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Cost Efficiency and Profitability Analysis of Private Commercial Banks in Ethiopia: An Empirical Study

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ABBREVATIONS

AE	-Allocative efficiency
DEA	- Data envelopment analysis
FDH	- Distribution free approach
GDP	- Gross domestic product
NBE	-National bank of Ethiopia
NPL	-Non-performing loans
PA	-Parametric approach
ROE	- Return on equity
SFA	-Stochastic frontier approach
TE	-Technical efficiency
TFA	-Thick frontier approach

CHAPTER ONE

1. Introduction

1.1. Background

The measurement of efficiency and profitability is basically having a great value for every organization employing inputs to produce outputs or services. These measurements can serve as inputs for policy formulation and contribute to resource allocation process. Besides, from a managerial perspective they are powerful tools that provide a plant form for assessing performance of an organization and identifying best practices. That is true for financial institution such as banking sector.

The banking sector is one of the prominent components of the financial sector, along with insurance and security sectors. It plays a significant role in the growth of an economy in terms of providing loan, deposit and payment services to both individuals and institutions. More over, it has a number of roles to play, such as contributing to wards employment generation, strength and linkage with other sectors of the economy, in prompting growth and stability, and creating sizeable impacts on the national income of the country

In developed countries the banking industry does not only serve as the above mentioned roles, but also it plays a great role in their daily life by providing deposit and loan, and payment services to accomplish their daily life. However, in developing counties like Ethiopia, bank still depends up on individual's disposable income (gross income less consumption), religious belief (especially in Muslim part) and government policies and other factors. Nevertheless, the growing role of a bank in an economy can not be ignored in many developing counties as the sector plays essential roles in economic growth and development of a country. However, the bank industry plays its economic roles only when it is efficient and profitable. In the case of Ethiopia, no attempt has been made to evaluate the efficiency and profitability of the bank industry. Thus, it is very important to under take empirical assessment on the performance of the bank sector particularly on the

cost efficiency and profitability of the sector with a view of increasing its contribution to the national economy.

1.2. Statement of the Problem

Intellectuals have long recognized that financial sector in general; commercial bank in particular, plays a vital role in the efficient functioning of the growth of an economy. Bank sector represents one of the tools which are of primary important in an economy. In short, banks have dual role: as an infrastructure and as commercial service. As an infrastructure service, banks play a key role in economic development. A well functioning of the bank sector enables efficient allocation of a country's capital and channels national saving to investment. As a commercial service, its importance stems from its ability in offering different services such as payment service, saving, borrowing to different economic agents. Given thus dual roles the sector directly affects the activities of individual business firms and the economy as a whole.

Like in many other developing countries, Ethiopia's banking industry is in an infant stage of development. However, there are positive development in the industry following the transformation of the country's economic policy from centrally planed to market oriented economy and the industry is also sufficiently advanced to permit at least to evaluation of its efficiency and their profitability. For banking sector, efficiency would imply improved profitability, better utilization of resource, greater soundness that has sufficient capacity to fulfill its promises, increase chance of success in a competitive market, and better quality service for consumers. This is particularly relevant in the Ethiopian banking industry where there is fierce competition among the banks for market share. Thus, emerging efficiency and profitability of the private local banks in the country is not the only principal source for the growth of the banking industry, but also benefit the whole economy through better mobility of the financial resource from the house holds to the investors, better payment system and providing more opportunity for investors.

Despite the importance and role of the banking sector in the economy, very little is known about its efficiency and profitability of the Ethiopian banking sector since the

liberalization of the market. Except an empirical study that was investigated by Muluneh Ayalew (2006), there is no other empirical study that was investigated the efficiency and profitability of commercial banks operating in Ethiopia since to exist. This paper, therefore, attempted to make empirical evaluation on the cost efficiency and profitability of the Ethiopian banking industry with particular focus on private commercial banks operating in the country. In this paper, we employed a parametric approach to assess the efficiency and profitability of private commercial banks. So that, the paper attempts to fill the gap by examining the cost and profit efficiency and inefficiency level of private commercial banks and their root cause of inefficiency. The outcome of the study would serve as guide to policy designing and implementation.

Hypothesis of the Study – The following hypothesis are to be tested in the study.

1. Private commercial banks under the sample are cost and profit inefficient.
2. Predicated efficiency and profitability level of private commercial banks are not varying over the sample period.
3. Asset, capital, return on equity, deposit ratio, age and GDP have direct relationship with cost and profit x-efficiency, while NPL (None performing loan) have direct relationship with cost x-inefficiency and inverse relationship with profit x-inefficiency.

1.3. Objective of the Study

1.3.1. **General objective:**–The general objective of this study is to estimate the cost efficiency and profitability and examine the factors that plays important role in determining the technical (cost) efficiency and profitability of private commercial banks operating in Ethiopia.

1.3.2. **Specific objective:**–The specific objectives of the Study is:-

1. To measure the level of technical (cost) efficiency and profitability of private commercial banks operating in Ethiopia.
2. To show the difference in x-inefficiency between private commercial banks.

3. To see the time variation of efficiency and profitability for the last Nine years (2000-2008).
4. Identifying major drawbacks and causes for poor and unsatisfactory bank performance (i.e x-inefficiency).

1.4. Scope and Limitation of the Study

The scope of this study is limited to private commercial banks operating in the Ethiopia. The analysis of this study includes those bank companies that have been providing general banking service only during the period of 1997 to 2008. Those are Awash, Dashen, Abyssinia, Wegagen, United, NIB commercial banks. These bank companies are representative of the private banking industry as they hold more than 85% of the market share of the private bank industry. Government banks, Oromia cooperative Bank and lion Bank are deliberately excluded from this study with a reason. The commercial bank is still the leading bank and maintains the highest market share. Hence, including the CBE to the study would likely bias the result. The development bank of Ethiopia is excluded for its very objection is not commercial. It is intended to finance long term investment. A simple reasoning is given to construction and Business bank. It is a government bank. The Oromia cooperative Bank and lion international bank are infant banks. They have been in operation only for few years.

Though, unavailability of source document such as books on efficiency from the library, lack of official data on non performing loans from banks and difficulty to obtain input process are faced, alternative data like provision on loans and advances and estimated value for input prices will be used, which may reduce the problem of biasness.

1.5. Significant of the Study

The measurements of efficiency and profitability of the financial sector are important for the purpose of policy formulation. Regulators are also interested in efficiency of the performance of the industry with the aim of protecting the interest of the public. So the finding under this study is important in providing supportive insight about efficiency and

profitability features of the private commercial banks operating in Ethiopia, which could be beneficial to the supervisor authority for prudential regulation and policy formulation.

The result of this study is also expected to give a benchmark for policy makers and researchers to examine the effect of the financial liberalization on a give country economy. It also provides valuable and suggestive information to the researchers for their further study on the efficiency and profitability analysis of private commercial banks. The result can also be used by the management of these banks in their endeavors toward improving their bank's performance. In a nut shell, the result may give adequate information for managers and policy makers to make informed decisions and employ resource more optimally.

Lastly, the study will contribute in filling the literature gap with the area and can motivate other researchers for further study, especially in the accounting and finance department. Because most of the research is conducted using the traditional ratio analysis to measure the cost efficiency and profitability of the banking industry.

1.6. Organization of the Study

The study has six chapters. The first chapter is an introduction part, which includes back ground of the study, statement of the problem, objective of the study, significant of the study, and scope and limitation of the study. Chapter two embodies review of related literature (both conceptual and empirical reviews). Chapter three, overview of banking industry and their structure in Ethiopia. Chapter Four, consists of methodology and data source of the study. Chapter five, an empirical analyses and interpretation of the study. Regression and correlation analyses in identifying factors that affect the efficiency of the Ethiopian banking industry are also analyzed in this chapter. The Final chapter offers conclusion and recommendation of the study.

CHAPTER TWO

2.1. Conceptual Literature Reviews

2.1.1 A Brief over View of Efficiency Concept and Measurement

Efficiency and profitability are two core concepts in accounting. They are important performance indicators by which a given entity can be evaluated. Efficiency concept is used to character (measure) how the entity's assets or resources are utilized optimally. Efficiency is a statement about the performance of processing a set of input in to asset of out put.

Traditionally, to estimate efficiency & profitability, researchers used certain simple ratios such as wage/sales, Cost of goods to sales, and selling administration cost to sale ratios for profitability analysis. Researchers are also used the following ratios to measure efficiency

1. Net profit margin (Net profit after tax over net sales): - To measure how much after-tax profit are generated by each dollar of sales.
2. Return on investment (ROI):- (Net profit after taxes over total sales) -To measure the rate of return on the total assets utilized in the company
3. Return on equity (ROE) = Net profit after taxes over share holders' equity – To measure the rate of return on the book value of stockholders total investment in the company

Similarly, the efficiency and profitability of bank industry had been measured by conventional financial ratios such as the following

1. Return on asset measure the net income of profit as a percentage of total assets. This measure provides an indication of the profitability of banks assets.
2. Asset growth and quality ratio – measuring the growth (or decline) of banks assets over time periods, a reasonable indication of both their current and long term performance and prospects.

3. Gross yield on asset- it is the ratio of gross income to total asset. It indicates the sum of interest and non interest income per unit of asset. it reflects how efficient the bank has used it's total asset in generating income
4. Liquidity Ratio – liquidity measure the ability of the bank to fulfill or honor the immediate commitments in due time. This is defined as cash and cash equivalent asset over current liability

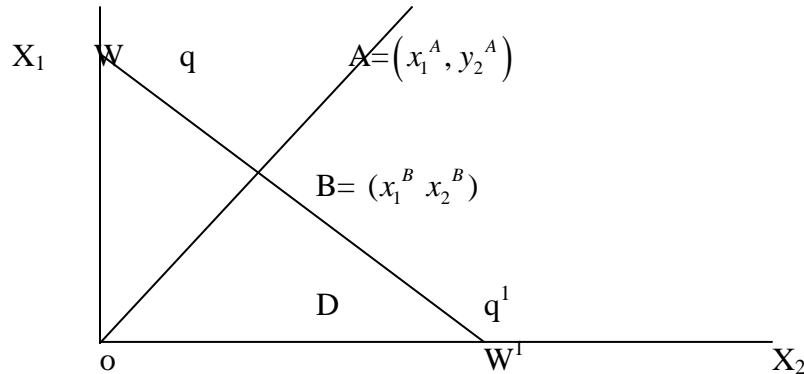
However, there are a number of problems associated with such simple ratio based analysis. First, it is generally impossible to identify best practice organizations because it is unlikely that all ratios will point to the same bank or banks. Second, if the ratios disagree, it may be difficult to decide in advance which ratios should be given more weight in order to compare the banks performance. Third, the traditional approach does not readily allow banks to identify the source of inefficiency. The modern approach to efficiency and profitability measurement tries to circumvent the problems associated with the traditional method by using frontier efficiency method. The modern approach of cost efficiency and profitability measurement were begun with Farrell (1957). He introduced the concept of efficiency frontier approach that measures company performance relative to the best practice frontier consisting other companies in the industry. Frontier functions represent the best practice technology, against which the efficiency of the companies within the industry can be measured (Coelli; 1996). If the companies belong to the Frontier, it is efficient, otherwise inefficient.

Frontier efficiency method is superior to the conventional ratio approach of measuring efficiency & profitability of bank industry for the following reasons. First, the frontier efficiency is important to test the efficiency hypothesis. Second, it provides guidance to regulators and policy makers regarding the appropriate response to the problems and development of the industry. For instance frontier methodology can be used to determine whether consolidation is likely to bring improvement in services provided to consumers. Third, the application of frontier is useful to compare the economic performance across countries. A fourth application is to inform the management about the evaluation of the firm's profitability and efficiency over time and performance departure.

Farrell et al (1957) introduced measurement efficiency that consists of two components: technical (or physical) efficiency and allocation (or price) efficiency. The product of the two measurement of efficiency gives a measure of overall company efficiency, which also referred to as company efficiency (economic efficiency). Technical efficiency reflects the ability of a firm to produce maximum potential output from a given amount of resource inputs or to use minimal amount of input to produce a given amount of output under a certain technology, and it signifies how far the firm can increase output without utilizing resources. Thus, technical efficiency depicts the ability of a firm to produce on the production frontier. Allocative efficiency refers to the extent to which an entity inputs in optimal proportion for a given set of input prices and technology. In other words, allocative efficiency represents the ability of choosing optimal input level for a given factor price. Technical efficiency can be further decomposed into pure technical efficiency (PTE) and scale efficiency (SE). Scale efficiency is used to determine how close an observed entity is to the most productive scale size (Banker and thran, 1999). A company is scale inefficient if it exceeds the most productive scale size (therefore experiences decreasing return to scale) or if it is smaller than the most productive scale size (therefore failing to take full advantage of increasing return to scale). Scale inefficiency for a company is defined with respect to those companies in the industry which operate with average and marginal product is equal (Fursand, 1980).

Many authors have pointed out the relevance of measuring technical efficiency (cost efficiency). Farrell et al (1957) argues that measuring technical efficiency is important because it allows us to determine whether outputs can be increased simply by raising efficiency, without a need of increasing input quantities. Moreover, Lovell (1993), states that measuring efficiency make it possible to rank and evaluate the decision making units (DMUs) that are analyzed, thus permitting the design of incentive mechanisms to reward the best DMUs, as well as policies to which raise efficiency. The concepts of Farrell's technical efficiency and allocative efficiency are best illustrated by using simple example involving firms, which utilized two inputs (x_1, x_2) to produce output (y) under the assumption of constant return to scale. In figure 1 below, qq' is isoquant for a

firm, which represents the various combination of the two input (x_1, x_2) required to produce a desired fixed amount of out put by using the state of production technology. Firms which are operating on the isoquant are therefore considered as technical efficient.



The distance AB represents the technical inefficiency of a firm. That is the amount by which all inputs could be proportionally reduced with out any reduction in output. This is usually expressed in the percentage term by the ratio AB/OA , which represent the percentage by which all inputs need to be reduced to achieve technical efficient production. The technical efficiency of the firm at point B is most commonly measured by the ratio OB/OA . It takes the value of between 0 and 1, that value of one indicates the firm is fully efficient. In figure 1 above, point B is technically efficient since it lie on the efficient isoquant. The technical efficiency ratio of the firms at B is OB/OB or unity. In addition, it is important to measure the extent of firm use the various factor of production in best proportionalities, considering prices. In fig 1 above, the input price ratio is presented by the slope of Isocost line WW' and allocative efficiency can be calculated. Allocative efficiency of a firm operating at point $A = (X_1^A, y_2^A)$ is defined to be the ratio of OC/OB because the distance AB represent the reduction in production cost that would occur if production where to occurred at the allocative and technically efficient point D instead of technically efficient but allocatively inefficient point B .

Frontier efficiency has been used extensively in measuring the level of efficiency and profitability. Frontier efficiency estimation technique can be classified in to parametric

(econometric) and non –parametric (mathematical programming) approaches. The econometric approaches rely on a parametric or functional specification of input –output relation such as cost & production, or profit function characterizing the data. It normally recognizes that deviation from the given technology is measured by error terms which consist of two parts; one represents randomness, and the other inefficiency. The usual assumptions with the two components are that the inefficiency follows the asymmetric half normal distribution and random error term is assumed normally distributed. The random error is generally thought to encompass all events out side the control of the company including both uncontrolled factors directly related to the actual cost function and methodological error, such as misspecification of the functional form and error term. In contrast to econometric approach, the mathematical programming method used the linear programming technique to evaluate the efficiency of the organization relative to the other organization in the industry. This approach doesn't normally have any stochastic components. Hence, it assumes that any departure from the frontier is the result of inefficiency. The most commonly used version of mathematical programming methods are data envelopment (DEA) and free disposal HULL (FDH). DEA approach for measuring efficiency was introduced by Charnes, Cooper and Rhode Charnes (1997). DEA is non – parametric in the sense that it simply constructs the frontier of the observed input-output ratio by linear programming technique. It compares decision making units (DMUS) that use the same inputs to generate outputs to get the relative efficiency measure of individual DMUs.

Both the parametric and non – parametric approaches have their own advantages and limitations. The primary advantage of the parametric approach is that it allows the entities to deviate from the efficiency frontier due to purely random error as well as through inefficiency. But the primary challenge in implementing the parametric approach is determining how best to separate random error from inefficiency because both are not observable. The parametric approach, however, has been criticized for potential confounding estimate of efficiency with specification error as it requires the specification of functional form of which characterized input-output relation. Hence, any resultant efficiency scores will potentially depend on how accurately the chosen functional form

represents the production & cost relation. On the other hand, unlike parametric approach, non-parametric approach method has advantage of none having to specify the form of production or error term. However, one potential problem with non parametric approach is that, it doesn't have any stochastic error components. So that, any deviation from the frontier is assuming to be inefficient.

In general both mathematical programming and econometric approach are widely used for the analysis of efficiency & profitability. The success of both relies on some common factors such as the homogeneity of all inputs and outputs and the measurement accuracy of input and output across firms. In this paper we used the parametric approach one.

2.1.2. Efficiency concepts

2.1.2.1. Production and cost approaches to Function

Input- Output

Even though cost function approach is the dual (part) of the production function approach to modeling inefficiency, there are some advantages of using the cost functions approach. These are the following

1. The cost- function approach helps to handle cases easily where the producer (entity) produces multiple outputs. Where as the production approach to stochastic frontier analysis is done on the assumption of a single output. It would be rather restrictive to assume a single output in modern day settings where a large number of firms produce multiple outputs.
2. The cost function approach is an input-oriented measurement of efficiency. So it can make a distinction between variable input and quasi- fixed input (inputs fixed in the short term). Where as, the production function approach is an out put- oriented measure of efficiency. So that, treats all inputs equally (can not differentiate between fixed and variable inputs) - (kumbhakar and Sarkar 2004).
3. The cost- function approach imposes a behavioral assumption on producer's i.e., producers minimize cost. Where as, the production- function approach does not impose any such behavioral assumption explicitly (though implicitly one assumes output maximization at least in a single output frame work). However, in competitive

environments in which input prices (rather than input quantities) are exogenous (out of management control); and in which output is also demand driven and so can also be considered as exogenous. But the cost function approach is the more appropriate approach under this environment.

4. The data requirements for the cost function approach are higher compared to that for the production function approach which the latter requires data only on output and inputs, the former required data on total expenditure, outputs, and input prices. In addition, where a multiple equation framework is used data on input or input – cost share are also required (Kumblakar and Lovell 2000, Kumbhakar and Sarkar 2004).

Hence, based on the above advantage of cost- function approach, we use the approach towards estimating and modeling inefficiency in this paper.

2.1.2.2. X- Efficiency

Professor Harvey Leibenbtin (1966) was the first to introduce the concept of x-efficiency. He defined it as the loss at which a bank is operating (deviation from the optimum). x- In efficiency is an intra firm inefficiency or the deviation from the production efficient frontier, which depicts the maximum attainable output for a given level of input. This inefficiency can arise from management practice and the environment. X- Inefficiency reflects the differences in managerial ability to control cost and/or maximize profit but not to suboptimal economies of scale or scope. It has been linked to managerial quality. Empirical x-inefficiency is a measurement of how banks utilize their inputs to produce a given level of output. Berger et al (1993) describes x-inefficiency, as a variance from the efficient frontiers set by the best practice or benchmark firm. It incorporates two components; those are technical and allocative inefficiencies (Allen and Rai, 1996). According to Farrell (1957) technical inefficiency occur due to suboptimal usage of input leading to waste, while allocative inefficiencies arise from inappropriate mix or composition of inputs using inefficient business process. Both inefficiencies are attributed to employee, management or environment factors. Despite the fact of harmony across all methods, it seems clear that x-efficiency differences are much more important than scale and scope efficiencies in banking. For instant, most of the studies find that, the

average cost of x-inefficiencies are on the order of 20% higher for virtually all size classes of banks, as opposed to scale inefficiency's. Scope inefficiencies are difficult to measure but also appear to account for 5% or less of costs (Berler and Humphrey, 1994, Bergeretal 1997).

Duality concepts have the best economic foundation for analyzing the efficiency of banks for they are based on economic optimization in reaction to market price and competition. The following sections will discuss cost and profit x-efficiency based on the duality concept.

2.1.2.3. Cost Efficiency

Cost efficiency gives a measure of how close a bank's cost is to what a best practice bank's cost would be for producing the same out put bundle under the same conditions (environment rule and regulations). It is derived from a cost function in which variable cost depends on the prices of variable inputs, the qualities of variable output and any fixed inputs or outputs, environmental factors and random error, as well as efficiency. Such cost function may be written as.

$$C=c(\mathbf{w}, \mathbf{y}) + \mu_c + V_c \text{ ----(1)}$$

Where, c measures variable costs, w is the vector of price of variable inputs, y- is the vector of qualities of variable outputs, μ_c -denotes inefficiency factor that may raise costs above the best practice level, and V_c -denotes the random error that incorporates measurement error and luck that may temporally give banks high or low costs. The inefficiency factor μ_c incorporates both allocative inefficiencies (from failing to react optimally to relative prices of inputs, w), and technically inefficiency (from employing too much of inputs to produce y). To simplify the measurement of efficiency, the inefficiency and random terms μ_c and V_c are assumed to be multiplicatively separable from the rest of the cost function, and both sides of equation -1 can be represented in natural logs follow.

$$\ln c = \ln f(\mathbf{w}, \mathbf{y}) + \mu_c + V_c \text{ -----(2)}$$

Where, f denotes some functional form. The term $\mu_c + Vc$ is treated as various x-inefficiencies and composite error terms measurement.

We can define the cost efficiency of bank “b” as estimated cost needed to produce a given output, If the bank were as efficient as the best practice bank in the sample facing the same exogenous variable (W,Y) divided by the actual cost of bank b, adjusted for random error. That is

$$\text{cost } Eff^b = \frac{C^{\min}}{C^b} = \frac{\exp \left[f \left(w^b, Y^b, Z^b, X^b \right) \right] \exp \left(\ln u_c^{\min} \right)}{\exp \left[f \left(w^b, Y^b, Z^b, X^b \right) \right] \exp \left(\ln u_c^b \right)} = \frac{U_c^{\min}}{U_c^b} \text{ -----3}$$

Where, U_c^{\min} is the minimum cost across all banks in the sample. The cost of efficiency ratio may be thought of as the proportion of cost or resources that are used efficiently. Cost efficiency ranges over (0, 1), and equals one for the best practice firm in the observed data. For example, a bank with cost efficiency of 0.80 is 80% efficient or equivalently wastes 20% of costs relative to a best practice firm facing the same conditions. That means the bank is incurring a cost of 1.0 birr to produce a unit of output that can be produced by 0.80 cents by efficient banks. It is also possible to interchange the numerators and denominators and define cost efficiency as the ratio of actual cost of production to the ideal cost. In this cost efficiency will be the reciprocal of the former coefficient and is equal to or greater than one i.e (1, ∞). For example, a bank with cost efficiency of 1.2 means the bank is incurring a cost of 1.2 birr to produce a unit of output that can be produced by 1.0 birr by efficient bank. In this paper we used the latter method for measuring cost efficiency and the first method for measuring profit efficiency.

2.1.2.4. Standard Profit Efficiency

Standard profit efficiency measures how close a bank is to producing the maximum possible profit given a particular level of input prices (and other variables). In contrast to the cost function, the standard profit function specifies variable profits in place of variable costs and takes variable output prices as given rather than holding all output qualities statistically fixed at their observed possibly inefficient levels. That is, the profit

dependent variable allows for consideration of revenues that can be earned by varying output as well as inputs. Output prices are taken as fixed, allowing for inefficiencies in the choice of outputs when responding to those prices. The standard profit function in log form is

$$\ln(\Pi + \theta) = (w, p) + \mu_{\Pi} + V_{\Pi} \quad \text{----- 4}$$

Where Π is the variable profit of the firm, which includes all the interest and non interest income earned on the variable output minus variable costs, c , used in the cost function; θ is a constant added to every firms profit so that the natural log takes a positive number. It is defined as $(\Pi^{\min}) + 1$; p is the vector of prices of the variable output; V_{Π} represents random error; and μ_{Π} represents inefficiency that reduces profits.

We can also define standard profit efficiency as the ratio of the predicated actual profits to the predicted maximum profit that could be earned if the considered bank was efficient as the best bank in the sample, net of random error, or the proportion of maximum profit that are one actually earned.

$$std \ \Pi \ Eff^b = \frac{\Pi^b}{\Pi^{\max}} = \frac{\{\exp(f(w^b, p^b, z^b, v^b))\} \exp(\ln v_{\Pi}^b) - \theta}{\{\exp[f(w^b, p^b, z^b, v^b)]\} \exp(\ln u_{\Pi}^{\max}) - \theta}$$

Standard profit efficiency is the proportion of maximum profits that are earned. The profit inefficiency is due to excessive costs or deficient revenue or both; the firm is losing the profit that can be earned. Similarly to the cost efficiency ratio, the profit efficiency ratio equals one for a best-practice firm that maximizes profits for its given conditions with in the observed data. Unlike cost efficiency, however, profit efficiency can be negative since firms can throw away more than 100% of their potential

2.1.2.5. Profit Efficiency

Profit efficiency concept is superior to cost efficiency concept for evaluating the overall performance of firms. This is because, profit efficiency accounts for errors on the output side as well as those on input side. Besides, profit efficiency is based on the more

accepted company goal of profit maximization, which requires that the same amount of management attention be paid to raising a marginal birr or revenues as to reducing a marginal birr costs.

Moreover, profit efficiency is based on comparison with the best practice point of profit maximization within the data set, whereas cost efficiency evaluates performance holding output constant at its current level, which generally will not correspond to an optimum profit. A firm that is relatively cost efficient at its current output may or may not be cost efficient at its optimal output, which typically involves a different scale and mix of outputs.

This, standard profit efficiency may take better account of cost inefficiency than the cost efficiency measure itself, since standard profit efficiency embodies the cost inefficiency deviations from the optimal point.

2.1.3. Input-output Specification

The concept of economic activity as an input process is perhaps the most basic concept of economics. Nevertheless various difficulties emerge when an effort is made to specify the input and outputs involved and to define the nature of transformation implied (Bouding, 1961 cited at Kwan, 1996).

Frich (1965) defined production as process of transformation, directed by human beings, which is considered desirable by some individual. Transformation implies that certain goods or services (inputs) enter a process where they lose their identity, i.e. cease to exist in the original form while other goods and services (outputs) are generated. However, the production process in banking involves the use of deposits and other assets. It is therefore a stock concept, unlike the outputs of manufactures firms, can be measured in terms of quality once the goal is clearly defined (Kwan, 1996).

The non-tangible nature of bank output and theoretical gap in the banking literature on multi-input-multi-output structure causes confusion in the definition of output

measurement. There are two different methods of tackling this problem; production approach and asset/ intermediation approach.

2.1.3.1 Production Approach

In the production approach to measuring bank output is; banks are treated as firms which use capital and labor to produce different categories of deposit and loan accounts. Outputs are measured by the number of these accounts or the number of transactions per account. Total costs are all operating costs used to produce these outputs. Output is treated as flow, that is, the amount of ‘output’ produced per unit of time, and inflation bias is absent (Benston 1965).

There are several problem associated with this approach. First, there is the question of how to weight each bank service in the computation of output. Second, the method ignores interest costs, which will be important for measuring output. For example, deposited rates falls as the number of branches increases, further more, and it is unlikely data from different banks are comparable, making accurate measures of relative efficiency difficult to obtain.

2.1.3.2. The Intermediation Approach

This approach recognizes intermediation as the core activity of banks. Therefore, banks are not producers of loan and deposits, services. Instead, output is measured by the value of loan and investments; total cost by operating costs. Deposits may be treated either as input or as outputs. The intermediation approach treats bank output as a stock, showing the given amount at one point in time.

However, if banks have a wide range of assets, such as trust operations or securities, the intermediation approach will make their unit costs appear higher than for banks which engage in the traditional intermediation. The relative importance of different bank products may also be ignored in the computation, unless weighted indexes are used.

Neither, intermediation approach nor the production approach takes account of the multi-product nature of banking. For example the monitoring role of banks was an important service offered by bank. So that should the monitoring function be treated as a cost (to provide services) or as a services itself? Most bank productivity studies use the intermediation approach because there are fewer data problems than production approach. But empirical work suffers from a number of difficulties. First, the way output measures, no account is taken of the different risks attached to each loan. Third, the maturity structure of loans and deposits, critical in banking is ignored. Finally any change in the structure of the banking market could distort output measures.

But each of the approaches has some advantages. The production approach may be some what better for evaluating the efficiencies of branches of bank because branches primarily process customer documents for the institution as a whole and branch managers typically have little influence over bank funding and investment decisions. The intermediation approach may be more appropriate for evaluating entire bank because this approach is inclusive of interest expenses, which often account for one half to two third of total cost. As well, the intermediation approach may be superior for evaluating the importance of frontier efficiency to the profitability of the bank, since minimization of total costs, not just production costs is needed to maximize profits. So that, in this paper the intermediation approach is employed.

2.2. Empirical Literature Review

There are few studies made on the efficiencies and profitability analysis in banking sector in the context of developing countries, particularly in African countries. However, there are various empirical studies have been done on developed and some emerging economies.

A number of those studies used stochastic frontier analysis in evaluating banking efficiency. For example, Berger and Mester (1997) with respect to U.S banking; Kraft, Hofler and Payne (2002) with respect to Croatian banking; Bedari (2003) with respect to Botswana, Namibia and South Africa banking; Kumbhakar and Sarkar (2004) with respect to Indian banking; and Styrin (2005) with respect to Russian banking, to name a few.

Empirical evidence shows that X- efficiency of the banking system is significant throughout the world. By employing stochastic cost frontier analysis using panel data on Indian banking system, Kumbhakar and Sarkar (2004) found that cost efficiency of Indian banks ranged from 69 percent in 1986 to 75 percent in 2000. By using a Fourier-flexible trigonometric cost frontier function, Kraft, Hofler and Payne (2002) estimated a mean cost inefficiency ranging from 1.09 to 1.3 for to 1.36 for south Africa banks.

Berger and Mester (1997), explored the relationship between age of the bank and efficiency to investigate the theory that says bank production might involve (learning by doing) (Mester 1996). Their result, however, showed a very small coefficient on the contribution of age to efficiency.

Benger and Humphrey (1997), estimate the efficiency of financial institution using five different frontier approaches. This study surveys 130 studies that apply frontier efficiency analysis to financial institutions in 21 countries and found out an average efficiency of banking sectors around 77 %.

Taylor and Fancies (1998), analysis Australian credit union using a stochastic cost frontier approach. The cost inefficiently estimates range from 0.04 to 0.12 with a mean inefficiency level of 0.07. The suggestion is that a typical credit union in 1995 produces its products at a cost that was approximate seven percent greater than necessary, with over all inefficiency ranging from five percent to over twelve percent.

Teflula (2002), applies the transadentional logarithmic model to measure cost and profit efficiency of 89 banks drawn from nine (9) sub- Sahara- Africa countries over a period of eight years. He found that a mean profit and cost inefficiency 34 % and 19% respectively.

Maggie and Hetterman (2005), applied stochastic frontier approach for a period of 1995-2002 to measure x- efficiency of china's banking sector. The mean x- efficiency score for 187 observations was 0.407. Suggestion that, for a given level of out put the banks could used inputs more efficiency and so reduces costs by approximately 60 %.

Worthington and Hurley (2002), analyzed the efficiency of Australian general banks for the year 1998 by adopting SFA. This study use intermediation approach to select bank output, and included labor, physical capital (fixed) and deposits (federal capital) as in puts. The outputs are loans, foreign deposits and off balance sheet activities. The finding of their study showed that the average efficiency score at Australia banks industry was 0.50. The main sources of inefficiency appeared to be technical inefficiency.

With reference to the impact of market liberalization on banking industry in four Asian countries, Thivade, Martin, and Harold (2001), employed data of the 1980-1997 periods to investigate the impact of market liberalization on banking sector- efficiency and profitability using stochastic approach across four Asian countries, namely Taiwan, Korea Philippine and Thailand. The paper used three inputs: Labor, financial, and capital (deposits) and fixed capital. The out put were loan (net of provisions) investment and foreign fund, deposit in corresponding banks. The empirical finding of the research revealed that the liberalization of the Korean and Taiwan banks were associated with

improvement in efficiency and profitability, where as for Philippine and Thailand the liberalization seemingly failed to stimulate efficiency and profitability.

Many studies also tried to examine the determinants of inefficiencies and included asset size, organization form, market environment, capital size and other firm specific characteristics. By using data on Russian Commercial Banks on quarterly basis from the first quarter of 1999 to the fourth quarter of 2002, Styrim (2005) examined the major determinants of inefficiency in Russian bank. Styrim found that banks based in Moscow are less efficient than the other (out side capital). Broft, Hofler and Rayne (2002), found negative relations between inefficiency and asset size in Croatian banks. That means firms with higher asset size are more efficient than those with lower asset size.

Berger and Mester (1997), found that the cost efficiency estimates do not vary much across asset size. Holding all else equal, the cost efficiency is about 25 % higher at the large banks (with assets over \$ 10 billion) than the smallest banks (with asset under \$100 million). But in term of efficiency (both standard and alternative), small bank show the greatest level of efficiency. The cost and profit efficiency results together seems to imply that, as banks grow larger, they equally able to control costs, but it become harder to efficiently create revenues. This is consistent with conventional wisdom and the historical facts that small banks typically have higher profitability ratio. It also helps to explain the lack of a positive correction between cost efficiency and profit efficiency (Berge and Meter, 1997).

Studies on cost and profit efficiency of commercial banks in Ethiopia are almost not done. Muluneh Ayalew (2006) is the one who worked on cost efficiency of private commercial banks in Ethiopia using stochastic frontier approach for the year between 1997 and 2005. He found that the cost efficiency for the first quarters of estimation period 67 % and during the last four quarter of the period of estimation 89%. That means, the banks under review have begun to operate to a point closes to the cost frontier during the last four quarters compared to the beginning quarter.

Almost all empirical literatures, which estimate bank efficiency and profitability, were attempted to make regression on a set of environmental or explanatory variable such as asset size, capital, age, deposit ratio geographic concentration, organization form, capital, branch networks and other financial information, so as to explain variation in efficiency and profitability. However, there is a considerable lack of information on what are the main determinants of efficiency with in bank sector. This is an important area which deserves further investigation.

To sum up, the literature reviewed indicated that there is no clear consensus on the specification of banking outputs in spite of large number of studies on efficiency and portability of banking sector. Some earlier literature used deposit as proxy for the out put measure. Another group of authors used physical out put measure as number of polices. The latter measure employed by killner, Mathe and Wson (1993), and Bernlister (1997). It would be useful to further research to compare the efficiency scores using alternative definition of outputs. On the other hand, there is more uniformity in the choice of inputs. Nearly all studies labor, fixed capital and deposits to cover input (it is also in this paper uses these inputs). On the subject of comparison of different efficiency methodologies, the two studies that make such comparison (Ferrier and Lovelli (1996) and Humphery (1997)) found that the same efficiency ranking except small difference interims of estimated efficiency scores. The efficiency score of DEA is generally expected to be lower than Stochastic frontier approach scores (SFA) because it measure all depart, form the frontier as inefficiency, where as the econometric approach (SFA) allows for the random error. Hence, in this paper the economic approach (SFA) is employed to minimize the short coming of the DEA. To provide new information on the effect of choice of methodology in efficiency estimation more studies are needed to be done.

Chapter Three

3. Overview of Banking Industry and Structure in Ethiopia

3.1. Bank and its Economic Roles

Many researchers tend to indicate that a well developed financial sector and its various components including banks have substantial potentials for spreading positive externality through the commercial sector of the economy. A large and growing theoretical literature exploring the nature of the relationship between economic growth and bank have developed and suggested that a well functioning and efficient bank industry is fundamental to economic growth. That means, the more efficient and developed country's bank industry market, the greater its contribution to economic growth. There are several ways in which bank services contribute to economic development. The following highlight the broader economic contributions of banking industry in an economy.

i. Promoting financial stability: – Risk is unavoidable feature of any economic phenomenon. Bank play crucial role in promoting financial stability through identification of risk at individual, society, corporate and national level. There by, encouraging individuals and firms to specialize create wealth and under take beneficial projects they would not otherwise consider, with out services provide by banks such as project feasibility analysis, risk management counseling and long and short term loans. Individuals and firms in the economy could incur significant losses or not engaged in activities that create wealth (Dos, Darres and Podpreram, 2993). In doing this bank permits economic activities to operate with less volatile and risk of failure, thus providing financial stability with in national economy.

ii. Effectively and efficiently mobilized and allocated financial

Resource in an economy: - Banks mobilize financial resource from households who have excess financial resource to investors who needs these resources to invest in an economy. Under this function, banks play a very important role in the functioning of in more complex economy, by promoting economic development and

in the working of Monetary- credit policy. These functions of banks help production, capital accumulation and allocating these among alternative uses and users.

iii. Forster more efficient allocation of capital allocation through its prudent

investment activates: - Banks spend time on collecting information to evaluate projects in order to help firms and individuals in their decision regarding their investment activities. As result, these individual are able to distinguish between productive and inefficient projects. With out this banking function, individual savers and investor typically incurred high cost to collect and evaluate the information regarding the feasibility of the project. Moreover, activities of banks in continually evaluating and monitoring risks, in providing market information on likelihood of losses which can lead to improved resource allocation-(OECD, 2003).

iv. Providing Payment Service-Bank:- allows to individuals and other economic agents to transact their daily business and life activities by cash and other than cash such as check, debit and credit cards, electronic fund transfer

3.2 History of Banking in Ethiopia-in Short

In 1905 the first modern bank in the history of the country, bank of Abyssinia, was established. The bank was owned and managed by the British-owned national bank of Egypt and was given a banking monopoly for fifty years, including the right to issue notes and coins (Gebre-Hiwor 1924, Belay, 1987 and Brown Bridge and Harvey 1998). However, three other banks were established during the next decade. The first 100 percent African owned bank on the continent, bank of Ethiopia replaced bank of Abyssinia in 1931. Bank of Ethiopia was also authorized to issue notes and coins and act as the government's bank. Unfortunately after few years of operation the bank was closed following the Italian invasion. Several Italian banks opened branches in Ethiopia during the occupation period. The state bank of Ethiopia was established in 1942 and become operational in 1943 (Belay, 1987 and Brown Bridge and Harvey, 1998).

A new banking law split the functions of state bank of Ethiopia in 1963 in to central and commercial banking, respectively, as National Bank of Ethiopia and commercial Bank of Ethiopia. Both were owned by government. The 1963 law allowed for other commercial banks to operate, including foreign owned ones provided that they were at least 51 percent owned by Ethiopians (Belay, 1987 and brown bridge and Harvey 1998). Following the law many other banks were established. In 1975, following the fall of the imperial government, there was a major change of economic strategy in the banking sector as it was seen in all other economic sectors. The new government aimed to create a socialist and centrally planned economy based on the soviet model. All privately owned banks were nationalized and concentrated in to commercial bank of Ethiopia. Then the main financial sector reform was to direct the government banks to finance greatly increased public sector (Brown Bridge and Harvey, 1998).

Even though economic liberalization began during the last years of the previous government, neither then nor in the statements of the successor government, did financial sector reform appear as a priority? The succeeding government was also very determined not to allow foreign banks into Ethiopia, even as minority partners with Ethiopian banks. The commitment for continued ownership of existing financial institutions was extremely strong (Brown Bridge and Harvey, 1998). However, in recent years measures are being taken to privatize the construction and business bank.

The main institutional changes proposed were very much less radical compared to elsewhere in Africa (Brown bridge and Harvey 1998). Among such changes were.

- Allowing private sector banks to operate, but only if owned 100 percent by Ethiopians;
- Restructuring the agricultural and industrial development bank (now development bank of Ethiopia) and Housing and savings Bank (now construction and Business Bank); and
- Giving greater autonomy in lending decisions to commercial Bank of Ethiopia.

3.3. Traditional Banking Market in Ethiopia

In developing countries like Ethiopia, economic regulations, for example, interest rate control has led to the growth of traditional and unregulated banking markets such as edir, ekub, credit union and micro finance, which are an important source of fund for both households and small scale business sectors. Such market becomes active under conditions of heavily regulated market, which held interest rate below market levels, this is 4% in Ethiopia. Recently, the market has declined as the awareness & educational level of the citizens are increase and the accessibility of the modern banks is increasing in most area of the country. As a result, the business is shifted from those traditional banks to modern financial institutions that offer substantially high return. It does not mean the role and contribution of those traditional financial institutions are decline, especially in the rural area of the country and lower income urban society. For example, it is expected that about 50-60% of small to medium scale business firms and households use those traditional banking market .Those banks use a sophisticated credit-rating system to reduce default risk. In this market, the average annual interest rate is higher than the modern market. It is expected about two or three times higher than the official rate.

Currently, this traditional bank becomes closely integrated with the modern financial institution. For example, a traditional bank makes saving deposit at a modern bank branch, which then extends a loan to the borrower who is designated by the depositor. Therefore, the traditional institutions earn saving deposit rate plus the spread rate from the borrower.

3.4. Problems with Ethiopian Banking Structure

There are a number of problems related to banking structure which are common to all developing countries like Ethiopia. Those are high operating costs, high inflation rate and little or no competition (Hanson and Rocha (1986). In Ethiopia the financial repression (which is rise with inflation) is raise bank cost ratio because it reduces the real size of the banking system and encourage non-price competition. The causes of these high operating cost (both interest and non-interest costs) are interest rate ceiling, accelerating inflation, and high and rising of reserve requirements. To be notice that, inflation if unanticipated,

is likely to be profitable for banks, because the banks will hold the deposits which are decline in real value on daily or even hourly basis due to losing of the purchasing power of the deposit fund and thereafter, the banks paying a relative small net interest rates after deducting inflation rate. The out come of this is high windfall profit, which if prolonged, will mask inefficiencies in the banking system.

The NBE directive NO.SBB/45/2008 statutory reserve requirement obliges banks to hold a proportion of their deposit balance (which is 15% of the total deposit) with national bank of Ethiopia. This reserve requirement is high relative to other country. The fund reserve in the national bank of Ethiopia is no earned interest, so it is a cost for the banks or a tax on financial intermediation. Because the higher the reserve ratio, the lower the available deposit fund to revenue earning activities.

The other banking structure problem in Ethiopia is related with arrears and delinquents loans, most of the problems arise, because of inadequate credit policies and asset portfolio management. As a result, it increased the default rate and non performing loan accounts. Those results are reducing the net return to savers and banks at same time, because they create a wedge between deposits and loans rate there by impairing financial intermediation. The other problem is related with the absence of some detailed and explicit documented lending policies. As result, it creates some difficulty to manage their risks and their senior managers are less able to exercise control over lending activities. This can lead to an excessive concentration of risk, poor selection of borrowers, and speculative lending. In Ethiopia lack of accountability is also a problem because of overly complicated organizational structures and poorly defined responsibilities. Generally, the financial sectors of Ethiopia is dominantly known by poor pay, political interface in management decisions and regulatory systems, which limits banks to prescribed their activities in delivering bank service to the society and limit the development of financial innovation.

There are remedies must take to improve the banking structure in Ethiopia. First, training and motivating staff should be given top priority, because human

resource is the most valuable asset in the sector. Second, the sector should open to foreign banks because entry of those banks can improve asset management of the banks and bank business operation by introducing latest technology to banking business. As a result, it can increase the efficiency and profitability of the sector. But this option in Ethiopia is politically unacceptable, because entry of those banks can limit the financial sector distribution to central part of the country, which is expected profitable to them, and discourage the development of local financial firms.

3.6 Current Structure of the Ethiopian Banking Structure

The structure of Ethiopia's financial sector mainly consists of the banking system, insurance companies and micro-finance institutions. At the end of fiscal year 2008; the number of banks reached 11 (eleven) including the newly established bank, Lion International Bank (2006/07) excluding the NBE. In terms of ownership, three banks, namely Commercial Bank of Ethiopia, Development Bank of Ethiopia and Business and Construction Bank are state owned while the rest are privately owned. The total number of branches reached 487, out of these branches; the Commercial Bank of Ethiopia alone took 196 branches (40.3 %) while all private banks accounted for 232 branches (47.6%). Despite such a move in branch expansion, Ethiopia remains one of the underbanked economies even in sub-Saharan African countries standard. The bank branch to population ratio for Ethiopia stood at 1:158,372 persons in the year 2008. The spatial distribution of bank branches indicates that 38% (185 branches) were located in Addis Ababa, the capital and business center of the country.

Like wise, the total capital of the banking system reached birr 9.3 billion at the end of June 2007, largely ascribed to the rise in the paid up capital of the Commercial Bank of Ethiopia. The share of state-owned banks from the total capital of the banking system was 68.5% and the share of the CBE was 47.2%. However, it is worthy noting that the share of private banks both in the banking branches and capital has shown an increasing trend (NBE's Report 2007/8).

3.6.1. Development in Interest Rate

The interest rate structure of the banking system has not shown any significant change in 2007/08. This was mainly due to the prevalence of excess liquidity in commercial banks. As a result, the simple average saving deposits rate remained at 3.08% which was close to the minimum deposit rate of 3.0%. Interest rate on fixed deposits, however, ranged between 3.94% for a maturing period of less than one year to 4.22% for those extending above two years. On average, banks paid 4.08% interest per annum on fixed (time) deposit, where as the average interest rate on demand deposit remain at 0.06%. The minimum and maximum lending rate also remain 7% and 14% respectively, average rate is 10.5%. In general, both fixed and saving deposits rate were negative in real terms taken in to account the 15.2% of the average annual core (non food) inflation. Lending interest rate, however, was positive at 3.7% in real term.

3.6.2. Resource Mobilization

Basically, the banking system mobilizes resources in the form of deposits, collections of loans and borrowings. Accordingly, total resources mobilized by the banking system reached 23.3 billion in 2006/07. Deposit liabilities of the banking system reached Birr 53.9 billion at the end of June, 2007 excluding lion and cooperative Bank of Oromia. Demand deposits accounted for 48.8% of total deposits followed by saving deposits (44.0%) and time deposits (7.2%) of the total deposits of the banking system, state owned banks accounted 67.7%. the share of commercial Bank of Ethiopia reached 64.6% and the share of private banks reached 32.3% in 2006/07 in deposits mobilization. Resources mobilized by private banks were increased from time to time; where as resources mobilized by state owned banks were decline. This is due to the expansion of branch networks by private banks.

3.6.3. New Lending Activities

The total fresh loans provided by the banking system reached birr 15.6 billion in 2006/07. The beneficiaries of these new loans were international trade (28%), domestic trade (19%), agriculture (16.9%) and housing and construction (10.8%). Another major

beneficiary was industry and transport sectors which received 9.8 and 9.2% of the total disbursement, respectively.

3.6.4. Outstanding Loans

Total outstanding credit of the banking system (including credit to the government) reached Birr 44.3 billion at the end of June 2007. Of the total outstanding credit, claims on the private sector (including cooperatives) accounted for 62.3% followed by claims on central government (29.9%). The portion of private banks tends to wind up from year to year. Sectoral distribution of outstanding loans reveals that credit to trade (i.e. both international and domestic) account for 23.1% while claims on industry and agriculture were 15.8% and 9.5%, respectively.

3.7. Banking Legislation and Supervision

In Ethiopia – Financial sector regulation and supervision are strategies that come along with the implementation of financial policy reforms. Banks are one of the heavily regulated financial institutions. There are four (4) objectives of regulations and supervision of banks operation.

1. To ensure the safety and soundness of banks and financial instruments.
2. To provide monetary stability.
3. To provide an efficient and competitive financial system.
4. To protect customers from abuses.

3.7.1 The Pre Reform Banking Sector Regulation

The NBE was granted substantial autonomy to oversee monetary policy using different instruments such as reserve and liquidity requirements on commercial banks and determine interest rate for various systems. These autonomy powers of NBE were disrupted in 1974, when the Derg come to power.

The monetary and banking proclamation of 1976, made the NBE to become the financial arm of the state, required to provide loans and advance to the government. And the NBE had been given power to control the operation of banks and other financial institution,

and to direct bank and other institution to deny credit allocation to private enterprises (Gebrehiwot, 1597). The controlling mechanisms during these period includes fixing both deposit and lending Interests, controlling foreign exchange and credit allocation in discriminatory manner, and restricting new entry to the sector.

3.7.2 The Post Reform Banking Sector Regulation

The new banking law (proclamation no. 84/1994) was passed in January 1994 and established the minimum capital requirement for starting new commercial banks to be birr 10 million and a capital adequacy ratio of 8% of risk weighed assets. Any applicant complying with the proclamation's provision might be granted a license. Now, the minimum requirements including educational background and work experience in banking sector that must be fulfilled by the applicants directors and senior management to approve the license.

In 1996, NBE established a new division to undertaken regulation and supervision. Its first task was to draw a set of guideline. These codify what is expected to banks and of NBE it self. Among its tasks NBE license and employed external auditors to prepare regular accounts for financial institutions. This is important, since private bank sector has not capacity in hiring external auditors and audits their financial statement.

There are two bank supervision mechanisms used by NBE to control the bank business activities. Those are off-site supervision and on-site examination.

i. **Off-site supervision**:-this is used to asses the liquidity and solvency position of the financial institution. off-site surveillance mechanisms requires banks to submit key financial data such as the composition of lending and the scale of non-performing loans on regular basis in order to identify all the risks to which banks are exposed. On the liability side, NBE's directive requires banks to maintain liquid assets of less than 15% of their total demand, saving and fixed deposits with less than one month to maturity. Banks must report their weekly liquidly position to NBE as to safe guard depositor.

ii. **On-site examination**:-this used to assess the financial and managerial conditions of the banks using qualitative and quantitative measures. The quantitative measure focuses on analysis of the bank's performances with respect to improving the quality of assets, maintaining capital at adequate level, profitability and liquidity positions. The qualitative measure focuses on determination of the general health of banks by assessing the adequacy of the operating policies and procedures, activities of the board and executive management and internal control system.

In general, these help us to recognize that banking industry has vital role in the economy. As stated above banking sector deposit mobilization and loan and advance have significant portion in gross domestic products of the country. Thus, examining the efficient allocation of financial resource is very important.

Chapter Four

4. Methodology and Data Source

The empirical study in this paper adopted two stages of analysis. The first stage involves measurement of the cost efficiency and profitability of private commercial banks operating in Ethiopia using parametric approach. As reviewed in chapter two, there are five techniques to measure the efficiency of financial institution and their branches. These techniques differ from one another base on the assumptions imposed on the data we use. These assumptions are

1. The functional form of the best practice frontier (in log or in linear function).
2. Whether it takes account for random error (uncontrolled factor that gives temporarily high or low output, input, cost or profit).
3. The probability distribution assumed for the inefficiencies and random error (half normal or truncated distribution).

These techniques can be categorized in to two approaches based on the assumptions mentioned above.

4.1. Non – Parametric Approach

Under this approach there are two techniques: Data Envelopment analysis (DEA) and Free Disposal Hull (FDH). These techniques ignore prices and account only for technical inefficiency in using too many inputs or producing too few outputs, it can't account allocative inefficiency in misresponding to relative prices in choosing inputs, nor can they compare firms that tend to specialize in different inputs. Because there is no way to compare one input with another with out the benefit of relative prices (Berger and Mester, 1997). These techniques also assume no measurement error in constructing the frontier and deviation from the efficient frontier is treated as inefficiency. Thus, these weaknesses would causes to overstate the inefficiency.

4.2. Parametric approach

This approach pre specifies the functional form for the best frontier and takes account of the random error. For example, a bank is said to be inefficient, if its costs are high or its profit are lower than the best practice bank after removing random error. Under this approach, there are three techniques: Distribution Free approach (DFA), Thick frontier Approach (TFA) and Stochastic frontier Approach (SFA).

In this paper we employed a parametric approach of stochastic frontier technique. The choice of this method in this study was for the following reasons.

- 1) It well corresponds with efficiency concept.
- 2) It is simple and widely used by researchers to measure efficiency and profitability of financial institutions and their branches.
- 3) It enables to measure both in technical and allocative inefficiency term.
- 4) It allows separating the random error from the inefficiency term; as a result, it avoids consideration of uncontrolled events as inefficiency.

4.3. Stochastic Frontier Approach

The stochastic frontier analysis (SFA):- is a parametric approach technique that used to measure and estimates the cost efficiency and profitability of any industry. This method, stochastic frontier analysis, is developed independently by Aigner, Lovell, and Schmidt (1977); and Measuen and Vanden Broeck (1977); Coelli, Roa and Battese (1980). The method did not consider the random error due to uncontrolled factors as inefficiency in measurement of efficiency and profitability. It is shown by many researches as best technique relative to other alternative technique to estimate and measure efficiency. In this technique a banks observed total cost and profit is modeled to deviate from the cost & profit efficient frontiers due to random error and X-inefficiency. The stochastic cost and profit frontier has the following form.

$$E_{it} = C(Y_{it}, W_{it}, Z_{it}, \Delta_{it}, \epsilon_{it}) \quad i = 1, 2, 3, \dots, I \quad t = 1, 2, \dots, T$$

$$\Pi_{it} = \Pi(P_{it}, W_{it}, Z_{it}, \Delta_{it}, \epsilon_{it}) \quad i = 1, 2, 3, \dots, I \quad t = 1, 2, 3, \dots, T \quad \mathbf{1}$$

Where, the subscripts i and t respectively refers to the i^{th} bank in period t ; and E measures total actual costs; Π -measures total profit (the difference between total revenue and total cost (both non interest & interest expenses)); C & Π are some functional form; Y is the vector of quantities of variable outputs, W is the vector of prices of variable inputs, Z - indicates the quantities of any fixed net puts(inputs or outputs), which are included to account for the effects of these net puts on variable costs owing to substitutability or complementarily with variable net puts i.e. technology, P is it the output price in the i^{th} bank in t^{th} period. μ is a set of environmental or market factors that may affect performance. The error term ϵ_{it} has two components and can be broken down as follows.

$$\epsilon_{it} = V_{it} + U_{it} \dots\dots\dots 2$$

Where, the U_{it} accounts for inefficiency factor that may noise above or below the best practice level. It is called X-inefficiency. This includes both allocative inefficiencies from failing to react optimally to relative prices of inputs, W , and technical inefficiencies from employing too much of the inputs to produce Y . V_{it} captures measurement error and chances that may temporarily gives banks high or low costs.

To simplify the measurement of efficiency, the error term ϵ_{it} (which comprises of the inefficiency and random terms (U_{it} and V_{it})) is assumed to be multiplicatively separable from the rest of the cost and profit function, and taking both sides of the first equation by substituting E_{it} with the right side of the second equation can be represented as

$$C_{it} = C(Y_{it}, W_{it}, Z_{it}, \Delta_{it}), \exp(V_{it} + U_{it})$$

$$\Pi_{it} = \Pi(P_{it}, W_{it}, Z_{it}, \Delta_{it}), \exp(V_{it} + U_{it})$$

Where $i = 1,2,3,\dots,I$ $t=1,2,3,\dots,T$ 3

These equations can be rewrite in natural log as follows

$$\ln C_{it} = \ln C(Y_{it}, W_{it}, Z_{it}, \Delta_{it}) + V_{it} + U_{it},$$

$$\ln \Pi_{it} = \ln \Pi(Y_{it}, W_{it}, Z_{it}, \Delta_{it}) + V_{it} +$$

Where $i=1,2,3,\dots,I$ $t = 1,2,3, \dots T$4

The stochastic frontier approach consists of two components: a deterministic part $\ln C(Y, W, z, \Delta)$ that is common to all producers, and producer specific random part $(V_{it} + U_{it})$. The producer specific X-efficiency is calculated using the method proposed by Battese and Coelli (1995). The model specifies X-inefficiency effects in the stochastic frontier model that are assumed to be independently (but not identically) distributed non-negative random variables. For the i^{th} bank in t^{th} period, the X-inefficiency effect, U_{it} , is obtained by truncation of the $= N \sim (\mu_{it}, \sigma^2)$ distribution, Where

$$\mu_{it} = \psi_{it} \delta \dots\dots\dots 5$$

Here ψ_{it} is a (IXM) vector of observable inefficiency factors, whose value is fixed constants. And δ is an (MXI) vector of unknown scalar parameters to be estimated. The above equation specifies that the means of the normal distributions, which are truncated at zero to obtain the distributions of the X-efficiency effects, are not the same, but are functions values of inefficiency factors used and a common vector of parameters (Coelli, Rao and Battese (1998)).

4.4. Model Specification

In this paper we employed stochastic frontier analysis to measure and evaluate the efficiency and profitability of private commercial banks operating in Ethiopia. Therefore, base on the methodology mentioned above to measure efficiency and profitability for private commercial banks operating in Ethiopia. The methodology can be more specified by Trans log function. Sometimes the Trans log function is called frontier- flexible function (FFF). It includes both standard Trans log and frontier trigonometric terms. These variable make the approximately function-closer to the truth path of the data whenever it is the most needed. Generally, it is believed that a good fit of data for estimating efficient frontier is important for estimating efficiency and profitability, because inefficiency are measured a deviation from these frontiers. Both the Trans log and the frontier-flexible function- provide the same average level and dispersion of efficiency and ranked the individual banks almost in the same order. The Trans log cost and profit function can be specified as follows.

$$\begin{aligned}
\ln C_{it} = & a + \sum_{j=1}^3 \beta_j \ln (Y_{jit}/Z_{it}) + 1/2 \sum_{i=1}^3 \sum_{k=1}^3 \beta_k \ln (Y_{jit}/Z_{it}) \ln (Y_{kit}/Z_{it}) \ln (Y_{kit}/Z_{it}) \\
& + \sum_{m=1}^2 \gamma_m \ln (W_{mit}/W_{3it}) + 1/2 \sum_{m=1}^2 \sum_{n=1}^2 \gamma_{mn} \ln (W_{mit}/W_{3it}) \ln (W_{nit}/W_{3it}) \\
& + \sum_{j=1}^3 \sum_{m=1}^2 X_{jm} \ln (Y_{jit}/Z_{it}) \ln (W_{mit}/W_{3it}) + \phi \ln \text{prov}_{it} \\
& + 1/2 \phi_{11} [\ln \text{prov}_{it}]^2 + V_{cit} + U_{cit} \dots\dots\dots 5
\end{aligned}$$

$$\begin{aligned}
\ln (\Pi + \theta) = & a_o + \sum_{i=1}^3 a_i \ln w_i + 1/2 \sum_{i=1}^3 \sum_{j=1}^3 a_{ij} \ln w_j + \sum_{k=1}^3 \sum_{m=1}^3 B_{km} \ln Y_m + \sum_{k=1}^3 \sum_{i=1}^3 \delta_{ki} \ln Y_k \ln w_i \\
& + v_i + u_i \dots\dots\dots 6
\end{aligned}$$

Where, E_{it} equals $C_{it}/W_{3it} Z_{it}$ and the subscript i and t represent that, the i bank during the t^{th} time period, C_{it} represents total expenditure of the bank (interest plus & non interest expenses), W_{mit} denotes input prices (W_{3it} price labor for the i^{th} bank during the t^{th} time period, W_{2it} price for the fixed assets and W_{1it} price for deposits and borrowing), Z_{it} is capital for the i^{th} bank during the t^{th} time period, Y_{it} denotes outputs (Y_{1it} total outstanding loans net of provisions, Y_{2it} gross foreign assets and Y_{3it} local investment share and provide represents provisions for bad debts of the bank during the t^{th} time period).

Under this function, it need to impose a parametric restriction-to make linear homogeneity and symmetric along the input prices. These restrictions are

i. Linear Homogeneity in Prices

$$\sum_{i=1}^3 \alpha_i = 1, \sum_{i=1}^3 \alpha_{ij} = 0, \text{ for all } i, \sum_{i=1}^3 \sigma_{\mu i} = 0 \text{ for all } i$$

Divided the total cost and inputs prices by one of these homogeneity restrictions to get price homogeneity among the input prices.

ii. Standard Symmetry Restrictions

$$\alpha_{ij} = \alpha_{ji} \text{ and } \beta_{km} = \beta_{mk}$$

4.5. Model to Split the Error Terms

Once the parameters estimates in SFA model are known, the next step is to obtain the procedure specification for estimating inefficiencies by splitting the error terms. The estimated E_i or $V_i + U_i$ are can obtain easily from the difference between the standard functions and the estimating actual results (residuals). But this residuals are composes of both $V_i + U_i$, So it needs to split the term to estimate on the inefficiency. Generally, it is clear that from the E_i there is U_i (inefficiency) what ever the value of V_i , because when the value of E_i is greater than zero the inefficiency value likely greater than zero. Accordingly, the conditional distribution of V_i given E_i could be exploited to estimate of the producer specific inefficiency. Therefore, the firms specific cost or profit efficiency estimation of bank i at time t , can be obtain by the mean of the conditional distribution of the inefficiency (μ_i) given E_{it} (Jondrow, Lovel Materv, Schinst (1982). Sometimes this technique known as *JLMs* technique, either the mean or the mode of this conditional distribution can be used as point estimator of inefficiency (Coeliet al, 1998). There fore, the JLMs techniques can be specified as follows.

$$\epsilon_i / \mu_i = \sigma(\phi(\epsilon_i \lambda / \sigma)) / 1 - \phi(-\epsilon_i \lambda / \sigma)$$

$$\text{Where } \sigma^2 = \frac{\sigma_\mu^2 \sigma_v^2}{\sigma_\mu^2 \sigma_v^2} \text{ and we have used paramatration } \lambda$$

There is also another alternative technique point estimator for producer specific inefficiency proposed by Betttes and Coelli (1988). The technique can be specified as follows.

$$\epsilon_i / \mu_i = \exp(-\mu_i) / \sigma_i = 1 - \phi(\sigma_A + rE_i / \sigma_A) / 1 - \phi(\gamma \epsilon_i + 1/2 \sigma_A^2)$$

$$\text{Where } \sigma_A = \sqrt{\gamma(1-\gamma)} \sigma_s^2 \quad \gamma \frac{\sigma_\mu^2}{\sigma_v^2}$$

Using these two techniques can compute the producer specific cost and profit efficiency.

These are

1. JLMS technique- using the following model

$$C_i = \exp \{- \epsilon_i / \mu_i\}$$

2. Betterse and coelli technique specified as follows

$$C\epsilon = \epsilon (\exp(-\mu_i) / \epsilon_i)$$

The second technique is the best prediction of inefficiency than the first technique. Under the second technique the value is range from zero to one. When the value is one, it indicates the firm is efficient. Where as when the value is zero, it indicates the firm is inefficient.

4.6. Time Varying Efficiency Analysis

This analysis involves the measurement of time varying inefficiency of the private commercial banks operating in Ethiopia in order to see and evaluate the impact of policy intervention and rule & regulation imposed by the regulatory body. It is important to know the behavior of the sector inefficiency over time (whether it is increase, decrease or constant). Bettels and Coelli (1992) proposed a time varying model that use to estimate the inefficiency effects in a stochastic frontier production function for panel data, which is defined by

$$\mu_{it} = (\exp(\eta(1-T))) \mu_i \quad i = 1, 2, 3 - -T$$

Where, μ_i is assumed to be iid (independent and identical distribution) as the generalized truncated normal random variable and η is an unknown scalar parametric to be estimated.

In speciation of the above equation, if the i^{th} bank is observed in last period of the panel, period T, then $\mu_{it} = \mu_i$, because the exponential function, $\exp(-\eta)(t-T)$, has value one when $t=T$. The random variable μ_i can be considered as inefficiency effect for the i^{th} bank in the last period of panel. For earlier periods in the panel, the inefficiency effect are the product of the inefficiency effect for the i^{th} bank in the last period of the panel and the value of the exponential function, $\exp(\eta(t-T))$, whose value depends on the parameter,

n, ε , and the number of period before the last period of the panel, $-\eta (T-t)$. If the parameter η is positive, the $-\eta(T-t) \equiv \eta(T-t)$ is non negative, so $\exp (-\eta (T-t))$ is not smaller than one, which implies that inefficiency fall over time. Conversely, if η is negative then the inefficiency increase over time.

4.7. The Second Stage Analysis

Once we have discussed the measurement method and specified our model, the next stage will be to explore determinate factor that affect bank efficiency and profitability. A number of empirical studies (example pitt, lee, (1988) and kaliragis 1981) have investigated the determinant of inefficiency among firms in banking industry by regressing the predicated inefficiency effect obtained from the first stage analysis to the vector of firm specific factors such as degree of competitiveness, input and output quality indicators, networking character (i.e number of branches), asset size, capital, ownership form, age, change in regulation and various management characters (colli, 1998, cited at celli et al, 1998) and (kumbhera, 2004). The main motivation in the second stage efficiency analysis is to design appropriate policies to improve performance of producer and to rectify the problem that causes efficiency.

However, a two step procedure has its own short coming. None of the variable in the regression is completely uncontrolled (exogenous) and endogenous (controlled factors) of any regression variable can bias the coefficient estimates on all the regression and also makes conclusion about causation difficult. But it can only provides suggestion

Bettese and coelli (1995) specifies inefficiency effect in stochastic frontier model that are assumed to be independently (but not identically distributed) non-negative random variable for the i^{th} bank in t the period. Inefficiency effect μ_{it} is obtained by truncation of normal distribution with mean, μ_{it} and variable.

$\mu_{it} = Z_{it}\delta + \epsilon_{it}$ where Z_{it} is a $(1 \times M)$ Vector of observation explanatory variable, whose value are fixed constant one. δ is a $(M \times 1)$ Vector unknown scalar parameter to be estimated, ϵ_{it} is a random component $\sim N(0, \sigma^2)$ or x-inefficiency variables μ_{it} can be express as follow.

$$\mu_{it} = f(\text{RoE, Capital. Asset size, Branches number, share of deposit, age, NPL, GDP, } \delta) + \epsilon_{it}$$

Where, ROE- return on equity, NPL-non performing loan, and GDP-Gross domestic product.

4.8. Source of data and choice of variables

The data for this study was mainly from various annual reports prepared by national bank of Ethiopia and reported to different concerned bodies. Besides, secondary data were utilized that obtained from different books, published and unpublished materials and articles.

4.8.1 Choice of Variables

The basic question in constructing model for efficiency and profitability are arises in the definition of input and outputs. So that, to estimate the best practice frontier, inputs and outputs are needed to be defined.

4.8.1.1. Defining and measuring out put: – like other financial sector, bank output are intangible and difficult to measure. Thus, the alternative way is to search measurable proxies that are highly correlated with the service that banking companies provided to the customers. There are three principal approach in financial sector which have been used to measure output namely, intermediaries approach (asset approach), user cost approach, and value added approach (production approach). The intermediate approach considers the financial service as pure financial intermediation that transforms the deposits in to loan, in this case the deposits are considered as input. The second approach (value added approach) is view

the banks as financial institutions using capital and labor to produce financial products like loans and deposit accounts service, and then deposits are to be considered as output (chakraberti and chawla, 2003). The user cost method treats financial products as inputs or out puts based on its contribution to revenue of the financial firm. This approach is not convenient for the banking industry. Because banking industry offer many type of services such as lending, deposits, and payment which are priced implicitly.

Hence, in this paper the intermediary approach is used to define the out put of the banks. Accordingly, in our model Loans, other investment and foreign assets are considered as out puts. So regarding the outputs we got the data on total outstanding loans of each bank (net of provision), the data for other investments is calculated by adding investments of the banks on T-bill and investments (in other domestic economic sectors) and foreign assets is calculated based on the monetary and financials statistics manual of IMF (2000).

4.8.1.2. Definition and Measurement of Input

In contrast to output, inputs are easier to identify and measure in banking industry since the units of measurement are tangible and directly observable. Following the previous in banking literature, this study categorized the banking industry inputs in to three inputs, based on the intermediary approach.

- i. **Labor input:** - labor is the most important input for banking industry. All previous studies on banking efficiency use labor as the main input. Labor input is defined as the total number of persons employed by the banking sector which includes clericals, senior accountant, management, supervisor staff, administration personnel and others. Wages (prices for the labor input) are calculated by dividing total employee salary and benefit expresses of the bank to number of staff (employees).
- ii. **Deposits input:** - the price for the input deposit are calculated by dividing total interest expenses by the sum of saving and time deposits and domestic borrowing. Here we excluded demand deposits from being a denominator for the calculation of prices deposits. This is done because interest is paid on demand deposits only by

few banks and these banks pay a very small rate compared to what they pay on saving and time deposits. In addition, for an account to bear interest there is a floor minimum balance to be met during a month. That means, current account (demand deposit) with a balance below an amount set by the bank during any one day of month cannot get interest. In reality for depositors with millions of birr balance in most days of the month it is possible to have a balance with hundreds of birr at least one day with in a month.

- iii. **Fixed Asset inputs (Business Service and Material Input)**- it consists of building, automobiles, stationary and printing, legal fees, advertising expense, cost of physical capital, rental expenses, cost of equipment and other small expenses. The price of the physical and equipment assets is calculated just by taking depreciation of the bank and for other fixed assets is computed by dividing total expenditure on these assets to consumer price index. This approach is consisted with Cummins and wlis (1998).

4.9. Efficiency Factors and their Source of Data

The data for these factors are obtained from National Bank of Ethiopia quarter report and other published and non published reports. The two stage regression models analysis the potential correlation of the x-inefficiency of profit and cost with these efficiency factors. These factors can be categorized into operational specific factor, market specific factors and Macro economic factors. Those factors have a marginal impact on x- inefficiency of commercial banks.

1. **Operational Specific factors**- these factors includes the following:

- i. **Return on equity:** - measures the profitability of bank in a sense of income to shareholder ratio. The higher the profitability of a specific bank implies a satisfactory performance of management. We infer an inverse relationship with x-inefficiency of cost and profit. The data for this variable got from the balance sheet and income statement of the commercial banks reported quarterly to NBE.

- ii. **Capital and Reserve:** taken as the sum of equity capital and legal reserve. This is used to absorb portfolio losses and an alternative to deposits funding source for loans. It also allows banks to lend more for single borrower, that is enable the banks to raise more funds by selling share, to earn more profit and to reduce transaction costs, so that the x-inefficiency of cost and profit is expected to have negative correlation with capital. The data is taken from the balance sheet and income statement of each bank reported quarterly to NBE.

- iii. **Asset:** is the total worth of the bank and expresses the overall size of the bank. Large banks (i.e. own more assets) have more managerial input in identifying, resolving inefficiency. So that cost and profit x-inefficiency will have inverse relationship with total capital. The data is taken from provisional balance sheet of commercial banks submitted to NBE on monthly basis (in million of Birr).

2. Market Specific factors:- These factors includes the following.

i. Number of branch (network):- branches are outlets that intermediation processes are taking place and products are delivered to customers. If a bank maintains various branch distributed through out the country's territory, it will attract more customers, mobilize more resource and maximize profit, provided that the branches are opened on adequate feasibility study. However, the cost of the bank would go up the more branches outlets it opened. Hence, x-inefficiency of cost has direct relations with number of branch while profit with x-inefficiency has inverse relation. The data for number of branches in each quarter is calculated based on the assumption that each branch begins operations one month after the license is issued by NBE and in this case a branch licensed during the last month of a quarter is assumed to begin operation during the coming month of a quarter. This happened because it was impossible to get data on the date the branch began to operate rather we get from NBE is the date it was licensed.

ii. Bank deposit to total bank deposit: - indicates the level and extent of deposit market share of a bank in the industry. Banks usually earn more profit, if they are able

to channel loans of various types to the different sector of the economy and collect them. At the same time, banks can incur more interest expenses as interest bearing deposits are increased. Thus, we infer positive correlation with cost and negative relation with profit x-inefficiency. The data is taken from the national Bank of Ethiopia quarterly reports.

iii. Non-performing loan (NLP): are loans whose arrears are reached higher level and an over due loan with less repayment probability or no repayment. Banks with more problem loans are likely to incur higher costs associated with extra monitoring and administration other sources of funds (Maggai et al, 2005). The main source of a large amount NPL is inefficiency practices of the banks. Thus, it has direct relationship with inefficient. There is some problem with this data, because the information is confidential. In this situation, we use the provision to bad loans instead of the non-performing loans. But it is not best substitute ,because the provisions is more of a function of the provisioning directive of national Bank of Ethiopia than that of total non-performing loans of the bank. In fact it has some relations. That is why we took it.

iv. Age: - shows the time a bank provide general banking service to customers. As the age of a bank increase, the management of the company becomes highly skilled and experienced to utilize the resource of the company efficiently. Hence, cost and profit x-inefficiency will have inverse relationship with age. The data for age is calculated by given 1.0 for a year and 0.25 for a quarter. That means a bank at its age of first quarter is given a figure of 0.25 and during the second quarter is given 0.50 balance and soon.

3. Macro-economy factors – The factor included under this category is

i. Gross Domestic Product Growth Rate:-once economic growth is sustainable and satisfactory, that country's financial infrastructure could be well established and uncertainty for investors also become less. This creates a favorable environment to the well performance of banking industry and growth to the real sector. Therefore, we predict a negative relation ship with x-inefficiency of cost and profit. The data is taken from the NBE annual report (2007/08).

Chapter five

5. Empirical analysis and interpretation

All data and information for the analysis are obtained from audited financial statements of all private commercial banks under sample and interview feed back of bank's officials (which is use to supplement the same qualitative analysis). Other source of information includes annual and quarterly bulletins of national bank of Ethiopia (NBE), various other bulletins, financial sector research working papers and financial Journals.

The computer program of frontier version 4.1 C is used to obtain information on maximum likelihood estimated parameters of stochastic frontier of cost and profit functions. The program was developed by coeli, (1996). There are two alternative versions in the program model specifications. Namely, the Bettlese and coeli, 1992 model for determining the time behavior of the cost and profit x-inefficiency of the commercial banks under the sample. The model is called "Error components frontier Model (ECFM)". The other program is Bettlese and Coelli, 1995 model which is used to estimate stochastic frontier and predict firm level x-efficiency. The model is called "technical efficiency effects frontier model- TEEFM". Using these estimated inefficiency results as dependent variable to regress up on firm specific inefficiency factors and environment factors. This is called a two stage estimation procedure.

5.1. First stage analysis (parametric approach analysis)

5.1.1. Hypothesis testing- here we test null (H) and alternative hypothesis of parameters to determine the cost and profit functions and predict inefficiency distribution that appropriately represents the data and the efficiency trend over time. Hence, the following paragraphs present the hypothesis test and their results.

i. Hypothesis test for selection of appropriate functional form

Under this first hypothesis test, we test whether the cost and profit function are stochastic function form or standard average response function form. That is, to test the null (H_0) and alternative (H_1) hypothesis in order to select the best model that better describes the data. The generalized likelihood ratio test is used. To be noted, this test statistics has a mixed chi-squared distribution and the critical value for a given level of significance is lower than that reported in the usual chi-square test (kmunbhakan and Sarkar, 2004 and coeli, Rao and Bettese, 1998).

Under the null (H_0) hypothesis $H_0: \gamma=0$, i.e. the model is equivalent to the average standard response function (OLS), which assume no x-inefficiency effect, $\mu_i=0$. The generalized likelihood ratio test is calculated using the following formula.

$$\mathbf{LR= -2 (L (H_0))-ln (L (H_1)) \text{ or } -2 (ln (2(H_0)/L(H_1))}$$

Where, $L (H_0)$ and $L (H_1)$ are the value of the likelihood function under the null and alternative hypothesis, H_0 and H_1 , respectively.

Table 1 (on page 4) below, presents the estimated parameters of the cost and profit function and the estimated parameters of the inefficiency function calculated by Battese and Coeli,1992, TEEFM. The estimated parameters are obtained from the quarterly data on private commercial banks for the period from fiscal year 1999/00 first quarter to fiscal year 2007/08 fourth quarter. The main focuses of the analysis here is efficiency, So that, the conventional practice of individual parameters estimates are not discussed, because the muticollinearity inherent in Trans log specification makes them difficult to interpret. But we can only note that the estimated coefficients are theoretically consistent and twelve out of the –two parameters of the Tran slog cost function & eleven for Trans log profit are significant.

As can be seen from table 1 on page 4, the log –likelihood function for the full stochastic frontier model are calculated. We found 29.06 and -19.86 for cost and profit functions respectively and the value for the OLS fit of the cost & profit functions are 21.27 and -15.73 respectively, which are much less than that of the full frontier model. This implies that the generalized LR –ratio statistic for testing the absence of the x-inefficiency effects from the frontier is calculated for both cost and profit function as follows.

LR=-2(21.27-29.06) =16.58 for cost

LR=-2(-19.86-(-15.73)) =8.26 for profit

The critical value of cost and profit are 2.67 and 8.13 for degree freedom equal to 9 for both cost and profit as shown in table 1 (kadde and palm, (1986). Therefore, 16.58 and 8.26 are significant because both exceed 2.67 and 8.26. Hence, our analysis overwhelmingly rejects the null hypothesis of no x-inefficiency effects in private commercial banks in Ethiopia. Thus the standard average responses function is not adequate for analyzing the cost and profit behavior of banks and a model is required. This implies that the stochastic frontier specification fits the data better than a deterministic frontier. Thus, the model implies that the performance of the banks is better analyzed with in a stochastic frontier framework. As a result, stochastic frontier function is selected to analyze the cost and profit efficiency of private commercial banks operating in Ethiopia.

Table 1: Final Maximum Likelihood Estimation of the Model calculated by TEEF

COST			PROFIT	
parameters	coefficient	t-ratio	coefficient	t-ratio
Beta 0	-0.216192	0.076012	-1.216192	9.1125876
Beta 1	0.161523	0.130845	2.1615230	0.2321458
Beta 2	0.312968	0.056855	0.3129684	-1.0132658
Beta 3	-0.283256	0.056622	-3.304597	-2.0387450
Beta 4	-0.136821	0.014895	-0.125691	-0.082235
Beta 5	0.638972	0.396356	0.0822318	0.0215467
Beta 6	0.545223	0.283018	0.3282771	0.4536212
Beta 7	-0.458969	0.256555	0.061582	0.0154897
Beta 8	2.781620	0.339234	0.048281	0.0203654
Beta 9	-0.198687	0.165691	-0.037789	-0.013254
Beta 10	0.079552	0.067513	1.252810	0.7325481
Beta 11	1.792343	0.054609	1.327873	0.3654897
Beta 12	0.014681	0.072437	0.618917	0.0035421
Beta 13	0.226475	0.027311	-1.327815	-0.5598762
Beta 14	-0.257881	0.198807	-0.027893	-0.0456872
Beta 15	-0.244833	0.022890	-1.455786	-0.0324587
Beta 16	0.085321	0.080535	-2.583940	-0.1325645
Beta 17	-0.125821	0.110474	-0.198522	-0.0034871
Beta 18	0.092418	0.030018	-1.456230	-7.1231564
Beta 19	-0.066223	0.029660	2.012752	1.5945623
Beta 20	0.114782	0.118719	2.456873	0.5235649

Beta 21	-0.123250	0.012278	-0.012587	0.0234267
Beta 22	1.568796	0.08735	1.2547631	0.0382564
Log likelihood	29.06		-19.86	
Ordinary east square(ols)	21.27		-15.73	
Number of restrictions	9		9	

Table-2:- Final Maximum Likelihood Estimates of the Model Calculated by ECF

parameter	Cost		profit	
	coefficient	t-ratio	coefficient	t-ratio
sigma-square	0.274563	3.271548	0.364521	0.264531
gamma (γ)	0.982415	7.25483	0.743675	6.435218
mu (μ)	0.181356	-1.458624	0.21513	0.443256
eta (η)	0.274658	1.542368	0.435286	0.498652

On table 2 above, the Parameter γ (gamma) indicates the relevance of stochastic frontier model specification. It measures the variation between observed cost and profit x-inefficiency and the best practice on the frontier. If the value of gamma close to zero, all banks in the sample produces their output with the available inputs in the same way i.e. there is no inefficiency operation practices among the banks. Where as, if the value is different from zero, there is an inefficient operation among the banks. So that, the acceptance of the null hypothesis $\gamma=0$, means that $\mu_i=0$ and that the x-inefficiency (μ_i) must be removed from the model. But as shown in table 2, $\gamma \neq 0$ this means, there is difference in operational practice among banks. The shares of inefficiency from the total variance of cost and profit function were about 94% and 73% respectively. This suggests that the variable error term or $(\mu+v)$ is explained much more by the variance of the component of x-inefficiency (μ_i) than by that of the random error term V. This reveals that the variation between actual value and the best practice on the frontier is due to x-inefficiency. These ensure stochastic frontier model as appropriate to represent the data to measure the cost and profit efficiency of private commercial bank in Ethiopia.

2. Hypothesis test of time varying inefficiency model

The null hypothesis (H_0) in this study is the inefficiency level of private commercial banks time invariant (constant). This happens when $H_0: \eta=0$, this means no change in the x-inefficiency effects over time, given the specification of the time varying x-inefficiency model. On the other hand, the alternative hypothesis is the inefficiency effects vary overtime, this occurs when $H_1: \eta \neq 0$, either positive or negative value. The positive value indicates the inefficiency effects decrease from time to time; where as the negative value indicates that the inefficiency effects increase from time to time. When we see the outcome in table 1, the value is positive for the cost function (0.19) and for the profit function (0.16). So that, the inefficiency effects has improved for cost and profit x-inefficiency in the sample period. Therefore, we reject the null hypothesis and accept the alternative hypothesis, even though insignificant t-ratio at 5% significant level.

3. **x- inefficiency distribution test-**: under this study the null hypothesis $H_0: \eta=0$, which specifies the stochastic frontier x-inefficiency effects is half normal distribution with non negative value and the alternative Hypothesis $H_1: \eta_i \neq 0$, which specifies the x-inefficiency distribution is truncated normal with negative value. As can be seen from table 2 above, the value of η for cost x-inefficiency is 0.18 and for profit x-inefficiency is 2.1. Even though these values are different from zero, they are insignificant t-test. Therefore, we accept the null hypothesis that state the inefficiency distribution for both cost and profit are half normal distribution and rejected the alternative hypothesis.

Table3, private commercial banks cost and profit x- efficiency scores calculated by TEEM.

Year	Cost x-efficiency(in decimal form)	Profit x-efficiency (in decimal form)
2000	1.45	0.71
2001	1.35	0.72
2002	1.26	0.67
2003	1.25	0.55
2004	1.20	0.66
2005	1.16	0.76
2006	1.12	0.79
2007	1.08	0.82
2008	1.04	0.84
Mean	$10.91/9=1.21$	$6.52/9=0.72$

Source: Author computation

On Table 3 above, shows the cost and profit x-inefficiencies of private commercial banks operating in Ethiopia under sample period. The first column is the sample period of years, the second column is the estimated cost x-inefficiency and the third column is the estimated profit x-inefficiency, calculated by TEEFM. At the bottom of the table, the average scored for cost x-inefficiency is 1.21 and for profit x-inefficiency is 0.72 relative to the best practice bank. These scores indicates that the private commercials banks under sample produced their output by using more additional inputs of 0.21 than the best practice bank and generating 0.28 less profit than the best practice bank. This means, that there is an opportunity for average bank to reduce their cost and improve their profit by 0.21 and 0.28 respectively with the available resource in the sample period. In other words, these scores indicate that how private commercial banks are

operating above or below the cost and profit frontier. This implies, a typical private commercial bank on average produce its product at a cost approximately 0.21 greater than necessary and generating a profit approximately 0.28 less than the best practice bank with the existing available resource in the sample period.

As can be also seen on table 3 above, the inefficiency trend over the sample period is not equal for cost and profit x-inefficiency. That means, the decline in the cost x-inefficiency is relatively better than that of the profit x-inefficiency, between 2000 and 2008. This indicates that the private commercial banks are comparatively better at managing cost than at generating profits. This may be due to management focus on cost minimization rather than on overall company performance to support the shareholder's best interest. In the case of profit, the average profit inefficiency score was 0.29 in 2001, this score declined over the year, with the lowest score of 0.16 in 2008, Where as in case of cost, the x-inefficiency score declining from a high of 0.45 in 2000 to .04 in 2008. So that, the x-inefficiencies trend of both cost and profit indicated that, the cost x-inefficiency improvement was better than that of profit over the sample period.

The results also suggest that the banks had a potential for reducing cost x-inefficiency by approximately 0.21, if they had effectively used their available resources in the sample period. In other word, they have the capacity to produce actual output with 0.21 less resource in the sample period. On the other hand, regarding the profit x-inefficiency banks had a potential to earn 0.28 more profit in the sample period, if they had effectively utilized the existing resources. Generally, private commercial banks had recorded little improvement in profit efficiency within the banking business environment in Ethiopia. They faced serious challenges between 2002 and 2005 and some what good environment between 2006 and 2008. In the first year's category, the average profit x-inefficiency of some private commercial banks reached above average i.e. more than 0.28. For example, Abyssinia bank recorded profit x-inefficiency 0.78 in 2002 and 0.74 in 2003, that is why the bank recorded losses in those years. This unexpected decline in profit efficiency of private commercial bank was due to various

factors. These factors can be categorized into bank specific and macro- environment factors.

1. **Bank specific factors-** The factors that influenced and affected the performance and x-inefficiency of private commercial bank related with firm specific factors during those periods were the following.

i. **Misalignment practices of banks-** it is well known that the alignment of resources such as human, financial, capital investment and technology and allocation of them in appropriate productive technology are keys for banks to be efficient and competent. Thus, to achieve this alignment, banks must have competent and skilled man power or they must heavily invest in senior managers having the required expertise. But most of the senior management and operational staff members have not the required skills and expertise to run the banking business smoothly and most of them also have no long vision to the organization, because they are temporarily workers they are employed not more than two or three years. So that, this made the existent of managers in the organization uncertain, they depend on the interests of broad of directors and top managements (chief executive & officers) for existence. As a result, almost all private commercial bank managers & operational staff members becomes unstable. These uncertainty and lack of skills and belongings to the organization reduce managers and workers motivation and commitment. This has a great impact on inefficiency of the banks.

ii. **Lack of internally developed production manuals and understanding of these manuals by management and operational staff.**

This is another factor which causes to increase the inefficiency of the private banks. Production process manuals consists of policies, rules, guidelines and operational procedures that are used to organize inputs (resources) and to consume them efficiently & effectively in the production process in order to accomplish a specific task of producing output. If these policies, rules and operational procedures are designed and implemented appropriately, it helps the company to identify the critical work design issues such as the efficient & effective production process path that add a great value to

the banks. In order to give such value to the organization the production manuals must be developed internally. That means, it must consider overall company culture, capability and resources. It must also be revised regularly as the business & other external environments change. However, private commercial banks have not clearly developed operational manuals to every activity, even if they developed for major operational areas, the manuals are not appropriately developed by considering the resource, capability and the overall organizational culture of the company. These manuals are also not revised for longer period of time and do not properly described each step of the tasks. As a result, they are not able to identify the defects timely before the production process was affected. Moreover, operational staffs do not properly implement the guidelines of the operational manuals. This is due to lack of appropriate control system and training to the operational staffs. For example, banks contribute greatly to economic growth by promoting capital accumulation through the supply of credit to individuals and other economic agents. To execute this task, banks need a good credit policy and procedures, which must be implemented by appropriate personnel. However, NBE directive shows that all banks have problems of resources allocation in the form of loan; this can be either inappropriate design of policy/manuals or in the implementation process of the manuals. As a result, great volumes of loans were found as non- performing loan that reduces the private commercial banks profit. This made banks in the sample to be profit x-inefficient in the sample period.

iii. Lack of good and productive human resource management practice

HRM practices are organizational matters/issues, which attract and retain employees; reinforce employee behaviors by motivation, incentive and penalties; and develop employee's skills by providing short & long term educational trainings. It is understood that a good architecture of this system provides a high level of framework and guiding principle for human resource management, while policies and rules bring this framework down to an operational level. Therefore, Human Resource management practice supports the profit generating activities of the banks and /or improves their efficiency. However, the private commercial banks operating in Ethiopia under sample period have not appropriately designed and implemented HRM practices due to complex organizational

structure without clear assign of responsibility & accountability to each task of production process. Lack of appropriate alignment of these practices for cost minimization and revenue generation contributes for cost & profit x-inefficiency of the bank.

iv. Lack Of internally Formulated and Managed Strategy

A well formulated Strategy helps the company to fit their capability and resources such as human, capital and financial of the company with the external environments. The alignment of the resources and capability with the external environments and business practices helps the private banks manager to focus on these resources & capabilities that bring a competitive advantage to the overall company efficiency and performance. As a result, it improves the cost & profit efficiency by eliminating unproductive operational activities and reducing wastage of resources. But most of the private commercial banks have no clear strategy to exploit the external opportunity and to defend the external threats. Hence, Lack of a well formulated and managed strategy contributed to the profit x-inefficiency of private commercial banks.

2. **Macro-environment factors-** the other factors that influenced & affected the private commercial banks profit & cost x-inefficiencies were related to macro environment factors. Those factors affected the whole banking business environment. The following macro-environment factors were contributed to the x-inefficiency of private commercial banks during the period under study.

i) **Action of Regulatory body:-** The national bank of Ethiopia is the regulatory body of all financial institution operating in Ethiopia including the banks. This regulatory body was established in 1964, to achieve favorable macro economy and to supervise & control all activities of financial institutions in Ethiopia in general, banking industry in particular through issuing directives. These directives issued regularly by NBE sometimes affected the efficiency and performance of the commercial banks. Some of the directives issued during that period affected the performance of private commercial bank negatively were the following.

1. A reduction of saving interest rate on saving accounts to 3%. In turn, all private commercial banks followed to cut on lending rate to compensate on saving interest rate reduction.
2. The NBE directive no. SBB/28/2002 enforced all banks to hold 100% provision for doubtful loans in four phases. This leads to increase the bad debt expenses account that reduces the private banks profit.

These actions had a significant impact in reducing the private commercial bank's return and made them profit x-inefficiency.

ii. Policy constraint and internal problems:- In Ethiopia the investment policy prohibit foreigner to invest on financial sector in general, bank sector in particular in the country. This policy, that prohibition foreign bank to participate in the country affected the competitive environment and growth rate of the industry. However, allowing these banks to operate in the country may improve the profitability and efficiency of the local banks by introducing latest banking technology such as internet banking and debit & credit card payment systems in to the country banking business environment. Hence, the banks and the community as well as the overall economy may benefit from the IT banking service. But currently in Ethiopia the issue is not politically acceptable due to the fear that the entrance of these banks in the country may complicate the management of the country monetary system and/or simply kill-off the domestic banks by severely limiting them to participate in the more lucrative activities such as international trade and corporate finance. With respect to internal problems the major one is lack of innovated and motivated financial management skills and non-commitment to management merit system also contributed to the profit & cost x-inefficiencies of private commercial banks in Ethiopia.

iii. Fall in world coffee price- coffee is the core source of foreign currency to Ethiopia. During 2003-2004 the price of coffee had adversely declined in the world market. This is due to unfair marketing system in the world market, for example, the largest coffee distributor; Star Bucks controlled the coffee market in united state & other western counties. This resulted in reduction of the coffee price unfairly. This had

an adverse impact on the coffee exporting countries foreign income, especially developing countries like Ethiopia by reducing their export's income. This also affected the banks income from foreign transaction and loan to foreign transaction.

iv. **Increase in world oil price.** This is due to increased worldwide demand in oil and an increased geo-political tension between the importer and exporter countries. This also negatively affected the Ethiopian economy by reducing export receipts and increased the import cost directly due to increased cost of transportation and this also affected the performance of commercial banks negatively by reducing their income generating from foreign transactions.

v. **Existence of unfair banking system in the country:** - in Ethiopia the banking system was dominated by government. For instance, all public enterprises that have large amount of fund and business transaction were allowed to deal only with government banks (CBE). This is unusual in an economy that advocates a free market system. This indicated that the existence of unhealthy competition in the banking industry. In such market system, government has unlimited power and intervened through policy distortion without any strong ground and reduced the profit of private commercial banks. As a result, these distortions created by the government's dominance in the bank market affected the performance of the private commercial banks and influenced the x-inefficiency of the banks. Therefore, Private commercial banks implicitly discriminated from the free market.

Other factors that contributed to the profit & cost x-inefficiency of private banks were the following

1. The Ethio-Eritrea boarder conflict that occurred between 2000 and 2002.
2. The sever drought that occurred in the country during 2003.
3. The world economic crisis after septeber, 11th terrorist attract on USA.
4. Absence of a relatively lucrative t-bill market at primary level to invest and a complete absence of secondary market in the country to raise additional capital.

5. Extremely narrow range of banking service products such as deposit mobilization, checking account, loan & advances, local transfer & foreign letter of credit facilities and safe custody.
6. Very large excess liquidity.
7. Low level of latest IT introduction and exploitation in executed banking service.

Factors that contributed for the recent improvement of private banks cost and profit x-efficiencies under the sample period were the following.

i. Favorable macro environment and economic growth

Recently the country scored above 11% of economic growth for consecutive five fiscal years. The agriculture sector contributed the highest rate to the economic growth with a share of 45% followed by manufacture and service industry with a share of 33% & 13% respectively. Due to the economic growth the per capital income and saving level of the citizens, and investment activities increased too. Consequently, the number and content of bank service users were increased. Hence, the banks profitability improved through generating revenue from loan, deposit and local transfer & payment services. Similarly the efficiency level of the banks was improved due to effective resource allocation and utilization through scale of economics.

ii. **Branch expansion:** - recently private banks expanded their service outlets (branches) through out the country's territory, most of the branches were opened based on a good feasibility study. This helped to mobilize their resources in the form of deposit, collection of loans and borrowing to different sector of the economy. For example, from the total deposit of 23.3 billion birr in 2006/07 the share of private banks was 32.3%, increase by 23.2% (NBE annual report). As a result, the private commercial banks profit & cost x-efficiency was improved.

iii. **Introduction of IT based banking in the banking business environment:** - recently some banks introduced modern banking technology in bank business environment. For example, dashen bank uses ATM (automatic teller machine) to deposit

and withdraw money. This helps the banks to utilize their resources effectively and efficiently. As a result, the banks operational expenses were reduced and at the same time their profitability was improved.

Table 4: Cost efficiency of private commercial banks in Ethiopia.

Rank	Bank	Individual cost x – efficiency (in decimal form)	Cost efficiency estimated relation to frontier
1	NIB	1.03	1.00
2	Dashen	1.06	1.04
3	United	1.11	1.08
4	Abyssinia	1.12	1.10
5	Wegagen	1.41	1.37
6	Awash	1.52	1.45

Source: Author computation

As one can see from table 4 above, NIB bank was the lowest cost x-inefficiency score than the other private bank in the sample period. This indicates that, NIB bank was the most cost efficient bank from the group, followed by dashen bank with a score of 1.06. In other words, NIB bank’s cost x-inefficiency was 0.03, while that of Dashen bank was 0.06. This implies, NIB bank had produced the existing outputs with only 0.03 more cost of inputs, while dashen bank produced its outputs with 0.06 additional costs of inputs than the best bank. That means, NIB and Dashen banks had the capacity to produce their outputs with less of 0.03 & 0.06 input costs respectively. The sources of this lowest cost x-inefficiency were the following.

NIB bank: - the source of lowest cost x-inefficiency scored by NIB bank was

- i) Well capitalization and better diversification of the bank asset portfolio. This implies that, the bank had reduced the risk of uncollectability of loans. As a result, the bank reduced the amount of doubtful loan expenses during the sample period.
- ii) Higher volume of healthy loans this is due to good credit policy of the bank.
- iii) Lower numbers of branch, most of them were opened based on a good feasibility study.

Dashen bank- source of lower cost x-inefficiency for Dashen bank was due to skillful and competent managers of the bank and good asset portfolio management practices that helped to minimize the cost x-inefficiency of the bank.

The above table also indicated that, Awash bank and Wegagen bank were the most cost inefficient banks compared to the best practice bank in the sample period. On average, the cost x-inefficiency scored by Awash bank was 1.52, while that of Wegagen bank was 1.41. In other words, the cost x-inefficiency of Awash and Wegagen bank were 0.52 and 0.41 respectively. This means, both banks incurred unnecessary additional cost of 0.52 and 0.41 respectively to produce their outputs. These inefficiencies indicate that wastage of resources in both banks. The main sources of those high score of cost-x-inefficiencies of both banks were the following.

Awash bank: - the main source of x-inefficiency of Awash bank were the following

- i) Rapid branch expansion:- the bank expand its branch to acquire market share by renting, purchase & construct buildings for branches offices. This resulted in high cost inefficiency, because higher amount of fixed assets were employed to expand the market share, which in turn increased fixed cost of the bank with out enough return to cover those fixed costs. That means, the contribution margin rate of the bank was low to cover the total fixed costs incurred for branch expansion.

ii) Misalignment practice of the bank managers:-the management of the bank lacks skills in formulating and managing a strategy that fit the resource and capability of the bank with the external environment and business practices. As a result, increased resource wastage practice in the bank. This in turn results the highest score of cost x-inefficiency.

iii) Lack of appropriate credit policies and assets portfolio management practices in the bank: - this results a large amount of doubtful loan account that reduced the bank's profit. This contributed to high score of cost inefficiency of the bank. For example. The bank held large amount of provision for doubtful loans in 2002 and 2003.

Wegagen bank: - the main sources of the highest cost x-inefficiency score of wegagen bank were the following.

- i. Unstable internal management and misalignment practice of the bank management in coordinating the company resource and capabilities with the corporate goals.
- ii. Lack of good credit policy and assets portfolio management practice of the bank lead to higher amount of bad debit expenses that reduced the bank's profit.

Table 5; present private commercial banks in Ethiopia according to profit x-efficiency (2007-2008) calculated by TEEF- Model

Rank	Bank	Individual banks estimated profit x-efficiency(in decimal form)	Profit x-efficiency estimates relative to frontier
1	Dashen	0.93	1.00
2	NIB	0.86	0.96
3	Wegagen	0.71	0.77
4	United	0.69	0.74
5	Awash	0.61	0.67
6	Abyssinia	0.59	0.64

Source Author computer

As can be seen from table 5 above, Dashen bank was the highest profit x-efficiency scorer (0.93) than the other private commercial bank on the sample period. This indicates that, Dashen bank was the best practiced bank (1.00) compared to the other private commercial banks operating in Ethiopia in terms of profit X-inefficiency relative to the frontier. The source of this result may be the following.

i) The organizational architects of Dashen bank had the capability of integrating various processes together to form a coherent structure. This means, the management had been aligning inputs with the strength of the bank and specifying its production function in a most efficient manner.

ii) The bank managers had transformed the inputs like human resource, financial, technological, capital and deposits into effective inputs and profitable outputs relative to other private banks in Ethiopia. For example, Dashen bank was relatively best in terms of credit allocation and income generating from the service it rendered to its customers.

As can be seen from table 5 above, Abyssinia bank was the lowest profit x-inefficiency scorer (0.59) than the other private commercial banks in Ethiopia in the sample period. Its mean profit x-inefficiency was 0.41. This means, the bank had lost 0.41 of its potential profit which would have been generated using the existing resources. In other words, it had a capacity to increase its profit by 0.41 without employing any additional resources. The main source of this lowest profit x-efficiency of the bank may be the following

i. The bank management was unable to align the company's resource such as human resource, capital technology and financial in to effective inputs and profitable outputs. For instance, the bank was dependent on few prominent borrowers and most of the loans were disbursed without collateral. This was the bank portfolio diversification problems that lead to record loss in year 2002, where the major borrower became delinquent borrowers due to various reasons.

ii) Internal management of the bank was unstable due to various reasons.

iii) The other source for high profit x-inefficiency of the bank was the adverse effects of NBE directives such as the higher level of provision requirement to doubtful loans and the cutting of the saving interest rate. There were also other factors influenced the profit x-inefficiency of the bank such as the NBE's imposition of sanction on the bank not to open additional branch offices and dividend payment to shareholders up to December, 2004.

In general, all those factors made the bank profit x-inefficiency to stand at 78% in 2002 and 74% in 2003.

As can be seen on table 5, Awash bank was the second highest profit x-inefficiency scorer (0.39). This means, the bank had a capacity to increase its profit by 0.39 without employing any additional resource. The source of this high score of inefficiency were from the inability of management in controlling expenses by renting expensive branch offices and acquiring buildings for branches expansion to acquire market share and lack of asset portfolio management and credit policy resulted in a large amount of doubtful expense account that reduced the bank's profit and transferred a large amount of fund to provision account for the doubtful loans security (annual report of NBE).

Second stage Analysis-

In order to give further insight into variation of cost and profit efficiency scores among individual commercial banks, a second stage analysis is conducted. Under this second stage analysis procedure, the estimated cost and profit efficiency scores computed in stage one analysis, taken as dependent variable and regressed against different factors that influenced and affected the efficiency and profitability of private commercial banks operating in Ethiopia. These factors can be categorized into macro economic factor, market specific factors and operational specific factors.

In this section, therefore, we discuss and identify the relationship of these factors with the x-inefficiency of the banks. As per the empirical literature and availability of data, these factors have a positive or negative impact on the x-inefficiency.

- Decision rule:** 1) if the regression coefficient of a factor is positive sign, the factor contributes to the x-inefficiency of the banks.
- 2) If the regression coefficient of a factor is negative sign, the factor contributed to the x-efficiency of the bank.

Table 6, correlation –coefficient of profit and cost x-inefficiency with inefficiency factors.

COST			PROFIT	
Parameters	coefficient	t-ratio	coefficient	t-ratio
δ_0	0.02435	0.02458	0.03258	0.03475
δ (ROE)	-0.2594	-2.1812	-0.04472	-1.9828
δ (capital)	0.1561	-3.3463	0.3597	2.6725
δ (Asset)	0.3256	-2.2355	-0.1246	-1.4956
δ (Number of branch)	0.3741	2.8912	0.0986	0.1678
δ (NPL)	0.3211	2.0129	0.0216	2.1594
δ (Deposit ratio)	0.01585	2.0527	-0.5020	3.5312
δ (Age)	0.0660	0.1187	-0.07352	2.5286
δ (GDP)	0.0132	-2.0520	0.36	0.2234

Source: Author computation

`Discussion on the relationship of the correlation coefficients with x-inefficiency factors

Table 6 above, presented the regression analysis of the average cost and profit x-inefficiency (dependent variable) of the private commercial banks in relation with efficiency factors of the independent variable. As the table above shows, most of the coefficients have the expected sign (+/-). The unexpected sign is also an indicator for the need of further examination.

The discussion of the resulted coefficient of the efficiency factors and their effect on x-inefficiency of cost and profit are presented as follows.

1. **Return on Equity**- this is an important factor that shows profitability of private commercial banks. The result from the table above indicates that the return on equity has an inverse relationship with cost and profit x-inefficiency, as hypothesized. This means, the increase or decrease in ROE has contributed in reducing or increasing the cost and profit x-inefficiency. However, the cost x-inefficiency was not statically significant. This implies that the profitability of the private commercial banks was not due to decrease in cost x-inefficiency .But it is due to excess demand for the bank funds (services) and the existence of weakened competitive environment. Generally, as the profit x-inefficiency decrease, return in equity will increase as hypothesized.

2. **Capital and Reserve**: - as can be seen on table 6 above, the correlation coefficient of capital is negative sign for cost x-inefficiency and a positive sign for profit x-inefficiency. This means, capital has an inverse relationship with cost x-inefficiency and a direct relationship with profit x-inefficiency. This indicates that banks with higher capital are more efficient than banks with low capital, because banks with large capital have a capacity of controlling cost inefficiency and a potential of absorbing a portfolio risk than banks with low capital, as hypothesized. This is consistent with moral hazard theory that

suggests managers of institutions closer to bankruptcy might be inclined to pursue their own interests. In addition, higher capital implies more fund is available to lend to borrowers without borrowing from other sources that require incurrence of additional costs. However, the sign of the result shows the correlation between profit x-inefficiency and capital is different from the hypothesized one. The private commercial banks had faced with a problem of high non-performing loans during the sample period. Moreover, NBE enforced these banks to hold more provision for doubtful loans to protect depositors. As a result, the private commercial banks prefer to increase their capital in order to strength the absorption capacity of risk loans and to reduced the transaction cost by lending more amount of loans for a single viable borrower. The profit generated from such customer is expected to improve the profit x-inefficiency and to reduce cost x-inefficiency by reducing transaction cost.

3. **Asset:** - this is also an important factor that influences and affects the x-inefficiency of banks. As indicated the result on table 6 above, the correlation coefficient of asset is negative sign for both cost and profit x-inefficiency. This implies that, there is an inverse relationship between asset size of a bank with cost and profit x-inefficiency. This means, as banks increase their asset level, they acquire more of managerial inputs that has a capacity of resolving inefficient operational activities of the bank such as modern banking technology in order to improve the cost & profit x-inefficiencies (i.e. cost minimization and profit generation). On the other hand, as asset level increase, major component of the asset, like loan and advance will also increase. If the disbursed loans quality is good, the banks can make more profit and allocates these assets more efficiently.

4. **Number of branch (branch network)**- as one can also see on tables 6 (page 21), the correlation –coefficient sign of branch network with cost and profit x-inefficiency is positive. The positive sign with cost x-inefficiency conform to the hypothesis. Where as, the positive sign with profit x-inefficiency does not. This unexpected sign result of profit x-inefficiency may be due to asset quality problem (that is, more non- performing loans). More of non performing loan makes the private commercial banks to hold more of

doubtful debit expense to their profit. This will cause these banks to be profit inefficient even though they have the greatest loan market share. While the positive correlation coefficient sign of branch network with cost x-inefficiency is due to branch expansion that causes banks to incur more cost for rent, administration and other contingent costs and management attention may divert from cost minimization to focus on to other routine administration activities. This increases cost inefficiency because of the direct relationship of cost and cost inefficiency.

5. Deposit ratio: – is the ratio of total bank deposit to total deposit of the industry. This is an indicator of the bank's capacity in resource mobilization from depositors to lenders. As shown in table 6 on page 21, the deposit ratio has a negative correlation coefficient sign for cost x-inefficiency. This is because commercial banks operating in Ethiopia (a country with less competitive environment) can raise additional deposits without incurring additional costs. As the total deposit is the sum of interest bearing (time deposit) and non-interest bearing (saving deposit) deposits, the total cost on these total deposits is insignificant (an average was 0.22 birr per deposit, 2007). This made cost of deposit the cheapest source of fund for banks. Where as, the correlation coefficient between deposit ratio and profit x-inefficiency is positive sign. This means, there is a direct relationship between profit x-inefficiency and deposit ratio. This does not conform to hypothesis. This implies, as the bank's deposit ratio increase, the profit x-inefficiency would also increase. This could be due to bad management practices in allocation of deposit in non profitable projects and to non-credit worthy customers. In the sample period, the reduction of profit due to imposing a high provision for doubtful loans was an empirical evidence of all commercial banks loans position in Ethiopia. This also reveals the problem on loan processing, and proper implementation of credit policy and procedures. Other factors that contributed to unexpected profit correlation sign result were the recession of the country economy (2002-2003) and NBE directives.

6. Non-performing loan (NPL):- is an important indicator of the level of risk of the banks. As shown on table 6 page (21), it has a positive sign for both cost and profit x-inefficiencies. This means, there is a direct relationship between NPL level with cost &

profit x-inefficiency. This is due to inadequate monitoring policy and low loan collection performance of banks. As a result, private commercial banks incurred additional costs for monitoring, Administration and reinforcing these loans that increase the cost x-inefficiency of the banks. The direct relationship of NPL and profit x-inefficiency may be due to poor asset quality (loan & advance). This implies that, there were more uncollectable loans in the sample period. As a result, the expected returns from such loans were nil (zero) and at the same time the banks were forced by NBE to hold provisions for these loans from their operating profit. These caused the profit x-inefficiency of the commercial banks to increase.

7. **Age**:-as can also be seen on table 6 above, the correlation sign for cost and profit x-inefficiencies were positive; this is in contrast to our hypothesis. This means, banks with longer ages are less efficient than those with shorter ages. This is contrary to the theory that bank production involves “learning by doing” (Mester, 1996). This might have resulted from the insignificant difference in age among the private banks. The main source of positive correlation sign of profit x-inefficiency with age was high employee turnover and lack of appropriate long term training to their man powers. As a result, the management and operational staff member of the banks were not developing skills and experiences to utilize resources efficiently and effectively as the age of the banks increase.

8. **Gross domestic product growth rate**: - as shown at the bottom line of table 6 above, the correlation coefficient for cost x-inefficiency was positive sign. Where as, for profit x-inefficiency was negative sign. This means, there is a direct relationship between GDP growth rate and cost x-inefficiency, not as hypothesized. This unexpected sign may be due to global and domestic economic recession as described before. The direct and indirect adverse effects of these events are costs to private banks. The negative relation of GDP with profit x-inefficiency conform the hypothesized sign. This suggests private commercial banks had made small profit in such sever constraints.

Chapter Six

6. Conclusion and Recommendation

It is well known that the major role of the financial sector is to pool financial resources from various sources and allocate them to different sectors that can utilize those financial resources effectively and efficiently. Within the financial sector, the major function of the banking system is to mobilize saving from the public and lend these savings to various sectors of the economy. Thus, the banking system plays a very crucial role in the pursuit of economic growth, which is a very prerequisite to poverty reduction and further development. The efficiency and profitability of this sector is critical and to be at the heart of the banking operation in order to contribute these roles effectively to the development of the financial sector and the economy as a whole. In other words, the banking sector contributed to the economy growth in general, financial sector in particular if efficiently and effectively provide different intangible products to different agents of the economy. Therefore, inefficiency or failure of this sector is a huge economy cost to the country economy. This could be evidenced from the current global economic crisis which its root cause is the failure of this sector.

This paper focuses on examining the cost efficiency and profitability of the banking sector in general and the private commercial banks in particular using a modern frontier analysis called stochastic frontier analysis (SFA) over a nine-year sample period. The SFA approach was adapted to measure the efficiency and profitability level of the private commercial banks operating in Ethiopia and to identify the factors that may influence the x-inefficiency of these banks. The data was obtained from an audited financial statement of private commercial banks and NBE annual reports over the period 2000-2008. After detailed analysis of these data we came up with the following conclusions and recommendations.

6.1. Conclusion

1. We test the null and alternative hypothesis of the cost function in order to identify the appropriate data representative function using generalized likelihood ratio test. The result obtained from this test enabled us to choose the stochastic frontier function, which properly represents the data. Hence, we reject the null hypothesis, which state the average standard response function that considered no cost and profit x-inefficiency.
2. Another test was conducted to know whether the inefficiency function is half normal with non-negative value or truncated distribution with negative value. Based on the frontier analysis, even though, we got a positive value of μ (mu), it is insignificant t-ratio. So, we reject the alternative hypothesis (truncated distribution) and accepted the null hypothesis, which predicated the inefficiency distribution of private commercial banks was half normal with non-negative value.
3. We also test the inefficiency trend of private commercial banks over the sample period. The result obtained from the frontiers analysis shown that, the η value was different from zero (positive value). This indicates that the inefficiency trend of private commercial banks was varied over the sample period. Therefore, we reject the null hypothesis and accept the alternative hypothesis. Because the η -value was positive, it showed the inefficiency of the private commercial banks was decreasing from time to time.
4. The result we got from the analysis indicated that Dashen bank was the most profit efficient operating private commercial bank in Ethiopia. NIB international bank, Wegagen bank, united bank and Abyssinia bank followed respectively. The highest score of profit x-efficiency of Dashen bank was mainly from the best management practices in aligning the resource of the bank with the business practices and goals.
5. The analysis result also indicated that NIB International bank was the most cost efficiency and became the best practiced bank interims of cost efficiency in the private commercial banking industry in Ethiopia. The main source of this highest cost x-efficiency score of this bank was from the smallest number of branch maintained, have a

good feasibility study procedure to open new branch and the higher amount of quality loans made:- this is due to a good credit policy and Asset portfolio management design and practice of the bank. Dashen bank, united bank, Abyssinia bank, Wegagen bank and Awash bank followed respectively. The main source of the lowest cost x-efficiency score for Awash bank was due to branch expansion out side Addis Ababa (the capital and business center of the country) to other area of the country with less of feasibility study.

6. The analysis of this study also found that the efficiency level of cost and profit of the private commercial banks were 1.45 and 0.71 respectively at the begging of 1999/00 fiscal year and 1.08 and 0.82 respectively at the end of 2007/8 . Its efficiency mean score for cost and profit were 1.21 and .78 respectively. These scores implied that, the private commercial banks under the sample incurred a cost of approximately 0.21 more than necessary and a loss of approximately 28% of their potential profits with in the sample period due to x-inefficiency. These indicated that the existence of an opportunity to all private banks to improve their cost and profit x-inefficiency if they utilized the existing resource efficiently and effectively with out employing additional resources.
7. Finally, the second stage analysis result provided the correlation of the operational specific, market specific and macro economic efficiency factors with the predicated cost and profit x-inefficiencies. The result indicated that the ROE, capital, Asset size, and deposit ratio have negative correlation with predicated cost x-inefficiency, while NPL and age have positive correlation. These result conform the hypothesized sign. But GDP and age with cost x-inefficiency, and capital, asset size and deposit ratio with profit x-inefficiency have positive relationship; do not support the hypothesis sign.

6.2. Recommendation

As we saw from the analysis and discussion in chapter Five, the main source of cost and profit x-inefficiency of most private commercial banks operating in Ethiopia under sample period were misalignment of resources such as deposit, capital investment, human resource, financial and technology with the corporate goals and business practices; lack of internal developed productive and understandable production manuals; lack of a good

design and proper implementation of HRM practices; lack of appropriate credit policy and asset portfolio management; and other macro environment factors. Therefore, the best strategy to improve or reduce the x-inefficiencies of private commercial banks are to minimize or eliminate the impact and effect of these factors on the banks overall performance and efficiency. Based on the result obtain from the analysis; we come up with the following recommendations.

1. The private commercial banks should design and properly implement HRM best practices, because a good HRM design and implementation helps the banks to utilize their human resource efficiently and effectively. So that, bank top level managers should focus and invest on the most valuable asset of the banks than in any other physical assets, because the competitive advantage emerge from this resource can not be easily copied by other competitors in the industry. To execute these, bank managers should provide Long and short term training to operational staffs regularly. Therefore, effective utilization of these resources supports the profit generating activities of the banks and improves their efficiency.
2. Private Banks should give high priority to their top managements because the success and failure of the company as whole depends largely on the skills and competency of these managers. To execute these, banks should design a good management development programs and promotion policies in order to motivate and increase their commitment in key area of the banks operation; by providing long and short term educational and other related trainings to enhance their skills and competency on formulating and managing strategies and achieving the objective of the banks. Therefore, these actions help to improve the cost and profit x-efficiency of the private banks.
3. The Banks should also develop and manage a strategy that fit the resource and capability of the banks with the opportunity and business practices. This helps to effectively align the different resources of the banks with the banks goals. The alignment of these resources with the goal of the banks helps to eliminate unproductive operational activities or reduction of wastage of resource in the banks. As a result, this also

contributes for improvement of cost and profit x-inefficiencies of private commercial banks.

4. They should also develop and implement policies and strategies to minimize the impact of external threats such as a strategy and policy to comply with government rule and regulations, for example NEB directive, government tax policy and labor union. Because the action of these external parties have a potential impacts on the operation of the banks and the overall environment of the banking business.
5. Private Banks should internally develop easily understandable and more productive production manual in their operations. They should also train their operational staff members in implementing these manuals. These production manuals should focus on customers because the performance and the quality of service they render depends on the feeling and response of these customers. These production manuals must also be revised timely as the demand of the customers and overall business environment are changing.
6. Private Banks should introduce modern technologies and business practices that have potential capabilities to support on utilizing the resources of the banks efficiently and generating sustained revenue to the banks. However, the private banks management must carefully identify the organization's needs for data processing as well as customers needs for the service before implementing the new technology. Management of the banks should also not take this as sole justification for internal data processing. Comparative feasibility study should precede any decision to develop an in-house system by providing training to IT staff.
7. Private Banks management should take more consideration and feasibility study for opening new branches, especially branches to open outside Addis Ababa (the capital and business center of the country) because branches open on this city expected more efficient than other area of the country. The following factors should consider in opening any branches such as need of banking services in the area, selection of site and other

relevant factors before opening new branch. Because branch expansion has an adverse effect on profit and cost efficiency.

8. The private commercial banks management must do a great effort to increase the capital level of the banks. Because large capital amount strengthen the risk absorbing capacity of the banks and increases their lending limits to single borrowers. Management could do this by selling additional shares to public or by taking some percentage of retaining earning every year. As a result, the private banks can improve their cost and profit x-inefficiencies by reducing transaction cost through lending to a single customer and generating revenue from the customer.
9. The Board of directors and senior managers of the private commercial banks must be skillful and competitive persons. Because the success and failure of these banks largely depends on the experience capability judgment and integrity of its Board of directors and senior executives. Therefore, the private banks should provide short and long term training to their BOD and senior managers in order to have the capacity of understanding the degree to which these banks are exposed to different risks such as credit risk, market risk, liquidity risk, operational risk, legal risk and reputation risk. At same time to have skills to design polices and develop techniques to reduce the impact of these risks on the performance of the company.
10. Government policy should focus more on increasing the level of competition in the commercial banks. Distortions created by dominance of the government in banking system must be removed. Public enterprises, which have large amount of fund and business transaction, have to be free to do business transaction with private commercial banks. More over, government must revise policy that forbids foreign banks entry because foreign banks entry may bring modern techniques and business practices. It may also stimulate the competition environment of the banking industry in Ethiopia.

Chapter Six

Conclusion and Recommendation

It is known that the major role of the financial sector is to pool financial resources from various sources and allocate them to different sectors that can utilize those financial resources effectively and efficiently within the financial sector, the major function of the banking system is to mobilize saving from the public and lend these savings to various sectors of the economy. Thus, the banking system plays a very crucial role in the pursuit of economic growth, which is a very prerequisite to poverty reduction and further development. So that, the efficiency and profitability of this sector is critical and to be at the heart of the banking operation in order to contribute effectively to the development of the financial sector and the economy as a whole. In other words, the banking sector contributes to the economy's growth by efficiently providing different intangible products to different agents of the economy. Therefore, inefficiency or unprofitable (failure) of this sector is a huge economic cost to the country's economy. This is evidenced from the current global economic crisis whose root cause is the failure of this sector.

Therefore, this paper focuses on examining the cost efficiency and profitability of the banking sector in general, the private commercial banks in particular using a modern frontier analysis called stochastic frontier analysis (SFA) over a nine-year sample period. The SFA approach was adapted to measure the efficiency and profitability level of the private commercial banks operating in Ethiopia and to identify the factors that may influence the x-inefficiency of these banks. The data was obtained from an audited financial statement of private commercial banks and NBE annual reports over the period 2000-2008. After a detailed analysis of these data, we come up with the following conclusions.

1. After testing the null and alternative hypothesis of the cost function in order to identify the appropriate data representative function using a generalized likelihood ratio test. The result obtained from this test enabled us to choose the stochastic frontier function, which properly represents the data. Hence, we reject the null

hypothesis, which state the conventional average modes that considered cost and profit x-inefficiency.

2. Another test was conducted to know whether the inefficiency function is half normal with non-negative value or truncated distribution with negative value. Based on the frontier analysis, even though we got a positive value of $K(\mu)$, it is insignificant t-ratio. So that, we reject the alternative hypothesis (truncated distribution) and accepted the null hypothesis, which predicated the inefficiency distribution of private commercial banks was half normal with non-negative value.
3. We also test the inefficiency trend of private commercial banks over the sample period. The result obtained from the frontiers analysis shown that, the value was different from zero (positive value) –so that, this indicates that the inefficiency trend of private commercial banks was varied over the sample period (null hypothesis). because the λ -value was positive it showed the inefficiency of the private commercial banks was decrease from time to time.
4. The result we got from the analysis indicated that Dashen bank was the most profit efficiency of private commercial banks operating in Ethiopia. NTB international bank, Wegagen bank, united bank and Abyssinia bank followed respectively. The highest score of profit x0efficiency of Dashen bank was mainly from the best management practices. The bank has shown its capacity in aligning the available resources with its corporate strategy.
5. The analysis result also indicated that NIB In'1 bank was the most cost efficiency and become the best practiced bank in terms of cost efficiency in the private commercial banking industry in Ethiopia. The main source of this highest cost x-efficiency score of this bank was from the smallest number of branch opened on feasibility study base and the higher amount of quality loans made; this is due to a good credit policy and Asset portfolio management design and implementation. Dashen bank, united bank, Abyssinia bank, Wegagen bank and Awash bank followed respectively. The main source of the lowest cost x-efficiency score for Awash bank was due to branch exposition out side Addis Ababa (the capital and business center of the country) to other area of the country with less of feasible study.

6. The analysis of this study also found that the mean level of cost and profit x-inefficiency of the private commercial banks were 0.25 and 74% respectively. These scores implied that, the private commercial banks under the sample incurred a cost of approximately 0.25 more than necessary and a loss of approximately 26% of their potential profits within the sample period due to x-inefficiency. These indicated the existence of a room to improve cost and profit x-inefficiency of private commercial banks without employing additional resources.
7. Finally, the second stage analysis result provided the correlation of the operational specific market specific and macro economic efficiency factors with the predicated cost and profit x-inefficiency. The result indicated that the ROE, capital, Asset size, deposit ratio and age have negative correlation with predicated cost x-inefficiency, while NPL and age positively correlated. These results conform the hypothesized sign. But GDP with cost x-inefficiency, and capital, Asset size and deposit ratio with profit x-inefficiency that have positive relationship don't support the hypothesis result.

Recommendation As we saw from the analysis and discussion in chapter Four, the main source of cost and profit x-inefficiency of most private commercial banks operated in the sample period were in alignment of resources such as deposit, capital investment, human resource and technology with the corporate business, lack of internal developed productive and understandable production manuals, lack of a good design and proper implementation of HRM practices, lack of appropriate credit policy and Asset partition management and other macro environment factors. Therefore, the best strategy to improve the x-inefficiencies are the following

1. The private commercial banks should design and properly implement HRM practices, because a good HRM structure helps to utilize the human resource of the banks efficiently and effectively. So that, these banks should focus and invest on the most valuable asset of the banks than in any other physical assets, because the competitive advantage emerges from this resource can not easily be copied by other competition in the industry. To execute this the banks should provide long and short term training to operational staffs regularly. Therefore, effectively utilizing of

these resources are supporting the profit generating activities of the banks and their efficiency.

2. Private banks should give high priority to top management of motivate and to increase their commitment in key area and issue the banks operation providing long and short term educational and other related trainings to chance their skills and comparatives on developing and managing strategy and on achieving the objective of the banks. Therefore, these actions are helps to improve the cost profit x-efficiency of the private banks
3. The Banks should also develop and manage a strategy that fit the resource and capability of the with the opportunity and business practices of the bank. This helps to effectively align the difference resources of the banks with the business practice. The align meant of these resources with the strategy of the banks are helps to eliminate unproductive operational activates and to improve of all lilies of service render to custom. As a result, it contrasted to improve the cost and profit.
4. They should also develop and implement policies and strategies to minimize the impact of external treats such as a strategy and policy to compliance with government rule and regulations, for example NEB directive gov't tax policy and working union. Because the activn of these external parties have a potential impacts on the operation negativity of the banks and the overall environment of banking business
5. They should internally develop understands and productive production manual and train their operational stats in implementing these manuals. These production manuals should focus on customers because the performance and the quality of service they render depends on the feeling and response of these customers. These production manuals must also be revised timely as the demand of the customers and overall business environment are change.
6. Private banks should introduce modern technologies and business practices that have potential capabilities to support on utilizing the resources of the banks efficiently and /or generating sustained revue to the banks
7. Private Banks management should take move consideration motives for opening new branches, need of banking services in the area, selection of site and other

relevant factors before opening new branch. Because branch expansion has an adverse effect on profit and cost efficiency.

8. The private commercial banks management must do a great effort to increase the capital level of the banks. Because large capital amount strengthen the risk absorbing capacity of the banks and increases their lending limits to single borrowers. Management could do this by selling additional shares to public or by taking some percentage of retaining earning every year.
9. The Board of directors and senior managers of the private commercial banks must be skillful and competitive persons. Because the success and failun of these banks largely depends on he experience capability judgment and integrity of its Body and senior executives. Therefore, the private banks should provide short long term training to their Body and senior managers in order to have the capacity of understanding the degree to which these banks are exposed to credit market liquidity, operational, legal and reputation risks also to have skills to design and approve all significant policies relating to risks arising from all activities.
10. Government policy should focus more on increasing the --- of competition in the commercial banks. Distortions created sy dominance of the government in banking system must be removed. Public enterprises, which have large amount of fund and business transaction, have to be tree to do business transaction with privet commercial banks. More over, government must revise policy that forbids foreign banks entry because forergh banks entry may bring modern techniques and business practices if also stimulate the competitive environment of the banking industry in Ethiopia.

However, the private banks management must carefully identify the oregano's needs for data processing as well as customers needs for the service before implementing the new technology management also should hot take this as sole justification for internal data processing. Comparative feasibility study should precede. Any diction to develop an louse system by providing explosive training, to IT staff (for example Abyssinia bank).

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Bank	Awash						Dashen					
Year	Interest income	Non-interest income	Total	Interest expense	Non-interest expense	Total	Interest income	Non-interest income	Total	Interest expense	Non-interest expense	Total
2000	50	14	64	20	21	41	48	19	67	20	29	49
2001	57	19	76	30	28	58	70	37	107	31	40	71
2002	61	20	81	29	33	62	77	38	115	36	40	76
2003	58	43	101	26	57	83	82	52	134	30	67	97
2004	68	56	124	30	59	89	117	75	192	41	73	114
2005	94	55	149	34	60	94	162	72	234	52	85	137
2006	137	91	228	48	69	117	242	125	367	67	115	182
2007	214.5	128.5	343	62	77	139	320	165	485	93	134	227
2008	251	172	423	106	113	219	420.07	249.75	669.82	162.15	175	337.15

BANK	United						Wegagen					
YEAR	Interest income	Non-interest income	Total	Interest expense	Non-Interest expense	Total	Interest income	Non-interest income	Total	Interest expense	Non-interest expense	Total
2000	8	6	14	2	7	9	26	19	45	14	24	38
2001	13	9	22	4	10	14	38	22	60	17	29	46
20002	17	7	24	6	11	17	42	20	62	20	30	50
2003	19	12	31	6	18	24	42	25	67	17	35	52
2004	27	19	46	11	25	36	66	44	110	18	47	65

2005	46	45	91	17	31	48	80	70	150	22	65	87
2006	71	55	126	29	37	66	120	100	220	35	91	126
2007	122	70	192	40	65	105	165	135	300	55	112	167
2008	171	108	278	63	91	154	238	192	430	90	151	241

Bank	NIB						Abyssinia					
Year	Interest income	Non-interest income	Total	Interest expense	Non-interest expense	Total	Interest income	Non-Interest income	Total	Interest expense	Non-interest expense	Total
2000	3	2	5	1	3	4	40	21	61	17	23	40
2001	19	13	32	5	9	14	72	17	89	27	27	54
2002	29	16	45	10	13	23	65	15	80	34	38	72
2003	37	29	66	11	36	47	62	19	81	27	46	73
2004	56	37	93	15	29	44	97	26	123	29	40	69
2005	83	52	135	24	45	49	105	47	152	33	37	70
2006	107	54	161	33	47	80	165	55	220	41	57	98

2007	147	61	208	42	60	102	202	65	267	60	112	172
2008	210	106	316	62	96	158	252	95	347	93	232	325

Year Bank	1999/00	2000/01	2001/02	2002/03	2003/04	2004/5	2005/6	2006/7	2007/8
Awash	663.78	1137.23	1497.44	1901.16	2385.16	3318.13	4475.82	5921.92	7239.92
Abyssinia	477.53	674.53	981.28	1223.95	1534.77	1737.99	2539.4	3119.94	3721.01
Dashen	810.97	1011.06	1270.68	1663.99	2210.50	2948.89	3733.54	4688.10	6079.72
NIB	0	185.31	375.8	779.93	1264.55	1792.27	2426.62	1973.80	2624.49
Wegagen	432.01	679.36	2499.78	5383.49	6917.91	748.37	959.05	1210.69	1769.8
United	85.25	170.74	236.44	348.56	585.53	811.05	1413.31	1834.10	2687.98
average	2469.54	3858.23	6861.42	11301.02	14898.42	11356.6	15547.74	18747.67	24122.0

Individual Private commercial banks total capital

Year Bank	1998/99	1999/00	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8
awash	55.57	94.26	113.78	127.36	147.24	177.5	226.80	304.32	433.87	597.15
Dashen	67.56	84.75	93.54	152.24	159.70	229.92	242.26	311.08	611.40	730.64
Abyssinia	41.92	123.37	174.33	173.02	174.83	208.58	268.36	406.8	418.74	522.05
NIB	0	40.87	70.71	139.05	139.05	189.55	265.23	313.43	420.13	602.10
Wegagen	58.17	57.75	60.13	101.57	91.31	145.59	189.26	256.84	401.71	606.88
United	25.14	40.87	62.90	66.20	91.78	96.11	124.76	193.22	358.96	467.36
Average	248.36	441.87	574.74	708.63	804.38	1047.25	1190.61	1786.12	2644.81	3526.1

Private commercial banks operating period

Bank	Awash	Dashen	Abyssinia	Wegagen	NIB	United
Age	12.75	12.25	11.75	10.5	9.75	9.25

Private commercial banks number of branch

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of Branch n	79	90	103	116	153	159	174	212	261

Individual Private commercial banks branch number

Year Bank	2004	2005	2006	2007	2008
Awash	31	34	36	45	53
Dashen	31	33	37	42	48
Abyssinia	19	22	26	28	42
Wegagen	25	29	33	39	40
United	14	17	22	30	36
NIB	13	17	20	28	42
Total	133	152	174	212	261

Individual private commercial banks deposit ratio (in percentage)

Year bank	2000	2001	2002	2003	2004	2005	2006	2007	2008
Awash	30	26	25	24	23	22	21	19	20
Abyssinia	21	21	22	19	16	16	16	16	16
Dashen	26	28	28	29	28	28	28	29	29
NIB	3	7	8	10	14	14	14	14	14
United	3	4	5	5	9	8	9	9	9
Wegagen	16	14	12	13	12	12	12	13	12
Mean									

Individual private commercial banks **Return on equity**

Year Bank	2000	2001	2002	2003	2004	2005	2006	2007	2008
Awash	22	16	7.4	14	24	25	28	29	33
Dashen	24	42	32	29	44	41	42	47	43
Abyssinia	17	25	6	5	27	31	26	29	32
Wegagen	14	24	19	16	34	35	34	37	36
NIB	4	27	23	16	29	28	31	30	33
United	11	13	7	8	10	42	25	28	29

Individual commercial banks Provision for bad loans

Year Bank	2000	2001	2002	2003	2004	2005	2006	2007	2008
Awash	18.5	23.5	44.3	72.7	80.4	9.16	16.1	11.3	8.23
Dashen	17.7	22.9	27	48	63	71	57	61	45
Abyssinia	7.8	18	38	62	73	61	53	64	59
Wegagen	6.6	15	20	29	42	51	39	43	49
NIB	-	0.6	3.5	22	30	47	38	31	42
United	0.5	1.3	2.5	7	15.5	23	28	24	31

Firm code	year	Loan net of provision	investment	Foreign bank deposit	Deposit	Labor	Fixed asset
1	2000	515	20	139	612	8	17
1	2001	691	10	192	914	11	18
1	2002	845	161	192	1270	14	22
1	2003	1218	152	245	1696	19	26
1	2004	1627	325	190	2291	23	39
1	2005	2160	28	446	2998	29	46
1	2006	3080	28	546	3921	41	60
1	2007	3889	28	647	5217	53	97
1	2008	4280	28	829	6662	73.24	94
2	2000	433	151	45	618	7	23
2	2001	542	54	104	773	10	29
2	2002	613	140	66	978	13	38
2	2003	766	319	100	1194	14	57
2	2004	873	340	116	1554	16	74
2	2005	1210	238	267	2012	22	75
2	2006	1780	201	367	2719	30	90
2	2007	2403	3	426	3308	38	100
2	2008	2611	134	532	4100	48	131
3	2000	59	25	29	87	1	3
3	2001	210	0	54	239	3	3
3	2002	320	0	96	387	4	5
3	2003	528	31	97	694	6	6
3	2004	756	81	92	984	8	7
3	2005	1086	2	200	1393	11	10
3	2006	1418	2	208	1593	17	31
3	2007	1755	3	249	1990	25	42
3	2008	2034	3	178	3208	36	43
4	2000	87	0	19	91	2	6
4	2001	133	0	25	134	3	7
4	2002	161	25	38	192	4	8
4	2003	283	0	70	291	4	9
4	2004	369	0	195	538	7	9
4	2005	570	0	290	873	10	11
4	2006	975	0	167	1237	14	14
4	2007	1368	0	468	1566	23	32
4	2008	1310	0	406	2463	34	34
5	2000	255	0	91	386	7	9
5	2001	329	0	56	468	9	9
5	2002	386	0	64	533	10	14
5	2003	542	0	140	722	11	15
5	2004	695	0	185	896	14	16

5	2005	951	0	350	1312	20	21
5	2006	1516	0	248	1835	31	25
5	2007	2060	0	702	2791	44	33
5	2008	2208	0	625	2939	55	41
6	2000	514	5	58	514	4	6
6	2001	669	5	84	683	6	12
6	2002	631	5	85	967	7	13
6	2003	747	5	141	1137	8	13
6	2004	889	5	123	1319	10	19
6	2005	1173	0	193	1717	13	35
6	2006	1902	0	203	2290	30	38
6	2007	2197	0	260	2857	35	41
6	2008	2567	0	295	3673	45	66