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The Structure and Efficiency of Ethiopian Commercial Banks

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Acronym

AIB	-	Awash International Bank S.C
APE	-	Alternative Profit Efficiency
BOA	-	Bank of Abyssinia S.C
CBB	-	Construction and Business Bank
CBE	-	Commercial Bank of Ethiopia
CBO	-	cooperative Bank of Oromia
DB	-	Dashen Bank S.C
DBE	-	Development Bank of Ethiopia
DEA	-	Data Envelopment Analysis
DFA	-	Distribution free Approach
FDRE	-	The Federal Democratic Republic of Ethiopia
NBE	-	National Bank of Ethiopia
NIB	-	Nib International Bank S.C
NPL	-	Non-performing Loan
ROA	-	Return on Asset
ROE	-	Return on Equity
SFA	-	stochastic frontier Analysis
SPE	-	Standard profit efficiency
TFA	-	Thick frontier Approach
TGE	-	Transitional Government of Ethiopia
UB	-	United Bank S.C
WB	-	Wegagen Bank S.C

Abstract

Using the stochastic frontier analysis and employing the cost, standard profit, alternative profit and labor efficiency concepts, this study has analyzed the efficiency situations and identified the exogenous factors affecting the inefficiencies of the Ethiopian commercial banks from 1994/95 to 2004/05. Furthermore, the study has investigated whether or not management inefficiency existed in the banks and the quality difference in the outputs of the banks. The findings also depicts that Ethiopian commercial banks have on the average cost, standard profit alternative profit and labor efficiency scores of 92.2, 68, 71.3 and 80.3 percent respectively. However, the econometric findings suggest that the alternative profit efficiency concept to be the most appropriate efficiency concept to assess the Ethiopian commercial banking industry. In view of this, the study indicates that alternative profit efficiency is affected positively by the private ownership, cheap source of deposit, larger size, higher capital size, lower risk preference of the management, longer years of operation and lower number of branches even though it deteriorated over the study period. In addition, the findings also reveal the existence of management inefficiency and output quality difference among the banks.

Chapter One

1.1 Introduction

1974 marked the beginning of a new and different period for the Ethiopian banking sector under the "Derg" military regime (1974 – 1991) which came to power after overthrowing the Imperial Government.[1] The emerging market lead economy of the Imperial period was substituted by a centrally planned socialist economy. In line with the ideological doctrine of building a socialist socio-economic system, all domestic and foreign private commercial banks that have been in operation during the Imperial period were nationalized and lumped up together with Commercial Bank of Ethiopia.[2] In similar move, the four specialized banks were taken over and reorganized into two specialized banks – Agricultural and Industrial Development Bank and Housing and Mortgage Bank. Hence, the commercial and development banks[3] were aligned to serve the needs of the state marshaled economy. After seventeen years of ruling, the Derg was ousted from power in 1991 and a Transitional Government assumed power in its place until the formal establishment of a Federal Democratic Republic (FDRE) three years later.

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[1] The Imperial government followed a free market economic policy in the financial sector. The sector consisted of one central bank, four commercial banks of which three of them were private commercial banks with 49 percent foreign capital and four specialized banks.(Belay, 1994)

[2] It is because competition between state banks was inadmissible in a socialist economy and Proclamation number 184/1972 dated July 1, 1980 provided the legal bases for the merger.

[3] The two specialized banks did not do well at the time the regime fall in 1991; both had almost gone bankrupt as they have been shackled by a high level of non-performing loans in their asset and problem of insolvency. The banks contracted the problem from the notoriously inefficient public enterprises and cooperatives to which they lent a large proportion of their loans. In contrast, Commercial Bank of Ethiopia was not in as bad a shape as the specialized banks in 1991 though it also had a huge liquidity problem. (Harvey, 1996)

Under the FDRE and the preceding Transitional governments, a series economic reform measures have been implemented to realign the National Economy from centrally planned economy left behind from the Derg period into a market led economy. In view of this, the Financial Sector Reform which constitutes an important component part of the economic reform package aimed to improve the competitiveness and efficiency of the financial sector and facilitate economic growth by mobilizing excess saving for investment (Ali 2000, Gebrehiwot 1997, Tonny and Alemayehu 2001). Among other things, the Financial Sector Reform program:

- Redefined the duties of National Bank of Ethiopia with regard to its role in monetary policy implementation as well as regulatory and supervisory mandate over other financial institutions.[4]
- Opened up the financial sector to domestic private investment even though the sector is still closed to foreign banks.[5]
- Removed interest rate ceilings, credit rationing to priority sectors and introduces competition in the sector by easing entry and exit conditions.[6]
- Provided greater management autonomy for the public owned banks.[7]
- Recapitalized Construction and Business Bank and Development Bank of Ethiopia.[8]

[4] Proclamation 83/1994 and proclamation 84/1994
[5] Proclamation 83/1994 and proclamation 84/1994
[6] Gebrehiwot 1997
[7] See Ali 2000, Gebrehiwot 1997, Tonny and Alemayehu 2001
[8] Hervey 1996

Taking benefit of the policy reforms, seven new private commercial banks have been established and two more private banks, Lion International Bank S.C and Oromia International Bank, are in the process of establishment. Hence, the financial system of the country currently consists of ten banks, nine insurance companies, 25 micro-finance institutions, saving and credit association and a big informal sector in the rural area in 2004/05[9]. The banking sector in its tern comprises of ten commercial banks, namely, the Commercial Bank of Ethiopia, Construction & Business Bank, Development Bank of Ethiopia (DBE) Awash International Bank, Dashen Bank, Bank of Abyssinia, Wogagen Bank, United Bank, Nib International Bank and Cooperative Bank of Oromia. The first three of these are state owned banks while all the later are indigenously owned private commercial banks.

1.2 Statement of the problem

The financial liberalization program constitutes an important component of the economic reform programs initiated, inter alias, to transform the national economy from centrally planned to market led economy (Ali 2000, Gebrehiwot 1997, Tonny and Alemayehu 2001). Financial liberalization included, among other things, removal of interest rate ceilings, credit rationing to priority sectors and easing entry and exit conditions and enhancing the human resource capacity of the sector through a staff development and training initiatives. Underpinning the liberalization initiative however is the objective to enhance efficiency of commercial banks by creating a flexible and competitive financial sector in which banks have

[9] Befekadu and Berhanu ,(2000/01)

more control over their resource utilization. However, as to whether or not financial liberalization can necessary induce efficiency in commercial banking business is a subject of contention in the literature of efficiency studies.[10]

Some studies such as Isik and Hassan in Ataullaha and Le (2003) conducted in a few developing countries assume that through such measures as deregulation of interest rates and state-directed credit policies, removal of entry barriers, and privatization of public sector banks financial liberalization initiates a more adaptable and competitive financial sector which in turn create an encouraging and enabling environment for the financial institutions to use their resources more efficiently (Ataullaha and Le, 2003). Leightner and Lovell (1997), who examined the impact of financial liberalization on the efficiency and productivity of commercial banks in Thailand during 1989-1994 using non-parametric Data Envelopment Analysis (DEA) with two alternative input output models based on commercial banks' profit maximizing objective and central bank's regulatory objective, found that the liberalization process has had a positive impact on the productivity of commercial banks. Gilbert and Wilson (1998) after studying the effect of financial liberalization of 1991 in Korea on the productivity of commercial banks during the early 1990s using similar approach also reported positive impacts. However, when they calculated technical efficiency of Korean commercial banks employing the parametric Stochastic Frontier Approach (SFA) they were unable to find convincing evidence showing that financial liberalization had impacted the efficiency of commercial banks positively (Ataullaha, and Le 2003). Studies conducted in Turkey after implementation of financial liberalization also came up with conflicting findings. Yildirim,

[10] See Studies such as Cevdet et al (2000), Berg et al (1991) Bhattacharyya et al (1997) and Berger and Humphrey (1997).

analyzed in 2003 the efficiency of Turkish banking sector (1988 – 1999) applying nonparametric DEA approach and concluded that the overall banking sector in Turkey did not achieve sustained efficiency gains during the study period. On the other hand, Isik and Hassan who had also undertaken a similar study in same country in the same year as Yildirim came up with a finding that stood out against the findings of the later in that they found some evidence indicating improvement in efficiency of banks after the financial liberalization (Ataullaha, and Le 2003).

It has been over a decade since the implementation of the financial liberalization in Ethiopia. A few of the commercial banks have been in operation through out this period. But all the eight banks included in this study have been active over the last six years (1999/00 – 2004/05). Regrettably, only a couple of efficiency studies were conducted after the introduction of the financial liberalization. Contrary to optimistic theoretical expectation of the reform, a study undertaken on the private commercial banks in Ethiopia (Solomon, 2003) with regard to this issue found out that the private commercial banks that were established after the reform are not efficient in both resource allocations as well as operationally. Studies such as Harvey (1996) attribute the inefficiencies in the banking sector to variety of causes such as the deficiency in skills and experience in modern banking practice.[11] The structure of deposit of commercial banks may have had also a part in causing the inefficiency in the sector.[12] Furthermore, Belete

[11] During the "Derg", the banks lending decisions were made outside the management of the commercial banks with little or no commercial consideration. In addition, as most of the loans granted to public sector with implicit government guarantee, collateral valuation was not made for most of the loans. The current management and employees of public commercial banks most whom are from the time of the Derg possess limited experience in and knowledge of commercial project appraisal or/and securities associated with them. Similarly, the new private commercial banks that drew most of their staff and management from the former employees of the public banks have unfortunately imported the problem from the later.

[12] For instance, if demand deposit constitutes a bigger share of the total deposit of commercial banks, the temptation of holding an excess reserve can be high. On the other hand, if the banks deposit is dominated by saving and time deposits,

(2005) has also suggested that the oligopolistic market structure of the country may have also contributed for their efficiency level of the banks.[13] In addition, the prevailing weak innovative and technological conditions, the size of capital and asset, the organizational forms adopted may have all contributed to the inefficiency. The ever increasing expense on provision for doubtful loans can also be an indicator to the existence of inefficiency in the sector. Studies[14] also suggested that public banks had a problem of utilizing labor efficiently; a problem might have also been inherited by the younger private commercial banks.

To the researcher's knowledge, most of the efficiency studies that were so far been attempted on the commercial banks in Ethiopia have employed ratio analysis method, which is static by its nature. Hence, the studies were limited by the method they used in that they have not been able to consider the bank operations in its entirety at one point in time and handle multiple inputs and outputs. Besides, judging the validity of the indexes of the findings is also very difficult in so far as there is no consensus among experts with regard to its scientific standard in interpreting findings. The single cost efficiency study undertaken in the private commercial banks and the Data Envelopment Analysis of CBE have so many methodological as well as conceptual weaknesses.[15] Furthermore, the non-existence of stock market in the country has made it difficult to owners and regulators to assess the performance of the banks from market point of view. Hence, it is quite evident that some other methodologies must be considered to assess the entire operation with due regard to multiple inputs and multiple output in

holding an excess can be too risky for the banks. This could expose them to moral hazard and adverse selection problems to increase their profit margin. (See also John and Break (1991) & Mayor (1990).

[13] According to him, a single commercial bank dominates the market (Commercial Bank of Ethiopia) and other seven small banks which follow the decisions taken by leading bank.

[14] See El-Gamal and Inanoglu,(2005)

[15] Detail discussion in this issue is presented in chapter 3 of this paper.

determining the efficiency levels of commercial banks and provide answers for the following questions.

1. How efficient are the Ethiopian commercial banks in terms of cost, standard profit and alternative profit concept?
2. Do ownership, deposit structure, age, capital and asset levels, the number of branches and the risk preference of the management affect the efficiency of commercial banks?
3. Is there any management inefficiency in the commercial banking sector?
4. Does the sector utilize labor efficiently?
5. Is there any gain achieved in efficiency in commercial banks from the financial liberalization measures?
6. Is there any quality difference in the output of the sector?

1.3 OBJECTIVES

The overall objective of this research is to contribute to measure the efficiency levels of commercial banks. More specifically, using the stochastic frontier approach, this study will:

- Evaluate the efficiency levels of each commercial bank in terms of cost, standard profit and alternative profit concept.

- Assess the effects of the types of ownership, type of deposit, age of the bank, capital and asset level, risk preference of the management and the number of branch offices on efficiency.
- Assess the existence of management efficiency.
- Evaluate the gains of commercial banks in efficiency after the financial liberalization.
- Assess the existence of quality difference in the banks' output in the period after liberalization.
- Predict the efficiency of labor in the commercial banks.

1.5 Significance of the study

The major expected beneficiaries of the findings of this study can be the regulatory body such as National Bank of Ethiopia and the management of each bank. The study can help the National bank of Ethiopia to objectively identify the inefficient banks and utilize its scare financial and labor resources in assisting and following-up the less efficient banks to improve their efficiency. On the other hand, this study can also provide the management of each bank an insight into the extent they can increase or decrease their profit or cost without expending additional input.

To the best knowledge of this researcher, there is no other research work done on the efficiency of commercial banks employing methodologies that make use of multiple inputs and outputs at the same time in all the banking firms. In view of this, I believe this paper will

contribute, though in a modest way, to fill the gap that exists in the literature of the efficiency study on the Ethiopian commercial banking industry.

1.5 The source of Data

All of the balance sheet and the income statement data of all the banks were collected from the audited annual reports of each bank. With regard to some macro variables such as the real GDP growth was collected from the annual and quarterly bulletins of National Bank of Ethiopia.

Chapter Two

The structure of the banking industry

2.1 The Banking Sector in Ethiopia

The Ethiopian financial sector, which is dominated by banks[16], contributed on the average about 1.8 percent of national income in the period between 1999-00 and 2004/05. The sector has developed positively with respect to financial deepening in the study period. The ratio of M_2/GDP and deposit to GDP are growing at 7.1 and 9 percent from 35 % to 49 % and 31% and 46% respectively. (Dereje, 2006) The average of M_2/GDP from 2001 to 2004 for Ethiopia is also higher than the averages of the same ratio of the oil producing (20.5) and Highly Indebted Poor African Countries (26.1%) (Secerdoti, 2005)

For the prudent governance of the banks, the government has enacted Proclamation: 84/1994, "Licensing and Supervision of Banking Business." According to this act, the banks are:

- Required to have a minimum paid up capital of birr 10 million or maintain a financial capital of at least equals to 8 percent of their risk weighted asset. However, the minimum paid-up capital was increased to birr 75 Million in 2002.[17]
- Required to transfer at least 25% of their net income to Legal Reserve Account.[18]

[16] According to National Bank of Ethiopia's annual report, it consists of ten banks, nine insurance companies, 25 micro-finance institutions, saving and credit association and a big informal sector in the rural area in 2004/05. The banking sector in its tern comprises of nine commercial banks and single development bank, Development Bank of Ethiopia (DBE). The CBE, CBB and the Development bank of Ethiopia are public owned while the rest are domestically owned private commercial banks established after 1994.

[17] SBB/24/1999

- Prohibited from permitting any holding allocation exceeding 20 percent of the total owners' equity to an individual and his/her close relatives.[19]
- forbidden advancing any loan to the central and regional governments
- Required to restrict their maximum reserve and liquid assets balance to less than 35% of the banks' deposit level.[20]
- required to limit any lending to a single borrower along with its affiliates to 25 percent of total capital of the bank, any lending to a single related party borrowers to only 15% of the total capital and the total lending to related party borrowers to 35% of its total capital at the maximum[21] and any lending to its directors and chief executive officers, their close relatives and affiliated businesses without a prior NBE approval to a total of birr 30,000[22] at the maximum.
- Required to classify their loans and advances into five categories so as to correctly reflect the risks involved with their lending activities of the banking business.[23]

2.2 The Branch Network of the Banking System

The branch network of the banking sector consisted of 391 branches in 2004/05 of which the commercial banks accounted for 359 and DBE for 32. (NBE, 2004/05) According to the same report, the network of commercial bank branches grew on average at the rate of 5.8 percent per

[18]This was deemed necessary in order to enhance the banking capital and also to reduce the risks of depositors.
[19] This appears to be a precautionary measure to avoid any concentration of ownership.
[20] Apparently, this is meant to discourage indirect and low cost government borrowing. In line to this, a NBE directive issued in 1996 requires the commercial banks to hold at least 5 percent of their deposit and similar liabilities in the form of primary reserve assets and 15 percent of current liabilities in the form of secondary reserve assets (SBB/15/1996).
[21] The intention is to minimize the risks that may be associated with a single borrower (SBB/029/2002).
[22] SBB/10/95
[23] The first two categories are "Pass" and "Special Mention" loans;[23] in which the banks' should provide against their income at least about 1 and 3 percent of the granted loan, respectively. The three other categories are "Sub-Standard", "Doubtful" and "Loss"[23] and in these categories, the banks are required to provide against their income 20, 50, and 100 percent of the loan and advance value respectively.(SBB/32/2002)

annum, increasing from 266 in 1999/00 to 359 in 2004/05. The private commercial banks account for about 43 percent of the total branch network and is growing at an average rate of 15.2 percent per annum which is suggestive of the aggressive expansion of private commercial banks. Even though the expansion in public owned commercial banks has been declining over the study period[24], it still accounts for 63.7% of the branch network. However, the CBE alone controls 75 percent of the public owned commercial bank branches. With regards to regional distribution of the bank branches in 2004/05, about 78.7 percent of them were located in Addis Ababa, Oromia and Amhara regions[25] while only 21.3 percent of the branches are distributed across the remaining 8 regions.[26]

Population per bank branch has declined significantly in the study period. According to NBE report, population per bank branch falls from 237,706 in 1999/00 to 185,000 in 2004/05. However, as shown in the appendix 1, the variation between regions in terms of population per branch ratio is huge.[27]

[24]It declines at an average rate of 1 percent per annum.
[25] Each of them account for 34.4, 27.9 and 16.4 percents respectively.
[26] A single bank branch is operating in each of Benesahngul-Gumuz and Gambel regional states. On the other hand, Harari, Somali, Tigray, Southern Nation Nationalities and People Regional States (SNNPRS), Afar and Dire Dawa have 3, 7, 24, 35, 3 and 9 bank branches respectively. (refer Appendix 1)
[27]Population per branch varies from the ratio as low as 22,187, 44,222 and 65,333 population per branch in Addis Ababa, Dire Dawa and Harari regions to very high, 463,000, 618,000, 625,000 and 425,771 for Afar, Somali, Benishangul-Gumuz and SNNPRS regions per branch respectively. A single bank in Oromia, Amhara and Gambela is expected to serve about 243,606, 298,750 and 247,000 individuals. (refer Table 1 of appendix) According to Thorsten Beck et. al. (2005), Ethiopia is one of the under banked countries in the African continent. He points that population per branch is about 22,000 persons in Namibia, 28,000 in Egypt, 31,000 in Zimbabwe, 62,000 in Nigeria, 66,000 in Zambia, 72,000 in Kenya, 175,000 in Tanzania, and 189,000 in Uganda.

2.3 Liquidity of Commercial Banks

As Sacerdoti (2005) pointed out that the excess liquidity in Ethiopian commercial banks has been one of the highest in Sub-Saharan Africa. The excess liquidity, which is the extra amount that the commercial banks deposit with NBE in excess of the required level for statutory reasons, was on the average about 7.2 percent of GDP or 10.4 percent of the banking assets in the period between 1999/00 and 2004/05.

Table 2.1: Excess Liquidity in Commercial Banks

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
EXCESS LIQUIDITY in million birr	3942.00	1459.40	4275.60	6374.90	4029.60	11,910.00
EXCESS LIQUIDITY TO GDP in %	6.10	2.10	6.10	9.50	5.30	14.60
LIQUIDITY RATIO in %	46.80	23.20	45.20	52.20	37.90	59.50
LOAN TO DEPOSIT in %	66.20	38.80	51.60	45.80	39.5	43.60

Source: National Bank of Ethiopia Quarterly Bulletin, First Quarter 2004/05

The value of excess liquidity in banking sector has grown at an average rate of 18.16 percent per annum to a peak of birr 11.9 billion in 2004/05 which was equivalent to 14.6 percent of the GDP or 16.84 percent of the total banking assets in the same period.[28] Similarly, the annual average liquidity ratio of the commercial banking sector was also about 44.1 percent of the

[28] Refer table 2. 1

total assets of the sector in the same period.[29] The ratio of loan to deposit, which is another index for excess liquidity and shown in Table 2.1, also declined at an average rate of 3.4 percent per annum.

2.4 The Asset Structure of Commercial Banks in Ethiopia

The asset of commercial bank can be broadly classified into seven components.[30] The asset include Cash on Hand, Deposit with other Banks, Suspense Accounts (receivable items), Loan and Advance, Investment accounts, Fixed and Other Assets.

[29] All of the commercial banks are parts and parcels of the liquidity problems; even though the liquidity ratio varies considerably from bank to bank. The CBE, CBB and United Banks have on the average the highest liquidity ratio amounting for 57.6, 55.5 and 53.9 percents from 1999/00 to 2004/05 respectively while Dashen and Nib banks have 36.04 and 37.94 percent liquidity ratio in the same period respectively. The Awash, Abyssinia and Wegagen banks have liquidity ratio of 44.64, 46.65 and 48.14 percent in the same period respectively. With regard to the average growth rate of the liquidity ratio, CBB, CBE and Bank of Abyssinia had the highest growth rate of 17, 13 and 11 percent per annum respectively. In contrast, Dashen, Wegagen and Nib banks had successfully reduced their liquidity ratio on the average rate of 7, 5 and 3 percent in that period respectively. (See appendix 2a) With regards to the ratio of liquid asset to total asset, CBE has been the most liquid bank between 1999/00 and 2004/05 as it carried on the average about 44.5 percent liquid asset in their total asset. In contrary, CBB has also the lowest liquid asset over its total assets (22.73%). Awash, Dashen, Bank of Abyssinia, Wegagen and United banks hold liquid assets equivalent to 37.9, 33.2, 32.5, 38.3 and 37.8 percent of their total asset. (See appendix 2b)

[30] SBB/ 21/96

Table 2.2: Asset of Commercial Banking System (In million birr)

ASSETS	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Consolidated Commercial Banks Assets						
CASH ON HAND	486.61	687.20	748.46	852.96	848.92	1339.85
DEPOSIT WITH BANKS	8392.53	6671.15	7365.88	9963.17	10731.87	18475.08
SUSPENSE ACCOUNTS	6559.06	6882.06	8229.61	12278.36	13765.84	16638.76
TOTAL LOANS AND ADVANCES	12811.94	13680.26	13682.12	13334.28	14150.26	17859.49
INVESTMENTS	2898.50	7025.02	8469.77	10586.23	13951.91	10531.39
FIXED ASSETS	487.62	539.19	586.66	652.52	735.94	812.45
OTHER ACCOUNTS	1496.68	1968.95	1988.04	3303.77	3614.35	5086.98
TOTAL ASSETS	33132.95	37453.82	41070.55	50971.29	57799.09	70743.99

Source: National Bank of Ethiopia

As shown in Table 3, the total value of commercial banking assets in 2004/05 amounted to birr 70.7 billion a sum equivalent to 86.7 percent of GDP on the same year. It has been growing from 1999/00 to 2004/05 at average rate of 16.6 percent per annum. The Loans and Advances accounted on the average for about 30.7 percent of total commercial banks' assets during the same period. Similarly, "Suspense Accounts" and "Deposit with other Bank", which can also be considered as liquid asset, on the average made up about 21.6% and 20.9% of the total asset, respectively. Contrary to the excess liquidity problem in banking sector, the percentage share of "Investment" from the total commercial banking asset stood on the average at 18 percent. This might have been due to low real return and/or illiquidity of the investment

instruments. The rest[31] of the assets together accounted on the average for 8.8 percent of the total commercial bank asset. Furthermore, positive growth has been registered in all the components of the bank assets through out the study period.[32]

The total asset of CBE is valued at birr 52.9 billon, which is equivalent to 74.8 percent of the total commercial banking asset in June 30, 2005. Even though its share out of total commercial banking asset declined from 85.5% in 1999/00 to 74.8% in 2004/05, its own asset has been increasing in the same period at an average rate of 13.5 percent per annum.[33] Comparatively, the private commercial banks assets have grown at the average rate 33.7 percent from 1999/00 to 2004/05. The value of total asset of these banks has increased from birr 3.8 billion in 1999/00 to 15.9 billion in 2004/05. [34] Unlike the CBE, their share from the total commercial banks asset has increased from 11.4% to 22.4% in the study period. Appendix 3also shows that all the asset components of the private commercial banks have also been blessed with a positive growth through out this period. Dashen Bank comparatively accounted for more than 26 percent of the total private commercial bank assets. Awash, Bank of Abyssinia, Wegagen and Nib banks on the average account for 23, 18, 16 and 11 percent of private banks assets

[31] These are Cash on Hand, Fixed Assets and Other asset Accounts.

[32] The highest growth was observed in investment account (39.1%) due to growth in Treasury bill investments (67.4%) and cash on hand (24.3%) indicating the problem of excess liquidity in commercial banks. fixed assets also grows at an average rate of 29.8% envisaging the extensive expansion in private banks.

[33] Moreover, it's Loans and Advances account for 25.6% of its total asset while Suspense Accounts and Deposit held with other Banks makes up for 23.6% and 21.5% respectively. Investment accounts also accounted for 21.3% of the total asset of which 80.6 percent is investment in Treasury bill. Cash on hand, Fixed and other assets constitutes for 1.7, 1.3 and 5.7 percent of the total banks asset respectively. Except loans and advances, all the components of the bank's asset have registered positive growth rate. With respect to loans and advances, it declines as a result of competition from the new private commercial banks.

[34]As regard to structure of private commercial assets, Loan and advances has accounted on average for 49.8 percent total private banking asset. "Deposit with other Banks" and "Suspense Account" also constituted for 18.4% and 14.7% of the total asset respectively. Contrary to CBE, investment of private banks accounts for only 4.5% of total private bank asset. Cash on hand, fixed assets as well as other assets accounts for 4.5, 2.2 and 5.8 percent of the total private banks assets respectively.

from 1999/00 to 2004/05 respectively. United Bank, accounting for only 6 percent of the private bank assets, is the smallest private commercial bank in terms of asset value.

2.5 Outstanding Loan in Commercial Banks

As shown earlier, Loans and Advances constituted the largest share of the total assets of all the commercial banks. Table 2.3 also reveals that the total non-central government outstanding loan has increased from 12.8 billion birr in 1999/00 to 17.9 billion birr in 2004/05, growing at an average rate of 7.35 per annum.[35]

Table 2.3: Outstanding Loan by Ownership Group

(Million birr)

	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05
FOR ALL BANKS						
TOTAL OUTSTANDING LOAN	12810.72	13680.45	13477.45	13312.34	14325.53	17670.85
PUBLIC ENTERPRISES	1453.25	1239.15	1498.26	1029.57	2047.68	2996.00
COOPERATIVES	420.30	342.62	361.97	334.60	367.05	929.76
PRIVATE SECTOR	10260.27	11534.37	11099.56	11491.62	11496.65	13404.91
INTER BANK LENDING	676.91	564.32	517.66	456.55	414.15	340.19

Source: National bank of Ethiopia

[35] The share of the Private Sector from the total outstanding loan was on the average as high as 73.7% while the annual average share of the Public Enterprises and Co-operatives from the same was 16.9% and 4.5% respectively. However, the share of the private sector from the total outstanding loan has been declining at an average rate of 6 percent per annum. In contrast, the public enterprises and cooperatives outstanding loans and advances have been growing on the average at 24.4 and 28.7 percent per annum in the same period.

In comparative terms the CBE alone accounted for about 53.5 percent or (birr 9.6 billion) of total outstanding commercial bank loan while the share of the private commercial banks was 41.7 percent or (birr 7.4 billion) in 2004/05. However, the CBE's Loans and Advances declined on average at 1 percent per annum from 1999/00 to 2004/05 while the Loans and Advances of private commercial banks grew at 31 percent in the same period. Similarly, the share of CBE as a percentage of the total the commercial banking loans and advances has declined at an average 4.4 percent per annum, falling from 78.8 percent in 1999/00 to 53.5 percent in 2004/05, apparently as a result of vigorous competition from the private commercial banks.[36] With regards to individual private commercial banks, Dashen bank accounted on average for 29 percent while Awash, Bank of Abyssinia, Wegagen, Nib and United banks, respectively, share 20, 21, 13, 11 and 6 percents of the private banks loan portfolios from 1999/00 to 2004/05.[37]

A closer look into the conditions of loan disbursement and loan collection is essential to better understand not only the nature but also to incorporate flow concepts in the stocks of loans and advance. With regard to disbursement, Dereje (2006) points out that it has been growing at an average rate of 21.9 percent per annum from 1999/00 to 2004/05 reaching to birr 8.85 billion in 2004/05. Out of the total disbursed loan by the commercial banks in 2004/05, CBE alone accounted for about 45.2% while the private commercial banks together disbursed the

[36]On the average, about 72.6% of CBE's and 99.4% of the private banks' outstanding loans and of advances between 1999/00 and 2004/05 went to the private sector. However, share of the private sector from CBE's total loans and advances declined as the share of Public Enterprises and the Co-operatives increased from 11.3 and 3.2 percent in 1999/00 to 17.9 and 4.3 percent in 2004/05 respectively growing on average rate of 26 and 36.3% percents per annum respectively. On the other hand, the private commercial banks lending to Public Enterprise and Co-operatives only accounted for 0.59 and 0.01 percent private commercial banks loan portfolio. Refer appendix 4.

[37] These values are calculated from the data collected from the balance sheet of the commercial banks.

remaining 54.8%.[38] As regards to loan collection, the performance of the commercial banks has been growing at an average rate of 18 percent per annum amounting to birr 6.8 billion in 2004/05 alone. It must also be noted that the loans collection has increased in general at an average rate of 9.3 and 38.8 percent per annum in the CBE and the private commercial banks respectively during the same period. [39]

2.6 Deposit Structure of Commercial Banks

Deposit is the most important sources of funding for commercial banking assets. It is part of the liabilities of banks' balance sheet. (Greuning, 1999) Both corporations and households often aim at minimizing their idle cash by letting the banks to collect the excess funds by writing claims against themselves in the form of deposit and also agreeing to pay attractive deposit rate or by providing a current account service to depositors.

Table 2.4 shows that the total deposit in commercial banks has been increasing from 1999/00 to 2004/05 at an average rate of 13 percent per annum. At the end of June 2004/05, the total deposit amounted to birr 37.8 billion, which was equivalent to 53.5% of the banking liability of the year. Demand Deposit accounted on average for 51.6% of the total deposit while Saving

[38] Out of the loans disbursed in this period, the Private Sector has received about 81.2 percent of the total. The share of Public Enterprise and Co-operatives was on the average about 7 and 10 percent of loans disbursed. Moreover, 61.6% and 99.4% of loans disbursed from CBE and the private commercial banks, respectively, made to the Private Sector. The Co-operatives and Public Enterprises received 15.3% and 20.8% of CBE's disbursement per annum. The private commercial banks seem to engage in business with private sector rather than public enterprises and cooperatives even though explicit legislature or directive prohibiting any party from engaging in business with other does not exist.

[39] (See Dereje 2006)

and Time constituted 44.1% and 4.4 % of the Deposits respectively, from 1999/00 to 2004/05.[40]

Table 2.4: The Share of Commercial Banks Deposit

(%age)

TOTAL BANKING SECTOR DEPOSIT						
	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
DEMAND DEPOSITS	0.535	0.519	0.497	0.499	0.512	0.500
SAVINGS DEPOSITS	0.424	0.436	0.455	0.459	0.449	0.458
FIXED DEPOSITS	0.041	0.044	0.047	0.042	0.038	0.043

Source: Author's Computation from the Deposit Data from National Bank of Ethiopia

Appendix 5 also reveals that CBE accounted on average for 79.2 percent of the total commercial banking deposit while the private commercial banks contributed 16.4% of the same. The share of CBE's out of total deposit of the commercial banking deposit has been declining at an average rate of 3.4 percent per annum[41] while that of private commercial banks has been increasing at 23.2 percent per annum.[42] In terms of structure, Demand Deposit on the average comprised of 58% of total deposits of CBE's and 25.9% of total private commercial banks deposits while Saving accounted for 40% of the deposit in CBE and 63.3% of the private commercial banks. Time Deposits constituted only 2% of CBE's total deposit and 10.8% of the private banks deposit. The relative larger share of Demand Deposit from CBE's total deposit may suggest the lower interest cost per unit of deposit for CBE while the relative higher share of Saving and Time Deposits from the total deposit of private commercial banks

[40] In addition, each of them is growing on the average rate of 12.6, 15.8 and 15.5 percents respectively.
[41] CBE's Demand, Saving and Time deposits shares also declines at 1.9, 5 and 10.8 percents respectively.
[42] The share of CBE from the total banking deposit has decreased even thought its Demand and Saving deposits have been growing at an average rate of 11.1 and 10.1 percent respectively.

may imply the higher interest cost per unit of deposit for the private banks. With regard to individual private banks, Dashen Bank mobilizes 29 percent of total private commercial banks deposit. Awash, Bank of Abyssinia Wegagen, Nib and United banks collected on the average 23, 20, 14, 11 and 9 percent of the total private banks deposits.[43]

2.7 Capital Structure of Commercial Banks

By very nature banks are characterized by a low capital to liability ratio which is a phenomenon that may not be prevailed in any other sector. (Greuning, 1999) This unique situation may motivate managers to engage in high risk investment to generate high profit at the risk of depositors'. With the view to mitigate such problems, bank regulators require commercial banks to have some level of minimum capital and minimum capital adequacy ratio. As discussed earlier, National bank of Ethiopia also sets the minimum paid-up capital, capital adequacy ratio and legal reserve requirements. This will help to improve the public confidence on the banking system and advances the payment system.

Table 2.5: Capital in Commercial Banking System

(In million birr)

COMMERTIAL BANKING SECTOR						
	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
TOTAL CAPITAL	1798.97	2151.82	2645.21	2164.18	2630.63	2971.73
Equity Capital	1021.06	1115.54	1186.67	1282.18	1364.38	1574.62
Legal reserve	422.12	568.85	454.51	606.39	708.3	837.83

Source: National Bank of Ethiopia

[43]These values are calculated from the data collected from the balance sheet of the commercial banks.

As shown in Table 2.5, the capital level of commercial banking sector has reached from birr 1.79 billion to birr 2.97 billion at an average annual growth rate of 11.8 percent from 1999/00 to 2004/05. The growth in capital may have been a result of the growth in legal reserve (15.4%)[44] and expansion of private banks owner's equity (9.12%) as per directive of NBE[45] and extensive expansion of private banks. It must also be noted that the capital growth was registered despite the fact that owners' equity of publicly commercial banks did not increase in this period. In 2002/03, commercial banking capital had declined about 18.2 percent as a result of loss registered in CBE after the new directive regarding doubtful loans.[46]

2.8 The Structure of Commercial Banking Income

The income generated in commercial banks can be broadly divided into two broad categories. The first component is an interest income generated from the difference between relatively higher lending interest rate and relatively lower deposit rates. Income generated from interest earning assets could also be included in this category. The second category of income is Non-interest Earning which is generated from rendering banking services[47] such as trade servicing, issuing guarantees, money transfer and foreign exchange dealings.

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[44] It is the result of growth in profitability of all banks.

[45] See section 2.1 in this chapter.

[46] CBE alone contributed the highest share of commercial banking capital accounting on average for about 62.6 percent of the total capital per annum in the study period. Though the capital of CBE increased on the average rate of 4.4% as a result of increase in legal reserve (13.1%), however, its share out of the banking capital has decreased from 71.6 to 48 percent in the same period. On the other hand, the capital of private commercial banks has been growing on the average by 26.7 percent per annum in this period. Their total capital becomes birr 1.54 billion in 2004/05. Consequently, their share out of commercial banking capital has increased from 24.5% in 1999/00 to 48.1% in 2004/05. Breaking even with CBE, both the owners' equity as well as legal reserve has contributed to the growth in capital of the private banks. (refer Appendix 6)

[47] The incomes included in this category are incomes in the form of commission, service charge or other incomes from operations such as trade servicing activities, issuing guarantees, foreign exchange or money market dealings, money transfer services, financial advisory services, discounting financial instruments and some other activities.

Dereje (2006) points out that Interest Income accounts on the average for 51 percent of total commercial banking income amounting birr 774.3 million per annum from 1999/00 to 2004/05.[48]. Income from this category has been increasing at an average rate of 1% per annum even though Interest income, as a percentage of the total commercial banking income has been declining at an average rate of 9 percent per annum in the study period. According to Dereje (2006) the Non-interest Income accounted on average for 49 percent of the total earnings of the commercial banks amounting to birr 700.8 million per year in the study period. Service charges and commissions accounted for 35 percent of the Non-interest Income while other income types generated the remaining 35 percent.[49] . Income generated from this category has been growing on the average by 23% per annum in the study period. In contrast to Interest Income, the share of Non-interest Income out of the total earning of the commercial banks has been growing at a rate of 11 percent per annum in this period.

Interest Income accounted on the average for 49% of CBE's total income and amounted to birr 971.2 million while it constituted on the average 54.8% (valued at birr 385.3 million) of the total income earned by the private commercial banks in the study period.

[48] Contrary to this, the interest income decreased about 13 and 12 percents in 2001/02 and 2002/03 respectively. The reduction in lending interest rate in 2002, the reduction in loan portfolio of CBE and the decline in nominal Treasury bill rates may have also contributed to the decline of Interest Income in the above years. However, Interest income peaked up again on 2003/04 and amounted to 1.24 billion birr on 2004/05.

[49] Similarly, the share of service charges and commission also grow on the average at 45% while other income's share declines at -16% per annum.

Chapter Three

Literature Review

3.1 Introduction

Many developing countries have attempted to implement Financial Sector Liberalization Policy since the early 1980s within the wider framework of Structural Adjustment Program[50] with the view to reduce government intervention in the economy and thereby remove government imposed distortion of the market [51](Mavrotas and Kelly, (2001)). There is plenty of literature on the rationale for the adoption of the policy as well as on the outcomes attained in these countries after implementing the reforms. As to whether financial liberalization as a policy instrument is inherently helpful in resolving the economic problems of financially repressed economies, conflicting points of views that range from optimistic, skeptic to pessimistic are reflected in the literature. This review will, however, limit itself to briefly examining only those that relate to the aims and objectives of this study.

Apparently, the articles of Mckinnon (1973) and Show (1973) were the first works that conceptualized and forwarded the notion of financial liberalization to reverse the economic problems of financially repressed economies where interest rates languish below the market clearing rate and generate below the optimal saving and consequently limiting the levels of investment. Furthermore, a World Bank study conducted in 1989 concurred with the views of

[50] The deregulation included, among other things, fiscal consolidation, reforms of the exchange rate and foreign trade system, price liberalization, deregulation of activities and other reforms with a view to improve the supply responsiveness of the economy.

[51] In terms of theoretical grounding, Mavrotas and Kelly (2001) associated the financial liberalization to welfare economics in that it adheres to the notion that competitive markets could lead to Pareto optimal equilibrium.

Mckionnon and Show in that it also confirmed that the scarcity of financial savings that induce measures such as credit rationing to priority areas that characterize a repressed financial system is detrimental not only to the growth in volume and the productivity of investment but also to economic development as a whole.

The works of Ataullaha et. al. (2003), Hogan et. al. (1984), Wade et. al. (1991), Isik et. al. (2003), Demetriades et al. (2001), and Luc (1991) in general conceived financial liberalization positively emphasizing its meritorious aspects.

Ataullaha et. al. (2003) maintained that financial deregulation can trigger positive economic outcomes to reverse the contradictions of a repressed financial system. They point out that deregulation can among other things facilitate the mobilization of domestic saving, improve access to credit and upgrade the resource allocation capacity by reducing intermediation costs and financial deepening.

Hogan and Sharpe (1984) highlighted that financial liberalization can contribute to improvements in the efficiency level of the financial institutions. [52] Wade et. al. (1999) and others such as Hasen et. al. (2000) also concurred to the views of Hogen and Sharpe. They too pointed out that financial liberalization has been instrumental to the genesis of a more flexible and more competitive financial sector. They attributed this to the deregulation of interest rate and the abolition of state-directed credit allocation, removal of entry barriers and privatization

[52] The main emphasis of the early empirical studies on the financial liberalization in LDC's was on 'macroeconomic' impacts of financial liberalization, such as impacts on level of savings and investment in the economy.

of the public banks that were undertaken in implementing the deregulation program. In the view of Isik and Hassen (2003), the conducive and enabling atmosphere of flexibility and competition created by financial liberalization can encourage and enable financial institutions to utilize their resources and operate efficiently. In an earlier work, Demetriades et. al (2001) have also underscored that financial deregulation can also provide banks with a greater opportunity to improve their efficiency levels by enhancing their revenue and by reducing their risks by diversifying their asset in a wider range of portfolio.

Furthermore, Luc (1991) cited the merits of financial liberalization with regard to addressing the principal-agent problem. He argues that the incentives to managers (the agents) to efficiently allocate their economic resources to their best use defer under different ownership arrangements. In a situation where the owners (principals) have lower incentive or/and ability to supervise the activities of the executives, the agents can be tempted to maximize their own benefit at the risk of increased inefficiency costs associated with the agency problem. He further pointed out that the private ownership is, in general, superior to the public ownership. That is, the public banks may have additional objectives other than profit maximization and/or cost minimization such as gearing their effort to meet other state's objective. Hence, by emancipating the banks from any form of government intervention, financial deregulation thought to enhance the levels of bank efficiency.

Conversely, the works of Akerlof et. al. (1993), Hellman et. al. (2000), Charles (2001), Berger and Humphrey (1997), Akerlof et. al. (1993), Hellman et. al. (2000), and Calvo et. Al. (1996)

maintained views that are skeptical if not critical to position of supporters of financial liberalization.

Akerlof et. al. (1993) and Hellman et. al. (2000) argued in their respective works that the stiff competition pursued under the auspices of financial liberalization usually lowers the profits. Furthermore, they claimed that profit loss can be even worse when the problem of asymmetric information such as moral hazard and adverse selection prevail. According to them, these factors may increase the risks associated with the banks' outputs and inputs to the extent of not only reducing their ability of allocating resources efficiently, but also of operating competently. Similarly, they also argued that the improvements in investment opportunities created by the financial deregulation will widen the array of the new business activities the banks may engage in while at the same increasing their risks.[53] In connection to this they also contend that coupled by the institutional weaknesses and market failures, the new developments can exasperate financial risks of the banks even further and thereby jeopardize returns on investment. On the basis of this, it is possible to assert that financial liberalization may not increase the efficiency of the financial institutions.

Charles (2001) also argued that even though the basic rationales for financial liberalization are still uncontested, they appear too unsophisticated to be applied in the real world situations and particularly in the developing countries. He further contended that the basic principles of the financial liberalization are not only formulated under very specific assumption such as the

[53] This includes derivative trades, money market dealings, other foreign currency related transactions and so many others. So that it will create a greater freedom to banks to allocate their assets. Hence, it may increase the potential for gambling and also inefficient allocation of resource in the economy and inefficiency in the banks operation.

financial sector to be made up of large number of financial institutions which are capable of allocating the economic resources and operating efficiently on their own. He also criticized the model for assuming that goods markets as a rule function properly. Besides, if these conditions fail to hold, Charles argued that the results expected from deregulation program can be jeopardized.

Supporting Charles's point of view, Berger and Humphrey (1997) contended that whether or not financial liberalization will succeed in improving bank level efficiency will largely be determined by the prior conditions of the financial sector. Furthermore, they stressed that the expansion of bank branch network and the excessive growth in the banks' asset subsequent to the liberalization will make it difficult for the banks to properly manage and improve the efficiency levels. In relation to this, they pointed out that the prudential policy environment of the regulators can also affect the efficiency of the sector.

Akerlof and Hellman in their respective articles published in 1993 and 2000, respectively, underscored that the expanded and diversified investment opportunities created by financial liberalization may motivate financial institutions to take excessive risk. In view of this, Calvo et. al (1996) warned that the sector can drift into financial crisis rather than attaining a high level of efficiency unless adequate supervision and regulation are firmly in place.

Nonetheless, the efficiency levels of commercial banks are also affected by a lot of factors other than the financial liberalization policy. Hence, it may be useful to briefly review some

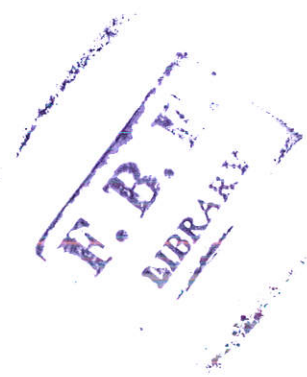
empirical works made in different countries in order to identify and understand the factors that determine and explain efficiency gains and/or losses.

3.2 Empirical Literature

The literature provides some empirical studies that employed different kinds of frontier methods to measure the efficiency of commercial banks in different part of the world. Some of these empirical works examined commercial banks in a single country, while the others encompassed the group of banks operating in a group of countries over time. These experiences may help us to determine the factors that affect the levels of efficiency in the banking sector.

After surveying 122 studies carried out in 22 different countries utilizing different methods of measuring efficiency, Berger and Humphrey (1997) underscored in their report that the results generated from these different methods were dissimilar as much as they were incomparable with one another. They ascribed this to:

- Efficiency concept variations
- Sample size and study period differences
- Functional form and variable specification disparity



Berger and Mester (1997a) conducted a study in 6000 US commercial banks in the period between 1990 and 1995 applying the distribution free approach with flexible frontier functional form. They found out that the average cost, standard profit and alternative profit efficiency scores of the banks were 87, 54 and 46 percent, respectively.[54] Comparing the cost and alternative profit efficiencies, cost efficiency scores of the banks were found to be higher than the profit efficiency scores reflecting output quality difference dominated market power. This study also showed that bad management was identified to be the cause for inefficiency of banks rather than bad luck.[55] It also revealed that banks with high risk preference were found cost and profit inefficient suggesting the prevalence of the moral hazard problem. Conversely, the cost and both alternative and standard profit efficiencies of well capitalized banks (banks with the higher proportion of financial capital to total asset) were higher than less capitalized banks. Smaller banks performed better than the large ones in terms of the standard and alternative profit efficiencies. In contrast, the cost efficiency did not vary in line with bank size variation reflecting that revenue creation becomes more difficult than controlling expenses as banks get bigger and bigger. The age of the banks was also found to be significantly and positively related to both profit and cost efficiency though the coefficient is too small.

In a similar study[56], but encompassing a longer study period and different samples, Berger and Mester (1997b) found out that the average cost efficiency of US commercial banks had

[54] The estimated results also showed that the trans-log and the flexible-frontier functional forms had a similar statistical result indicating both of the functional forms fits the US commercial banking data. On the other hand, the estimated stochastic frontier models did not fit the US commercial banks data in the study period.
[55] To measure the management efficiency the NPL variable has been included in the cost and profit function with state NPL to control the endogenity problem of NPL.
[56] The study employed the Distribution Free Approach along with the flexible frontier functional forms between the period of 1984 and 1995.

deteriorated slightly on average from 80% in 1984 to 77% in 1995. On the other hand, they discovered that alternative profit efficiency scores had slightly improved while the standard profit efficiency scores remained unchanged throughout both the study periods. From this finding they concluded that the effect of financial liberalization is dubious in improving the bank level efficiency. In contrast to the findings of the first study, the later study revealed that smaller banks have become not only more standard and alternative profit efficient but also cost inefficient than larger ones.

Employing the stochastic frontier analysis in combination with flexible-frontier functional form, Claudia et. al. (1999) studied the efficiency of the Italian commercial banks. The findings of the study revealed that the average cost efficiencies of the banks had increased from 85% in 1993 to 87% in 1996. In contrast to the findings of the above studies in USA, the Italian study did not find any statistically significant relationship between the asset size of the banks and bank efficiency.[57] Interestingly, this study also underscored that the cost efficiency of the well capitalized banks was better than the less capitalized banks in a statistically significant way. Moreover, it also showed that asset quality[58] had positive and statistically significant correlation with cost efficiency. With regard to the efficiency of the management, this study disclosed not only that the Italian commercial banks have been well managed but also that good management is crucial for cost efficiency. Banks with larger branch networks were found to be cost inefficient. With a view of reducing biases that may occur in treating different size categories together, the study estimated different frontiers for different size

[57] It envisaged that large and small banks do not have significant difference in managing their cost.
[58] It is approximated by the proportion of non performing loan to total loan.

groups. However, this procedure renders comparison between different bank size groups more difficult. In view of this, it may have been better if it using some other efficiency concept such as alternative profit efficiency concept could have been a better option.

Using the stochastic frontier approach with flexible trans-log functional form, Hasen et. al. (2000) carried out a study to predict the efficiency level of the Hungarian banking sector after the financial deregulation and to identify the factors that affect bank efficiency. This study showed that the financial liberalization had contributed significantly in improving the efficiency level of the banks. Findings indicated that the average cost of the banks declined from 28.62 to 16.83 and the profit inefficiencies from 32.54 to 25.01 between 1989 and 2000. Banks with a relatively larger asset were found to be more cost and profit efficient than banks with a smaller asset while bank with a small return on asset[59] were denoted to be inefficient. With regard to the relationship between efficiency and the age variable on one hand and efficiency and the length of the service day on the other, the findings indicated that the former had statistically insignificant relationship while the later were statistically significant and positive relationship.

Konstantin (2005) conducted a cost efficiency study on the Russian commercial banks employing the stochastic frontier method with a simple trans-log function form after the financial deregulation of the 1990s in the aftermath of the fall of the soviet system. The findings of this study showed that the cost efficiency level of banks improved in the study

[59] It indicates banks with risk-averse management.

period.[60] Foreign owned banks were found to be the more cost efficient than both private and public banks. Nonetheless, the cost efficiency scores of the private banks were reported to be higher than the public banks. The study also revealed that well capitalized and large banks and banks that operated in Moscow[61] have been cost inefficient.

Berger el. al., (2005) have also undertaken a study utilizing the stochastic frontier approach to measure profit efficiency of commercial banks in China after the implementation of the financial reform. The findings were quite revealing in that it showed that the financial reform had played a significant role to enhance the efficiency of the banking sector. It also reported that the type of ownership had statistically significant relation with level of alternative profit efficiency of the banks. Foreign, private and publicly listed banks[62] were found to be profit efficient while the relation between the state ownership and profit efficiency was negative. However, the study did not report the comparative position of public and private ownership in regard to profit efficiency level.

Rodrigo et. al. (2003) conducted a cost and profit efficiency study in Chile employing stochastic frontier with trans-log functional form for the period between 1990 and 2000. They reported that the average cost efficiency had declined from 91% in 1991 to 75% in 2000 while profit efficiency did not vary statistically significantly in the study period. Furthermore, the findings revealed that Public ownership, larger asset size, high market concentration and lower

[60] The coefficient of time variable in time varying stochastic frontier model had a positive and statistically significant value indicating the improvement in efficiency in the study period

[61] It indicates the banks located where there is high competition.

[62] Commercial bank in china had been classified into government owned, foreign ownership, private ownership and publicly listed and traded ownership categories.

levels of ownership concentration were factors that accounted for the increase in cost inefficiency statistically significantly. Conversely, credit risk and cost inefficiency were found to be statistically significant negative related to one an other which is indicative of either the existence of good management in Chile's commercial banks or the deliberate postponement of current costs into the future in line to "Skimp" hypothesis of Berger and Deyong (1997). Profit inefficiency was reported to be a negatively and statistically significant related with public ownership and larger market share[63] while credit risk and profit inefficiency had a positive and statistically significant relationship.

Kumbhakar et. al. (2004)) have carried out a cost efficiency study also on the Indian commercial banking sector applying the stochastic frontier approach with trans-log functional form to measure the efficiency of the banks in the period from 1986 to 2000. The finding from the study revealed that the average cost efficiency of the banks had improved from 69% in 1986 to 75% in 2000. Private Banks were found more efficient than the public banks in the studied period.[64] Even though the average cost efficiency levels have increased in the study period, the study exposed that the response to the deregulation measures from the different groups of banks was not statistically significant.[65]

A similar study undertaken in the Hong Kong commercial banking sector by Simon (2001) in the period between 1992 and 1999 reported that the average cost efficiency ranged between

[63] It is a proxy for the bank size.
[64] The efficiency level public banks were about 90% of the private bank efficiency level.
[65] In other words, efficiency levels of all groups of banks (public, private, foreign and some other form) did not increase following the deregulation policies as the theory suggest.

70% and 84%.[66] The efficiency levels were also found to have improved over the study period. With regard to specific bank characteristics, the estimated cost efficiency of the larger banks were found to be on the average higher than the small banks while banks with a larger amounts of loans and deposit were reported to have been more cost efficient than banks that possessed smaller loans and deposit. Furthermore, banks with a higher proportion of non-performing loans were found more cost efficient than banks with a smaller proportion of non-performing loan implying a deliberate transfer of costs to the future with the view of reducing current expenses incurring from loans monitoring and supervision activities in order to increase their profit in the short run.[67]

Maudos et. al. (2002) had conducted a multiple country efficiency study in 10 European countries[68] to investigate cost and alternative profit efficiency of commercial banks in the period between 1993 and 1996. In line with other similar empirical investigation such as Berger and Mester, (1997a), Berger and Mester (1997b), Hasen et. al. (2000), they also considered both cost and alternative profit efficiency levels of the banks. Findings of this study also revealed that not only that the average cost efficiency of the banks to be higher than their alternative profit efficiency, but also that the standard deviation of the profit efficiency scores were higher than the standard deviations of the cost efficiency scores. According to the authors, this may imply that the banks of the ten countries had more or less a similar capacity to control their cost while their ability of creating revenue varied significantly. The estimated result also showed that medium sized banks and the banks with the highest loan to asset ratio

[66] It had employed a stochastic cost frontier with traditional trans-log cost function.
[67] This is consistent to the "skimping" hypothesis.
[68] The countries are Austria, Belgium, Finland, France, Germany, Italy, Luxembourg, Portugal, Spain, Denmark, Greece, Holland, Ireland Sweden and the UK.

were more cost and alternative profit efficient than other categories of banks. The growth in the entire economy of these countries may have also contributed to the improvement in both efficiency scores. Even though the risk-preference[69] had no statistically significant relation with the cost efficiency estimation, the banks with a high risk-preference were found to be more profit efficient. Furthermore, the findings of the study implied that profit efficiency of a given bank tend to improve with a higher market share though its cost efficiency would decline at the same time.

Using a stochastic frontier approach with flexible frontier functional forms, Rossi et. al. (2004) studied the efficiency of banks in a group of former socialist countries of Central and East Europe after the financial deregulation[70]. The study found the cost and profit efficiency scores of the banks to be lower than the estimated efficiency frontier. The predicted profit efficiency scores were also reported to be lower than the cost efficiency reflecting the weakness of the management in engaging in profit generating operations than controlling their cost. Nonetheless, the study also reported that both the cost and alternative profit efficiencies have been improving through out the study period. Furthermore, the estimated results indicated that the bank size did not have any impact the cost efficiency statistically significantly even thought profit efficiency declined as the banks grew larger. In the tradition of Claudia et. al, (1999), this study also estimated three separate frontiers for three size groups to control for the size biases. Though the procedure solved the size bias, it rendered comparison of the efficiency among banks grouped in different size categories more difficult.

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[69] It is approximated by the standard deviation of return on asset.

[70] The countries included in this study are the former nine socialist counties such as Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Rumania, Slovakia and Slovenia.

A very similar study had also been undertaken by Bonin J. P. and others (2003) to examine the efficiency of the banks in 11 former socialist countries of east Europe, specially focusing on the ownership system and efficiency levels. This multiple country study showed that private and foreign owned banks to be more efficient than public banks.[71] Moreover, foreign owned banks were reported to have performed better than domestic private banks in terms of profit efficiency even though the cost efficiency scores of the former were lower than the later.[72] Furthermore, larger banks were found to be less cost and profit efficient than the smaller ones.

Kasman et. al. (2005) under-took a comparative efficiency study among 16 Latin American and Caribbean countries employing stochastic frontier method with a flexible-frontier functional form to estimate both cost and profit efficiency concepts in the period between 1996 and 2001. According to the predicted result, the average cost scores were ranging between 61.1 and 88.4 percent and it varied between 49.1 and 87.9 percent for the profit efficiency scores respectively. The estimated results also revealed that large banks were found to be more cost efficient even though they were less profit efficient compared to their smaller counter parts. Furthermore, foreign owned banks also found to be more efficient than the domestic banks in both cost and profit efficiency.

Using the Data Envelopment Analysis (DEA), Ataullaha and Li (2003) have studied the efficiency of commercial banks in India and Pakistan both prior to and after the financial

[71] The study has employed the stochastic frontier approach along with the traditional trans-log functional form to estimate both the cost and alternative profit efficiency scores.
[72] This suggest that foreign banks are more interested in short run profit rather than transferring technologies and innovation in the sector.

liberalization[73] covering the period between 1988 and 1998. The estimated results exposed that the efficiency levels of the banking sector in both countries had been improved by more than 10 percentage points after the financial deregulation. However, the authors attributed the improvements of Indian commercial banks to both pure technical and scale efficiency while the improvement in scale efficiency was identified as factor for the improvements in efficiency of the Pakistani commercial banks. Despite the empirical evidence in bank efficiency improvement after the financial deregulation, the authors underscored that the predicted efficiency scores were found to be very small in both countries as a result of the gradualist strategy adopted in implementation the financial liberalization policy in both countries. In addition, the estimated results of the study also suggested that financial liberalization had reduced the difference in the efficiency levels that had formerly prevailed between the large and the small banks.

Even though bank efficiency studies abound globally, regrettably very few such studies are available on Ethiopian and African banking sector. To the best knowledge of the researcher only two frontier efficiency studies had been undertaken on the Ethiopian commercial banking sector. With regard to the report of most of the efficiency studies made in other African countries, were unfortunately inaccessible to the researcher. Hence, this review is condemned to limit itself to only the few literature that are available in considering studies conducted in Ethiopia and other African countries.

[73] The financial liberalization was implemented in 1991.

Employing the Data Envelopment Analysis, Wade et. al. (1999) has studied the Tunisian banking market after the reform of 1987. The study covered the period between 1992 and 1997. According to the findings of this study, the average efficiency score of the banking industry was about 55%.[74] Comparatively, the private banks were found to perform better than the public banks with regard to efficiency in the study period. Banks with higher proportion of non-performing loan to its total asset and banks with large asset size were reported to have exhibited fairly lower efficiency level. The study concluded that the reforms undertaken in the banking sector in 1987 had succeeded to lesser extent in minimizing the efficiency gap between the public and private banks even though the efficiency levels have shown a general improvement in the study period.

Using the stochastic frontier analysis and cost and profit efficiency concepts together, Devi Bedari, (2002) had also undertaken a comparative study to measure the cost and profit efficiency scores of banks in three South African countries in the period between 1995 and 2000.[75] The predicted results of this study indicated a relatively higher cost efficiency score in comparison to the profit efficiency score. Moreover, the predicted average cost and profit efficiency scores were reported to be about 85.7 and 66.9 percent in the study period, respectively.[76] The finding also showed that predicted cost and profit efficiencies levels have been improving in the study period.

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[74]The private banks have an average efficiency score of 64% while the public banks have 46%. Large banks which have an asset size exceeding TD (Tunisian Dreham) 2 million have efficiency score of 31.8 while small banks with capital levels of less than TD 1 million have average efficiency scores of 79.8%.

[75] It has considered four banks from each of Namibia and Botswana and three banks from South Africa.

[76]Moreover, it also pointed out that the Namibia's banks became the most cost efficient while the Botswana's banks also found to be the most profit efficient.

Applying the traditional trans-log functional form and the quarterly balance sheet and income statement data in the period from 1997/98 to 2004/05, Muluneh (2006) constructed a stochastic cost frontier to assess the efficiency of the private commercial banks in Ethiopia after the financial liberalization. The predicted results showed that the cost efficiency scores of the private commercial banks did not improve statistically significantly over the study period. The study also revealed that cost inefficiency of the banks is negatively related to capital levels. The size of the bank, the number of branches and age of the banks, on the other hand, had a positive relationship with cost inefficiency. Nonetheless, the study has some fundamental weakness. The first weakness is its limited scope in that it limited itself only to the private commercial banks and used a single cost efficiency concept. Secondly, the cost efficiency concept assumed a perfectly competitive market model though this model is not a typical feature of the Ethiopian banking sector. Hence, the findings of this study turned out to be too limited in scope to be forcefully conclusive. Thirdly, the quarterly data that was used in the study was obtained from the banks' balance sheet and income statement that have not been audited. Hence, caution must be made in this regard as it may have contained some errors.

The second frontier efficiency in Ethiopia is that of Waltom (2003) which was undertaken in 2003 to determine the efficiencies of the branches of the Commercial Bank of Ethiopia in the period between 1993 and 2002. This study had employed the multi-staged DEA.[77] Findings of the study indicated that the average operational and profit inefficiencies of the branches to have been 26 and 22 percent in the study period, respectively. The estimated results also confirmed that both operational and profit efficiencies have improved slightly in the study

[77] In order to analyze the performance of the branch offices in terms their size, he grouped the branches into four categories.

period. According to Waltom (2003), the improvement in efficiency must have been a result the deregulation policy and the favorable economic environment that prevailed at the time. [78]

[78] However, the study also conceded at the same time that the efficiency level of the branches of all size categories except the small branches has been declining between 1998 and 2001. The study reported only Grade 1 and Grade 4 branches as efficient while Grade 2 and Grade 3 branches were reported as under performers in that they neither contributed to the corporate level incomes nor to their own profitability.

Chapter four

Methodology

4.1 Methodological Literature Review

4.1.1 Farrell's Approach

Farrell's article (1957) is the first work ever attempted to measure firm efficiency in relation to production frontier. He defined the concept of efficiency and also proposed computational frame work for efficiency measurement.[79] He also classified efficiency into three broad categories of Technical Efficiency, Price or Allocative Efficiency and Economic Efficiency.[80] Assuming a convex iso-quant with a single output and two factor inputs and constant return to scale production function, Farrell measures the efficiency of a firm within a given industry (See figure 1 bellow).

According to Farrell, the length of line segments OQ/OP measures the level of Technical efficiency of a firm operating at point P as indicated in Figure 1. This ratio will always take a value between one and zero. Similarly, the ratio of the line segments OR/OQ measures the Price (Allocative) efficiency. The overall efficiency level of a firm can be calculated by using ratio of line segments OR/OP in the figure 1.[81]

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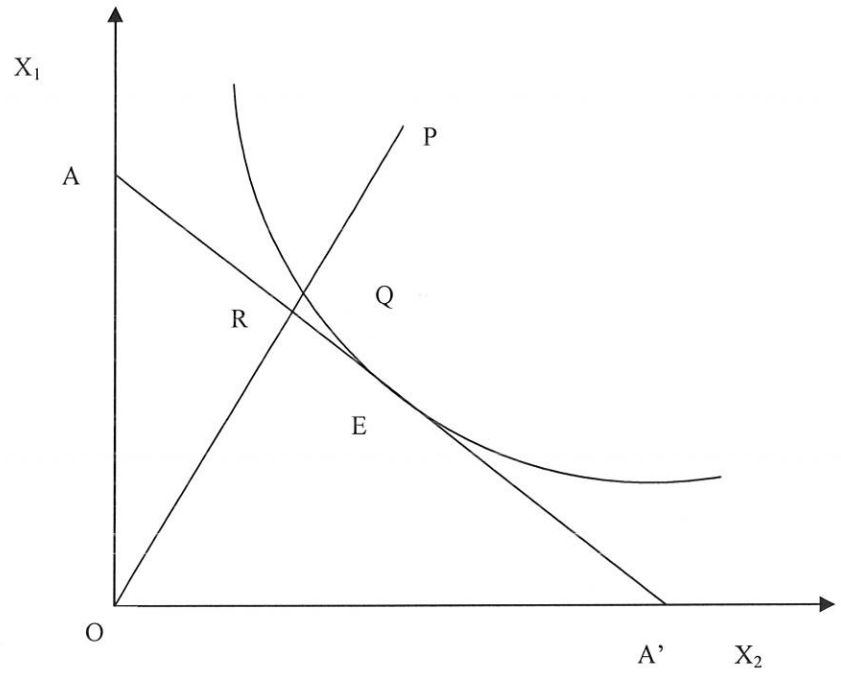
[79] According to him, efficiency is a measurement as to how a firm can produce an output that is as large as it can possibly produce from a given input.

[80] The technical efficiency measures the success of a firm in producing the maximum output from a given input. Price efficiency, on the other hand, measures the success of a firm in selection of optimal input mixes that allocate the factors of production to their best use based on their opportunity costs. Economic efficiency measures the combination of both technical and price efficiencies. (Kopp, 1991)

[81] Even though Farrell's methodology succeeded in resolving the problems of indices of efficiency stated on Vittas (1991), it was still far from being perfect. Farrell himself pointed out that the efficiency level of a specific firm indicates only the efficiency level within the estimated sample. The generalist implicit assumption of homogeneity in factors of production makes the separation of management inefficiency from the quality of input very difficulty. Forsund et. al (1980) criticized

Figure I: Farrell's Envelop



4.1.2 Frontier method of efficiency measures

A) Deterministic parametric frontiers

A step forward was taken in developing methodologies of measuring efficiency when Aigner and Chu (1968) a decade after Farrell's work came up with the homogeneous Cobb-Douglas production function and its non-negative error term or inefficiency. [82]

Cobb-Douglas's production function can be expressed mathematically as:

Farrell's approach for being susceptible to observation with extreme value. Similarly, the assumption of constant returns to scale is very restrictive. It must, however, be noted as this juncture that Forsund also recognized the advantage of Farrell's method in that it does not impose any ad-hoc functional form on the data.

[82] According to Kopp, frontier production or cost functions are superior to Farrell's standard in many respects. It can be used as a standard and will provide information about the best practice in the sample set. It also shows the maximum output that can be produced for a given level of input or the minimum cost required to produce a given level of output for a give level of input price. Any deviation from this level can be considered as inefficiency. (Forsund et. al, (1980))

$$\text{Ln } Y = \text{Ln } f\ (X_i) - U^{83}$$

Hence, the estimated frontiers will envelope the entire input-output combination in a given technology.[84]

Nevertheless, this approach has a problem of assuming ad-hoc functional form without any theoretical justification. Similar to Farrell's approach, it is also sensitive to outlier observations. In contrast to Farrell (Forsund, 1980), it does not provide statistical properties in estimating the parameters.

B) Deterministic statistical frontier

To bring a statistical property into the one-sided error term (U) of Aigner and Chu (1968), Afriat (1972), Richmond (1974) and Schmidt (1976) have introduced a specification that assumes beta, gamma and exponential distribution on U, respectively.[85]

$$Y = f\ (X_i)\ e^{-u86}$$

However, the dependent variable (Y) will depend on the estimated parameters of the function $f\ (X_i)$ so that the reliability of the asymptotic efficiency and consistency of the maximum likelihood estimator become questionable.[87]

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[83] Where Y is output, $f\ (X_i)$ is the Cobb-Douglas production function with its inputs. The one sided error term will force the production $f\ (X_i)$ to exceed actual output level (Y).

[84] The assumption of the functional forms also makes it possible to express the frontier technology in a simple mathematical form and eliminate constant returns to scale assumption of Farrell's method.

[85] This method will bring another restriction in efficiency measurement due to the assumptions of distribution of U unless there is prior knowledge about the distribution sample data. As a result, the estimated efficiency scores generated from different distributional assumptions differ from one estimate to another.

[86] U is assumed to be independently and identically distributed to X_i and X_i is also assumed to be exogenous to one-sided error term (U). To estimate the parameters of the model, all of the above writers utilize maximum likelihood or corrected OLS estimation methods. Both Afriat and Richmond have proposed to use the expected value of the one-sided error terms to calculate the efficiency score for the observations of firms. (Kopp, 1981)

C) Stochastic frontiers

All frontier methodologies above discussed considered the efficiency of a single firm to depend on factors under its own control assuming a single one-sided error term. However some external factors that are beyond the control of the firm management, but that can significantly affect a firm's efficiency abound in reality. In view of this, Aigner, Lovell and Schmidt (1977) and Mecusen and Vonden Broeck (1977) have come up with a specification that take stock of composite error term with the view to include random error term and the one sided-error (inefficiency) term in efficiency study.

The stochastic frontier approach can be expressed mathematically as:

$$Y = f(X_i)\, e^{(v-u)} \quad (LN\, Y = LN\, f(X_i) + V - U)$$ [88]

Forsund (1980), however points out that the major difficulty in this method is its arbitrary distributional assumptions to disentangle the inefficiency component and the random error from that of the estimated residual.

In view of alleviating the inconsistency of distributional assumptions of SFA, Stevenson (1980) relaxed the implicit assumption of Aigner, Lovell and Schmidt that maintains the likelihood of inefficient behavior monotonically decreases for increasing levels of inefficiency

[87] However, Green (1980) suggested in this respect that if the density of U is zero at U=0 and the derivative of the density of U with respect to its parameter approach zero as U approaches zero, the asymptotic efficiency and consistency conditions will be met. (Forsund, 1980)

[88] In this specification, U captures one sided error term or inefficiency. V, on the other hand, shows the effect of random error components. The parameters of this model are estimated by employing maximum likelihood method assuming U to follow half normal.

and thereby extends the stochastic frontier model to accommodate the mode of the one-sided error term U to be different from zero.[89]

To further relax the restrictive distributional assumption imposed on the one-sided error on stochastic frontier analysis, two parametric methods are recommended in the efficiency study literature. (Bauer et. al (1998), Berger and Mester (1997a), Berger and Humphrey (1997)) The first is Thick Frontier Approach (TFA) which measures the efficient frontier using the observations pertaining to the best performer quartile which exhibits the lowest average cost curve in the industry with out any distributional assumption.[90] To disentangle the inefficiency from the random error term, it defines inefficiency as a deviation between the highest and the lowest average cost in a single quartile in a predicted performance while the deviation from the predicted performance value within the highest and the lowest quartiles is defined as random error.[91]

The second method is the Distribution Free Approach (DFA) which assumes the core or the average efficiency for subject under study to be constant over time and the random error averages out over time to disentangle the inefficiency from the estimated residual.[92] Since the random error is zero overtime, the residual will measure the average inefficiency from all the regressions. The calculated inefficiency score under this method is also an average efficiency

[89] This is to say, the Stevenson's approach relaxed the restrictive assumption of a half normal one-sided error term to accommodate the more general mean values other than zero.
[90] To determine the best quartile, it will stratify the subject of the study according to their assets size. Then, those subjects with the lower average costs in each strata will form a subset of the sets of all subject in estimating the thick frontier. Moreover, it will estimate the parameters of the best frontiers assuming some functional form.
[91] The major weakness of this approach is that it will not estimate point efficiency scores or firm level efficiency scores. This approach is also criticized for its ad-hoc functional form assumption on the shape of the frontier.
[92] This approach assumes functional forms as any other approaches of parametric method. It requires a panel data model to estimate the parameters and the composite error terms. It proposes independent regressions for each period in the panel.

as TFA. Its assumption of functional forms and composite error terms may however, lead to specification error and to a consequent over/understatement of the inefficiency points. (Bauer et. al (1998), Berger and Mester (1997a))

With due recognition of its limitations cited above, this study will utilize the Stochastic Frontier Method in analyzing the data of the commercial banks of Ethiopia for the following reasons:

1. The reliability of commercial banking data can to a certain extent be questionable. In view of this, parametric method is preferable rather than non-parametric method since the former assumes random error term.
2. As commercial banks are few in number and a great majority of them were in market for a relatively shorter period of time, the DFA or TFA approaches, which require observations over a longer period for a meaningful econometric analysis, are inappropriate for application in this study.
3. Since the intention of this study is to predict efficiency at a firm level, the stochastic frontier method is preferable and appropriate for application than the DFA and TFA in this study.

4.2 The Model Specification

4.2.1 Efficiency Concepts

In this study, three different efficiency concepts that are based on economic optimization behavior of economic agents are employed simultaneously with the view to limit the weaknesses and exploit the strengths of each concept. These concepts are cost, standard and alternative profit efficiency concepts and are adopted from Berger and Mester (1997a). According to them, cost efficiency is derived from a cost function and is defined as "...a measure of how close a bank's cost is to what a best practice bank's cost would be for producing the same output bundle under the same conditions"(pp 3). The cost function is defined as a variable cost (C) dependant on the price of variable input (W), the quantity of variable output (Y), any fixed input or output (net-puts) (Z), environmental factors (K) and the composite error term Ei[93].

Mathematically, it can be expressed as follows:

$$\text{Ln C} = \text{Ln } f\text{ (W, Y, Z, K)} + \text{Ln Ei} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Cost efficiency, which is derived from equation 1, assumes that efficiency of a bank is evaluated in competitive market by varying the output price while holding the output level at a current level. Under this method the optimal output might not be the most cost efficient of all while the efficiency calculated is economic efficiency. (IBID 1997a)

[93] It is the sum of the one-side error term and the random error term. $\text{Ln } E_i = \text{Ln } U_i + \text{Ln } V_i$: Where: $\text{Ln } E_i$ = residual, $\text{Ln } U_i$ = i.d with mean μ_{it} and constant standard deviation $\partial^2{}_u$. In addition, it will take a negative value for profit function. $\text{Ln } V_i$ = the random error term which is i.i.d with mean zero and standard deviation $\partial^2{}_v$.

The second of the efficiency concepts is the Standard Profit Efficiency (SPE) and is derived from profit function. SPE measures how close a bank is to the best performing bank in producing the maximum possible profit for a given level of input and output price. In contrast to the cost function, the standard profit function in its equation (2) replaces the variable cost with profit and the dependent variable output (Y) with output price (P). Inefficiencies in standard profit efficiencies are also determined by choices of output. Hence, standard profit efficiency will eliminate the difference that prevails in the cost efficiency between optimal output and the efficient level of output. But it must also be noted that the standard profit efficiency can be biased in favor of the larger banks than the smaller ones unless otherwise controlled by the model specification.[94] Consequently, banks that operate bellow the optimal level can be evaluated as inefficient.

Mathematically this can be shown:

$$\text{Ln}(\prod + \Theta) = \text{Ln}\, f\,(W, P, Z, K) + \text{Ln}\, Ei \quad \ldots\ldots (2)$$

The last of the three concepts is the alternative profit efficiency (APE) which is derived from profit function. This concept measures how close a bank comes to earning the maximum profit that is earned by the best performing bank at a given output level and input price. Unlike standard profit efficiency, APE determines profit efficiency by varying output price while holding output at constant level. Hence, the predicted results indicate the maximum profit that

[94] The concept assumes that banks can sell any amount of its output at a given market price and hence banks with a larger output make a larger profit.

[95] Where: $\prod$ = variable profit, P = vector of price of output, Θ = constant number added on the profit of all banks so that natural log of profit of all banks would be defined. But all the other variables are the same with above.

could be generated from a given level of output by statistically controlling the size bias at a given output levels.

Mathematically alternative profit function is express as:

$$\text{Ln}(\prod + \Theta) = \text{Ln} f(W, Y, Z, K) + \text{Ln Ei} \quad \ldots\ldots (3)$$ [96]

According to the stochastic frontier analysis methodology, Ln Ei is assumed to be a composite error term which is the sum of random error (V_{it}), and (U_{it})[97] assuming both V_{it} and U_{it} to be independently distributed while V_{it} is also assumed to distribute identically with the explanatory variables. The choice between these distributions is arbitrary. [98] Hence the study will conduct which of the distributional assumption is appropriate. Furthermore, in line with Battese & Coelli (1992), the one-sided error term (U_{it}) is assumed in this study to be the product of some exponential function which is given by (exp - η(t-T)) and the inefficiency of i^{th} firm (u_i) in the last period.[99]

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[96] According to Berger and Mester (1997a), alternative profit efficiency concepts it expected to better explain the efficiency of the bank understudy under the following conditions. I. When there is substantial difference in output quality. II. When the output levels in the sector are not completely variable. III. When the output market is not completely competitive. IV. When the output prices are not accurately measured.

[97] It assumed to be one sided, non-negative and follow a half normal distribution or exponential (Aigner et al, 1977), or truncated normal (Stevenson, 1980) or gamma distributions (Greene, 1990). Furthermore, the logic for the inefficiency term to follow asymmetric distribution is that it can no longer be subtracted from cost or added to profit while the random error might add to or subtract from the cost and profit function.

[98] Most of the early stochastic frontier analysis usually used the half normal or exponential distribution without any reasonable justifications. However, the resent developments such as truncated and gamma distributions have relaxed the restrictive distributional assumption by providing a more general specification.

[99] Where: η is unknown scalar parameter which is estimated together with the other cost and profit functions parameters. T indicates the last period of the efficiency study. Moreover, if η has a positive sign, the exponential term will be a number no smaller than one since T exceeds t (- η (t-T)>0). Therefore, U_i term will be smaller than $U_{it.}$ If η is negative, the exponential term will be a number between 0 and 1, U_i term will exceed $U_{it.}$ (See Coeli 1998)

4.2.2 Variable Included in Cost and Profit Functions

Determining the outputs of banking sector has been a controversial topic in the discourse of banking efficiency studies. (Bauer et. al (1998), Berger and Mester (1997a)) Nonetheless, this study has utilized "the asset" or "the intermediation" approach in determining bank output.[100] Hence, all financial assets have been considered to be the outputs while financial liabilities and capital are taken as input. Loans and advances (Y_1) and other financial assets[101] (Y_2) are regarded as bank output. Conversely, labor, deposits and other inputs[102] are taken as other inputs in the production process. The price of labor, deposit and other inputs are approximated by employing the ratios of wage bill to total number of employees (W_1), total interest expense to total deposit (W_2) and total operational costs less wages bills and interest costs to total fixed assets (W_3) respectively.

Similarly, the ratios of interest income from total loan and advances to total outstanding loan (P_1) and total incomes except interest income to total assets (P_2) are taken as output prices. Even though foreign assets (Z_1) and fixed assets (Z_2) are bank output by definition, the difficulty in getting reliable price information has compelled the researcher to take them as net-puts. Finally non-performing loan (NPL) is included in the regression with its second order term as an environmental variable and is also used in assessing management inefficiency. Similarly, financial capital (Z_3) is included as a net put and with the view to control for the problem of size heterogeneity as suggested by Berger and Mester (1997a). Hence the dependent variables cost and profit as well as output and net-put will be divided by financial

[100] This is because; all the commercial banks are engaged in the traditional intermediation banking activity as it has been discussed in chapter two.
[101] Other assets will include all financial assets other than loans and advances, foreign asset and fixed asset.
[102] Other inputs include all financial liabilities except deposits, capital and labor.

capital to be included in this study. Finally, with the view of controlling for endoginity of NPL, the real GDP growth (G) is included too.

4.2.3 Functional Form

The most popular functional form to estimate the cost or profit functions in banking efficiency studies is the trans-log form. This functional form is also employed in this study in spite of its multi-colliniarity problem, its limitation in degrees of freedom[103] and its inability to properly fit the extreme values far away from the mean in terms of output size and mix. The traditional trans-log functional form is nonetheless preferred to flexible-frontier in this study in that it minimizes the degrees of freedom problem as compared to the later. As per the above discourse, cost function can be express as:

$$\text{Ln } C/W_3Z_3 = \alpha + \Sigma^2{}_1\, \beta_i \text{ Ln } (W_i/W_3) + \tfrac{1}{2}\, \Sigma^2{}_1\Sigma^2{}_1\, \beta_{ij} \text{ Ln } (W_i/W_3) \text{ Ln } (W_j/W_3) +$$

$$\Sigma^2{}_1\, \gamma_k \text{ Ln } (Y_k/ Z_3) + \tfrac{1}{2}\, \Sigma^2{}_1\Sigma^2{}_1\, \gamma_{km} \text{ Ln } (Y_k/ Z_3) \text{ Ln } (Y_m/ Z_3) +$$

$$\Sigma^3{}_1\, \delta_r \text{ Ln } (Z_r/ Z_3) + \tfrac{1}{2}\, \Sigma^3{}_1\Sigma^3{}_1 \delta_{rs} \text{ Ln } (Z_r/ Z_3) \text{ Ln } (Z_s/ Z_3) +$$

$$\Sigma^2{}_1\Sigma^2{}_1 \eta_{ik} \text{ Ln } (W_i/W_3) \text{ Ln } (Y_k/ Z_3) + \Sigma^2{}_1\Sigma^3{}_1 \rho_{ir} \text{ Ln } (W_i/W_3) \text{ Ln } (Z_r/ Z_3) + \Sigma^2{}_1\Sigma^3{}_1$$

$$\tau_{kr} \text{ Ln } (Y_k/ Z_3) \text{ Ln } (Z_r/ Z_3) + \theta_1 \text{Ln } (NPL) + \tfrac{1}{2}\, \theta_{11} [\text{Ln } (NPL)]^2 + G + \text{Ln } U_c + \text{Ln}$$

$$V_c \text{..} (4)$$

[103] In this regard it is similar to the "flexible-frontier" functional form. Frontier-flexible functional form is a trans-log function with trigonometric terms and is the most flexible form that is used in some recent efficiency studies of banks (Berger et al, 1997). It won't impose any restriction on returns to scale, elasticity and the shape of the frontier (Coelli et al. 1998). However, it is susceptible to multi-colliniarity problem and degrees of freedom.

In both standard profit and alternative profit efficiencies, the dependent variable is replaced by Ln ($\prod$ +Θ)/ (W_3 Z_3) in equation (4).[104] Similarly, as outputs are replaced by output price in standard profit function, the output price variables in the above equation (4) will replace (Y_k/Z_3) and (Y_m/Z_3) by (P_k/W_3) and (P_m/W_3) respectively. The one-sided inefficiencies for standard and alternative profit efficiency estimates, $LnU_{\prod}$ and $LnU_{A\prod}$, in the equations, have negative signs. As shown above, cost and profit functions and the input as well as output prices are divided by W_3 to impose linear homogeneity restriction[105] on the functional form. In addition, the standard trans-log symmetry restrictions apply in the trans-log portion of equation (4). That is, $\beta_{ij} = \beta_{ji}$, $\gamma_{km} = \gamma_{mk}$ and $\delta_{rs} = \delta_{sr}$

4.2.4 Labor Efficiency Measurements

To assess labor efficiency of the commercial banks in this study the model that is used in the works of Mohmoud A. El-Gamal and Hulusi Inanoglu (2005) is employed.[106] It will measure technical efficiency of labor in the banking sector.

Mathematically it is expressed as:

$Ln\ H_{it} = Ln\ f\ (L_{it}, D_{it}, B_{it}, P_{it}, \phi) + Ln\ E_{it}$ ..... (5)

Where: H = total quantity of labor hours used by bank i in period t

L_{it} = total amount of loan

[104] Θ is a constant added to every firm's profit so that the natural log is taken of a positive number.

[105] That is, if the entire input price is doubled, cost of inputs and output price are doubled.

[106] Mohmoud A. El-Gamal and Hulusi Inanoglu (2005) defined the minimum labor requirement function.

D_{it} = total deposit

B_{it} = Total number of branch

P_{it} = total physical capital (fixed asset)

ϕ = vector of parameters

f is assumes to be a trans-log functional form

In a more specific form, it can be expressed as:

$$\begin{aligned}\text{Ln } H_{it} = {} & \alpha_0 + \alpha_l \text{ Ln } L_{it} + \alpha_d \text{ Ln } D_{it} + \alpha_b \text{ Ln } B_{it} + \alpha_p \text{ Ln } P_{it} + \\ & + \tfrac{1}{2} [\alpha_{ll} (\text{Ln } L_{it})^2 + \alpha_{dd}(\text{Ln } D_{it})^2 + \alpha_{bb} (\text{Ln} B_{it})^2 + \alpha_{pp} (\text{Ln } P_{it})^2] \\ & + \alpha_{ld} \text{ Ln } L_{it} \text{ Ln } D_{it} + \alpha_{lb} \text{ ln } L_{it} \text{ Ln } B_{it} + \alpha_{lp} \text{ Ln } L_{it} \text{ Ln} P_{it} \\ & + \alpha_{db} \text{ Ln } D_{it} \text{ Ln } B_{it} + \alpha_{dp} \text{ Ln} D_{it} \text{ Ln } P_{it} + \alpha_{bp} \text{ Ln } B_{it} \text{ Ln } P_{it} \\ & + \text{Ln } E_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)\end{aligned}$$

4.2.5 The Estimation of Parameters and Prediction of the Efficiency levels

Given the distributional assumptions about U_i and V_i as well as the functional forms, the Maximum Likelihood estimation approach and the Corrected Ordinary List Square can be applied to estimate the parameters and ∂^2s. Since the former is more efficient than the later and most of the econometric soft wares such as LIMDEP (Greene, 2000) and FRONTIER (Coelli, (1996)) are designed to fit the stochastic frontier method, this study also has employed the Maximum Likelihood estimation technique.

On the other hand, calculating a one-sided inefficiency term is a difficult job. Even if it were possible to estimate the true parameters of the cost, both the profit and labor utilization functions, it would only be possible to predict the composite error term (E_i) rather than the unobservable one-sided inefficiency terms (U_i). In view of this, Jondrew, Lovell, Materov and Schmidt (1982) proposed a conditional mean of U_i given Ei to predict the inefficiency term independently.[107] Battese and Coelli (1988) have also proposed another formulation of the above expression by replacing exp ($-U_i$) in place of (U_i).[108]

Hence, the researcher has employed the FRONTIER software to estimate parameters in this study and Battese and Coelli (1988) method is used to disentangle the one-sided error term from the composite error terms estimated from the regression.[109]

4.2.6 Efficiency Correlates

To determine the factors that affect inefficiency, after first calculating the inefficiency scores, the inefficiency scores are regressed on firm specific characteristics in line to Pitt and Lee (1981). However, Coelli et. al. (1998) and Kumbhaker, Ghosh and McGuckin (1991), have pointed out an inconstancy that the Jondrow et al (1982) method assumes the effect of inefficiency to be distributed independently and identically and underscored that the second regression violates the identical distribution assumption. To resolve this problem, Kumbhaker

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[107] According to Greene (1990), the conditional mean of (U_i) given the value of (Ei) for the truncated normal function would be equals to: $E[U_i/Ei]=\{\sigma\lambda/(1+\lambda^2)[\varnothing(\varepsilon\lambda/\sigma+\mu/\sigma\lambda)\}/\{1-\phi(\varepsilon\lambda/\sigma+\mu/\sigma\lambda)-\varepsilon\lambda/\sigma+\mu/\sigma\lambda\}$. Refer coelli et al (1998) for more discussion.

[108] $E\,[\exp(-Ui)/\,Ei] = \dfrac{[1-\phi(\sigma_A+\gamma Ei/\sigma_A)]\,\exp(\gamma Ei+\sigma_A^2/2)}{(1-\phi(\gamma Ei/\sigma_A)}$

[109] The Frontier preferred to the Limdep econometric software in this study. This is because the mathematical algorism of the software can not converge to estimate the parameters and predicted the inefficiency terms for the number of observations in this study.

et. al (1991) recommend to estimate a single equation which includes the firm specific factors along with the other production or cost function parameters. Berger and Mester (1997a) also identified the endogenity problem and indicated that the standard error of estimated efficiency scores will not be accounted for in the second regression. Based on Kumbhaker's procedure, Battese and Coelli (1995) have developed a panel data model that estimates the inefficiency covariates along with the cost and profit function parameters assuming U_{it} to be distributed independently, but not identically.[110]

Following Battese and Coelli (1995), this study will estimate the parameters of ownership type, the proportion of demand deposit to total deposit, size of bank asset, the ratio of financial capital to total asset, the ratio of liquid asset to total asset and total number of branch offices and age of the banks along with the other parameters of cost and both profit functions in order to determine the factors affecting the inefficiency level of the commercial banks included.

[110] See Coelli et. al. (1998)

Chapter Five

Result and Discussion

5.1 Introductions

As mentioned in chapter four, two output variables, three input prices, two output prices, three net-put variables and two environmental variables with their square and interaction terms are used as input to determine the efficiency levels of the commercial bank included in this study. With regard to standard and alternative profit functions analysis, thirty independent variables are used. Similarly, twenty nine of independent variables are employed in the study of cost function. Before implementing these variables in the econometric analysis, however it is appropriate to assess the nature of the variables in some details.

Appendix 7 shows the standard deviations of the variables for the outputs, net-puts, costs and profits have high values reflecting the size differences among the commercial banks. In view of this, transforming the data relating to the bank size variable as proposed earlier in chapter four, is deemed all the more necessary and appropriate. The study has also incorporated the stock of foreign asset of commercial banks in its data for analysis with the view of bringing the trade servicing activity into the efficiency study. Unbalanced panel data model with a total of 73 observations collected from the balance sheets and the income statements of all the banks has also been included for analysis in this study.[111]

[111] CBE, CBB and Awash Banks have eleven observations each, while Dashen and Bank of Abyssinia have been observed nine times and Wegagen bank is observed eight times. The two younger banks, United and Nib international banks have contributed for seven and six of the total observation respectively.

5.2 Discussion of Econometric Estimation Results

As elucidated in chapter 4, cost, standard profit and alternative profit functions have been estimated for eight commercial banks. The data appeared to fit the alternative profit function better than both cost and standard profit functions.[112] As shown in appendix 8, 23 of the 31 parameters of the alternative profit function are statistically significant while only 14 of the 30 parameters of the cost function and 15 of the 31 parameters of the standard profit functions are statistically significant at 5 or 10 percent significance levels, respectively.[113] The significant difference among the estimated parameters of the three functions might be a result of the weak inter-bank competition in both input as well as output markets and difficulties in getting accurate and reliable price information that typically characterize the commercial banking industry in Ethiopia. These distinct characteristic features, which mark the condition under which the commercial banks operate, may have made the alternative profit efficiency concept more appropriate for analyzing Ethiopian commercial banks than the concepts of cost and standard profit. Hence, this result seems to be consistent with the theoretical expectation.

Furthermore, many of the insignificant parameters of cost and standard profit functions are also explicable from the econometrics perspective. In chapter 4 it had been pointed out that the trans-log functional forms have multi-colliniarity and degrees of freedom problems. In light of this, small t-values are necessarily expected for the estimated parameters in view of the high standard deviations. However, the LR tests of these functions confirmed that the parameters of

[112] The likelihood ratio test, which is indicated in the appendix 13, have shown that jointly all the variables explain the model statistically significantly at 1% significance level.
[113] The (NPL^2) has been dropped from cost function due to high correlation with its level form.

cost and standard profit functions are jointly different from zero statistically significantly.[114] Hence, this can substantiate the correctness of the predicted efficiency scores.

All the parameters estimated in the trans-log functional forms have manifested the elasticity of the variables. However, as a result of the transformation of the data with the intention of not only controlling difference in size between the banks, but also to bring in homogeneity restrictions into the functional forms, has rendered the interpretation of the parameters and their signs difficult.[115] Besides, in so far as the objective of this study is restricted only to predicting the inefficiency terms, discourse on specific parameters other than the non-performing loan parameter is irrelevant to this study.

5.2.1 One-Sided LR and Wald Tests for the Error Component and Technical Efficiency Models

"Is the inclusion of the one-sided error term necessary in econometric study?" is a basic question often asked in efficiency studies. When $U_{it} = 0$, the stochastic frontier model is equivalent to the average response function or ordinary OLS. In view of this, it is appropriate to conduct a test whether or not to include the one-sided error term in an econometric study. To conduct this test, different methods are proposed. (Coelli et. al, 1998) But the most appropriate tests that are consistent to the specifications of this study are the following:

[114] See appendix 13.
[115] As shown in chapter 4, all the outputs, net puts, costs and profits were divided by financial capital while profit, cost, output prices and input prices were divided by W_3.

(a) $\gamma = 0$[116]

(b) $\gamma = \eta = \mu = 0$[117]

(c) $\gamma = \delta_0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0$[109]

As it shown in appendix 9, all calculated values of the above three statistics (a, b, c) exceed the critical value except $\gamma = \eta = \mu = 0$ of the cost function for all the four functions[118]. Therefore, the inclusion of the one-side error term (U_{it}) in the estimated frontier is appropriate.

On the other hand, the hypothesis that $\gamma = 1$ can't be rejected for all efficiency concepts except the alternative profit efficiency concept which is significant even at 1 percent level. This indicates that the stochastic frontier fits better than the deterministic frontier the data for alternative profit functions while deterministic frontiers[119] suffice to explain the one-sided error term in cost, standard profit and labor utilization functions.

5.2.2 Tests for the Functional Form

As pointed out earlier in chapter 4, many bank efficiency studies have utilized the traditional trans-log or flexible-frontier functional forms to estimate the efficiency scores. However, in view of the unavailability of required data for the period further back from the period under this study, this research has opted to confine itself to the trans-log form. On the other hand, it

[116] As suggested in Coelli et. al (1998) one-sided Wald test is used in conducting the test with asymptotic standard normal distribution.
[117] Similarly he also suggested employing one-sided generalized likelihood ratio tests following a mixed χ^2 (chai) distribution with degrees of freedom equals to the number of restriction
[118] These functions are the cost, standard profit, alternative profit and labor utilization functions.
[119] Deterministic frontiers are estimated frontier without random error term (v_{it}).

is worthwhile to test whether the Cobb-Douglas functional form could be more suitable in explaining the commercial banking data than the traditional trans-log functional form.

The testable hypothesis can be mathematically expressed as

$$H_0: b_{ij} = 0, H_1: b_{ij} \neq 0$$

b_{ij} is the parameters of all the cross products and squares of the explanatory variables in all the four estimated equations.[120]

However, as shown in appendix 10, the null hypothesis is rejected at 1% significance level for all the four functions. In view of this, the use of trans-log functional form is more appropriate than the simple Cobb-Douglas functional form.

5.2.3 Test for Distributional Assumption or μ

As portrayed earlier in chapter 4, it is worthwhile to test

$$H_o: \mu = 0 \text{ or } H_1: \mu \neq 0$$[121]

As shown in Appendix 11, the estimation result of $\mu=0$ for the alternative profit function is rejected statistically significantly at 5 percent levels. However, the cost, standard profit and labor functions, $\mu = 0$ can not be rejected statistically significantly. Hence, the truncated normal distributional assumption fits the alternative profits functions better than the half-normal distribution while the later distributional assumption is sufficient to estimate cost, standard profit and labor efficiency function.

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[120] The calculated statistic will follow a χ^2 distribution with degrees of freedom equals to the number of restriction.

[121] This test is conducted to check whether the half normal distributional assumption fits the commercial banking data better than the truncated normal distributional assumption. For detailed discussion in this topic refer Coelli et. al (1998).

5.3 Predicted Efficiency Scores and Operational Ratios

5.3.1 Cost and labor efficiency scores

The cost efficiency scores basically indicate how close the cost of a given bank is to the cost of the best performing bank for the same level of output under similar condition. As shown in Table 5.1 the cost efficiency scores of the commercial banks range between 77.4 and 99.7 percent with a mean value of 92.2 percent and a standard deviation of 0.06. This indicates that on the average the commercial banks do not vary significantly with regard to controlling cost. According to the predicted average cost efficiency score, the average commercial bank will incur 7.8 percent added cost to produce the same output under the same condition as the most efficient commercial bank.

An efficiency concept that is very much related to the cost efficiency is labor efficiency. Table 5.2[122] shows that the labor efficiency scores of the commercial banks range between 41.5 and 99.7 percent with mean and standard deviations of 83.4 and 0.08 respectively. The predicted results also give the impression that, in general terms, a labor efficient bank is also cost for efficient.

[122] The estimated labor utilization function is presented in the appendix 12.

Table 5.1: The Efficiency Scores of the Cost Efficiency

YEARS	CBE	CBB	AIB	DB	BOA	WB	UB	NIB
1994/95	1.00	0.98	0.96	-	-	-	-	-
1995/96	0.94	0.93	0.98	-	-	-	-	-
1996/97	0.91	0.85	0.98	0.98	1.00	-	-	-
1997/98	0.96	0.89	1.00	0.97	1.00	1.00	-	-
1998/99	0.95	0.89	0.94	0.94	0.96	0.91	1.00	-
1999/00	0.89	0.87	0.94	0.93	0.90	0.91	0.98	1.00
2000/01	0.95	0.88	0.89	0.89	0.93	0.88	0.92	0.99
2001/02	0.87	0.79	0.88	0.83	0.95	0.93	0.86	0.85
2002/03	0.98	0.90	0.82	0.89	0.98	0.96	0.94	0.77
2003/04	0.88	0.88	0.86	0.78	0.94	0.95	0.86	0.82
2004/05	0.89	0.82	0.88	0.93	0.92	0.89	0.83	0.87
Period Ave.*	0.93	0.88	0.92	0.90	0.95	0.93	0.91	0.88

Source: Estimation Result

As all the commercial banks included in this study have been operational during 1999/00 and 2004/05, this period is also the most appropriate period for comparing the efficiency scores of the banks. Hence, average cost and labor efficiency scores have been computed from Table 5.1 and 5.2 for each and every commercial bank, the commercial banking sector and ownership types. According to this computation, the average cost efficiency is 89.4 percent for all the commercial banks, 89.8 percent for all the private commercial banks and 88.3 percents for all the public owned banks. Moreover, the labor efficiency score is on the average 80.3 percent for all the private commercial banks and 82.6 percent for all the public banks.

A comparison of the average cost and labor efficiency scores of the banks also reveals an interesting picture. The Bank of Abyssinia with a respective average cost and labor efficiency score of 93 and 67.3 percent turns up to be the most cost efficient and the least labor efficient bank of all the commercial banks. Hence, it is the only bank that is cost efficient without at

* It is an average efficiency for each bank in the years they operate.

same time being labor efficient. In contrast, Awash, Wegagen and CBE with their respective average labor efficiency scores of 94.8, 92.2 and 91.1 percent and average cost efficiency scores of 87.6, 92.1 and 91 percent are not only the three most labor efficient banks but also at the same time the most cost efficient banks after the Bank of Abyssinia. With respective average cost and labor efficiency scores of 89.9, 88.2, 87.5, 85.6 and 74.5, 79.2, 73.9 and 74.1 percent, the United, Nib, Dashen Banks and CBB have an average cost and labor efficiency scores that are lower than the average for both the commercial banking sector and their respective ownership category, except the United Bank whose average cost efficiency is slightly higher than the average for its category and the average for the sector.

Table 5.2: The Efficiency Scores of the Labor Efficiency

YEARS	CBE	CBB	AIB	DB	BOA	WB	UB	NIB
1994/95	0.99	0.91	0.99	-	-	-	-	-
1995/96	0.76	0.79	0.63	-	-	-	-	-
1996/97	0.72	1.00	0.69	0.59	0.99	-	-	-
1997/98	0.79	0.86	0.68	0.64	0.42	0.86	-	-
1998/99	0.87	0.77	0.70	0.83	0.54	0.92	0.96	-
1999/00	0.90	0.68	0.93	0.67	0.69	0.89	0.60	0.83
2000/01	0.94	0.70	0.95	0.61	0.95	0.88	0.86	0.55
2001/02	0.98	0.75	0.94	0.80	0.58	0.84	0.94	0.78
2002/03	0.91	0.64	0.96	0.74	0.59	0.94	0.64	0.68
2003/04	0.96	0.69	0.99	0.83	0.64	0.99	0.73	0.92
2004/05	0.78	0.99	0.92	0.79	0.59	0.99	0.70	1.00
Period Ave. *	0.87	0.80	0.85	0.72	0.66	0.91	0.78	0.79

Source: Estimation Result

* It is an average efficiency for each bank in the years they operate.

5.3.2 Standard profit efficiency scores:

The second efficiency concept for which efficiency has been predicted for all the banks under study is the standard profit efficiency. This concept measures the profitability of the subject, commercial banks, relative to the best performing bank in the group. In other words, it measures the relative position of each bank with respect to the best bank.

In contrast to the cost efficiency scores, the standard profit efficiency scores manifested higher standard deviation not only among the commercial banks, but also within a bank over time. Predicted standard efficiency scores indicated that the commercial banks differed in their level of profitability.

Table 5.3: Efficiency Scores Calculated for Standard Profit Efficiency Concept

YEARS	CBE	CBB	AIB	DB	BOA	WB	UB	NIB
1994/95	0.78	0.74	0.96	-	-	-	-	-
1995/96	0.41	0.94	0.81	-	-	-	-	-
1996/97	0.38	1.00	0.75	0.86	0.64	-	-	-
1997/98	0.22	0.64	0.57	0.90	1.00	1.00	-	-
1998/99	0.33	0.82	0.38	0.98	0.22	0.73	0.24	-
1999/00	0.36	1.00	0.55	0.99	1.00	0.16	0.69	0.93
2000/01	0.35	0.93	0.28	0.52	0.95	0.52	0.41	0.62
2001/02	0	0.96	0.35	0.94	1.00	0.47	0.52	0.97
2002/03	0.86	0.97	0.22	0.93	0.75	0.46	0.99	0.73
2003/04	0.69	0.99	0.25	0.93	0.72	0.29	0.93	0.85
2004/05	0.84	0.50	0.22	0.84	0.26	0.33	0.84	0.76
Period Ave.*	0.47	0.86	0.49	0.88	0.73	0.50	0.66	0.81

Source: Estimation Result

* It is an average efficiency for each bank in the years they operate.

Table 5.3 presents the predicted scores of the commercial banks. As shown in this Table, the standard profit efficiency scores of the banks range from zero to 100 percent with the mean efficiency score of 68 percent and standard deviation of 0.28. The average efficiency score for all the commercial banks suggests that the average bank will loss 32 percent of its profit in comparison to best performing bank at a given output and input prices. With reference to the average standard profit efficiency score, the CBB appears to be the most efficient bank among the commercial banks.[123] On the other hand, with respective average efficiency scores of 31.2 percent and 37.2 percent, the Awash International and Wegagen banks are the most standard profit inefficient banks. The Dashen, Bank of Abyssinia, United and Nib International banks with standard profit efficiency scores of 85.8, 78, 73 and 81 percent, respectively, can be rated as above average in terms of standard profit efficiency. Conversely, the CBE, which is the largest of all the commercial banks fail below in terms of the average standard profit efficiency with an average standard profit efficiency score of 51.7 which is far below the average score for the commercial banking sector. This finding correspond the theoretical postulate discussed in chapter 4 which predicted the larger banks such as the CBE not to be more standard profit efficient than the smaller banks if the estimated specification controls the size bias. It reflects that the standard profit efficiency estimation has been robust in controlling the prevailing size difference among the commercial banks. With regard to the standard profit inefficient banks, the finding suggests that these banks may have been operating below their respective optimal output level.

[123] This could be a result of high growth in their profitability indicated by operational ratios.

5.3.3 Alternative profit efficiency

The third and last efficiency concept employed in this study is alternative profit efficiency. Similar to standard efficiency scores, alternative profit efficiency scores also predict the relative position of a given bank relative to the most profitable bank in the group against a given input price and output level. Table 5.4 presents the predicted alternative profit scores of the banks. As highlighted in chapter 4, the alternative profit efficiency concept assumptions matched well with the characteristics of the commercial banks included in this study and the robustness of the estimation results would also suggest a similar conclusion. In light of this, it can be inferred that the predicted alternative profit efficiency scores measure the efficiency levels of the commercial banks better than the cost and standard profit efficiency scores.

Table 5.4: Efficiency Scores for Alternative Profit Efficiency Concept

YEARS	CBE	CBB	AIB	DB	BOA	WB	UB	NIB
1994/95	1.00	1.00	1.00	-	-	-	-	-
1995/96	0.49	1.00	0.50	-	-	-	-	-
1996/97	0.19	0.38	1.00	0.57	1.00	-	-	-
1997/98	0.17	0.40	0.47	1.00	1.00	0.33	-	-
1998/99	0.18	0.63	0.66	1.00	1.00	1.00	0.92	-
1999/00	0.27	0.93	0.70	1.00	1.00	0.28	1.00	1.00
2000/01	0.14	0.78	0.39	0.63	1.00	1.00	0.87	0.79
2001/02	-	0.55	0.30	0.87	1.00	0.56	0.73	0.69
2002/03	0.85	1.00	0.21	0.88	0.86	0.68	1.00	0.62
2003/04	1.00	0.79	0.33	1.00	0.57	0.63	0.88	0.77
2004/05	0.33	0.70	0.29	0.78	0.68	1.00	1.00	0.45
Period Ave.*	0.42	0.74	0.53	0.86	0.90	0.69	0.91	0.72

Source: Estimation Result

* It is an average efficiency for each bank in the years they operate.

As shown on Table 5.4, the predicted alternative profit efficiency scores of the commercial banks range between 14.4 and 100 percent with an average efficiency score of 71.3 percent for all the banks. As in standard profit efficiency, the standard deviation of the alternative profit efficiency (0.29) is higher than the standard deviation of cost efficiency. The average alternative profit efficiency score suggested that the average bank will loss 28.7 percent of its profit to produce the same output under the same condition as the best performing bank.

In comparative terms, the average alternative profit efficiency score of private commercial banks (73.4%) is higher than the averages that of the public commercial banks (61.2%) while the standard deviation is 0.20 for the former and 0.25 for the later. With reference to alternative profit efficiency, as shown in Table 5.4, United Bank, with an average of 91 3 percent, is the most efficient. With respective average efficiency scores of 85.9, 85.1 and 79.2 percent, Dashen Bank, Bank of Abyssinia, and CBB are the three alternative profit efficient banks after United Bank. Wegagen and Nib International banks with average score of 69.3 & 70.3 percent respectively have done slightly below the average alternative profit efficiency score for all private as well as the average for commercial banking sector. On the other end of the continuum, Awash International Bank and Commercial Bank of Ethiopia with respective average efficiency scores of 43.2 and 36.8 percent are the most inefficient banks interns of alternative profit efficiency.

To sum up, the average cost efficiency score for all the commercial banks is much higher than the average score of both the standard and alternative profit efficiency. This finding is quite

consistent with previous empirical findings in other countries (Berger and Mester (1997a), Berger and Mester (1997b), Rossi et. al. 2004)). Broadly speaking, most of the profits of the commercial banks seem to accrue more from cost minimization rather than revenue creation stratagem. This line of attack may have been opted for consciously by the management that is cognizant of the more demanding function of revenue generation as opposed to cost controlling operations.

In a global sense, the predicted efficiency scores reported in this study are higher than those accounted in similar studies conducted in other countries. This, however, should not portray the Ethiopian commercial banks to be more cost and profit efficient than the banks of the other countries for which lower efficiency scores have been reported since the constructed frontier only shows the relative positions of the banks included in the sample for comparison with one another. Furthermore, the predicted efficiency levels do not depict the relative position of the frontier from the origin either. Had the objective of this study been comparing Ethiopian commercial banks with the counter parts in other countries, the result may have been different.

5.3.4 Operational Ratios

The operational ratios have also been used to determine the levels of efficiency with all its weaknesses in the commercial banks in the period between 1999/00 and 2004/05 to supplement the efficiency scores calculated above and to see the robustness of the estimation result. In this regard, four different profitability indicators have been considered in this study. These are:

1. Return on Asset (ROA)
2. Return on Equity (ROE)
3. Profit Margin
4. Gross Yield on Asset

Return on Asset (ROA): With regard to the ratio of net profit to total asset (Return on Asset), the average return per annum for all the commercial banks was on the average about 0.95% in the study period. As compared to the public commercial bank, with an annual average return of 0.75%, the private commercial banks appeared to perform better than the former in that they managed to generate an annual average of 1.99% during the study period (See Table 5.5 below).

Table 5.5: Average Profitability Ratios from 1999/00 to 2004/05

	All Banks	**All Pvt Bank**	**CBE**	**CBB**	**AIB**	**DB**	**BOA**	**WB**	**UB**	**NIB**
Return on asset	0.95	1.99	0.94	0.56	1.58	1.95	1.79	1.80	2.18	2.78
Return on equity	14.6	17.6	17.7	7.59	14.9	25.5	13.5	16.9	10.9	16.7
Profit margin	15.3	21.2	15.8	7.89	18.8	22.8	19.5	17.3	21.0	29.6
Gross yields on Asset	7.3	9.32	5.53	7.20	8.39	8.68	8.87	10.3	10.1	7.30

Source: Researcher's computation from income statements and balance sheets of the banks.

Taken separately, with respective average annual profit to total asset ratio (ROA) of 2.78 and 2.18 percent, Nib International and United banks, have registered the highest return on their respective Assets. The Dashen Bank with an average return on asset of 1.95 percent per annum is among the well performing banks. However, the Awash International Bank (1.58%), Bank

of Abyssinia (1.79%) and Wegagen Bank (1.80) performed below the average ROA of the private commercial banks. In contrast, with respective average annual ROA of 0.94 and 0.56 percent, the CBB and CBE have the lowest return on asset ratio among the commercial banks.[124]

Return on Equity (ROE): With reference to Return on Equity (ROE) which is the ratio of the net profit to financial capital, the annual average ratio is 14.6% for all the commercial banks and 17.6% for the private commercial banks in the study period. The Dashen Bank with a ratio of 25.5% has the highest return on equity among all commercial banks. The CBE is second with a ratio of 17.7% which is slightly higher than both the average of ROE for the entire commercial and the private banks.[125] With respective annual average of 14.9%, 16.9%, and 16.7%, the Awash, Wegagen, and Nib Banks have a ROE ratio which is slightly above the annual average of the entire commercial banks but below the annual average of all the private banks. ROE generated by the United Bank and Bank of Abyssinia is not only lower than the average of the private banks, but even also lower than the average of all the commercial banks. The CBB With an average annual ratio of 7.49% is at the bottom of the commercial banks in terms of ROE. Nonetheless, the average annual growth rate of "Return on Equity" is negative for the public banks while the private commercial banks enjoy an annual average grow rate of 24 percent.[126]

Profit Margin: Profit Margin is the ratio of net profit to the sum of interest and non-interest income. With regard to this indicator, the average annual ratio for all private commercial banks

[124] However, the CBB's return on asset is growing at an average rate of 82 percent per annum.
[125] This might be the result of low level of capital relative to its total income of CBE.
[126] Researcher computation

is 21.2 percent and for the entire commercial banking sector is 15.3%. As shown in Table 5.5 above, Nib, Dashen and United banks have produced the highest annual average profit margin ratio in the whole of the commercial banking sector during the study period. Excepting the CBB, all of the other commercial banks have generated annual profit margins that are higher than the commercial banking sector as a whole. However, similar to its returns on asset and equity, the CBE's profit margin has also been declining over the study period.[127] On the other hand, CBB's annual average profit margin is the lowest in the whole sector during the study period, even though it has been growing at an annual rate of 86% over the same time.[128]

Gross Yield on Asset: it is the ratio of the sum of interest and non-interest income to total asset. The average gross yield on asset ratio for the commercial banking sector in the study period is 7.3% per annum as a whole and 9.32% for the private commercial banking sub sector. As shown on the Table 5.5, the Wegagen and United with 10.3 and 10.1 percent return on their assets ratios, respectively, are the best performing banks on this indicator. With a respective annual average gross yield to asset ratio of 8.4, 8.67 and 8.87, the Awash International Bank, Dashen and the Bank of Abyssinia have performed above the yearly average of the commercial banking sector, but below the average of all the private banks. Generating 7.3 percent, the Nib Bank has the lowest gross profit yield within the private commercial banks. In contrast to the private commercial banks, the two public commercial banks, the CBE (5.53%) and CBB (7.2%), have performed below the annual average gross profit yield ratio of all the commercial banks.

[127] Researcher computation
[128] Researcher computation

The output generated from the operational ratios, in general terms, showed a similar result with alternative efficiency concept at least in three of the ratios. The best banks, which have the highest average alternative profit efficiency scores, also have one of the highest ROA, Profit Margin and the Gross Yield on Asset. [129] This result may also confirm the robustness of the alternative efficiency concept in measuring the efficiency scores in Ethiopian commercial banks.

5.4 Correlations among the Efficiency Concepts

In Table 5.6 Pearson correlation coefficients among the three efficiency concepts and labor efficiency of the commercial banks is provided. According to this table, the alternative and standard profit efficiencies have a positive linear relationship which is quite consistent with theoretical expectation. Similarly, the linear relationship between cost and standard profit efficiency is also positive. Alternative profit and cost efficiencies, however, have a negative linear relationship. Moreover, labor efficiency has negative linear relationship with both standard and alternative profit efficiency concepts while it has a positive relation with cost efficiency.

[129] The United, Dashen and Bank of Abyssinia are banks with the highest average alternative profit efficiency scores. These banks also have the highest operational ratios in the following order. United, Dashen and Bank of Abyssinia are ranked as 2nd, 3rd and 5th in their average ROA ratio. Similarly, Dashen, United and Bank of Abyssinia ranked as 2nd, 3rd and 4th with regard to Profit margin. With respect to Gross Yield on Asset, United, Bank of Abyssinia and Dashen banks are ordered as 2nd, 3rd and 4th rank. Similarly, CBE and Awash Bank stood as 7th and 6th in ROA, 7th and 5th in Profit Margin and 7th and 6th in Gross Profit on Asset ratios respectively. Even though CBB has the lowest average value in all operational ratios, they are not found as the most inefficient in alternative profit efficiency estimation. This might be the result of high growth in these operational ratios.

Table 5.6: Pearson correlation coefficient between efficiency concepts

	Cost Efficiency	Standard Profit Efficiency	Labor Efficiency
Alternative Profit Efficiency	-0.11	0.49	-0.19
Cost Efficiency		0.03	0.21
Standard Profit Efficiency			-0.34

Source: researcher's computation.

The negative relationship between cost and alternative profit efficiency concepts may have come up from the difference either in output quality or the monopoly power of the banks in setting output price. Banks with monopoly power can charge a higher price that maximizes their profit regardless of the quality of their output. According to Berger and Mester (1997a), banks with a higher product quality incur a higher cost to produce their output; but can also charge their customers a higher price since they produce high quality output. As a result, the banks seem to be cost inefficient even though they have higher alternative profit efficiencies. Hence, the negative Pearson correlation coefficient though small may suggest that the commercial banks charge higher price than the competitive market warrants as a result of higher output quality. However, since the average cost efficiency exceeds the average of both standard profit and alternative profit efficiency, the increase in output price can not be not due to uncontrolled cost. In view of this, it can be concluded that the negative linear relation

between cost and alternative profit efficiency may be a result of output quality differences within the commercial banks.

The positive linear relationship between cost and labor efficiency of the banks would suggest that the rise in cost efficiency might have been induced by improvements in labor efficiency. The linear relationship may also be a reason for the stability in cost efficiency scores in spite of the decline in profit efficiency in the study period. Nonetheless, negative relationship between labor efficiency and both standard and alternative profit efficiencies could simply be a mathematical relationship with no theoretical explanation in so far as revenue generation decision has little to do with labor efficiency.

5.5 Management Efficiency in Commercial Banking

In assessing the prevalence of management inefficiency in banks, Berger and Deyong (1997) recommend testing the management against the three causes of non-performing loan – "bad luck", "bad management" and "the skimping" in the banks' asset. The first, "bad luck" hypothesis assume that a bank can be forced to acquire and accumulate non-performing loan as the result of exogenous factors in which case efficient management exert extra effort to reduce the levels of the bank's NPL and incurring additional cost in the process. Consequent on this course line of action, the bank's cost will increase and its profit wile decline.

The hypothesis of "bad management", on the other hand assumes that non-performing loan can also be accumulated as a result of bad management. Management can create and accumulate

non-performing loans as the result of its inefficiency in evaluating borrowers and the collaterals pledged in association to the loan. Under such circumstance, the bank can acquire and accumulate not only non-performing loan, but also sustain higher cost and low profit because of the inefficient management. Hence, lower cost and profit efficiencies of the banks can relate to bad management.

"The skimping" hypothesis assumes that the management can also increase the stock of non-performing loan of the banks by cutting down loan monitoring and controlling activities with a view to reduce expenses and thereby increase profit in the short run. In doing this, the management will in the long run not only increase the banks' NPL, but also postponed loan monitoring and controlling expenses into the future. Hence, in pursuit of low cost and high profit in the short run, management can be an instrument to the accumulation of non-performing loans in banks in the long run.

In line with Berger's and Mester's (1997a) proposition, the level of non-performing loans of the commercial banks has been included as an explanatory variable in the econometric analysis of cost and profit functions. Moreover, real GDP growth rate has been included also as an explanatory variable to control the exogenity of the NPL. Estimation results presented in the appendix 8 shows that the parameters of non-performing loans (b_7) are statistically significant at 1 percent significance level in all of the three functions. Moreover, it has positive sign for cost functions and negative for profit functions. Furthermore, the parameters of square of the non-performing loan (b_{29}) in the profit functions have negative signs and statistically

significant at 5 percent significance level. Employing Berger and Deyong (1997) three hypotheses together with these findings, it can be concluded that the non-performing loans were accumulated as a result of bad management. Hence, the result implies the prevalence of management inefficiency in the commercial banks.

5.6 Efficiency Changes Over Time in the Commercial Banks

As presented in Table 5.7, the η(eta) of both standard and alternative profit functions are negative and statistically significant at 1 percent significance level. This illustrate that the profit inefficiencies of the commercial banks have increased during the period under study. Conversely, η (eta) of cost and labor utilization functions are both positive, even though they are statistically insignificant. Contrary to profit function, cost and labor inefficiencies have not increased statistically significantly in the study period.

Table 5.7: the test for $\eta=0$

	Calculated t-value	Critical value
cost	0.03(0.04)	2.326
Standard profit	-0.09(-8.24)	2.326
Alternative profit	-0.05(-3.50)	2.326
Labor utilization function	0.18(1.14)	2.326

Source: Author's computation

Similarly, the graphs of the efficiency score over time on figure 1, 2 and 3[130] in the appendix also provide a result which is consistent with above econometric result. Even though higher efficiency scores have been registered in some of the year in the study period, both profit efficiencies have been declining while the cost efficiency remained stable during the study period.

At this juncture, it must also be noted that the above finding is not consistent with the theoretical expectation of financial liberalization and the financial sector reform program. This might have been the result of the inconsistency in the assumptions of financial liberalization and realities in the Ethiopian financial sector. Similarly, the gradual and partial policy implementation of the Ethiopian government may have also been a contributing factor for the decline in efficiency[131]. The closed-ness of the sector to foreign investment and the weak competition that prevails in the banking sector may also hamper the product quality differences and the transfer of the knowledge within the banking sector so that the efficiency level can not increase.

5.7 Correlates of the Inefficiency

Following the methodology of Battase and Coelli (1995), explanatory variables for the inefficiency terms in the cost and profit functions were included in the study period. The variables are bank ownership[132], the ratio of demand deposit to total deposits, the size of bank

[130] See page 106-108
[131] Refer Harvey (1996).
[132] I.e., it is captured by a dummy variable in which 0 is taken if the bank is public owned or 1 if it is private bank.

asset, the ratio of financial capital to total asset, the ratio of liquid asset to total asset, the number of the bank branch offices as well as the age of the banks in operation.

Table 5.8: Regression Coefficients of Inefficiency Covariants

	Cost	Standard profit	Alternative profit
δ_0	.0.39 (-2.91)	- 6.4 (-8.74)*	-
δ_1	0.14 (0.70)	0.50 (0.50)	-0.29 (-0.31)
δ_2	- 0.15(-1.13)	-0.89 (0.9)	– 5.48 (-4.42)*
δ_3	0.014 (-0.38)	-2.46(-4.29)*	– 3.37 (-7.49)*
δ_4	-0.07 (-0.94)	.4.23 (-5.30)*	– 5.04 (-7.82)*
δ_5	0.003 (0.02)	-0.59 (-1.37)	- 0.79 (-3.32)*
δ_6	-0.003 (-2.56) *	0.12 (3.02)*	0.07 (3.36)*
δ_7	0.009 (0.07)	-0. 22(-1.36)**	-0.46 (-0.57)

Source: Estimation Result

As shown in Table 5.8, with the exception of the numbers of branch offices, all of the results are not statistically significant up to 10 percent significance level in explaining cost inefficiency. This result may have been due to problem of multi-colliniarity observed in the cost function. Moreover, the high correlation among variables such as types of bank ownership, the size of bank asset, number of branches and age of the banks may have also contributed for the high standard errors and small t-valves. On the other hand, results pertaining to the size of asset, the ratio of financial capital to total asset, number of branches and age of the bank are statistically significant at 5 and 10 percent in standard profit inefficiency regression. Furthermore, except the bank ownership dummy and age variables, all

* significant at 5%
** significant at 10%

the variables are statistically significant at 5 and 10 percent level in explaining the alternative inefficiency.

However, Gugarati (2004) points out that though the estimated parameters become insignificant due to multi-colliniarity problem, the estimates will be unbiased (but not efficient). In view of this, interpreting the regression parameters, even though they are insignificant, would be worthwhile.

Bank ownership (δ_1): When each variable is independently considered in all inefficiency equation, the ownership dummy appeared to be statistically insignificant in explaining the inefficiency. This result might have been induced by the high correlation between the various explanatory variables such as bank size, the number of branches, age of the bank and also the ownership type. It must, however, be noted that this result does not contradict the results generated from similar studies, for instance, in India, Russia, China and Turkey (Kumbhakar et. al. (2004), Konstantin (2005) Berger et al. (2005) and El-Gumal et. al. (2005)). The negative sign of the parameter of the dummy variable together with the intercept term in alternative profit inefficiency function suggests that the alternative profit inefficiency will decline if the bank is privately owned. The signs of the dummy variable together with the intercept term in cost and standard profit functions have revealed negative relationship with inefficiency terms.[133] Hence this finding is evidently consistent with the theoretical expectation.

[133] See table 5.8

The ratio of demand deposit to total deposit (δ_2): This ratio is statistically significant for alternative inefficiency at 1 percent significance level while it is statistically insignificant in explaining cost and standard profit inefficiencies.[134] It has also a negative relationship with the three inefficiency concepts in that all cost and profit inefficiencies tend to decline as the share of demand deposit as a percentage of the total deposit increase. This result seems to be consistent with the conventional knowledge which holds that cost will decline and profit will increase as interest paid on deposit decline. Consequently, cost and profit efficiencies will improve.

The size of bank (δ_3): A difference in the size of banks, which is approximated by the amount of total asset, negatively affects the banks' standard and alternative profit inefficiency statistically significantly at 1 percent significance level. On the other hand, it is statistically insignificant in explaining cost inefficiency. This result implies that as the banks grow larger and larger, their profit inefficiency will decline further while their cost inefficiency increases. Hence, it can be concluded that, due to asset diversification, the bigger banks can be more efficient in revenue generation than smaller ones. On the other hand, as the banks grow larger, they can develop a capacity not only to diversify their assets, but also to reduce the risks associated with concentration. Consequent to this, their profit can grow. However, the banks would incur additional costs to manage their assets properly. Hence, bigger banks have performed better in revenue creation while smaller banks are superior in cost control.

[134] It is a proxy for the cheap source of loan able fund.

The ratio of financial capital to asset (δ_4): Consistent with the well established theory (Berger et. al., 1997), Claudia et. al., 1999)), the well capitalized commercial banks manifested low levels of inefficiency in that both standard profit and alternative profit inefficiencies are negatively related to the ratio of financial capital to asset statistically significantly at 1 percent significance level. Hence, the inefficiencies of the banks will decline with the increase in their financial capital. Likewise, the cost inefficiency of the banks will also decline as the ratio of financial capital to total asset grows. This result suggests that moral hazard problem may be less prevalent in the commercial banks due to the high cost of financial capital.

The ratio of liquid asset to total asset (δ_5): The ratio has a negative sign for both of the profit inefficiencies and positive sign for cost inefficiency even though it is statistically significant only for alternative profit inefficiency equation.[135] This result shows that the standard and alternative profit inefficiencies declined while cost inefficiency increased as a result of the increase in the share of liquid asset from the total asset. There could be two explanations for this phenomenon. The first is that some of the liquid assets are part of earning assets with relatively low risks as well as low returns. For instance, Treasury bill investments or bank deposits will earn interest. Deposit in form of foreign currency, it would earn interest income and generate additional income in an instance of value appreciation in the currency of deposit. Furthermore, as long as the earning assets keep on growing in the banks' balance sheet, the profit will persist on increasing. The second explanation relates to stability of deposit supply. Generally depositors prefer to deposit their asset in banks with higher liquidity levels with a

[135] The ratio of liquid asset to total asset is included in the analysis to capture the risk preference of the banks management.

view to avoid any risk of losing their deposit. As a result, such banks enjoy stable deposit as more and more depositors come to them. The stable supply of deposit will enhance the lending capacity of the banks which in tern improves their profit and profit efficiencies. However, the stable deposit brings an additional cost in terms of interest payment on deposit and expense incurring in managing a larger liquid asset. Consequently, the cost inefficiency of the banks will increase.

The number of bank branches (δ_6): This variable has also affected both standard and alternative profit inefficiencies positively at 1% statistical significance level. This result revealed that as the number of branch offices increase, profit inefficiencies of the banks have increased. The inefficiencies may have been a result of the banks' management which may have been over stretched by the increased number of branches and also rendered incapable to meaningfully engage in revenue generation. On the other hand, in terms of cost inefficiency, the number of bank branch offices is statistically significant at 5 percent significance level. Moreover, it has negative sign implying a decline in cost inefficiency as the number of branches increase. This suggests that decentralized decision making may be more efficient in controlling costs than generating revenue in the banking industry.

The age of banks (δ_7): The last inefficiency explanatory variable in this study is the age of the commercial banks. With regard to this variable, the result is statistically significant only for standard profit inefficiency concept at 10 percent significance level. It is negatively related to both profit inefficiencies while it is positively related with cost inefficiency. This indicates that

the profit efficiency of the commercial banks may improve in the future as they learn from their own experience. However, the result also implies that the cost inefficiency can increase as the age of the banks increase perhaps as the result of the inevitable increase in replacement and maintenance costs.

Chapter 6

Conclusions and Recommendations

The Ethiopian commercial banking sector currently consists of nine commercial banks. The sector accounted on the average for about 1.8 percent of the GDP of the country between 1999/00 and 2004/05. A highly concentrated loan and deposit market, high and ever increasing excess liquidity and low market coverage and weak competition are the defining character of the sector. A single bank, CBE, which accounts for about 69.7 percent for total commercial banking asset, 75 percent of the total bank deposit, 54 percent of the loan portfolio and 41 percent of the branch network in the country is the predominant bank in the sector. Relatively the six the private commercial banks together with CBB account for only a smaller share of the banking asset and liabilities even though their asset, loan portfolio, capital and deposit have been growing notably over the last few years.

This study has attempted to predict and assess the cost, standard, alternative profit and labor efficiencies of the commercial banks in Ethiopian using unbalanced panel data and stochastic frontier model in with a view to find out the development registered, if any, after the implementation of financial liberalization policy between 1994/95 and 2004/05. It has also attempted to assess existence of management inefficiency and identify the factors that affected inefficiency in the commercial banks.

The study reveals that predicted average cost, standard profit, alternative profit and labor efficiency scores are about 92.2, 68, 71.3 and 83.4 percent in the study period respectively. This result also indicated that most of the commercial banks have comparable ability in controlling their cost. These predicted average efficiencies scores appear to be higher than efficiency scores reported by studies undertaken in other countries. However, the higher efficiency scores registered in this study may have been a result of the overall inefficiency in the Ethiopian commercial banks. On the other hand, both standard and alternative profit efficiency scores were found to be less than the cost efficiency scores reflecting the relative weakness of each bank in generating revenue.

Consistent to the theoretical expectation, the alternative profit efficiency concept appears to be more appropriate than cost and standard efficiencies to analyze of the commercial banks in Ethiopia. Using this concept, the United, Dashen and Bank of Abyssinia banks were found to be the most efficient banks while the Awash and CBE were rated as the most inefficient banks in the study period.

Contrary to the expectation of financial liberalization policy, the study discovered that both the standard and alternative profit efficiencies have been declining trend in the study period. On the other hand, even though the increase was not also apparent, the cost and labor efficiencies showed an increasing trend.

With regard to management efficiency, the findings indicated that the management in commercial banks seemed to be inefficiency in managing the banks' assets and liabilities as well as in generating profit. The study also revealed there is statistically meaningful level of output quality difference among the Ethiopian commercial banks.

Findings regarding inefficiency regression indicated that the private ownership has positively contributed to all the three efficiency concepts. Cheap deposits have found to be the bases for higher cost and both profit efficiencies. Similarly, the bigger banks have been more efficient in revenue creation rather than the smaller ones. Conversely, smaller banks have been better off in controlling their cost efficiency than the bigger ones. Well capitalized banks seem to be more efficient than their counterparts in all the three efficiency concepts. Similarly, risk-averse management was found to be profit efficient even though they were not cost efficient. Banks with a larger branches network also seemed to do well in managing their cost even though they were less efficient in revenue creation. Similarly, banks that have been operational for a long period were found to be profit efficient. However, they were not cost efficient due to their higher depreciation and replacement costs.

On the Bases of the above findings, the following measures are recommended to enhance the efficiency commercial banks and to minimize the risks to depositors and the economy at large.

- Weakness in profit creation in Ethiopian commercial banks is the result of the deficiency in required skills and experience of the management in profit generation.

Hence, to insure sustained development in the sector, it is necessary to take positive measures to upgrade the knowledge and skills of both the management and employees through a well planed staff development program. Furthermore, the government should permit the commercial banks to engage in a carefully planed joint venture with well experienced foreign banks to facilitate the transfer of knowledge and skills from the developed world to Ethiopian banking sector.

- The regulating body (NBE) should thoroughly evaluate the levels of the commercial banks financial capital relative to the asset to reduce the depositors' risk. Similarly, it should also thoroughly evaluate the performance of the less efficient banks with a view to prevent the bank failure.

- The management of the banks should also decentralize their out put decision making with the view to allow the middle and lower level management to make decisions with regard to output. Given the authority and accountability, the middle and lower level management can generate revenue as they did in controlling cost. However, the middle and lower level management need to be supported through a thorough and continues formative and summative evaluation.

- The government may have to reconsider the entry and exit requirements to attract more participants into the market and thereby scale up competition in the sector.

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Appendices

Appendix 1: The Regional Distribution of Commercial Branches on 2004/05

	Addis Ababa	Oromia	Amhara	Tigray	SNNPRS	Dire- Dawa	Somali	Harari	Gambela	Bensahangul and Gumuz	Afar
Bank branches	133	94	59	22	28	8	7	3	1	1	3
population[136]	2.97	26.55	19.12	4.34	14.9	0.4	4.33	0.2	0.25	0.63	1.4

Source: National Bank of Ethiopia and Central Statistical Authority.

[136] It is expressed in millions.

Appendix 2a: The Liquidity Ratio of Individual Banks from 1999/00 to 2004/05

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
CBE	43.62	34.92	42.80	69.09	73.76	68.87
CBB	27.44	28.32	29.68	35.93	48.68	58.62
AIB	46.53	40.75	43.33	47.68	50.84	44.64
DB	53.88	39.84	42.74	40.04	40.04	36.04
BOA	33.40	27.34	47.85	47.12	49.25	46.65
WB	63.54	50.33	44.27	44.60	46.69	48.14
UB	46.05	53.49	75.13	60.28	54.51	55.95
NIB	-	44.23	48.41	41.50	39.78	37.94

Source: Authors calculation from the data from banks balance sheet

Appendix 2b: The Ratio of Liquid Assets to Total Asset of Individual Banks from 1999/00 to 2004/05.

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
CBE	34.57	28.39	35.81	56.42	59.41	52.67
CBB	14.17	14.77	18.68	23.46	31.50	33.79
AIB	36.23	33.74	36.24	39.61	42.88	38.90
DB	37.69	32.09	34.25	32.60	32.57	29.85
BOA	22.42	19.87	38.09	38.03	39.62	36.90
WB	46.11	38.77	35.29	35.32	35.88	38.37
UB	24.48	32.24	45.22	36.89	43.03	45.11
NIB	-	27.38	48.41	41.50	39.78	37.94

Source: Authors calculation from the data from banks balance sheet

Appendix 3: The Structure of Asset for CBE and the Private Banks

PRIVATE COMMERCIAL BANKS						
CASH ON HAND	169.83	242.11	323.46	409.74	419.95	638.64
DEPOSIT WITH BANKS	707.55	918.51	1148.33	1515.23	1887.03	3300.42
SUSPENSE ACCOUNTS	550.09	543.55	1171.73	1156.25	1683.23	2553.88
TOTAL LOANS AND ADVANCES	1909.87	2650.64	3110.40	4270.32	5472.92	7452.80
INVESTMENTS	214.54	80.50	268.94	505.68	922.78	272.79
FIXED ASSETS	90.47	117.46	147.93	187.68	232.91	286.93
OTHER ACCOUNTS	137.92	197.04	251.18	662.31	820.36	1344.45
TOTAL ASSETS	3780.25	4749.80	6421.96	8707.21	11439.17	15849.89
CBE						
CASH ON HAND	311.03	435.49	410.00	424.22	406.13	669.34
DEPOSIT WITH BANKS	7552.69	5655.42	6005.53	8274.28	8545.11	14586.50
SUSPENSE ACCOUNTS	5975.27	6288.22	6997.66	11091.46	12037.51	13855.40
TOTAL LOANS AND ADVANCE	10098.98	10283.54	9855.46	8361.00	7944.36	9556.42
INVESTMENTS	2682.57	6893.41	8199.39	10049.24	13017.34	10097.51
FIXED ASSETS	360.49	387.52	407.21	429.21	469.39	491.09
OTHER ACCOUNTS	1356.24	1758.96	1715.33	2584.71	2733.59	3683.10
TOTAL ASSETS	28337.26	31702.56	33590.58	41214.13	45153.42	52939.35

(In million birr)

Source: National Bank of Ethiopia

Appendix 4: The Distribution of Outstanding Loan in Ownership Group CBE and Private Banks

(In Million Birr)

CBE						
TOTAL	10096.85	10283.54	9695.77	8361.00	8134.96	9556.42
PUBLIC ENTERPRISES	1347.98	1169.56	1449.49	986.52	2006.77	2968.17
COOPERATIVES	325.10	261.17	298.42	283.89	323.87	899.27
PRIVATE SECTOR	7746.86	8288.49	7430.21	6634.04	5390.18	5348.79
INTERBANK LENDING	676.91	564.32	517.66	456.55	414.15	340.19
PRIVATE COMMERCIAL BANKS						
	1910.77	2650.83	3071.32	4249.88	5459.4	7374.91
PUBLIC ENTERPRISES	30.11	12.56	12.92	14.53	25.82	22.16
COOPERATIVES	1.10	2.62	0	0	4.87	4.56
PRIVATE SECTOR	1879.56	2635.65	3058.33	4235.35	5428.70	7348.19
INTER BANK LENDING	0	0	0	0	0	0

Source: National bank of Ethiopia

Appendix 5: CBE and the Private Banks Deposit

(Million birr)

CBE						
TOTAL DEPOSIT*	0.861	0.840	0.806	0.776	0.752	0.714
DEMAND DEPOSITS♦	0.583	0.577	0.561	0.571	0.597	0.591
SAVINGS DEPOSITS♦	0.393	0.397	0.415	0.411	0.388	0.394
FIXED DEPOSITS♦	0.024	0.026	0.025	0.018	0.015	0.015
PRIVATE COMMERCIAL BANKS						
TOTAL DEPOSIT*	0.114	0.157	0.206	0.279	0.368	0.497
DEMAND DEPOSITS♥	0.269	0.241	0.251	0.260	0.263	0.267
SAVINGS DEPOSITS♥	0.625	0.649	0.631	0.625	0.642	0.629
FIXED DEPOSITS♥	0.106	0.110	0.118	0.114	0.095	0.103

Source: Author's Computation from the Deposit Data from National Bank of Ethiopia

Appendix 6: Capital in CBE and the Private Commercial Banking System

(In million birr)

CBE						
TOTAL CAPITAL	1288.76	1497.39	1866.89	1277.45	1495.44	1427.79
Equity Capital	619.74	619.74	619.74	619.74	619.74	619.74
Legal reserve	402.08	532.47	406.54	542.73	623.81	676.80
PRIVATE COMMERTIAL BANK						
TOTAL CAPITAL	441.33	575.40	691.21	803.91	1047.24	1428.71
Equity Capital	337.43	416.79	487.92	583.44	665.64	875.87
Legal reserve	17.42	36.38	47.94	63.51	83.55	158.16

Source: National bank of Ethiopia

* The share of the banks deposit out of total deposit

♦ The share of the specific type of deposit to the deposits of CBE

♥ The share of specific type of deposit from the deposits of the private banks

Appendix 7: The Mean and the Standard Deviations of the Dependent and Independent Variables

Variables	Mean	Standard deviation
p1	0.09	0.03
p2	0.03	0.02
w1	0.18	0.45
w3	0.03	0.02
w3	73.30	236.18
y1	1791.44	2979.08
y2	3729.65	8814.87
z1	791.25	1564.99
z2	105.00	165.26
z3	252.62	434.46
NPL	293.72	544.49
Profit	465.48	221.02
Variable Cost	166.12	294.89

Source: researcher Computation

Appendix 8: Estimation Result of Cost, Standard and Alternative Profit Functions

	cost	standard profit	Alternative profit
b_0	-0.003 (-0.84)	0.004 (0.07)	0.31 (2.56)*
b_1	-0.26(-0.36)	3.79 (6.19)*	-4.66 (-7.21)*
b_2	0.37 (0.74)	0.64 (3.01)*	2.18 (6.09)*
b_3	1.75 (4.71)*	-0.67 (-1.32)	-0.58 (-1.79)* *
b_4	0.81 (2.67) *	0.43 (0.73)	2.96 (7.30)*
b_5	-0.18 (-0.42)	0.73 (1.66)**	2.91 (5.92)*
b_6	-0.65 (-3.88)*	-1.00 (-1.83)**	-3.59 (-15.30)*
b_7	0.03 (2.47)*	-0.41 (-3.34)*	-0.19 (-4.95)*
b_8	-0.22 (-0.63)	-2.34 (-4.68)*	-0.63 (-2.55)*
b_9	-0.15 (-2.40) *	0.04 (3.19) *	-0.47 (-7.52)*
b_{10}	0.26(1.55)	0.15 (1.15)	0.98 (20.76)*
b_{11}	0.05 (0.21)	1.19 (1.77) **	1.64 (7.33)*
b_{12}	0.51 (3.80) *	-0.32 (-0.58)	-0.42 (-1.08)
b_{13}	-0.74 (-5.46)*	0.04 (0.08)	-0.87 (-2.63)*
b_{14}	-0.05 (-0.63)	0.17 (0.70)	0.31 (2.40)*
b_{15}	-0.12 (-2.09) *	-0.04 (-0.12)	-0.84 (-5.18)*
b_{16}	-0.10 (-0.78)	0.26 (1.37)	0.50 (2.88)*
b_{17}	0.24 (1.28)	-0.05 (-0.15)	1.45 (6.55)*
b_{18}	-0.14 (-0.75)	-0.04 (-0.35)	0.07 (0.37)
b_{19}	-0.05 (-0.24)	0.64 (1.55)	-0.64 (-3.59)*
b_{20}	0.20 (1.45)	-0.16 (-1.94)**	0.18 (0.61)
b_{21}	0.16 (2.68) *	-0.52 (-1.81) **	-0.18 (-1.51)
b_{22}	-0.06 (-0.48)	0.18 (0.75)	-0.89 (-5.49)*
b_{23}	-0.23 (-4.43)*	-0.27 (-0.69)	-0.18 (-0.88)
b_{24}	0.01 (0.09)	0.89 (2.98) *	0.53 (3.73)*
b_{25}	0.23 (1.85) **	0.28 (0.98)	-0.99 (-5.38)*
b_{26}	0.23 (1.70) **	-0.44 (-0.87)	-0.002 (-0.03)
b_{27}	-0.04 (-0.42)*	-0.10 (2.74)*	-0.03 (-0.18)
b_{28}	0.21 (2.26) *	0.32 (2.78)*	0.81 (6.01)*
b_{29}	-	-0.10 (-2.02)*	-0.05 (-4.29)*

b_{30}	0.04 (1.27)	-0.68 (1.62)	-0.13 (-4.85)*

Source: Estimation Results

Note: the numbers in parenthesis indicates t-values.

Appendix 9: One-Sided LR Test and Wald Tests

Cost	Calculated statistics	Critical values at 5%
$\gamma = 0$	0.98(9.56)♠	1.96
$\gamma = \eta = \mu = 0$	1.535[3]	7.045
$\gamma = \delta_0 = \delta_1 = \delta_2 = \ldots = \delta_7 = 0$	37.94[9]	16.27
Standard profit		
$\gamma = 0$	0.999(78.5E+5) ♠	1.96
$\gamma = \eta = \mu = 0$	154.3[3]	7.045
$\gamma = \delta_0 = \delta_1 = \delta_2 = \ldots = \delta_7 = 0$	207.7[9]	16.27
Alternative profit		
$\gamma = 0$	0.999(67.9E+6) ♠	1.96
$\gamma = \eta = \mu = 0$	52.3[3]	7.045
$\gamma = \delta_0 = \delta_1 = \delta_2 = \ldots = \delta_7 = 0$	171.9[9]	16.27
Labor efficiency		
$\gamma = 0$	14.8[1]	2.07 at 5%
$\gamma = \eta = \mu = 0$	5.926[3]	5.528 at 10 %

Note: the numbers in the parenthesis shows the number of restriction.

Source: Estimation Result

♠ It shows the calculated t-value.

Appendix 10: LR statistic calculated to $b_{ij}= 0$

	Calculated LR, Statistics	**Critical value at 1%**
cost	303.10 (22)	40.289
Standard profit	144.82 (23)	40.289
Alternative Profit	382.18(23)	40.289
Labor utilization function	98.94 (11)	23.21

Source: Estimation Result

Note: Values in the parenthesis is the number of restriction.

Appendix 11: test for $\mu = 0$

H_0: $\mu = 0$	Calculated values	Critical value
Cost	0.22(0.03)	1.96
Standard profit	-14.8(-0.68)	1.96
Alternative profit	2.98(3.83)*	1.96
Labor utilization function	0.045	1.96

Source: Estimation Result

Note: The numbers in parenthesis are t-values calculated.

Appendix 12: Estimated Parameters of the Labor Utilization Function

Parameters	Coefficients
b_0	0.03 (0.70)
b_1	-39.71 (-0.45)
b_2	-2.13 (-3.51)
b_3	-0.23 (-4.54)
b_4	0.62 (8.33)
b_5	-1.56 (-3.94)
b_6	0.06 (0.31)
b_7	0.35 (9.80)
b_8	0.08 (2.22)
b_9	0.66 (2.51)
b_{10}	0.08 (0.88)
b_{11}	0.97 (6.56)
b_{12}	0.02 (37.03)
b_{13}	-0.11 (-1.04)
b_{14}	-1.01 (-7.81)

Source: Estimation Result
Note: the values in the parenthesis are the t-values

Appendix 13: Likely Hold Ratio Test

	Calculated Critical Value	Critical Value at 1%
Cost	773.36	50.89
Standard Profit	331.52	50.89
Alternative profit	308.16	50.89

Source: Estimation Result

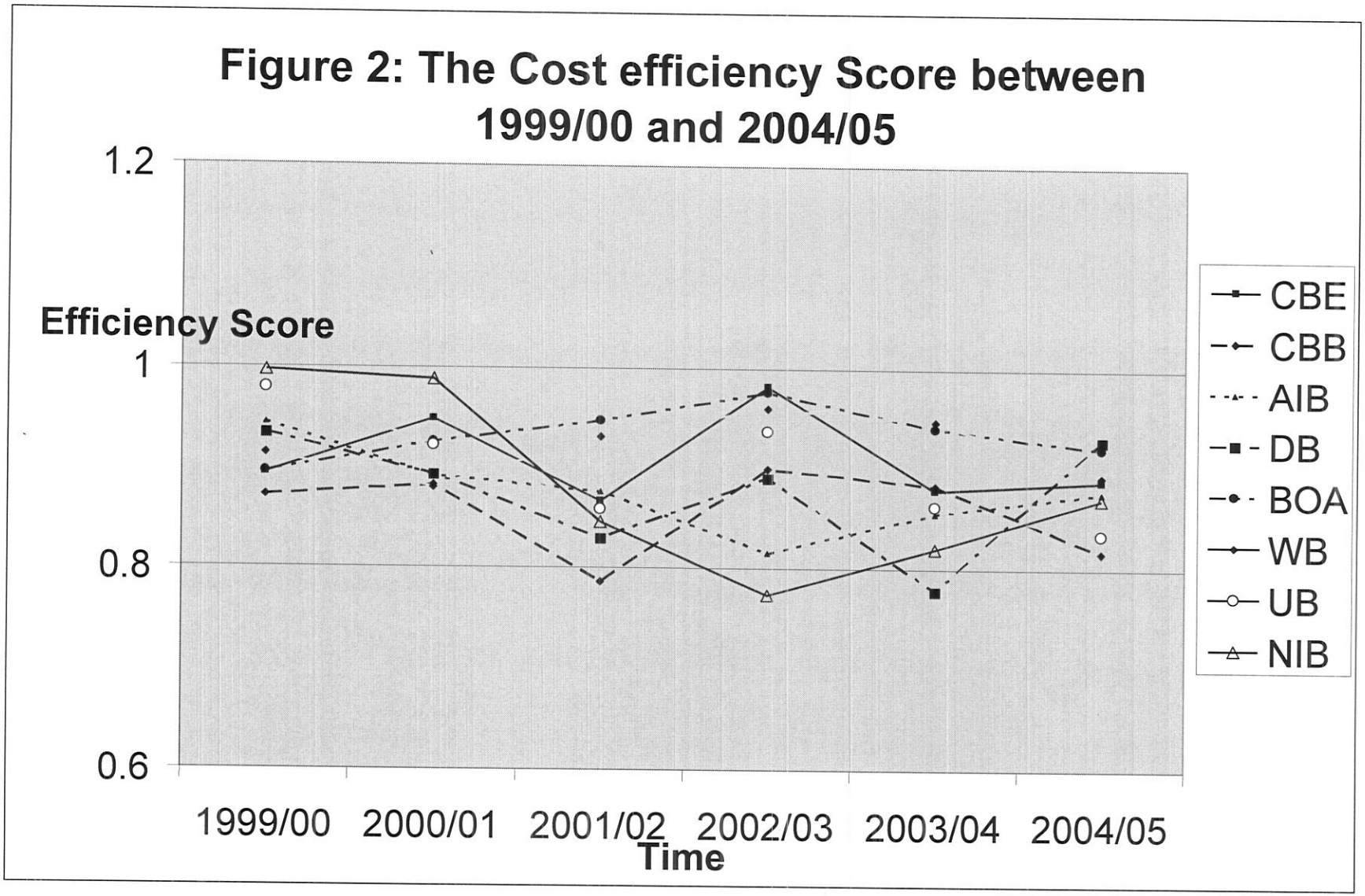


Figure 2: The Cost efficiency Score between 1999/00 and 2004/05
Efficiency Score
1.2
1
0.8
0.6
1999/00
2000/01
2001/02
2002/03
2003/04
2004/05
Time
CBE
CBB
AIB
DB
BOA
WB
UB
NIB

Figure 3: The Standard profit efficiency Scores between 1999/00 and 2004/05

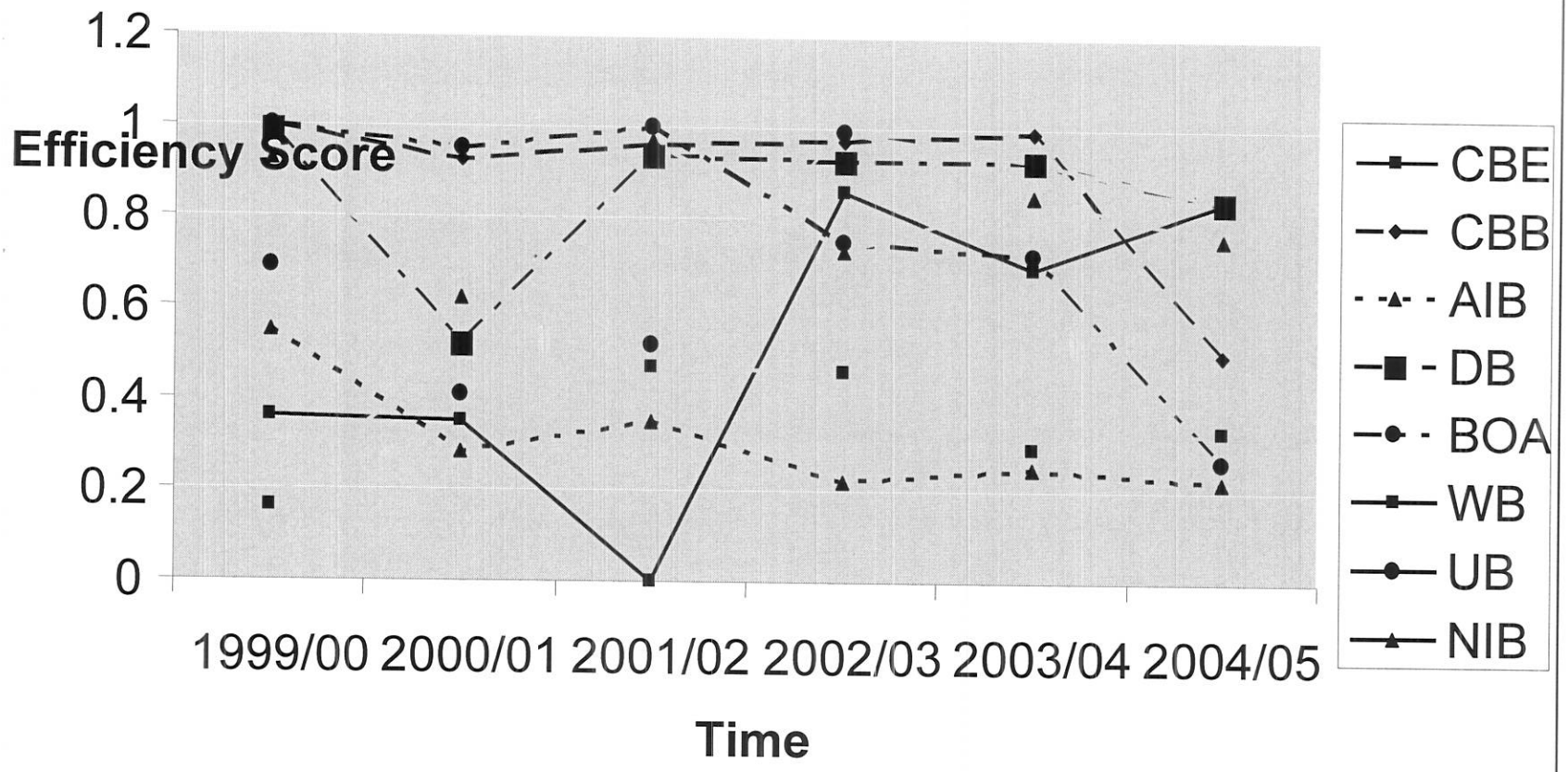
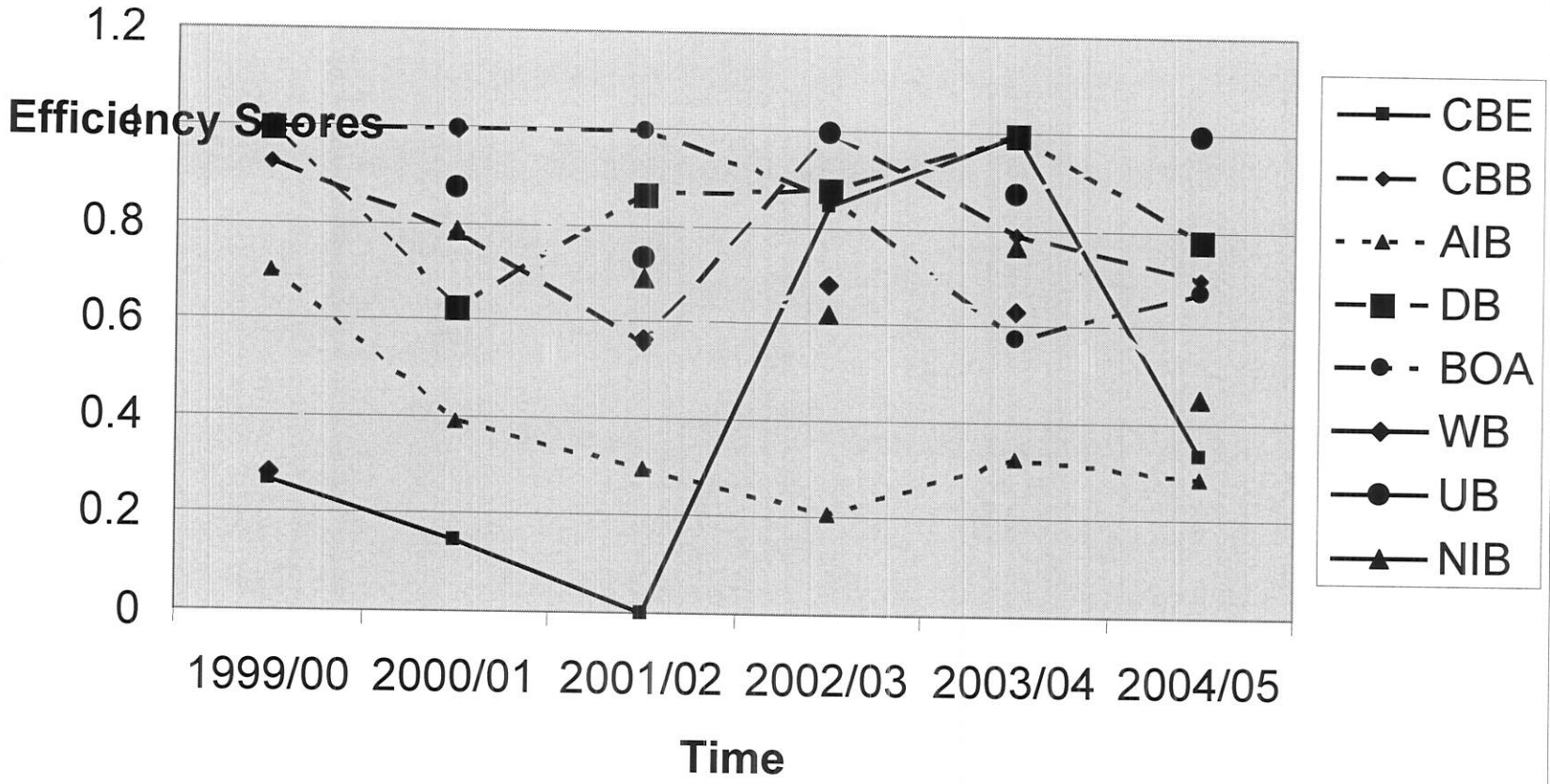


Figure 4: The Alternative Profit Efficiency Scores between 1999/00 and 2004/05



Declaration

This thesis is my own original work, has not been presented for a degree in any other university, and that all sources of material used for the thesis have been duly acknowledged.

Declared by	Certified by
Dereje Getachew	Dr. Mulat Demeke