea, 2012).

The banking sector in Africa and the rest of the developing countries has fundamentally reformed its business environment. Reforms in the financial sector have been implemented in many countries. The Ghanaian banking sector has undergone a number of reforms and restructurings over the years as a result of internal and external economic developments and unrest. Recent developments in the banking sector include the adoption of International Financial Reporting Standards (IFRS) in accordance with the Bank of Ghana's International Standards to reduce systemic risks. In Ghana they started in the late 1980s as part of the ongoing economic recovery programme. In 1987, interest rates began to liberalize in part. This entails liberalising the exchange rate and the exchange of licences at foreign exchange rates (Brownbridge & Gockel, 1996). The Financial Sector Adjustment Programme (FINSAP) was launched in 1989. It is therefore reasonable to assume that these reforms have changed the functioning of the commercial banks in Ghana and then on their results. In the course of these reforms, banks played an important role in financing economic activities in various market segments, in particular in sub-Saharan Africa (Athanasoglou, Delis & amp; Staikouras, 2006).

1.1 Motivation for the Study

On this basis, the efficiency of financial institutions is crucial for the whole economy. Banking failures pose a threat to the banking system. In order to combat this risk of default, various models and methods have been developed to assess and analyse the activities of banks. The adequate effectiveness of financial institutions in terms of technical efficiency is crucial not only for their clients, but also for their continued growth and survival

and for the economy as a whole (Bikker, 2010). The growth and development of Ghana's economy depend to a large extent on the success and efficient functioning of the banking sector (Ghana's banking sector in 2008).

2.0 Literature Review

In order to establish a link between the performance of the banking sector and the design and implementation of economic policy, an analytical framework on the link between financing and growth will be developed on the basis of literature. The works of Levine, Khan, Boyreau-Debray and Maswana help, among other things, to define the analytical framework and select variables that fit the model. In the weight, Granger causality and vector auto-regression model tests are conducted to investigate the impact of banking development on growth. The model also includes control variables for GDP growth: foreign direct investment flows replace physical capital and population, and the above-mentioned secondary education is human capital. Most researchers agree that there is a link between the banking sector and the economic policy framework. However, the researchers differed from the causal link between bank loans and economic growth (Oluitan, 2009). In addition, Neba Cynthia (2008) conducted a study on the role of microfinance in the growth of the Cameroonian economy. One of the main reasons Avkiran used the DEA model, which used interest rate and non-debt costs with interest income and variables in interest income to test the performance of Australian commercial banks between 1986 and 2013. Chen and Yeh (1998) calculated the operational performance of 34 commercial banks in Taiwan using the DEA model, which includes input variables, employees, interest costs and production variables, including loans and interest income, non-interest income and bank assets. The author concluded that a bank with greater efficiency does not always mean that it is better.

However, if the size of a branch increases the efficiency of the weight, it also increases after the most productive size, since size increases efficiency. Al-Shammar and Salimi (1998) examined the comparative operational efficiency of commercial banks in Jordan between 1991 and 1994. Noulas (2001) used the DEA model and the traditional approach to examine the impact of bank deregulation on private and public banks. Interest expense and non-interest expense were input variables, and interest income and non-tax income were production variables. The result is that state banks were less efficient than private banks and that this gap had widened during the research period.

Several studies have also been conducted to analyse efficacy in India using DEA methods). Bhattacharya et al. (1997) found that India's public banks were the most successful banks because Indian public banks dominated the banking sector, while new private banks have not yet emerged entirely from the Indian banking scenario. Satie (2001) examined the relative effectiveness of Indian banks in the 1990s. The Commission found that the average efficiency assessment of public banks compared to private Indian banks was biased, but different results were found when comparing Indian public banks with foreign commercial banks. It was also found that most banks are at an effective border in their outer hands.

Rammohan and Ray (2004) compared maximizing revenue from Indian public, private and foreign banks using the 1990 SPA They found that public banks were significantly better in their study and the government and other representatives involved in economic growth helped develop a good development strategy and policy

2.1 Technical Efficiency

The decision-making authority is technically efficient when producing as much production as possible from the import basket or using less import data to produce a certain quantity of production (Atkinson and Cornwell, 1994). Thus, measuring the DMU efficiency level makes it possible to determine whether it can increase production without consuming more resources or reduce the use of at least one input while maintaining the same level of production (Farell, 1957).

The main criteria for measuring the efficiency of banks are technical efficiency. Technical efficiency: production of maximum power with certain inputs; inputs for a certain output (Yang, 2005). Technical efficiency means the use of work, capital and machinery as inputs for production on the basis of the best sampling procedures in the decision-making entity table, which means that the same technology and the external environment do not take into account the waste of input resources when drawing up the target production (Bhat, 2001). Technical efficiency shall be measured on the basis of the ratio between physical production and import data. In the case of technical efficiency, a relative assessment of effectiveness is always available. If we call the system effective, we say that we can achieve the output needed with fewer inputs, or that the input used can generate a more desirable

output. As the purpose of this study is to measure the performance of an entity's activities, research focuses only on technical efficiency.

Given the various reforms and developments in the banking sector and the obvious challenges facing India's banking sector, it is interesting to know whether banks have acted effectively and what the parameters are, for measuring efficiency. The word "operation" is purely a development tool that can be used on some or all banking activities over a period of time. It will be used to measure increased efforts to achieve the objectives effectively and efficiently. Achieving the objectives includes the use of human, financial and past or expected technical efficiency, liability or management responsibility, etc. It also reflects the quality and performance of banking management. It deals with the achievement of the objectives and intentions of the company in relation to current developments in the past, albeit in the current context. It also covers financial costs and social aspects. It concluded that the ability to mobilize an organisation and use its material resources has become more important than the investment and management of physical resources. It is fair to say that anything that can be measured can be controlled. Measuring the efficiency of banks is an important area and is constantly evolving and adapting. Since the creation of this concept, it has been found out that, it is difficult to establish that, the production of intangible services requires an actual amount of resources and depends in particular on profitability in order to verify the efficiency of the activities. As the contribution of the service sector in developed countries grew rapidly with its development, management experts and academicians tried to develop advanced methods for measuring it. Actual efficiency can therefore only be measured by using key financial and non-financial indicators in the best possible way.

2.2 Empirical

There are a number of studies aimed at analyzing the efficiency of banks. Despite the differences in detail, the analysis of packaging data is the most popular in the literature. Barr et al. (2002), for example, assessed the productivity of American commercial banks.

The results of the study showed a high level of inter-toxicity efficacy and independent performance standards. Casu and Molyneux (2000) used the DEA approach to study the effectiveness of European banking systems. They wanted to see whether the production efficiency of European banking systems had improved and concentrated on a common European border. Jemrić (2002) examined the effectiveness of Croatian banks. The main results showed that foreign banks are on average the most efficient; banks that have recently entered the market are more efficient than banks that have been operating for a long time. Small banks are also more efficient than the big banks. Wu (2005) examines the productivity and efficiency of Chinese banks from 1983 to 2001. The main results showed that efficiency increased in the context of deregulation. Loukoianova (2008) compared the banking sector in Western Europe, the United States and Japan on the basis of bank specialization. Africa also seeks to measure its effectiveness and impact on results. Figueira, Nellis and Parker investigated the 2006 financial year. The results show that private African banks are not in a state-owned situation with banks. However, when it comes to foreign ownership as private property, it seems to have a positive impact on the bank's activities. Agu 2004 examined the efficiency of the Financial Sector in Gambia and found that Gambia's banking system was not functioning as effectively as it should. The inefficiency of the various functions is due to a complex regulatory framework, an oligopoly market structure and a small banking market. As far as I know, studies have not been carried out to assess the effectiveness of Ethiopian banks by analyzing data packaging or other border controls.

3. Methodology (Design Approach)

3.0 Data Sources and Model Specifications

The TFP model is used to measure the change in the productivity of the panel's data factors and to classify this change for technical efficiency and technological change. According to Fare, Gross of, Norris and Zhang (1994), the Malmquist TFP index shows more than 1 positive growth in the t+1 period and on the other hand, which is less than 1, indicating a decline. In other words, a technical efficiency index of more than 1 means that an organization has been able to carry out its production units and if the 1-year-old technology change index has a positive impact on the level of efficiency. Negative change in the technology index means a reduction in the production of the same number of inputs. Cena et al. (1994) shows the Malmquist FP index between the base period and the next period t, taking into account technological developments as follows:

$$TFPC^{s,t}(Xs, Xt, Ys, Yt) = \frac{d_0^t(Xt,\ Yt)}{d_0^s\ (Xs,\ Ys)} \left[\frac{d_0^s(Xt,\ Yt)}{d_0^t(Xt,\ Yt)} x \frac{d_0^s(Xs,\ Ys)}{d_0^t(Xs,\ Ys)}\right]^{0.5} \quad [1]$$

$$\text{Technical Efficiency Change} = \frac{d_0^t(Xt,\ Yt)}{d_0^s\ (Xs,\ Ys)} \quad [2]$$

$$\text{Technological Change} = \left[\frac{d_0^s(Xt,\ Yt)}{d_0^t(Xt,\ Yt)} x \frac{d_0^s(Xs,\ Ys)}{d_0^t(Xs,\ Ys)}\right]^{0.5} \quad [3]$$

if the TFPC index is a general change in cast iron productivity factors, the input variable X and Y are the output variable, with the t-status being two different periods, as mentioned above. The factor productivity index is calculated on the assumption that it continuously returns to the scale model. The first part of equation 1 measures technical efficiency, which refers to the period or the next t-period, the second part creates a technological change between the period or the next t-period in the bank. The Malmquist index has two different characteristics; there is no doubt that the behaviour and prices of the resources and services offered are not necessary.

4.0 Experiment and Analysis of Data

4.1 Efficiency and DEA Analytical framework

The concept of efficiency is based on the fact that an output is not producible without resources (inputs) and that these resources are limited in supply. It follows that the production volume (goods) is limited, which can be produced. There are two main indicators: distribution and technical efficiency. Distribution Efficiency means combining different input data for resources to produce a combination of different outputs [27]. However, technical efficiency is linked to achieving the cheapest maximum production. The overall performance targets are the combined effects of distribution and technical efficiency [27]. A standard should be established to measure efficiency.

For the purpose of measuring technical efficiency, provided that for a certain minimum quantity of resources or, alternatively, maximum production of a certain level will be used to achieve a given level of production. Using more resources than not is necessary to produce a certain amount of production means that resources must be lost and thus an inefficient production. It is also possible to change the production volume, which is, production actually produced may be used as an indicator of technical inefficiencies [28]. Technical inefficiencies therefore depend on the number of unnecessary resources used. The size of a health centre can sometimes lead to

inefficiencies. The wellness centre may be too large for the scale of its activities; therefore, some uncertainty. In the case of economies of scale, the health centre's inefficient productivity is increasing. On the other hand, the wellness centre may be too small for its level of activity and thus experience the effectiveness of the scale. The traditional method of measuring economic efficiency (including health economics) was based on statistical principles and econometric principles on production limits [28]. These features, which determine performance, are also called stand-up boundary models (SFMs). In 2015, 10,000 people in recent decades, however, an alternative method has been developed for a stylish border approach and its use has grown rapidly over the years. This method is called the Data Envelopment Analysis (DEA) [28]. The use of DEA for stochastic border models has a number of compelling methodological and practical advantages. The DEA consists of several inputs and several productions on a common efficiency scale, such as the SFA, and has become a dominant approach in measuring the effectiveness of the health sector and many other sectors of the economy [16]. The DEA does not specify the functional format defined for modeling and calculating DMU modelling. Unlike parametric boundary models, the dean does not have a model error problem, which can lead to misleading results [28]. In addition, unlike the SFA, the DEA does not suffer from problems with multilinearity and heteroscedasticity. Setting energy efficiency is an indicator of efficiency that is empirically available in this scenario (taking into account existing resources, institutional structure, etc.).
In other words, after the DEA has provided an indicator of relative effectiveness, inefficiency can be justified, i.e. using DEA. However, we can reduce the problem by using a large sample data set. Another limitation or disadvantage is that, because DEA is a method that is not a parameter, testing statistical hypotheses is difficult.

Also, because the DEA has extreme point techniques, noise such as error in measurements can cause a significant problem. Below is another overview of the DEA model for assessing the differences in production efficiency of health centers. We use a mathematical programming method based on decks that converts multiple measurements of inputs and outputs into one overall measure of production efficiency. DEA is based on the relative principles of effectiveness proposed by Farrell, but Charnes et al (1994) has expanded and developed Farrell's approach. It can be said that the DEA applies the complex concept of efficiency [28]. According to Charnes et al. (1978), the technical performance of health centres shall be weighted in proportion to the maximum production ratio and the weighted input, provided that the comparable shares of each health centre are less or equal to shares. This is done by addressing another problem.

$$Max\ h_0 = \frac{\sum_{r=1}^{s} u_r y_{rjo}}{\sum_{i=1}^{m} v_i y_{ijo}}$$

Subject to

$$\frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \le 1, \quad j = 1, \ldots j_0, \ldots n$$

$$u_r \ge 0, r = 1, \ldots, s \quad \text{and} \quad v_i \ge 0, i = 1, \ldots, m \qquad (1)$$

The standard DEA model, the relative efficiency of the production unit, is defined as the ratio between the weighted output amount and the weighted input amount. The scales shall be determined in such a way that the production unit as a maximum relative level.

Three common approaches to measuring the company's effectiveness in literature are: financial ratios, parametric approach and non-parametric approach (Habibullahet al. 2005). Managers, financial institutions, regulators and consultants typically use financial ratios such as cost-benefit ratios and equity return ratios derived from financial statements to measure the way decisions are made (DMU) (Baueret al.1998). In terms of value, financial ratios provide useful information about DMU financial performance compared to periods. In addition, financial ratios provide valuable information on the ranking of DVDs with similar

characteristics (Chen and Yeh, 1998). One of the weaknesses in the use of financial ratios is that there is confusion about the relative importance of different types of inputs and outputs. Another of the weaknesses related to the use of financial ratios et seq. is the relative importance of different types of inputs and outputs in relation to the government. The assessment of effectiveness shall be based on a parametric approach, including an assessment of the characteristics of the selected function and the measurement of the scale, provided that all sampling value development management methods function effectively. The efficiency assessment is based on a parametric approach, including an assessment of the characteristics of the selected function and measuring the savings so that all of them have access to it. It functions as a typically production or cost function (Chen and Yeh, 1998).

4.2 Analysis Finding

Given the various reforms and developments in the banking sector and the obvious challenges facing the Indian banking sector, it is interesting to know whether banks have acted effectively and what the parameters are for measuring efficiency. The word 'operation' is generally understandable and is exclusively a development tool applicable to all or all of the banking activities over a given period of time. It will be used to measure expanded efforts to achieve the objectives effectively and efficiently. Human, financial and past or foreseeable technical performance, management or accountability, etc. shall be used to achieve the objectives. It also reflects the quality and performance of banking management and results. It also deals with the achievement of the company's objectives and objectives in relation to past developments, albeit in the current context. It also includes financial costs and social aspects. Thus, the conclusion that the ability to mobilize an organization and use its tangible resources has become more decisive than the physical resources of investment and management. We can rightly say that anything that can be measured can be controlled. Measuring the effectiveness of banks' activities is an important area and has been constantly developed and modified. Since the concept was created, it was found that it was difficult to establish that an efficient amount of resources was needed to produce the production of intangible services and that this mainly depends on profitability to verify the efficiency of the activity. As the contribution of the service sector in developed countries has grown rapidly, both management experts and academicians have tried to develop advanced methods to measure it. Therefore, actual efficiency can only be measured with financial and non-financial key indicators in the best possible way.

5.1. Conclusion

In determining the technical efficiency and productivity changes of the Ghanaian banking sector in terms of production variables; interest income (credit) and non-interest income (operating income), this study shows that the average overall change in productivity of DEA and SFA factors decreases for non-interest-bearing accounts. The average technical performance of banks will also be reduced in line with the SFA's assessment, as banks' revenues are not usually based on interest or costs. By comparison, both the DEA and the SFA produce similar results in determining the overall change in the technical efficiency and productivity factors of the bank's exit portfolio. The definition of the SFA error component model "inefficiency" is reduced for interest (credit) and non-interest-bearing or cost-based income. In other words, banks become weaker or inefficient when they earn non-interest income because fees are already-fixed or fixed.

These findings have been confirmed by recent studies that Ghanaian banks' income portfolio is becoming increasingly interest-bearing or account-based costs because they are less competitive to earn. This study

shows that banks are becoming less effective at applying for non-interest income. However, as non-fixed-term or cost-based transactions gradually become a cheap or easy source of revenue, policy makers should monitor the arbitrariness that the bank's management reveals when applying these fees. Arbitrarily, the costs of services in the banking sector may increase in the long term and reduce the efficiency of banks' role as intermediaries in the economy.

Although the overall change in the productivity and technical performance assessment of DEA and SFA factors vary, the direction of production efficiency of the non-parameter and parametric assessment productivity assessment is similar to our choice of input and output variables. The direction of further research is to determine the profit profile and cost-effectiveness of Ghanaian banks in order to generate non-interest and fee-based returns. This provides a framework to understand whether the bank's desire to increase its revenues through off-balance-sheet or cost-based services would be sustainable.

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