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Efficiency of the Ethiopian Commercial Banks in the Pre and Post Reform Period a Non-Parametric Approach Analysis

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ABSTRACT

The objective of this paper is to analyze the technical efficiency of the Ethiopian commercial banks using non-parametric DEA approach in the pre and post reform period under the CRS and VRS. As the pre-reform period was characterized by the monopoly of the CBE, the study of Ethiopian banking sector in the pre-reform period equates the study of CBE and the post-reform period covers all the private sector banks and CBE. The study is based on intermediation approach and used three outputs (loans and advances, interest income and non-interest income) and four inputs (total deposit, total non-operating expense, fixed assets and interest expense).

The results showed the Ethiopian commercial banks moderate technical efficiency with mean score of 78.3%. The study also revealed the improvements in the banks technical efficiency is because of the increased scale of operation but showed weaker managerial efficiency. Also the assessment of the returns to scale showed the dominance of decreasing returns to scale in Ethiopian banking industry during the period under study.

Introduction

The modern banking system in Ethiopia was first introduced in 1905 by the Emperor Minilik II during which bank of Abyssinia was inaugurated in 1906. Bank of Abyssinia was the first indigenous bank in Africa and established by an official decree on August 29, 1931 with capital of £750,000. Before the bank of Abyssinia is replaced by bank of Ethiopia in 1931, the bank managed to expand its branches in various parts of Ethiopia. In the earlier periods of the Ethiopian banking history, the sector was all open to foreign banks to operate and invest in Ethiopia. This resulted in the opening of Barclays bank which came with British troops in 1941. In the following years Banco Di Roma and Banco Di Napoli s.c have obtained the license to operate in Ethiopia.

According to World Bank report (2013) total bank assets constitute 25% of the total GDP in Ethiopia which clearly indicates how significant the sector is to the overall economy. The report also marks the 1.7% professionals per bank which is slightly better than the figure reported in neighboring countries like Kenya but below Uganda and Tanzania. Ethiopia is the country where one hundred thousand individuals share 0.02 banks and where 84% 0f the banking sector is dominated by five banks of which the government owned banks take 61% (World Bank 2013). It is there for the extent of effort required by the banks regarding resource mobilization and the role they can play in regional imbalance is immense and needs greater effort and efficient resource management.

1.2 Review of Related Literature

The first attempt to comparing the efficiency of banks in various countries can be attributed to Berg et al. (1993). They have assessed the technical efficiency of three Nordic countries: Norway, Sweden and Finland using DEA model. The study used two inputs (labor and capital) and three outputs (total loans, total deposits and the number of bank branches). The study used total of 779 observations which consists of 503 Finnish, 150 Norwegian and 126 Swedish observations of individual countries. The result showed the 69% technical effi-

ciency score of Swedish banks making them the most efficient among the countries under comparison followed by Finnish 50% and the least technically efficient being the Norwegian banks with technical efficiency of 41%. The result of the study also shows the technical efficiency score of 30% and 40% was dominated by large Finnish and Norwegian banks. Most small banks were concentrated between the efficiency score of 40% and 60%. The largest Swedish bank has the technical efficiency of 64% and a total of 18 banks have full technical efficiency.

Hauner and Peiris (2008) and Panzar and Rosse's (1987) studied the effect of banking sector reform on efficiency and competition for fourteen Ugandan banks using DEA model for the period of 1999-2004 using quarterly data. The result of the study showed the banking sector reform has increased the level of competition and efficiency of banks.

Ayadi and Hyman (2006) assessed the performance of ten Nigerian banks using DEA for the period of 1991-1994 and found that poor bank management for the period under study.

Berg et al. (1992) used DEA and Malmquist indices to analyze the improvements on efficiency of Norwegian banks for the period of 1980-1989. And the findings show improvements in efficiency after the deregulation.   Humphrey (1991) stated the primary objective of financial deregulation is to improve resource allocation which can only be achieved by increasing efficiency and productivity gains.

1.3 Data and Methodology

The data for this study is taken from the annual audited financial statements of fourteen out of the total nineteen commercial banks whose data were available in the national bank of Ethiopia. And the study did not cover the development bank of Ethiopia and construction and business bank due to the variation of input and output used in this study due to the sensitivity efficiency scores with respect to changes in the var-

iables used. The total of 173 observations used to analyze the technical efficiency of the commercial banks under the CCR and BCC for the period of 1990-2013. The study is based on intermediation approach with four inputs (total non-operating expenses, fixed assets, interest expenses and total deposit) and three outputs (loans and advances, interest income, and non-interest income) The CCR(Charness, Cooper and Rhodes) and BCC(Battesse, Charnes and Cooper) models used for the study are given below:

The CCR Envelopment Form

$$Min\ \theta \qquad\qquad Equation\ I$$

Subject to:

$$\theta x_{iji} - s_i - \sum_j x_{ij}\lambda_j = 0 \quad For\ i = 1,2,...m$$

$$- s_r - \sum_j y_{rj}\lambda_j - y_{rjo} \quad For\ r = 1,2,\ ...\ k$$

$$s\ \imath .\ s\ \imath .\ \lambda_j \geq 0$$

(Source: Senarath Lalithananda Seelanatha, 2007)

Where θ is the CCR efficiency of DMU j. S_i and S_r represent input and output slacks respectively. The amount of output produced by using xij amount of ith input is represented by y_{rj}.

Basic BCC Model Formulation

$$Minz\ {}_o = \theta - \varepsilon \sum_i s_i - \varepsilon \sum_r s_r \qquad\qquad Equation\ II$$

Subject to

$$\theta x_{iji} - s_i - \sum_j x_{ij}\lambda_j = 0 \quad For\ i = 1,2,...m$$

$$- s_r - \sum_i y_{rj}\lambda_i - y_{rjo} \quad For\ \ r = 1,2,\ ...\ k \qquad \sum \lambda_j = 1$$

$$s\ \imath .\ s\ \imath .\ \lambda_j \geq 0$$

(Source: Senarath Lalithananda Seelanatha, 2007)

The minimum input combinations of the above linear programming objective function are set to produce the output equal to firm j. Therefore, the optimization solution to the above models determine the lowest fraction of inputs needed to produce output at least as great as that actually produced by firm j

Empirical Findings
Table 1: Technical Efficiency of Ethiopian Commercial Banks under CRS for the Period of 1990-2013

Banks / Years	CBE	AIB	DB	BOA	WB	UB	NIB	CBO	LIB	ZB	OIB	BUIB	BIB	AB
1990	0.655													
1991	0.66													
1992	0.834													
1993	0.65													
1994	0.83													
1995	1	1												
1996	1	0.968												
1997	1	0.803	0.867	0.609										
1998	0.953	0.912	0.707	0.639	0.723									
1999	1	0.808	0.599	0.826	0.699	0.846								
2000	0.977	0.841	0.802	1	0.659	1	0.77							
2001	0.947	0.7	0.766	1	0.792	0.953	1							
2002	0.555	0.676	0.708	0.843	0.75	0.861	0.932							
2003	0.802	0.673	0.807	0.836	0.762	0.904	0.973							
2004	0.694	0.646	0.805	0.96	0.903	0.718	1							
2005	0.74	0.715	0.831	0.864	0.863	0.721	1	0.582						
2006	0.669	0.762	0.913	1	0.898	0.847	1	1						
2007	0.709	0.889	0.883	0.945	0.877	0.895	0.981	1	0.624					
2008	0.775	0.718	0.792	0.833	0.891	0.791	0.956	1	0.657					
2009	1	0.662	0.655	0.708	0.725	0.711	0.864	0.784	0.641	0.534	1			
2010	0.897	0.575	0.572	0.621	0.77	0.748	0.756	0.658	0.687	0.506	0.459	0.672	0.692	
2011	0.873	0.573	0.574	0.686	0.711	0.757	0.739	0.55	0.699	0.534	0.475	0.716	0.552	0.678
2012	1	0.746	0.684	0.797	0.825	0.824	0.795	0.706	0.779	0.54	0.598	0.743	0.633	0.63
2013	1	0.741	0.661	0.715	0.863	0.755	1	0.739	0.895	0.551	0.734	0.851	0.663	0.715
AV	0.843	0.758	0.743	0.817	0.794	0.822	0.912	0.78	0.712	0.533	0.653	0.746	0.635	0.674

Source: Own computation

The above table presents the efficiency scores of the Ethiopian commercial banks and the statistical description of these scores for the period of 1990-2013 under the constant returns to scale. Following that, the Ethiopian commercial banks are characterized by relatively better level of efficiency. With the exception of Zemen bank with efficiency score of 0.533 which slightly higher than the 50% mark, all other banks have registered the efficiency score higher than 60% and the maximum goes to Nib international bank with the efficiency score of 0.912. Overall, commercial banks have registered inconsistent efficiency scores during the study period. Since the 1994 banking sector reform, the sector has seen the ups and downs on their efficiency scores. The mean efficiency score of the sector since the introduction of the private local banks has shown minimal efficiency score of 0.65 in 2011 and the maximum efficiency score is observed in 1995(1.00). As the number of banks increased during the study period, the efficiency of the CBE has shown significant improvement in most of the study periods. Therefore, the effect of increased competition on efficiency score has shown inconsistent result during the period under study and across the banks.

Despite having limited its branches only to Addis Ababa and introducing some new ideas into the banking industry, Zemen bank only registered 53% average efficiency score. The result of Zemen bank supports the claim that excessive investment in technology and ATM machineries does not necessarily improve the efficiency of banks.

Pure technical efficiency of Ethiopian commercial banks under BCC (VRS)

NIB has dominated all the other banks in terms of PTE because comparatively the bank has higher PTE score (0.959) than the rest of the banks in the sample. Whereas, ZB has the least mean PTE score of 0.584 which makes the bank as the most poorly managed institution in the sample under study. The CBO has shown better management performance than the older private banks such as DB, WB and AIB and has enjoyed better managerial efficiency than all the newly established banks.

Several studies showed the relationship between PTE and ownership structure. It is assumed that the PTE of private banks were found better than government banks as private banks try to maximize profit. Looking at the individual banks PTE score at individual periods it is not possible to put conclusion as to the significance of ownership to better efficiency scores.

Scale efficiency of the Ethiopian commercial banks under BCC model

The results of scale efficiencies of the Ethiopian commercial banks are interesting in the fact that almost all of the commercial banks are scale efficient. It is also possible to see the efficiency of the banks basically arises from scale rather than management. One of the leading private banks in Ethiopia, Dashen bank has shown continuous decline on SE since the year 2002 and the bank has also shown weaker PTE scores relative to other competing banks. This supports the claim that excessive investment in technology, ATM machineries and bank infrastructure does not necessarily increase the efficiency of banks.

Generally, Nib international bank has been the most efficiently managed bank with PTE score of 0.959 followed by Commercial bank of Ethiopia in the second place with efficiency score of 0.887 and Bank of Abyssinia is in third place with PTE score of 0.881 and on the opposite side Zemen bank has been the least efficiently managed bank with PTE 0.584.

With respect to SE or the ability to generate maximum efficiency from optimal scale size, Dashen bank has shown declines in SE starting the year 2002 with minimum SE score of 0.765 in the year 2013. The mean SE scores also show BIB (0.976) operating at best scale size followed by NIB in second place with efficiency score of 0.949 and CBE in third place

with efficiency score of 0.948. The movements in mean annual efficiency score of all the banks also show WB operating at worst scale size with efficiency score of 0.794. The results of the SE scores explain scale size does not necessarily provide better SE.

The nature of returns to scale

In most of the study period the sector has been dominated by the DRS and as number of firms joining the industry increases through time, most banks exhibited decreasing returns. One of the biggest banks in the industry CBE has shown varying tends in its operation. In the earlier years of the study period (1990-1994), the bank operated at increasing returns to scale even though it was reported lowest efficiency scores during the time. But after the 1994 reform till 1999, the bank operated at optimum scale of operation generating equal gains from proportional investments in inputs. From 2000-2008, it operated at DRS showing larger expansion, inadequate deposit mobilization and excessive investments in assets without proportionate increase in output. While Dashen Bank reported DRS for the entire study period, other older and bigger private commercial banks such as AIB, WB, BOA, UB and NIB have shown IRS and CRS at some point in the early period of their operation. But after certain years of operation and in trying to maximize their market shares, all the above mentioned banks started to display DRS at later stage of their operation

Conclusions

Overall, the Ethiopian banking sector has reported mean technical efficiency of 78.3% for the period under study. This shows banks could have saved 21.7 % of the inputs they have used to produce the same level of output relative to the best practice bank during the period 1990-2013. The annual mean technical efficiency of the commercial banks ranged from the maximum unity in 1995 after the reform and the minimum of 0.651 in 2011 where the sector entertained increased number of commercial banks.

The mean efficiency score (78.3%) reported is higher than the score (75.67%) stated by Tekeste (2013) which was based on the study period of 1999-2011. However, the minimum efficiency score found in this study (65.10%) has shown closer resemblance to the amount on Tekeste's (65.7%) for lesser number of observations. For over the entire study period CBE has exhibited the lowest efficiency score of 55.5% in the year 2002 which was severely caused by the massive fall in scale efficiency as the increases in scale of operation only caused the bank to register least SE score for the entire study period. However, the bank has shown improvements in managerial efficiency as TE score reached 83.1% in that year. Overall, the banking industry in Ethiopia has reported moderate technical efficiency with mean score of 78.3% and this has been attained through improved scale of operation but lower managerial efficiency.

As a caution, the result should be interpreted with great care as the methods applied and the combination of the inputs and outputs used could easily affect the efficiency score and result in a different conclusion.

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