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DOES RISK MANAGEMENT AFFECT ON BANK EFFICIENCY? AN ANALYSIS OF SRI LANKAN BANKING SECTOR

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ABSTRACT

Increasing competition in the finance sector in Sri Lank has created a huge competition among the banking sector. The high level of competition improved the bank efficiency and efficiency creates risk to the banks. Therefore, risk management is a vital in achieving efficiency. Therefore, this study addresses the question on "whether the Sri Lankan banks are efficient and how risk management improves the banks' efficiency?. The main objective of the study was to identify the efficiency of the banks by incorporating risk factors. This study adopted second Stage Data Envelopment Analysis based on Licensed Domestic Commercial Banks in Sri Lanka for the period from 2005 to 2011. At the first stage it use DEA to finds the efficiency scores by incorporating risk factors such as Credit, Market and Operational risk. In the second stage it applies Tobit regression to find the influence of external environment factors on bank efficiency. The mean efficiency of Sri Lankan banks is high when it compares with the other well countries such as India, UK, US, Taiwan and Islamic Banks located in London. Risk management has improved the efficiency of the Licensed Commercial Banks in Sri Lanka. Therefore, banks should identify their standing on the market on efficiency levels and should analyze their inefficiencies to improve the efficiencies further.

Keywords: Efficiency, Risk management, Data envelopment analysis, Banks.

1. INTRODUCTION

Banking industry is the backbone of a financial system. The importance of the stability in banking sector in a financial system was highlighted by various scholars during the recent financial crisis (Tafri *et al.*, 2011). At the end of year 2011 there are 24 licensed commercial banks operates in Sri Lanka with 9 licensed specialized banks. Early banking in Sri Lanka traced back to as only the lenders and pawn brokers. Now the operations of banks are extended to several areas such as different schemes of loan grants and deposits, leasing, investments, foreign exchange operations and facilitating for international trade. Therefore, when considers risk of banks now they are more exposed to various risk (Nadarajah, 2009). In Sri Lanka numbers of foreign banks are now same as the local banks since there are 12 domestic and 12 foreign banks are now

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operates in Sri Lanka. In Sri Lankan context, it is clear that the competition among the banks has increased over time. The numbers of banks especially the foreign banks and their branches and the non banking financial institutions have increased over the last five years. The developing competition itself highlights the banks to operate efficiently in the market in order to survive huge competition while protecting their market share among them. The competition has improved the level of efficiency and the efficiency will leads the banks for higher level of risk (Chiu and Chen, 2009).

Many studies on bank efficiency could found in literature (Pastor, 1999a; Yudistira, 2004; Chiu and Chen, 2009; Silva, 2009). Efficiency is the core of the economics. All the financial institutions and 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.

Though the number of studies conducted on efficiency of banks in many parts of the world has increased over the last years (Altunbas *et al*., 2000; Drake and Hall, 2003; Chiu and Chen, 2009) there is a lacuna in this field of study in Sri Lanka. Therefore, the Problem of the study is to find "Does risk management improves the bank efficiency"?. The main objective of the study is to find the efficiency of the banks with and without adjusting risk factors. There is a prevailing dearth of information in analyzing bank efficiency incorporating risk factors. As this study considers risk factors, it would add a significant amount of value to the pool of existing knowledge especially in Sri Lanka since the literature in Sri Lanka in this area has only focused on bank efficiency. And also following the objectives of the study the researcher have been able to identify the efficient banks and inefficient banks in Sri Lanka and also it will investigate how risk factors influence on the bank efficiency.

2. LITERATURE REVIEW

The performance level of a firm or a decision making unit could be recognized by its efficiency. Efficiency can be categorized as more efficient, efficient and less efficient than actual or expected efficiency level (Lovell, 1993). The importance of studying efficiency of Decision Making Units (DMUs) has heavily emphasized in the existing literature. The study on bank efficiency also proliferated during the recent past. When analyzing bank efficiency the risk factors should be linked together because banks not only should be efficient but also be secure. That is why risk and efficiency concepts are interrelated (Pastor, 2002b). In general banking efficiency literature 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) by using the production frontier concept which explains the relationship between the averages per unit of production output per unit of cost. Technical and allocative efficiency is derived from the X-efficiency. According Technical efficiency is the obtaining maximum outputs using the available inputs avoiding wastages. Technical efficiency is based on outputs or inputs conversion. Allocative efficiency is oriented on the combination of inputs and outputs proportionate usage with the existing prices (Lovell, 1993). Sealey and Lindley (1997) further developed the stochastic

production frontier. This study was carefully addressed the use of production frontiers for the financial institutions by using the balance sheet items. They introduced the selection of inputs and outputs for the identification of the production frontier. Further Aigner and Lovell and Schmidth (Cited in (Chiu and Chen, 2009) brought forward the concept of stochastic production frontier to measure the efficiency. From this method they proposed that how the theoretical econometric model could be combined with the practical scenarios. Efficiency can be measure either using parametric or non-parametric approaches. Data envelopment analysis is a non-parametric approach. Coelli (1996) was the first to introduce a computer programme for Data envelopment analysis in measuring the efficiency. Fried *et al.* (1999) pointed out that the DEA programme gives the result of the measure of technical efficiency plus with some additional input surplus. The DEA can carry on one step, two step and three step methods. Pastor (1999a) used one step method for his study. One step process is concerned with the input and output and environmental variables together to measure the performances of a unit. Many researchers have applied DEA for the analysis of bank efficiency. Ferrier and Lovell (1990); Grabowski *et al.* (1993); Fukuyama *et al.* (1999); Sathey (2003); Akhtar (2002); Silva (2009) have used the DEA to measure the efficiency of the banks with some other conditions such as ownership, productivity, cost and branches. However, later the literature proposed that analysis of bank efficiency without risk does not generate the correct level of efficiency (Pastor, 1999a; Altunbas *et al.*, 2000; Drake and Hall, 2003; Chiu and Chen, 2009).

Silva (2009) has studied bank efficiency in Sri Lanka over the period of 2003 to 2007. Result suggested that there is differences in efficiency levels of larger commercial banks and small commercial banks and the efficiency of the privately owned banks were higher than the publicly owned banks. He has found that mean efficiency of the licensed commercial banks in Sri Lanka is 91%. Hung (2007) found that the average efficiency of Vietnamese banks is 61% and there is a significant inefficiency in allocative efficiencies. That implies the banks were unable to use correct mix of inputs in the operation process. Existing literature also provides the study on bank efficiency with the risk factors. Initially, researchers have used the internal risk factors to analyze the bank efficiency (Mester, 1996; Pastor, 1999a; Altunbas *et al.*, 2000). Internal risk also was based on the credit risk analysis. Pastor (1999a) studied bank efficiency and risk based on credit risk. He has pointed out previous studies were used the credit risk as another input of the DEA process. However, he has made an argument on how to decompose the credit risk into two parts. Credit risk was measured by Pastor in terms of provision for loan losses (PLL). PLL has identified in two conditions which are, due to poor risk management (bad management) and adverse economic conditions (bad luck). Altunbas *et al.* (2000) applied internal risk factors to measure bank efficiency such as quality and liquidity risk. NPL ratio and the liquidity ratio were taken to measure the quality and liquidity risk respectively. They have found that small and largest banks are scale inefficient when the risk and quality factors are controlled (Altunbas *et al.*, 2000). This is because the largest banks would have not reached to the optimal size to achieve the optimal scale efficiency. Their cost is higher than the required and other banks should grow to achieve the

optimal scale efficiency (Altunbas *et al*., 2000). It also found that if the risk and quality factors are not concerned the scale efficiency has overstated. Berger and DeYoung (1997) highlighted that the failure banks are cost inefficient and it based on the poor loan performances. Bad luck is due to the prevailing economic conditions. Yudistira (2004) study found that larger banks have decreasing returns to scale where as small banks have increasing returns to scale. Further, he has found that largest scale of inefficiencies can be identified from large banks. The environmental factors such as current account, market power, location, ownership and size have significant impacts on bank efficiency scores. However, Chiu and Chen (2009) have found the bank efficiencies by incorporating both internal and external risk factors. They have used the credit, market and operational risk as the internal risk and they have taken Based on the above findings the study addressed the lacuna in analyzing bank efficiency by incorporating the main risk factors following Basel accordance since many studies have taken the credit risk as the risk factor.

3. METHODOLOGY

The study carries two stage DEA method, at the first stage it uses the DEA to find the bank risk adjusted and unadjusted bank efficiency. Secondly, it follows limited dependent variables regression to find the external environmental effects on risk adjusted bank efficiency.

3.1. Data Envelopment Analysis

There are two models found in literature for describe the efficiency models by using linear programming technique. Firstly, Charnes *et al.* (1978) model (CCR) on efficiency measurement brought the term DEA as a non linear mathematical programming technique to measure efficiency of Decision Making Units (DMUs). The basic mathematical programming of DEA is described in appendix one. Further in their 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 has the effects on changing the output by the same. The study was further developed by Banker *et al.* (1984) assuming the variable returns to scale (VRS). VRS indicates that either the DMU is having increasing or decreasing returns to scale. BCC model is based on VRS and it identify the technical efficiency, the relevant formula is given in appendix one. As a result of the assumptions of BCC model the VRS provides technical efficiency sores that are greater than or equal the efficiency scores of CRS model. In VRS model it finds the technical efficiency in to two components such as Pure Technical Efficiency (PTE) and Scale Efficiency (SE). The relationship between these components are given in appendix one (Jayamaha and Mula, 2010). DEA generates efficiency scores where banks gets one indicates the efficiency and if one gets the value lower than one which is identified as inefficient bank (Pastor, 2002b).

3.2. Selection of inputs and outputs

In order to apply DEA the important task is to defining the correct inputs and outputs of the process. The application of DEA in financial institutions has many arguments especially on selection of input and output combinations (Jayamaha and Mula, 2010). There are three basic approaches to select inputs and outputs for DEA method. Such as intermediation, production and asset transformation approach (Jayamaha and Mula, 2010). Intermediation approach is, banking function acting as a mediator among fund deficit and surplus units. Production approach is more emphasizes on services of banks those render to the 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 paying the attention on all three approaches and following the work of Sealey and Lindley (1997) the intermediation approach was adopted in selecting the input and output combinations. Under In this study the input oriented model has used since it gives the information as to how proportional reduction of inputs is necessary for maintain the current level of outputs to become inefficient banks to be efficient (Mostafa, 2007).

3.3. Output factors

Total amount of loans: Loans are the main base for generating interest income for the banks. Total amount of loan as per the balance sheet has taken as a one of the output of the process.

Total investment: Total investment represents the total securities and bonds that the bank holds as investment in government and private organizations. Investments are the sources of avenue to earn the other sources of income except the main source of income. Therefore, this is also considered as an output of the process. Non-Interest revenue: Non- interest revenue as recognized according to the Basel II accordance. Non- interest revenue is the total income excluding interest income. Non- interest revenue represents the income from foreign exchange activities, dividend income and gain from investment in securities etc. Those are income except the interest income therefore this is also could be considered as one of an output of the process.

3.4. Input factors

Labour: Labours are the main human resource and especially in bank employees play a crucial role since their service is paramount importance for the quality of the service. Number of employees has taken as the unit to represent the labour in the process.

Deposits: Deposits are the main source of input of the process. The main business of a bank is to receive funds from surplus units and to grant funds to the deficit units. Therefore, deposits are one of the main input factors of the bank production process.

Fixed assets: Fixed assets are the physical assets which used to generate the income for an organization. Property plant and equipments has taken as the fixed assets of the bank in this process.

3.5. First stage

At the first stage it measures the bank efficiency while incorporating risk factors by using Data Envelopment Analysis. It finds the efficiency score of banks with and without risk factors. Efficiency scores lies between 0 and 1 where, 1 represents the most efficient level and 0 indicates the inefficiency. DEA-Solver-PRO (Professional version 2.1) computer program was used to estimate the bank efficiency. The output of the DEA generates results for technical efficiency under two components such as CRS and scale efficiencies.

3.6. Second stage

In this stage it measures the effects of bank efficiency over firm's characteristics and macroeconomic factors by using limited dependent variable regression.

Specification of the Tobit regression model

$$ES_j = \beta + \beta_1 (GOV) + \beta_2(AGE) + \beta_3(LC) + \beta_4(SIZE) + \beta_5(EG) + \beta_6(MG) + \beta_6(PPINV) + u_i \quad \ldots\ldots(1)$$

Where, ES_j= Efficiency Scores of j^{th} firm

β…..β_6 = Parameters

u_i = errorterm

GOV = Government shareholding proportion, AGE= Number of years of the banking operations, LC = Loans to capitals ratio, SIZE= Size of the banks, EG= Economic growth, M2= Money supply, PPINV= private and public investment growth. Following Chiu and Chen (2009) the above factors were identified.

3.7. Firm's Characteristics Variables

Government shareholding proportion (GOV): Government share holding has included in the tobit regression function. This is mainly to identify the trust of the customers on the bank. Boardman and Vining (Cited in Chiu and Chen (2009)) has proved that the efficiency is higher at the privately owned banks than the publicly owned banks.

Number of years of the banking operations (AGE): This variable is an important factor in reducing the cost of the bank in the long run. When the number of years or the age of the banks increased it will enhanced the customer confidence on the bank and they willing to make transaction with those bank. Therefore, this study expects that this variable will have a positive impact on the bank efficiency.

The loans of capitals ratio (LC): This measures through the following ratio. Loans to capital ratio: Total loans/ Total capital. This ratio highlights the bank's business ability. However, the expected relationship is negative with the bank efficiency since the bank should have a diverse business professional ability. Size of the banks (SIZE): Size of the bank will measure through the natural logarithm of the total assets. Larger the size of the banks will shows more efficiency. This factor indicates that the banks abilities to face to any shocks with their huge capacity of the large amount of properties.

3.8. Macro Economic Variables

The study has employed selected macro economic factors into the regression model such as Economic growth (EG), Money supply growth rate (MG), Public and private investment growth (PPINV). EG measured through GDP growth rate and Money supply growth rate was based on M_{2b} and PPINV data were collected from annual reports of Central Bank of Sri Lanka.

3.9. Banking Industry and The Selection of The Sample

The banking industry in Sri Lanka includes two categories namely Licensed Commercial Banks (LCBs) and Licensed Specialized Banks (LSBs). There are 24 LCBs and 9 LSBs are functioning in Sri Lanka under the supervision of the Central Bank. There are 12 licensed domestic commercial banks and there are 12 licensed foreign banks in Sri Lanka. This study considered only the LDCBs in Sri Lanka which contains 12 banks. The data used in this study was secondary data which were collect from the published annual reports of the banks for a period of 7 years from 2005 to 2011. Moreover, this study used the Central Bank annual reports from year 2005 to 2011 in order to identify the macro economic variables.

4. RESULTS AND DISCUSSIONS

4.1. First stage

Technical efficiency results analyzed under CRS, VRS and Scale efficiency models (Appendix 2). Technical efficiency under CRS and VRS models were estimated. According to the CRS method (Table 1) Bank 4 had been operating with the highest technical efficiency and also Bank 10 has maintained a high level of technical efficiency throughout the period considered except in year 2009. The average efficiency score of banks was high in year 2011 since the non-performing loan ratio has declined in that particular year. Therefore, the higher efficiency score highlights the fact that banks was operating at their optimal levels in terms of input usage. VRS results show that Bank 1, 3, 4 and 12 has achieved the highest efficiency levels during the period considered (Table 2). The result of the first stage of the DEA is presented in appendix 2 (Table 3). The first stage results ranked the banks according to descending order based on their mean efficiency scores. Moreover, it identifies the efficiency scores again by adjusting the risk factors such as Credit, Market and Operational risk. The risk factors became additional inputs of the DEA model with the same out puts. The average efficiency score is 83.6% before adjusting the risk factors whereas after adjusting for risk factors the efficiency has improved 90%. The ranking of banks is based on the efficiency scores of these two conditions. According to the efficiency scores of no risk adjusted Bank 4 is in the first rank, Bank 10 is in the second and Bank 3 is in the third rank. The specialty is all these three banks are private banks. This shows that efficiency has improved by the risk management in Sri Lankan Banks. In Chiu and Chen (2009) study also has found similar results. The efficiency of the Taiwan bank before risk adjustment was 70% and after the risk adjustment it has moved to 93%. Also the result is compatible with the findings of the previous authors (Pastor, 1999a; 1996b). The efficiency scores also have been analyzed on the size factor.

The banks have been categorized into small banks where they have less than 100 billion rupees of total assets whereas above the limit have categorized as large banks. Thereby, there were 8 large and 4 small banks under this study (Table 4). The efficiency of the large banks has increased from 83% to 93% whereas in small banks it has reduced from 84% to 82%. This results expected that greater the bank size will increase the bank efficiency through risk management. Since larger banks are located in several regions and they have diverse opportunities across the country and outside the country. Further, larger banks have the capacity to access vast and variety of information than the small banks through their internal departments and also they have risk management departments separately with separate staff to handle the risk management. These findings are compatible with the Pastor (2002b) study on Spanish Banking system.

4.2. Second stage

The second stage of the DEA identifies effects of the external factors on efficiency (Table 5-appendix 2). Study used Tobit regression to analyze the efficiency scores of the first stage against the Firm specific factors and macro environmental factors. The total assets found to be significant at 10 percent level indicating that size factor is evident in the relationship of efficiency. Government shareholding also significant at 10 percent level and which indicates that the public confidence in banking industry. But the coefficient is negative and it says that government shareholding does not generate positive relation to the increase of efficiency. This indicates that if the government shareholding increased it will lead to decrease the efficiency level since the more involvement of the government will create an unnecessary control and policies on the operations of the banks. Size (Total assets) also shows a negative coefficient since more holing of assets will leads to inefficiency. This is because the over assets of the banks when compare with its outputs but this is significant banks should pay more attention on this assets. Number of years of operation is not a significantly evident for the efficiency of the banks. Since the efficiency is achieved through the usage of inputs to produce maximum level of efficiency. Therefore, the banks which have the long history or a higher number of years of operations necessarily do not generate maximum output with the given level of inputs. This is evident by the efficiency scores of the banks with the variation over the sample period. The other significant variables are money supply growth rate and public and private investment. Private and public investment is significant at 5 percent level. Since the investment of a country is a good indicator for the banks efficiency because the one of output of this DEA is loan and advances. Most of the investment depends on long term loans by banks therefore the coefficient of the variable is also a positive. The study has founded the similar results with the findings of Yudistira (2004). The size, Government shareholding, Public and private investment and Money supply growth rate are the influences variables on the efficiency scores of the banks.

5. CONCLUSION

Efficiency and risk management have become basic requirements of a decision making unit. Many researchers in the recent past have studied bank efficiency as indicated in literature. Efficiency of the banks has improved when risk management practices were adopted. All least efficient banks with no risk model also had improved their efficiencies. This implies that risk management in Sri Lankan banks at a high standard to improve the efficiency also isk management is favorable to improve the bank efficiency. Therefore, it is recommended to Sri Lanka banks to maintain their existing strategies on risk management and should follows the rules and regulations lay down by the CBSL in risk management.

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APPENDICES

APPENDIX 1

1. Basic Mathematical Programming of DEA (Akhtar, 2002)

Best practice DMU is identified from the relative efficiency and which defined as the ratio of weighted sum of output to weighted sum of inputs. This can be derived as follows;

$$es = \frac{\sum_{i=1}^{m} u_i y_{is}}{\sum_{i=1}^{n} v_i x_{is}} \quad \text{.....(1)}$$

Where;

m = Number of outputs

u_i= Weight of output i

y_i = Amount of output of i^{th} produced by s^{th} bank

n = Number of inputs

v_i = weight of input

x_{is}= Amount of input of i^{th} used by the s^{th} bank

es = efficiency ratio

2. Charnes *et al.* (1978) Model

Charnes, Cooper and Rhodes developed the following fractional linear programming model in order to treat inputs and outputs weights differently. Since the above mathematical programming model assume a common set of weights for inputs and outputs. The basic CCR model as follows;

Maximize es :

$$\frac{\sum_{i=1}^{m} u_i y_{is}}{\sum_{i=1}^{n} v_i x_{is}} \quad \text{.....(2)}$$

Subject to:

$$\sum_{i=1}^{m} u_i y_{ir} / \sum_{i=1}^{n} v_i x_{ir} \leq 1, \text{for } r = 1, \ldots\ldots, N \text{ and } u_i \text{ and } v_i 0, \ldots\ldots\ldots\ldots (3)$$

Following CCR model the fractional linear programming can be transformed into the following ordinary linear programming model (Yudistira, 2004). The equation 3 is changed by setting the denominator at constant and numerator to maximize.

$$\text{Maximize es} = m \sum_{i=1} u_i y_{is}$$

$$\text{Subject to : } m \sum_{i=1} u_i y_{ir} - n \sum_{i=1} v_i x_{ir} \leq 1, \text{ for } r = 1,\ldots\ldots\ldots,N ;\ldots\ldots\ldots (4)$$

$$n \sum_{i=1} v_i x_{is} = 1 \text{ and } u_i \text{ and } v_i \geq 0.$$

The above linear programme is assumes controllable inputs and constant returns to scale and it minimize the inputs. Thereafter, Banker *et al.* (1984) developed the DEA programme under the assumption of VRS because the CRS is not practical in real DMUs. Therefore the BCC model is presented below.

$$\text{Min } \theta, \lambda$$

$$\text{Subject to : } X\lambda \leq x_0$$

$$Y\lambda \geq \theta y_0$$

$$\Sigma\lambda = 1$$

Where; $\lambda \geq 0$

X= input

λ= benchmark of DMUs under the study evaluation

Y= output

□□□□□efficiency of DMUj.

3. Decomposition of Technical Efficiency

$$TE_{CRS} = PTE_{VRS} * SE$$

Where;

TE_{CRS} = Technical Efficiency of Constant Returns of Scale

PTE_{VRS} = Technical Efficiency of Variable Returns of Scale

SE = Scale Efficiency

APPENDIX 2

Table-1. Technical efficiency under CRS, 2005-2011

(1 represents banks on efficient frontier with highest efficiency)

Bank	2005	2006	2007	2008	2009	2010	2011
Bank 1	0.828	0.749	0.942	0.857	0.715	0.802	1
Bank 2	0.702	0.681	0.633	0.699	0.775	0.762	0.928
Bank 3	0.793	0.86	0.835	1	1	1	1
Bank 4	1	1	1	1	1	1	1
Bank 5	0.801	0.724	0.754	0.751	0.829	1	1
Bank 6	0.652	0.55	0.582	0.635	0.827	0.815	1
Bank 7	0.53	0.496	0.493	0.532	0.757	0.745	0.953
Bank 8	0.817	0.578	0.569	0.529	1	0.843	0.884
Bank 9	1	0.905	0.731	1	0.827	0.764	1
Bank 10	1	1	1	1	0.766	1	1
Bank 11							0.877
Bank 12	1	1	1	0.603	0.909	1	0.455
Mean	**0.829**	**0.777**	**0.776**	**0.783**	**0.855**	**0.855**	**0.925**

Table-2. Technical efficiency under VRS, 2005-2011

(1 represents banks on efficient frontier with highest efficiency)

Bank	2005	2006	2007	2008	2009	2010	2011
Bank 1	1	1	1	1	1	1	1
Bank 2	0.905	0.888	0.879	0.972	1	1	0.928
Bank 3	1	1	1	1	1	1	1
Bank 4	1	1	1	1	1	1	1
Bank 5	0.904	0.878	0.892	0.936	0.938	1	1
Bank 6	1	0.914	1	0.914	0.899	0.918	1
Bank 7	0.874	1	1	1	1	1	1
Bank 8	0.846	1	0.972	1	1	1	0.904
Bank 9	1	1	1	1	0.929	0.832	1
Bank 10	1	1	1	1	0.782	1	1
Bank 11	-	-	-	-	-	-	1
Bank 12	1	1	1	1	1	1	1
Mean	0.957	0.971	0.977	0.984	0.959	0.959	0.988

Table-3. Technical Efficiency and Rank of banks under CRS

Bank	Efficiency scores- Unadjusted	Rank	Efficiency scores- Credit, Market, and Operational risk adjusted	Rank
Bank 1	0.841	7	0.921	6
Bank 2	0.74	10	0.895	8
Bank 3	0.926	3	1	1
Bank 4	1	1	1	1
Bank 5	0.837	8	0.947	4
Bank 6	0.723	11	0.908	7
Bank 7	0.643	12	0.873	10
Bank 8	0.745	9	0.888	9
Bank 9	0.889	4	0.928	5
Bank 10	0.966	2	0.970	3
Bank 11	0.877	5	0.825	11
Bank 12	0.852	6	0.674	12
Mean	0.836		0.902	

Table-4. Mean Efficiency Scores of Unadjusted and Adjusted risk by size of the banks

Banks	Efficiency scores- Unadjusted	Efficiency scores- Risk Adjusted
Large Banks	0.834	0.939
Small Banks	0.841	0.829

Table-5. Second stage Tobit Regression on overall efficiency

Variable	Coefficient	Std. Error
C	-1.858018	1.114604
EG	-0.002099	0.01194
GOVE	-0.001524*	0.00093
LC	0.000927	0.000925
PPINV	0.156352**	0.056117
SIZE	-0.041994*	0.024163
MG	0.008446*	0.005045
AGE	0.003056	0.002568
Log likelihood	36.51164	

Note: ***Significant at 5% level* **Significant at 10% level*