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Does Ownership and Size Influence Bank Efficiency? Evidence from Sri Lankan Banking Sector

J.M.R. Fernando* and P.D. Nimal†

*Faculty of Commerce and Management Studies, University of Kelaniya.
ruwani@kln.ac.lk

†Faculty of Management Studies and Commerce, University of Sri Jayewardenepura.
pdnimal@gmail.com

Abstract

This study utilizes Data Envelopment Analysis (DEA) as a non-parametric approach for measuring efficiency to analyze the technical efficiency of the Sri Lankan banking industry from year 2007 to 2011. This study conducted efficiency analysis across the individual, industry, ownership and size factors. The reason behind the selection of the banking industry in Sri Lanka is mainly due to the reasons of competition among the banking sector and the key role they play in the country to protect the stability of the financial system. Hence the efficiency of the banking industry is of paramount importance for the efficiency of the whole economy. Therefore, the objective of the study is to find the efficiency of the banking industry by using DEA as a new approach for measuring efficiency. Results indicate that banks are operating at a higher level of efficiency recording an overall technical efficiency of 83.3 percent. The results also indicate that most of the large banks operate at increasing returns to scale whereas small banks operate at decreasing returns to scale. Opposite results were found for the size factor since there were no significant differences in efficiencies between small and larger banks. However, findings show that there is a significant difference among the ownership category. Public banks are less efficient than private banks in Sri Lanka. The study recommends the importance of rationalizing the policies on labor recruitments and acquisition of fixed assets since inefficiencies have been created mainly due to excess labor and assets usage.

Keywords: *bank efficiency; data envelopment analysis; ownership; size; Sri Lankan banks*

1. Introduction

The soundness of the banking industry impacts on the stability of the financial system of a country and on most of the economic activities because banks do play a key role in managing the flow of funds of an economy. Therefore, continuous functioning of banks with a high level of efficiency is highly important. In general, efficiency is how a firm uses its cost or effort to obtain the maximum output and it finds the ratio of inputs to outputs. Further, it can be

considered as obtaining maximum output using the minimum input and efficiency which is the core of the economies. All the financial institutions and the financial sector that are operating in an economy hope to operate efficiently in order to achieve the economic growth and the stability of the financial system.

Studies on banking industry have been on various aspects of banking in existing literature (Tafri et al. 2011). Further, the literature has focused on the efficiency of banks as a measurement of performance. Samad and Hussan (2000) used the financial ratio analysis to measure the efficiency of the Malaysian banks. Fernando and Pushpakumara, (2009) and Masruki et al. (2007) also analyzed efficiency based on the traditional accounting treatments. Many studies have found the profitability of banks to measure the performance however, there were questions as to whether this profit has been made on as a result of increased efficiency or not (Silva, 2009).

The other conflicts that the study has identified are whether these financial ratios could cover the main inputs and outputs of a business to find the correct level of efficiency. It is vital to define inputs and outputs of a business process correctly to measure the efficiency since the efficiency depends on the usage of optimal inputs to gain maximum outputs. Further, the profitability of banks does not imply how the banks have used its recourses efficiently. The performance of the banks can be correctly identified in terms of bank efficiency since if a bank has used more inputs to generate the highest level of profit.

Therefore, the aim of the study is to measure bank efficiency by correctly defining the basic inputs and outputs of the banking process and identify how efficiency varies with the size and ownership. Therefore, this study provides the answer to the problem whether Sri Lankan banks perform efficiently and how efficiency varies with the size and ownership factors. There are some limitations in this study since this study has attempted to find the efficiency only by considering the size and ownership category. However, there are some studies in Sri Lankan context that have gone beyond the local context with the ownership factor (Wanniarachchige & Uddin, 2011).

Table 1: Financial indicators of the banking industry in Sri Lanka

Indicator/ Year	2007	2008	2009	2010	2011
Net assets (Rs: Billion)	2,504	2,698	3,013	3,550	4,053
Gross advances (Rs: Billion)	1,534	1,671	1,640	2,017	2,495
Deposits (Rs. Billion)	1,741	1,878	2,232	2,586	2,948
Capital adequacy Ratio %	14.1	14.5	16.1	16.2	14.5
Gross non-performing ratio %	5.2	6.3	8.5	5.4	4.4
Return On Assets (ROA) %	1.9	1.9	1.8	2.8	2.4
Return On Equity (ROE) %	14	13.4	11.8	22.4	19.7
Number of bank branches	3,996	4,309	4,516	4,872	5,171

Source: Central Bank of Sri Lanka, 2011

An overview of banking industry in Sri Lanka

Early banking in Sri Lanka traces back to the lenders and pawn brokers only. Commercial and retail banking commenced since mid nineteenth century in Sri Lanka. At the beginning the services of the banking industry were limited to the plantation sector and after 1977 it was opened to all the business sectors (Nadarajah, 2010). Financial institutions in Sri Lanka are regulated by the Central Bank of Sri Lanka (CBSL). At the end of year 2011 there were 24 licensed commercial banks and 9 licensed specialized banks. There are rural and credit co-operative societies also functioning in Sri Lanka. Among those 24 commercial banks there are

12 Licensed Domestic Commercial Banks (LDCBs) and 12 Licensed Foreign Banks (LFBs). LDCBs consist with two public and ten private banks.

Table 1 shows some of the selected financial indicators of the commercial banks over the period of 2008- 2011. As per table 1, net assets, deposit advances and branch networks of the banks have continuously increased. Moreover, profitability indicators have also improved however more performance has been shown in the year 2010. At the end of year 2012, the majority of the assets and the deposits were held by licensed commercial banks among the regulated institutions in Sri Lanka. At the end of year 2012, the percentages of assets and the deposits hold by the LDCBs were 48 percent and 78 percent respectively (CBSL, 2012).

2. Literature Review

Measuring the efficiency of financial institutions was based on the traditional accounting measurements in the past even though the concept of efficiency is far beyond the ratio measurements under the accounting treatments. The identification of bank efficiency was based on the efficiency ratio under the traditional ratio approach and it has been computed as the ratio between the operating cost and total income.

Several previous studies have been done on bank efficiency and profitability (Samad & Hassan, 2000; Masruki et al., 2010). The efficiency of those studies was calculated based on the traditional ratio measurements (Cited in Silva, 2009). However the traditional ratio measurements failed to give a correct picture of bank efficiency. (Akhtar, 2009, as cited in Silva, 2009) has emphasized the following four weaknesses of the traditional measurements.

- Lack of acceptability of the relative importance of the input and output for the ratio calculation.
- Lack of consideration of the management actions and investment decisions on future performances.
- This is only for short term not for long term forecasting.
- This gives an incomplete picture about the whole process and fails to show the interaction among the different factors.

The CAMEL framework was introduced by the Federal regulators in the United States of America to assess the soundness of the financial institutions. This rating system was extensively used by many researchers in assessing the efficiency of the financial institutions (Hilbers, Krueger & Moretti, 2000). CAMEL is an acronym for the six components namely, Capital adequacy, Asset quality, Management quality, Earnings ability and Liquidity. However, Jayamaha and Mula (2010) indicated that the CAMEL framework also has its limitations as it cannot give a holistic picture of the banks' soundness.

Therefore, the traditional approaches are better applicable in measuring the performances but not the efficiency. Efficiency is far beyond the concept of performances. In general, banking efficiency literature has identified two types of efficiency levels (Yudistira, 2004) such as scale efficiency and X- efficiency. The theory on scale efficiency was first introduced by Farrell (1957) which explains the relationship between the average per unit of production and output per unit of cost. Economy of scale can be achieved by increasing the level of output with lower unit of production input. Cost efficient concept is different from this theory since this says that efficiency is the lowering cost per unit per given level of output. According to Lovell (1993), productive efficiency can be identified in terms of technical and allocative efficiency. Technical efficiency is obtaining maximum output using the available inputs avoiding wastages. Technical efficiency is based on the output or input conversion. Allocative or price efficiency is

oriented on the combination of inputs and outputs' proportionate usage with the existing prices (Lovell, 1993).

Berger and Humphrey (1997) have done an extensive study on the existing literature on efficiency measures and the results of those. They have taken 130 studies which have covered 21 countries' results. To measure the performances of a financial institution we can either use parametric or non parametric frontier analysis. This can be applied to identify the efficiency of a firm or their branches. Frontier analysis tells us as to how the other firms are closer to the best practice firm in the industry since this analysis takes into account the most important accounting measurements such as cost, profits, outputs, revenue and inputs in analyzing the performance of a firm (Berger & Humphrey, 1997). In this study they have found that many of the researchers had used the non parametric techniques.

Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH) are the main approaches that many researchers have used in their studies as non parametric approaches. DEA is a linear programming technique. Many researchers have employed the DEA in order to assess the efficiency of the banks (Ferrier & Lovell, 1990; Grabowski, Rangan, & Rezvanian, 1993; Fukuyama, Guerra, & Weber, 1999; Chen & Yeh, 2000; Drake & Hall 2003; Chiu & Chen, 2009; Silva, 2009). In the Sri Lankan context Jayamaha and Mula (2010), Silva (2009), Wanniarachchige and Uddin (2011) and Silva (2009) have used DEA to measure efficiency of the banks and have found that there are significant differences in efficiency levels of larger commercial banks and small commercial banks in Sri Lanka and the efficiency of the privately owned banks were higher than the publicly owned banks. He has found that the mean efficiency of the licensed commercial banks in Sri Lanka was 91 percent. According to Yudistira (2004) the efficiency of the Islamic banks has reduced during the period from 1998 to 1999 due to the global financial crisis but thereafter they have performed well. Sathye (2003) has concluded that publicly owned banks were the most efficient in India followed by the foreign banks whereas the least efficient category was the private banks.

3. Methodology

Data Envelopment Analysis (DEA) was used to measure the bank efficiency. Measurement of efficiency by using DEA is based on the linear programming technique that finds the solution to N problems. This finds the best practice (the optimal frontier) where the other decision making units are not producing much (or more) output with less or little amounts of inputs. Moreover, the best practice decision making units become the relative benchmarks of the industry (Berger & Humphery, 1997).

There are two models found in literature to describe the efficiency models by using the linear programming technique. First, Charnes, Cooper and Rohodes (1978) model (CCR) on efficiency measurement brought the term DEA as a non linear mathematical programming technique to measure the efficiency of Decision Making Units (DMUs). Through this study they have defined the output and input oriented ratio in identifying the efficiency of the DMUs. Their findings were based on the assumption of Constant Returns to Scale (CRS). A constant return to scale is a characteristic of a production function. This can exhibit where the changing of inputs by a positive proportional factor could have the effects on changing the output by the same. The study was further developed by Banker, Charnes and Cooper (1984) assuming the Variable Returns to Scale (VRS). VRS indicates that either the DMU is having increasing or decreasing returns to scale. Returns to scale increase once the input factors increased by a positive percentage and the output increases by a higher percentage than the input increases whereas decreasing returns to scale is where the proportionate change of output is lower than the percentage changes of input factors. Since it is based on the VRS, the BCC model has

developed and it has identified the technical efficiency. As a result of the assumptions of BCC model, the VRS provides technical efficiency sores that are greater than or equal to the efficiency scores of CRS model. In VRS model it finds the technical efficiency in two components such as Pure Technical Efficiency (PTE) and Scale Efficiency (SE). The relationship between these components are given in the appendix (Jayamaha & Mula, 2010). Coelli (1996) was the first to introduce the computer programme for measuring efficiency and this programme has the capability to use multi inputs and outputs to measure efficiency.'

The data used in this study were secondary data which were collected from the published annual reports of the banks for the period of 5 years from 2007 to 2011. The sample comprised only 12 licensed domestic commercial banks since it has ignored the licensed foreign commercial banks due to the unavailability of the published annual reports. However, the selected sample represents the higher market share of the banking industry in Sri Lanka.

The application of DEA in financial institutions has many arguments especially in the selection of input and output combinations (Jayamaha & Mula, 2010). Therefore, banking production process required to identify input and output combinations correctly in order to use the DEA. There are three basic approaches in selecting input and output combinations for the DEA research such as intermediation approach, production and asset transformation approach (Jayamaha & Mula, 2010). Intermediation approach is the banking function acting as the mediator among the fund deficit and surplus units. Production approach emphasizes more on services of banks those were rendered to their account holders. It is hard to quantify the relevant variables that are relevant to the production process. Asset approach is strictly confined to the assets and to the loans. Having paid the attention to all three approaches and following the work of Sealey and Lindley (1977), and Chiu and Chen (2009) the intermediation approach and the following variables were selected as the inputs and the outputs of the model;

Input	**Output**
Total Deposits	Total Loan
Number of employees	Non-Interest income
Fixed assets	Total investments

The labour and capital are used to intermediate the deposits in order to provide loans, make investments and to earn other sources of income. Fixed assets represent the capital of the banks. DEA-Solver-PRO (Professional version 2.1) computer program was used to estimate the bank efficiency. Two hypotheses were tested against finding whether there is a significant difference in efficiencies on the size and ownership factors. The large banks were categorized as having over 100 billion rupees of total assets, whereas having less than 100 billion rupees were categorized as small banks and the ownership has been categorized as public and private.

4. Findings

The results of the technical efficiency under CRS, VRS and Scale efficiencies are given in the appendix (table A1, A2, A3). The overall technical efficiency is higher in 2011 in Sri Lankan banking industry. The overall technical efficiency (CRS) is 83.3 percent of the banking industry as far as the whole period is concerned. The mean efficiency of the banking industry under the VRS model is 97 percent. The mean scale efficiency is 86.3 percent. Scale efficiency helps to determine whether the bank operates at constant returns to scale (firm is at the optimal scale of operation), increasing returns to scale (firm is too small in its scale of operation) or decreasing returns to scale (firm is too large in its scale of operation). Moreover, the scale efficiency can be properly identified with the size factor. According to the size differentiation, there are eight

large banks and four banks belong to the small category. Thereby, most of the large banks show decreasing returns to scale and the small banks operate at increasing returns to scale (table A6). There is only one bank representing a constant return to scale throughout the sample period. This is true for Yudistira's (2004) study on Islamic banks since larger banks have more excess capacity to use inputs whereas small banks do operate amidst of resource scarcities. Smaller licensed commercial banks have operated at increasing returns to scale since they are too small in scale of operations.

The efficiency scores of the large and small banks are presented in table A4. The mean efficiency of the large bank is 83.4 percent whereas efficiency of the small banks is 83.1 percent. The results of the independent sample t-test shows that there is no significant differences among the efficiency scores of the large verses small banks since the significant value is greater than 5 percent (table A5). This result is compatible with the findings of Yudistira (2004), and Fukuyama (1999) since they also found that size factor is not an important factor to achieve the optimal efficiency.

Efficiency scores under the ownership factor are presented in table A7. Mean efficiency of the publicly owned banks is 74 percent and privately owned bank is 85 percent. Efficiency of the privately owned bank is 11 percent higher than that of public sector banks. Independent sample t-test was used to test whether the difference in efficiency scores are significant. The result shows that the efficiency scores are significantly different at 5 percent level (table A6). These results are incompatible with the findings of Sathye (2003) since he has found that Indian public banks are efficient than the private and foreign banks.

5. Conclusions

The efficiency of the banks was measured in the previous literature mainly based on the traditional methods. The use of DEA to measure the efficiency levels gives the correct level of efficiency since it is based on the efficiency frontier concept. Unlike the traditional ratio approach DEA has the capability of analyzing the multi inputs and multi outputs. Based on the empirical findings, the mean efficiency score of the Sri Lankan banking industry is 83 percent and the highest efficiency was recorded in year 2011. The size factor is not a significant factor to achieve the highest efficiency size of the banks but the size mainly induced the scale efficiency not the technical. It is also found that most of the large banks have excess usage of labor and fixed assets. It is recommended to rationalize the recruitment of labor and the acquisition of assets to the banks. Moreover, they should consider how they can achieve the highest level of efficiencies with the optimal inputs.

Ownership category clearly shows that the private banks are more efficient than the public banks. This implies that in a Sri Lankan context private banks are more efficient than the public banks since they have better balance on their operational process and also they have better policies on deposits, labor and assets utilizations. In public sector ownership category banks have more inefficiency in their labor and assets utilizations. It is recommended that public bank to improve their strategies as to match their excess capacity, usage of assets and labor with their outputs.

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APPENDIX

Decomposition of Technical Efficiency

$TE_{CRS} = PTE_{VRS} \times SE$

Where; TE_{CRS} = Technical Efficiency of Constant Returns of Scale
PTE_{VRS} = Technical Efficiency of Variable Returns of Scale
SE = Scale Efficiency

Table A1: Technical efficiency under CRS, 2007-2011

Bank	2007	2008	2009	2010	2011
Bank 1	0.942	0.857	0.715	0.802	1.000
Bank 2	0.633	0.699	0.775	0.762	0.928
Bank 3	0.835	1.000	1.000	1.000	1.000
Bank 4	1.000	1.000	1.000	1.000	1.000
Bank 5	0.754	0.751	0.829	1.000	1.000
Bank 6	0.582	0.635	0.827	0.815	1.000
Bank 7	0.493	0.532	0.757	0.745	0.953
Bank 8	0.569	0.529	1.000	0.843	0.884
Bank 9	0.731	1.000	0.827	0.764	1.000
Bank 10	1.000	1.000	0.766	1.000	1.000
Bank 11					0.877
Bank 12	1.000	0.603	0.909	1.000	0.455
Mean	0.776	0.783	0.855	0.855	0.925

1 represents banks on efficient frontier with highest efficiency