RELATIONSHIP BETWEEN MICROECONOMIC VARIABLES AND EFFICIENCY OF COMMERCIAL BANKS IN KENYA

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DECLARATION

STUDENT'S DECLARATION

I declare that this Research Project is my original work and has never been submitted

for a degree in any other university or college for examination or academic purposes.

Signature: …………………………………. Date:…………………………………

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SUPERVISOR'S DECLARATION

This Research Project has been submitted for examination with my approval as

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DEDICATION

I dedicate this research project to my family who have always been supportive and encouraged me to aim high.

TABLE OF CONTENTS

LIST OF TABLES

ABBREVIATIONS

CBK	-	Central Bank of Kenya
CRS	-	Constant Returns to Scale
DCF	-	Direct Credit Facilities
DEA	-	Data Envelopment Analysis
DMUs	-	Decision Making Units
EBRD	-	European Bank for Reconstruction and Development
GDP	-	Gross Domestic Product
IE	-	Interest Expense
II	-	Interest Income
MENA	-	Middle East and North Africa
MPC	-	Monetary Policy Committee
OEA	-	Other Earning Assets
OOC	-	Other Operating Costs
PTE	-	Pure Technical Efficiency
SE	-	Scale Efficiency
SFA	-	Stochastic Frontier Approach
SPSS	-	Statistical Package for Social Sciences
TD	-	Total Deposits
VRS	-	Variable Return to scale
WDI	-	World Development Indicators

ABSTRACT

In any economy, the financial sector is the engine that drives economic growth through efficient allocation of resources to productive units. During the last two decades, the banking sector in Africa and in the rest of the developing world has experienced major transformation in its operating environment. Commercial banks play an important role in facilitating the economic growth. In the microeconomic level they represent the tool by which the government monetary policy is applicable. The study sought to establish the relationship between microeconomic variables and efficiency of commercial banks in Kenya. This study adopted a descriptive research design. The target population for this study was all the 44 commercial banks in Kenya as at December 2013. The research obtained absolute secondary data from commercial banks' audited financial statements, banks administrative report and from the Central Bank of Kenya (CBK) for the years 2008-2013. Data Envelopment Analysis (DEA) was used to measure technical efficiency of the commercial banks where coefficients were calculated from the most efficient commercial bank that have the ability to produce maximum output from a given set of inputs. In this research, intermediate approach of DEA was adopted. This analysis was done using SPSS (V 21) software and the findings presented in form of a tables and graphs to aid in the analysis and with which the inferential statistics were drawn. The study found that the four independent variables that were studied, explain 65.4% of the efficiency of the commercial banks in Kenya as represented by the adjusted R^2. The study concluded that size, management quality and capitalization positively and significantly influenced efficiency of commercial banks in Kenya while credit risk adversely affected the efficiency of commercial banks in Kenya. The study concludes that size, management quality and capitalization positively and significantly influenced efficiency of commercial banks in Kenya while credit risk adversely affected the efficiency of commercial banks in Kenya. The study recommends that in future studies of microeconomic variables should be conducted in other sectors with less strict regulations on the privacy of audit reports and other relevant data for microeconomic variables. The study further recommends that there should be a policy set to standardize the presentation of financial statements commercial banks in Kenya. Further studies should be done on companies in micro finance institutions to find out whether the study will yield the same information.

CHAPTER ONE

INTRODUCTION

1.1 Background

In any economy, the financial sector is the engine that drives economic growth through efficient allocation of resources to productive units. During the last two decades, the banking sector in Africa and in the rest of the developing world has experienced major transformation in its operating environment (Andersen & Trap, 2003). In a number of countries, financial sector reforms have been implemented. In these reforms, the role of commercial banks has remained central in financing economic activities in the various segments of the markets especially in Sub-Saharan Africa.

Commercial banks play an important role in facilitating the economic growth. In the microeconomic level they represent the tool by which the government monetary policy is applicable. Bank deposits represent the most liquid form of money such as the mandatory reserves held by government, and hence can control the money supply in the economy. On the microeconomic level commercial banks represent the primary source of credit to most businesses and individuals (MakDonald & Koch, 2006).

In recent years, banks have become more demand-oriented and have modified their strategic plans toward cost reduction, profit and shareholder value maximization (Fiordelisi & Molyneux, 2006). Both external and domestic factors have affected its structure, efficiency and performance. An efficient banking sector is better able to withstand negative shocks and contribute to the stability of the financial system.

Therefore, it comes as no surprise that since the publication of the seminal papers by Aigner et al (1977) and Charnes et al (1978), both econometric (parametric) and linear programming-based (non-parametric) methods have been employed in the estimation of bank efficiency.

Bank inefficiency has generally been found to consume a large portion of funds and to be a great source of problems in performance. For such reasons, studies on efficiency and productivity of banks are extremely valuable both for policy makers and for bank executives. According to the Central Bank of Kenya Act, one of its primary roles is to foster liquidity, solvency and a proper functioning stable financial system. This legislated function essentially implies a stable and efficient financial system that underpins intermediation process for economic growth and development.

The banking sector, across the globe, has experienced profound changes over the past two decades or so. Globalization, deregulation, financial innovation, and automation have been major forces leaving their impact on performance of the banking sector, Kenya being no exception. Such advancements pose a challenge for commercial banks in Kenya to control their costs, maximize revenues, and line up across efficiency frontiers. The concern becomes more obvious with an increasing trend towards competition among banks both locally and in the region. The drive to control costs and maximize revenues by banks is well reflected through improvements in efficiency and productivity over time. These objectives also become socially optimal since they help in rationalizing the financial costs of transaction and intermediation within the society.

1.1.1 Microeconomic Variables

Banking efficiency can be influenced by factors that can be controlled by the banks, as well as by factors that are not under the control of the banks. Controllable factors include everything related to management of inputs and outputs or transforming inputs into outputs. Bank size is generally introduced to account for existing economies of scale in the market banking. The relationship between size and efficiency is an important part of the firm's theory. Since larger banks are more able to realize economies of scale and reduce the cost of gathering and processing information (Dietrich & Wanzenried, 2011), the bank size should be positively associated with its efficiency. However, extremely large banks might illustrate a negative relationship between size and efficiency. This is due to agency costs, the overhead of bureaucratic processes, and other costs related to managing large firms (Pasiouras & Kosmidou, 2007).

Given by international prudential regulation, capital ratio was considered as an important tool for assessing capital adequacy and should capture the general safety and soundness of banks. Consequently, highly capitalized banks might reduce their funding costs, which affect positively their efficiency. By the other hand, highly capitalized banks usually have a reduced need to external funds, which has again a positive effect on their efficiency. However, if we consider the conventional risk-return hypothesis, we have to expect banks with lower capital ratios to have higher efficiency in comparison to better-capitalized financial institutions. Bourke (1989) report a positive and significant relationship between capital adequacy and efficiency. He concluded that the higher the capital ratio is, the more the bank's efficiency is. Kosmidou et al., (2005) confirm a positive and highly significant relationship between

the equity ratio to total assets and efficiency. However, Dietrich and Wanzenried (2011) find no significant crisis in Switzerland. Nevertheless, it has a negative and significant impact on bank's efficiency during the financial crisis 2007–2009. Again, anticipating the net impact of changes in this ratio is complex.

While some studies considered the overall bank risk as a determinant of their efficiency, other studies focus on one particular and major risk affecting bank efficiency, such as the credit risk. In the literature on bank efficiency, the bank loans over total assets ratio is mainly used as a proxy for credit risk when data do not permit the calculation of the non performing loans (Maudos and De Guevara, 2004). Delis Dietrich and Wanzenried (2011) was the first study approximating credit risk or credit quality by the Loan loss provisions over total loans ratio. Bourke (1989) and Molyneux and Thornton (1992), among others show that the level of credit risk tend to be negatively associated with bank's efficiency. Miller and Noulas (1997) suggest a negative relationship between credit risk and efficiency. This result might reflect the fact that the higher the loans-to-assets ratio (as a proxy for credit risk) is, the more financial institutions are exposed to high-risk loans and by far the greater accumulation of nonperforming loans will be. However, Kosmidou at al. (2005) and Fernandez (2007) provide the evidence that credit risk affect positively the bank efficiency.

In addition, many researchers include management quality as a specific-bank factor affecting their efficiency. Theoretically more competent management in banks is expected to be more efficient (Goddard et al., 2009). A further bank-specific variable is the ownership of a bank. According to Micco et al. (2007), in developing countries, state-owned banks tend to have a less efficient than privately owned banks. Iannotta et

al. (2007) report a similar result; government ownership of banks is negatively related to bank efficiency. On the contrary, the results of Bourke (1989), Molyneux and Thornton (1992) suggest that ownership type is irrelevant for explaining efficiency. Authors find a little evidence to support the theory that state-owned banks are less efficient than privately owned ones. However, we can notice that ownership structure is always measured in empirical literature by a dummy variable that take a value of one if bank is publicly owned and Zero otherwise.

1.1.2 Efficiency in Banks

The concept of efficiency as a performance indicator began to formalize in the early works of Edgeworth (Edgeworth, 1881) and Pareto (1927), and recorded its empirical implementation in the book of Shephard (1953). Regarding banks, the standard view of efficiency measurement in ratio analysis can be misleading as the cross-sectional differences in inputs and outputs combinations and their prices are not properly accounted for. Moreover, the interpretation requires great caution and extensive knowledge of the local bank conditions. In 1957, Mr. Farrell was the first to propose a measure of firm efficiency in terms of the frontier analysis, which is believed to provide an objective numerical efficiency value and ranking of firms. From this occurrence, researchers developed a number of different methodologies applying frontier approach. However, the estimated efficiency scores including the exact definition of certain frontier estimation characteristics differ throughout the studies.

Efficiency of the banking system is essential especially in developing countries because the banking system serves as the nerve for overall financial development in terms of economic growth at the macro level (Andersen and Trap, 2003). This is

because an efficient banking system will help to boost national income and wealth. Consequently, it would be able to encourage depositors to make more deposits and as a result encourages monetary advancement.

Improvements in efficiency and productivity gains can be considered as one of the goals of a firm in a competitive market. Therefore, measurements of efficiency and productivity gains provide supplementary information about the firm's performance. These measurements can be considered as non-financial performance indicators as they consider all of the contributors to the firm's performance. In any organization, whether profit-oriented or not, measurements of productivity help to analyze efficiency of resource use in the organization. Moreover, productivity indices help to set realistic targets for monitoring activities during an organizational development process by highlighting bottle-necks and barriers to performance (Farhana, Shabri and Rossazana, 2013).

1.1.3 Microeconomic Variables and Bank Efficiency

The importance of efficiency measurement in the financial sector is related to the extremely extensive impact that an efficient financial system has on the microeconomic as well as microeconomic level (Emrouznejad and Anouze, 2010). Financial sector deeply affects the allocation of financial resources, helping to find their best productive employment in the most effective way, reducing misallocation and unnecessary wastes.

In order to properly allocate economic resources, the financial system, banks included, needs to be efficient. Efficiency in banking then supports the fruitfulness of implemented microeconomic policies, generating durable development, economic

growth and welfare (e.g., by reducing the transaction costs). Recent trends in the market development of the banking industry include the growing demand for banking services and financial activities on the large international scale, cumulative impact of the fast technological development, decrease in regulation of the sector and interventions and also an increasing competition on the market (Angelini and Cetorelli, 2003).

Regulatory weakening gave a starting point to the emergence of acquisitions and mergers, creating larger institutions utilizing the scaling effect especially on the cost level. On the other hand, banks striking against wider competition face a decrease in average profits. Bank management is therefore struggling for an enhancement of efficiency, while regulators and lawmakers have to ascertain the efficiency before globalization of the market. Banks have to design their strategic moves with respect to many variables to survive, prosper and be rewarding, so that their politics and interests involve interests of the regulators, lawmakers, supervisory and antitrust agencies (MakDonald & Koch 2006). Both managers and external decision/law-makers need to have the accurate information about the effects of their acts on performance of these institutions.

1.1.4 Commercial Banks in Kenya

The Kenyan financial system comprises banks, non-bank financial institutions, insurance companies, microfinance institutions, stock brokerage firms, fund managers. The banking industry with asset base of over Kshs. 1.3 trillion is the largest sector in the Kenyan financial sector. With a limited and under developed capital

market, the banking sector plays pivotal role in intermediation process between savers and investors.

In recent times there has been serious contention between the Central Bank of Kenya Monetary Policy Committee (MPC) and the players in the banking industry on the high spread between lending and deposit rates. Such high spread is indicative of intermediation inefficiencies (Sologoub, 2006). In the Kenya context, the significant reforms initiatives undertaken, such as operationalization of credit reference bureaus, payments system improvements, operationalization of Microfinance Act and activation of horizontal repos presents opportunities for enhanced banking sector performance. These reforms are hinged on three key pillars of the Kenyan financial sector as envisioned in the Vision 2030 (the Government's Economic Blue Print) - Efficiency, Stability and Access. Thus, for Kenya to realize Vision 2030, the banking sector's efficiency is a critical element that remains the cornerstone of the targeted economic growth trajectory. In his speech at an official branch opening of a Kenyan bank, the Governor of the Central Bank of Kenya, appealing to banks on service delivery states: ...explore ways of enhancing efficiency in service delivery. By enhancing efficiency, banks are capable of offering more affordable banking services. This has the potential of drawing a larger number of Kenyans to the financial system resulting in an expandable banking clientele.

1.2 Research Problem

Banking sector efficiency is important for promoting access to financial services as well as stability of the banking sector as integral component of the financial system. Banks play essential role in the proper functioning of payments systems and their

efficiency is directly related to improved productivity in the economy (Ikhide, 2009). It becomes increasingly difficult to evaluate economic entities based on reported financial statements because managers can manipulate them to disguise potential problems (MakDonald & Koch 2006); therefore this study provided different approach to analyze banks' efficiencies. DEA is receiving increasing importance as a tool of evaluating and improving the performance of service operations. It has been extensively applied in the efficiency measuring and benchmarking of schools, hospitals, bank branches, production plants, etc (Charnes et al., 1994), the model could identify new problems in operation and new insights to improve efficiency.

Owing to importance of banking sector efficiency to microeconomic stability, a number of country specific studies on banking sector have been undertaken with mixed results. While a bulk of the studies focused on the developed economies, a handful of studies have been undertaken in the African context. Notable examples are: South Africa (Ncube, 2009), Tanzania (Aikaeli, 2008), Namibia (Ikhide, 2008; Adongo, Stork and Hasheela, 2005). Kiyota (2009) examined efficiency of commercial banks in 29 sub-Saharan African studies. Although there is a growing body of literature that focuses on efficiency and productivity gains, market structure and the performance of banking industries in other countries (Casu & Molyneux 2003; Chakrabarti & Chawla 2005; Girardone, Molyneux & Gardener 2004; Hondroyiannis, Lolos & Papapetrou 1999; Maudos & Pastor 2002), no major study has been conducted in Kenya.

Commercial banks are concerned with their operating efficiency since financial development is no longer tied to a certain economy but indeed guided by universal guidelines. The performance of commercial banks in Kenya depends on how efficient

they are so that they can cover all expenses as well as give something back to their stakeholders. The major concern by the various stakeholders who have interests in these banks is whether they are operating efficiently. Given the important role that they play in any economy, it is therefore crucial to understand efficiency and its determinants so that management knows how to improve efficiency and bank performance. However, if the determinants of efficiency are not properly enhanced, then commercial banks will be unable to adequately advance loans and other services to customers, and this will have an adverse effect on efficiency. If this extends over a long period of time, the eventual result is liquidation.

Locally, Kyalo (2002) did a study on capital allocation and efficiency of banking institutions in Kenya the case of quoted banks at NSE, Muhoro (2005) conducted a study determining the efficiency of the foreign exchange market in Kenya, Nzioka (2007) did an empirical study of the relationship between managerial skill & technical efficiency of commercial banks in Kenya, Njuguna (2008) reviewed the empirical analysis of the commercial banks efficiency and stock returns in Kenya, Gituto (2009) studied the relationship between efficiency and growth of commercial banks in Kenya while Wambugu (2011) did a study on the impact of information communication and technology on cost efficiency of commercial bonus in Kenya. None of these local and international studies have focused on the relationship between microeconomic variables and efficiency of commercial banks in Kenya. This study therefore sought to answer the question: What is the relationship between microeconomic variables and efficiency of commercial banks in Kenya?

1.3 Research Objective

The study sought to establish the relationship between microeconomic variables and efficiency of commercial banks in Kenya.

1.4 Value of the Study

The findings of will be important to various stakeholders in the financial sector because it will provide an insight into the determinants of efficiency. Since there is no well-developed capital and debt market in Kenya, the majority of the investments and savings are through the banking system, and for the public interest, it is valuable to find out Technical Efficiency of each bank and for the banking sector as a whole.

The banking system in developing countries like Kenya is facing increasing competition due to globalization of the financial systems, so it is important for the banks to realize the factors of challenge and means to respond to them. Assessing banks' efficiency would help managers to examine the success of their managerial decisions; to better understand their management effectiveness and provides them with valuable reference for improving their performance.

The impact or the pass-through of the Central Bank policies depends on the competitive structure and efficiency of the banking system, the study will help in assessing the banking sector efficiency and the sources of inefficiency that will provide a helpful insight to CBK with this regard. On the other hand, it will help policy makers to develop a strong and healthy environment for the banking sector by examining the impact of economic and financial reforms that have been taking places.

Investors want to see how well a bank is performing before potentially investing in it. A high stock price alone is not enough to measure; they have to see how well a bank

is performing too. Therefore, for a bank to survive and succeed, managers should learn the status of their efficiency and how it is compared to their counterpart in same country or other countries. Hence, to learn the suitable financial decisions that attain better allocated financial resources in a more efficient and effective manner, it is important to assess bank efficiency at country and/or cross countries level.

The information so obtained would be useful to the Government and research institutions that may want to advance the knowledge and literature on efficiency. It will also add to literature on the subject as reference material and stimulate further research in the area. To find out new insights on banking activities evaluation, new approach other than the conventional approach (financial ratios analysis) and to help in the proper merging between the two approaches whenever possible. In other words, to add knowledge to the science of banking evaluation and analysis especially in Kenya.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter covers literature review of the main variables of the study. In particular literature review has been done and continues to be done on the subject matter. The theoretical and empirical underpinning of relationship between microeconomic variables and efficiency of commercial banks is covered in this chapter. In addition a summary have also been provided at the end of the chapter.

2.2 Review of Theories

2.2.1 Neo-Classical Theory

The concept of technical efficiency derives its basis in the neo-classical theory of the firm and assumes profit maximizing behaviour. A firm or a bank may be technically inefficient for technical reasons such as low training or low human capital levels of managers and workers, or the use of inferior or out-of-date technology. The diffusion of new technology is not instantaneous and some firms or banks may lag behind others in the acquisition and utilization of new technology. With further training and updating of capital, the firm or bank can expect to move towards the efficient frontier (Cooper et al., 2003). X-inefficiency is not caused by the variability of skills or the time variability of technology diffusion but by the use and organisation of such skills and technology.

The production approach recognizes that a bank is a producer of a range of financial services. These services are for deposit holders and borrowers alike and include not

only intermediation services, but also a host of other financial services that would be charged to the non-interest earning account. Under this approach, the number of deposit and loan accounts plus the number of financial transaction logged over a period of time would be taken as the appropriate definition of output and the inputs will be purely labour and fixed assets (as a measure of capital in neo-classical production theory). Total costs would only cover operational costs and interest costs are excluded (Ferrier et al., 1993). The literature on bank efficiency has tended to produce results using the intermediation approach, largely because balance sheet and income account data is more readily available than what would be required for the production approach.

Most economists generally accept the principle of rational behavior and analyze banks utilizing the neo-classical theory of the firm (Adongo, Stork and Hasheela, 2005). Such approach makes possible to use traditional economic measures of efficiency (inputs, outputs, cost constraints, etc.). However, in reality, banks operate under uncertainty and imperfect information. This suggests that banks should not be assessed on the basis of traditional efficiency measures alone, and that assessing their overall performance requires assessing both efficiency and risk factors.

In this study, management quality is deemed to be one of the main determinants of efficiency. This correlates with the Neo-Classical Theory which stipulates that a bank may be technically inefficient for technical reasons such as low training or low human capital levels of managers and workers, or the use of inferior or out-of-date technology.

2.2.2 Agency theory

Agency theory suggests that even though a divergence in interests exists, owners can constrain management's ability to maximize personal utility by establishing a nexus of contracts that minimizes the divergence in interests in exchange for a level of salary and benefits to management that is greater than what owner-managers would grant themselves if they were in control of the firm (Jensen and Meckling, 1976). Agency costs arise from additional salary and benefits allowed by the contract. Jensen and Meckling (1976) introduced the aspect of agency costs. These costs arise because in the absence of any restrictions, a firm's management would be tempted to take actions that would benefit stockholders at the expense of bondholders (Jensen and Meckling, 1976).

Due to this, bond holders impose restrictions in the operations of a firm by way of covenants which hamper the corporation's legitimate operation. Furthermore, the bondholders are forced to monitor the firm to ensure that the covenants are upheld. The monitoring costs are passed to stockholders in terms of higher cost of debt (Ncube, 2009). Covenants lead to loss in efficiency of operation of the firm. The cost efficiency and the monitoring costs are important types of agency costs which increase the cost of debt and reduces the value of equity thus reducing the advantages of debt.

Jensen and Mecking (1976) posit that a firm should consider the agency costs of debt vis a vis the benefits of debt to determine the optimum debt. Optimum debt according to them is the point at which marginal agency costs of debt is equal to marginal benefits of debt. They identified the agency costs of debt as consisting of the agency

theory of capital structure. Consistent with agency theory postulates, banks with higher leverage or lower equity are associated with higher profit efficiency. In terms of bank size, smaller banks are more profit efficient whereas medium size and larger banks are cost efficient.

2.2.3 Efficient Structure Theory

Demsetz (1973) was the first to formulate an alternative explanation on market structure-performance relationship and proposes the Efficiency Hypothesis. Applied to banking sector, this hypothesis stipulates that a bank which operates more efficiently than its competitors gains higher profits resulting from low operational costs. The same bank holds an important share of the market. Consequently, differences at the level of efficiency create an unequal distribution of positions within the market and an intense concentration. Since efficiency determines market structure and performance, the positive relationship between these two seems superficial.

Efficiency, as a key factor of competitiveness, nowadays receives a multidimensional interest justified by the coexistence of well-defined capacities and skills making up an entangled and inter-related set which we cannot minimize nor neglect the value of one over the other. Among these capacities, the bank should be skilled in the five knowledge sets, have the talent to reinforce the training process and the relational network. It should as well master the sense of prediction and selection and rely on human capital (Cooper et al., 2003). It goes without saying then that cost shrinking is no more the objective itself, in that institutions are seeking the adjustment of costs to quality and to products volumes in order to be efficient.

Smirlok (1985), subscribing to the efficiency hypothesis, considers market share as a proxy for efficiency. The efficiency hypothesis prevails when a significant positive correlation between market share and profitability is signaled. This method implicitly assumes that a higher market concentration is the main source of market power. Shepherd (1986) criticizes this method by considering that the direct source of market power is the domination of participants over the individual market, independently of the ultimate sources of such a domination, hence the emergence of the Relative Market power (RMP) hypothesis. It is uniquely the banks with a large market share and diversified products that might exert their market power to determine prices and make profits. Consequently, under the RMP hypothesis, individual market shares accurately determine market power and market imperfections. Applied to banking sector, this hypothesis stipulates that a bank which operates more efficiently than its competitors gains higher profits resulting from low operational costs. The same bank holds an important share of the market.

2.2.4 Market Power Theory

The Market Power hypothesis is empirically proved when concentration introduced in the explanatory equations of performance is found non-significant in contrast to market share which should be positively and significantly correlated with price and/or profitability. Nevertheless, it is not obvious that employing market structure in these equations produces unambiguous results (Aikaeli, 2008).

According to the Quiet Life (Hicks, 1935) hypothesis, a bank management unit with a large market share is less centred on efficiency as the exploitation of market power in terms of fixing prices allows deriving automatically benefits. An increase in market

power comes with a deterioration of efficiency in which makes banks unable to earn higher profits. The Quiet Life hypothesis puts forward an explanation in the case of the absence of a presumed relationship between profitability and market structure.

A bank with a strong position in the market may either reinforce its domination over the market or achieve a higher efficiency by marshalling its assets. As such, total asset is a main determinant of efficiency of banks.

2.3 Determinants of Bank Efficiency

In the literature, bank efficiency is usually expressed as a function of internal and external determinants. The internal determinants originate from bank accounts (balance sheets and/or profit and loss accounts) and therefore could be termed micro or bank-specific determinants of efficiency (Maudos & Pastor 2002). The external determinants are variables that are not related to bank management but reflect the economic and legal environment that affects the operation and performance of financial institutions. A number of explanatory variables have been proposed for both categories, according to the nature and purpose of each study.

Studies dealing with internal determinants employ variables such as size, capital and risk management. One of the most important questions underlying bank policy is which size optimizes bank efficiency. Generally, the effect of a growing size on efficiency has been proved to be positive to a certain extent. However, for banks that become extremely large, the effect of size could be negative due to bureaucratic and other reasons. Hence, the size-efficiency relationship may be expected to be non-linear. We use the banks' real assets (logarithm) and their square in order to capture this possible non-linear relationship (MakDonald & Koch 2006).

The need for risk management in the banking sector is inherent in the nature of the banking business. Changes in credit risk may reflect changes in the health of a bank's loan portfolio (Cooper et al., 2003), which may affect the performance of the institution, since poor asset quality is the single most important cause of bank failures. During periods of increased uncertainty, financial institutions may decide to diversify their portfolios in order to reduce their risk. However, the results of the existing literature are better described as mixed, with studies like Altunbas et al. (2000) suggesting that efficiency is not very sensitive to credit risk, and others like Hughes and Mester (1993) reporting an opposite result. To proxy credit risk we use the loan-loss provisions to loans ratio.

Turning to the external determinants of bank efficiency, it should be noted that we can further distinguish between control variables that describe the microeconomic environment, such as inflation and GDP, and variables that represent market characteristics (Cooper et al., 2003). The latter basically refer to banking-sector reform, market concentration and ownership.

Foreign ownership may have an impact on bank efficiency due to a number of reasons: first, the capital brought in by foreign investors decrease fiscal costs of banks' restructuring (Tang et al., 2000). Second, foreign banks may bring expertise in risk management and a better culture of corporate governance, rendering banks more efficient (Bonin et al., 2005). Third, foreign bank presence increases competition, driving domestic banks to cut costs and improve efficiency (Claessens et al., 2001). Finally, domestic banks have benefited from technological spillovers brought about by their foreign competitors. For these reasons, an examination of the impact of foreign ownership on the efficiency of banks is a useful exercise and this potential

effect is captured by the evolution of the shares of foreign banks as a percent of the total bank assets (constructed on a country-specific basis).

A relationship between bank efficiency and ownership may also exist due to spillover effects from the superior performance of privately-owned banks compared with publicly-owned banks, which do not always aim at efficiency. Although there is no clear empirical evidence to support such a view, the peculiarity of the banking sectors examined, where the share of commercial banks under public ownership was relatively high until the early 2000s makes the examination of the hypothesis appealing (Bonin et al., 2005). To test this hypothesis, we use the time-dependent market share (in terms of assets) of publicly-owned banks in the sector (once again this variable is constructed on a country-specific basis).

The efficient structure paradigm links concentration to high profitability through efficiency (Demsetz, 1973). This hypothesis posits that relative efficient banks compete more aggressively for market shares, which leads to more concentrated markets. Yet, other studies showed that in highly concentrated markets, risk aversion prevails, rendering the relationship between efficiency and concentration negative (Sathye, 2001). This possible adverse relationship is further enhanced if the ''quiet life'' hypothesis holds; that is increased concentration leads to a relaxed banking environment with no incentives to minimize costs (Berger and Humphrey, 1997). In an effort to identify the effect of concentration on bank efficiency, we use a concentration ratio constructed from the market shares (in terms of assets) of the three bigger banks in each country.

Finally, following the literature (Maudos et al., 2002; Pastor, 2002; Angelini and Cetorelli, 2003), the second-stage analysis includes some microeconomic country specific variables, namely the ratio of total investment to GDP (invgdp) as a proxy for fluctuations in economic activity, and a short-term, which captures variability of market. These variables are taken from the EBRD and the WDI. Bank efficiency is sensitive to microeconomic conditions despite the trend in the industry towards greater geographic diversification and larger use of financial engineering techniques to manage risk associated with business cycle forecasting. Generally, higher economic growth encourages banks to lend more and permits them to charge higher margins, as well as improving the quality of their assets.

Reviewing 130 studies of efficiency of financial institutions Berger and Humphrey (1997) classified these methods according to the employed technical approach into parametric and nonparametric. Parametric methods such as; stochastic frontier approach (SFA) and nonparametric such as data envelopment analysis (DEA). Apply these methods alone to evaluate banks performance determines the efficiency scores but gives no details of factors related to inefficiency, especially if these factors are in the form of non-numeric variables such as operating style in banking sector (Emrouznejad and Anouze, 2010). The present study adopts the use of DEA methodology since it has been identified as a valuable analytical research instrument and a practical decision support tool for a variety of reasons.

2.3.1 DEA Model

DEA is a nonparametric method for measuring the performance of Decision Making Units (DMUs) such as bank, hospital, university or service. It groups data into inputs and outputs to produce a productive efficiency frontier against which individual bank

or entire countries banks can be benchmarked. Input variables within DEA context are resources to be minimized while output variables are product or services to be maximized to achieve a high efficiency score. The DEA efficiency score is a relative measure, which is derived for each bank from the DEA based on the quality of transforming the inputs into outputs (Pastor, 2002).

DEA is receiving increasing attention as a tool of evaluating and improving the efficiency of manufacturing and service operations. It has been extensively applied in the performance evaluation and benchmarking of schools, hospitals, bank branches, production plants, etc (Charnes et al., 1994). DEA is a multifactor productivity analysis model for measuring the relative efficiencies of a homogeneous set of decision making units, the efficiency score in the presence of multiple input and output factors is defined as:

Efficiency = weighted sum of outputs / weighted sum of inputs

Regarding the appropriate inputs and outputs variables to be employed by DEA model for banks, as mentioned in several studies, there is an ongoing debate in the banking literature on the proper definition of inputs and outputs variables, and there are two main approaches that can be used to determine the bank inputs and outputs.

Intermediate approach: by this approach the selection is made based on the bank's assets and liabilities, bank assets including labor represent the inputs and liabilities represent the outputs. Production approach: which considers the bank as normal company or producer, and hence the inputs are the physical elements such as labor and capital and all other assets and liabilities are outputs, this approach argued that all

deposits (which are assets) should be treated as output since they are produced by capital and labor.

In the intermediation approach, Allen, and Santomero (1996), Berger and Humphrey (1997), the selection is based on the bank's assets and liabilities. Bank assets represent inputs and liabilities for outputs. For Berger and Mester (1997), bank inputs are purchased funds, core deposits and labour. Outputs are consumer loans, business loans and securities. Rezvanian and Mehdian (2002) apply the same method. Inputs are borrowed funds (time deposits and other borrowed funds) and other inputs (labour and capital). Outputs are total loans, securities and other earning assets. Cavallo and Rossi (2002) also treat labour, capital and deposits as bank inputs. In additions to the studies mentioned above, most of the academic working papers adopted the intermediary approach, Ismail (2004) for measuring the banks performance in Malaysia, Pasiouras (2006) for estimating the technical and scale efficiency of Greek commercial banks.

 In this study, the selection of input and output variables will be based on the intermediate approach. Inputs are the number of employees (LAB), fixed assets (FA) and total deposits (TD). TD is made up of demand deposit, saving deposit and fixed deposit. My outputs are direct credit facilities (including loans and overdrafts) (DCF), other earning assets (mainly investments in stocks) (OEA).

2.4 Review of Empirical Studies

Farhana, Shabri and Rossazana (2013) examined cost efficiencies of the selected Islamic and conventional commercial banks over the period of 2006 to 2009 in Malaysia. Data envelopment analysis (DEA) was initially used, to investigate the cost

efficiency of the Malaysian banking sector and followed by Tobit regression analysis determine factors influencing the efficiency of Islamic and conventional banks in Malaysia. The DEA results revealed technical efficiency as the main contributor of cost efficiency for conventional commercial banks and allocative efficiency as the main contributor for cost efficiency of Islamic commercial banks. This indicates conventional commercial banks have been efficient in utilizing information technology and electronics. Islamic commercial banks conversely have been efficient in allocating and utilizing their resources. Additionally, scale efficiency is found to be the main source of technical efficiency for both Islamic and conventional commercial banks, denoting that size is important in improving bank efficiency. The results of Tobit regression analysis are twofold. First, it documents capitalization and bank sizes are positively and significantly associated to efficiency. Secondly, loan quality is found to be negatively and significantly associated to efficiency.

Fadzlan, Mohamad and Mohamad (2009) sought to provide a comparative analysis on the performance of the Islamic banking sector in 16 MENA (Middle East and north Africa) and Asian countries. A two-stage procedure is followed to examine the efficiency of Islamic banking sectors in 16 MENA and Asian countries. First, data envelopment analysis (DEA) is used to estimate the technical, pure technical, and scale efficiency for each bank in the sample. Following previous research, an annual frontier specific to each year is constructed, as it is more flexible and thus more appropriate than estimating a single multiyear frontier for the banks in the sample. It has been pointed out that the principal advantage of having panel data is the ability to observe each bank more than once over a period of time. Nevertheless, the issue is also critical in a continuously changing business environment because the technology

of a bank that is most efficient in one period may not be the most efficient in another. To an extent, this relieves also the problems related to the lack of random error in DEA by allowing an efficient bank in one period to be inefficient in another, assuming that the errors owing to luck or data problems are not consistent over time.

In the second stage regression, Tobit regression is used to determine the impact of internal and external factors on Islamic banks' efficiency. The results suggest that the MENA Islamic banks have exhibited higher mean technical efficiency relative to their Asian Islamic bank counterparts. The empirical findings suggest that during the period of study, pure technical inefficiency outweighs scale inefficiency in both the MENA and Asian countries banking sectors. Banks from the MENA region were found to be the global leaders by dominating the efficiency frontier during the period of study. Positive relationship was found between bank efficiency and loans intensity, size, capitalization, and profitability. The empirical results show that technically more efficient banks are those that have smaller market share and low non-performing loans ratio. A multivariate analysis based on the Tobit model reinforces these findings.

Ncube (2009) examines the South African banking sector efficiency. The paper focused was on cost and profit efficiency of banks in South Africa. Applying stochastic frontier model, the paper examined cost and profit efficiency of four small and four large banks. Results indicated that over the study period (2000 - 2005) South African banks significantly improved their cost efficiencies and no significant gains on profitability fronts. The results also indicate that there is a weak positive correlation between cost and profit efficiency of South African Banks. In addition, most cost efficient banks were also most profit efficient. A regression analysis of cost

efficiency and bank size suggests a negative relationship with cost efficiency declining with increasing bank size.

Kiyota (2009) provides a comprehensive banking sector efficiency analysis of sub-Saharan African countries. The study employs two stage analyses in examination of profit efficiency and cost efficiency of commercial banks: stochastic frontier approach and Tobit regression. Stochastic frontier approach is utilised to estimate profit efficiency and cost efficiency, whereas Tobit regression is employed to provide cross-country evidence of the influence of environmental factors on efficiency African commercial banks. Results of the study indicate that foreign banks outperform domestic banks for profit efficiency, and entry of foreign banks appears to have positive performance impacts on domestic banks. Also, Consistent with agency theory postulates, banks with higher leverage or lower equity are associated with higher profit efficiency. In terms of bank size, smaller banks are more profit efficient whereas medium size and larger banks are cost efficient.

Aikaeli (2008) investigate efficiency of commercial banks in Tanzania. Utilising secondary time series data of the Tanzanian banking sector, the paper examines technical, scale and cost efficiency of banks. Data Envelopment Analysis (DEA) model was applied to derive efficiency estimates of banks. Results of the study suggest that overall bank efficiency was fair, and there was room for marked improvements on all the three aspects of efficiency examined. Foreign banks ranked highest in terms of technical inefficiencies. Cost inefficiencies of banks was attributed to inadequate fixed capital, poor labour compensation, less management capacity as banks expanded and accumulated excess liquid assets.

Applying standard econometrics frontier approach, Ikhide (2008) examines cost efficiency of commercial banks in Namibia. The cost structure of the banks was estimated using loans as output of the three input factors: labour, capital and deposit. Results of the study indicate that efficiency of commercial banks can be improved by increasing their scale of operations. In other words, there are substantial economies of scale to be exploited to enhance sector's efficiency. The findings suggest that more efficient combination of inputs will reduce operating costs and stimulate efficiency in the Namibian commercial banking sector.

Chan (2008) did a study on bank efficiency in selected developing countries. This study aimed to investigate the existence of cost efficiency and profit efficiency among the banking sector in selected developing countries in the Asia, Middle East, and the African region from 2000 to 2005. A comparison between the cost and profit efficiency from the selected developing countries in the three regions was done in this study. In addition, this study also aims to identify the determinant of the bank efficiency level from both micro-level and macro-level perspectives. The parametric approach and non-parametric approach were employed in this study. From the estimation results from parametric approach, commercial banks in the selected developing countries are cost efficient. This result is consistent with most of the literatures. Next, the estimation results of the cost and profit efficiency indicate that commercial banks in the Middle Eastern and North African region are the most cost efficient followed by commercial banks in the Asian region.

The DEA results reported a relatively low cost efficiency scores as compared to the stochastic frontier models. A further decomposition of cost efficiency into technical and allocative efficiency indicates that the commercial banks' cost inefficiency are

actually due to technical inefficiency. It is also found that the bank-specific factors did influence the efficiency level of the commercial banks in the three regions under analysis. The efficiency scores of the commercial banks in terms of cost and profit efficiency across regions are found to have negative relationship with the equity to total assets ratio. On the other hand, the return on assets is found to be positively related to profit efficiency of the commercial banks over the regions. The positive relationship between loans to total assets ratios and profit efficiency indicates specialization in lending activities enable commercial banks to be more efficient. Cost efficiency of the commercial banks in the Asian region is found to positively related to real GDP per capita, banking institutions' credit to the private sector, and market concentration and negatively related to trade openness.

On the other hand, broad money to GDP ratio is positively related to profit efficiency of the commercial banks in the Asian region. However, credit extended to the private sector seems to be negatively related with profit efficiency level of the commercial banks in the region. This might be due to the reasons that most of the credit extended to the private sectors were channelled to the priority sectors and Small and Medium Industries with a lower rate of interest charged. Bank efficiency in the Middle Eastern and North African regions seems to be more prone towards the factors of openness such as trade openness and financial development. Whereas the main microeconomics variables are found to exert strong influences over the bank efficiency in commercial banks in the African region.

Ahmad (2008) conducted a study on the efficiency analysis of commercial banks in Pakistan. Pakistan is a developing country and its financial sector consists of different types of institutions. Commercial banks are major part of Pakistan financial sector. In

28

the economic development of a country commercial banks play an important role. The outstanding microeconomic performance of Pakistan in the last five years portrayed Pakistan as an example of successful economy. As in Pakistan, no comprehensive study has been carried out for the measurement of commercial banks efficiency to show banking sector performance under changed scenarios, so this study is conducted to determine the efficiency of commercial banks, Data Envelopment Analysis (DEA) was used due to its ability to capture multiple outputs and no danger regarding the misspecification of the frontier. Input oriented approach of DEA under Constant Returns to Scale (CRS) and Variable Return to scale (VRS) is used for the efficiency measurement of the commercial banks. In this study, scale efficiency and Returns to Scale under which commercial banks operate id also estimated. Intermediation approach is used to define the inputs and outputs of the commercial banks. Five specifications of DEA are developed for efficiency measurement by using panel data of commercial banks for the period from 2001 to 2004.

For each year, efficiency frontier is estimated under each specification to measure the relative performance of commercial banks. After the estimation of efficiency form non-parametric DEA, tobit model is used to develop the relationship between efficiency scores and factors efficiency it under each specification. After analysis it was found that commercial banks could improve their efficiency by increasing profits, assets, markup interest earnings and non-markup interest earning and decreasing liabilities, markup interest expenditures and non-markup interest expenditures among the bank specific variables. At the same time, government can improve the efficiency of banking sector in Pakistan by promoting foreign banking and discouraging the privatization of public sector bands and mergers in the banking sector.

Further, Sufian (2006) examined the efficiency of the Malaysian Islamic banking sector during the period 2001-2004 by using the non-parametric DEA method. He found that scale efficiency (SE) outweighs pure technical efficiency (PTE) in the Malaysian Islamic banking sector, implying that Malaysian Islamic banks have been operating at the non-optimal level of operations. He suggests that the domestic Islamic Banking Scheme banks have exhibited a higher technical efficiency compared to their foreign Islamic Banking Scheme bank peers. He suggests that during the period of study the foreign Islamic Banking Scheme banks' inefficiency was mainly owing to scale rather than pure technical.

Hassan (2005) examined the relative cost, profit, X-efficiency, and productivity of the world Islamic Banking industry. Employing a panel of banks during 1993-2001, he used both the parametric (stochastic frontier approach) and non-parametric (DEA) techniques as tools to examine the efficiency of the sample banks. He calculated five DEA efficiency measures, namely: cost, allocative, technical, pure technical, and scale, and further correlated the scores with the conventional accounting measures of bank performance. He found that the Islamic banks are more profit efficient, with an average profit efficiency score of 84 percent under the profit efficiency frontier compared to 74 percent under the stochastic cost frontier. He also found that the main source of inefficiency is allocative rather than technical. Similarly, his results suggest that the overall inefficiency was output related. The results suggest that, on average, the Islamic banking industry is relatively less efficient compared to its conventional counterparts. The results also show that all five efficiency measures are highly correlated with ROA and ROE, suggesting that these efficiency measures can be used

concurrently with the conventional accounting ratios in determining Islamic banks' performance.

Hussein (2003) provides an analysis of the cost efficiency features of Islamic banks in Sudan between 1990 and 2000. Using the stochastic cost frontier approach, he estimates cost efficiency for a sample of 17 banks over the period. The interesting contribution of this paper is that specific definitions of Islamic financial products are used as outputs. In addition, the analysis is also novel as Sudan has a banking system based entirely on Islamic banking principles. The results show large variations in the cost efficiency of Sudanese banks, with the foreign-owned banks being the most efficient. State-owned banks are the most cost inefficient. The analysis is extended to examine the determinants of bank efficiency. Here, he finds that smaller banks are more efficient than their larger counterparts. In addition, banks that have higher proportion of musharakah and mudharabah finance relative to total assets also have efficiency advantages. Overall, the substantial variability in efficiency estimates is put down to various factors, not least the highly volatile economic environment under which Sudanese banks have had to operate over the last decade or so.

El-Gamal and Inanoglu (2004) used the stochastic frontier approach to estimate the cost efficiency of Turkish banks over the period 1990-2000. The study compared the cost efficiencies of 49 conventional banks with four Islamic special finance houses (SFHs). The Islamic firms comprised around 3 percent of the Turkish banking market. Overall, they found that the Islamic financial institutions to be the most efficient and this was explained by their emphasis on Islamic asset-based financing which led to lower non-performing loans ratios. It is worth mentioning that the SFH achieved high

levels of efficiency despite being subjected to branching and other self-imposed constraints such as the inability to hold government bonds.

Penny (2004) investigated X-efficiency and productivity change in Australian banking between 1995 and 1999 using the data envelopment analysis (DEA) and the MPI. He found in his analyses that regional banks were less efficient than other bank types. He ended up with the conclusion that diseconomies of scale start at a very early stage and cannot be considered as sufficient evidence to allow for mergers between large banks. Total factor productivity in the banking sector was found to have increased by an average annual 7.6 percent between 1995 and 1999. Technological advances shifted out the efficiency frontier leading to an increase in productivity. The performance of the banking sector was less efficient in 1999 relative to the frontier in 1995.

Sturm and Williams (2004) evaluated the impact of foreign bank entry on bank efficiency in Australia during the post-deregulation period of 1988-2001. Using the DEA and stochastic frontier approaches, they discovered that foreign banks were more efficient than their local counterparts. It also emerged from their findings that bank size served as a barrier to entry for new entrants in the banking sector. They also found the emergence of deregulation and competition as helpful towards improvement of bank efficiency in Australia.

Hassan and Hussein (2003) examined the efficiency of the Sudanese banking system during the period of 1992-2000. They employed a variety of parametric (cost and profit efficiencies) and non-parametric DEA techniques to a panel of 17 Sudanese banks. They found that the average cost and profit efficiencies under the parametric

were 55 and 50 percent, respectively, while it was 23 percent under the non-parametric approach. During the period of study, they found that the Sudanese banking system has exhibited 37 percent allocative efficiency and 60 percent technical efficiency, suggesting that the overall cost inefficiency of the Sudanese Islamic banks was mainly owing to technical (managerially related) rather than allocative (regulatory) factors.

Samad (1999) was among the first to investigate the efficiency of the Malaysian Islamic banking sector. In his paper, he investigates the relative performance of the fully fledged Malaysian Islamic bank compared to its conventional bank peers. During the period of 1992-1996 he found that the managerial efficiency of the conventional banks was higher than that of the fully fledged Islamic bank. On the other hand, the measures of productive efficiency revealed mixed results. He suggests that the average utilization rate of the Islamic bank is lower than that of the conventional banks. Similarly, he found that profits earned by the fully fledged Islamic bank, either through the use of deposit or loanable funds, or used funds, are also lower than the conventional banks, reflecting the weaker efficiency position of the fully fledged Islamic bank. In contrast, the productivity test by loan recovery criterion indicates that the efficiency position of the fully fledged Islamic bank seems to be higher and that bad debts as a percentage of equity, loans, and deposits also show a clear superiority over the conventional bank peers.

2.5 Summary of Literature Review

The concept of technical efficiency derives its basis in the neo-classical theory of the firm and assumes profit maximizing behaviour. Efficiency, as a key factor of

competitiveness, nowadays receives a multidimensional interest justified by the coexistence of well-defined capacities and skills making up an entangled and inter-related set which we cannot minimize nor neglect the value of one over the other.

Bank efficiency is usually expressed as a function of internal and external determinants. A relationship between bank efficiency and ownership may also exist due to spillover effects from the superior performance of privately-owned banks compared with publicly-owned banks, which do not always aim at efficiency. The efficient structure paradigm links concentration to high profitability through efficiency. The present study adopts the use of DEA methodology since it has been identified as a valuable analytical research instrument and a practical decision support tool for a variety of reasons. Most of these studies are done in other countries whose strategic approach and financial footing is different from that of Kenya. Most of them also focus on both the microeconomic and macroeconomic variables. There is therefore a literature gap on the relationship between microeconomic variables and efficiency of commercial banks in developing countries. This study therefore sought to fill this gap by focusing on the relationship between microeconomic variables and efficiency of commercial banks in Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

This study adopted a descriptive research design. The choice of the descriptive survey research design was made based on the fact that in the study, the research is interested on the state of affairs already existing in the field and no variable was manipulated. A descriptive study attempts to describe or define a subject, often by creating a profile of a group of problems, people, or events, through the collection of data and tabulation of the frequencies on research variables or their interaction as indicated by Cooper and Schindler (2003). Descriptive research portrays an accurate profile of persons, events, or situations (Kothari, 2000). Descriptive design allows the collection of large amount of data from a sizable population in a highly economical way.

3.2 Population

Cooper and Schindler (2003) define target population as the entire group that is of interest to the researcher. The target population for this study was 44 commercial banks in Kenya as at December 2013. The study used a census approach to pick all the 44 commercial banks in Kenya since the population is not large. A census is where data is collected from all members of the population (Hair, Celsi, Money, Samouel, & Page, 2011).

3.3 Data Collection

Regarding the data collection, the research obtained absolute secondary data from commercial banks' audited financial statements, banks administrative report and from

the Central Bank of Kenya (CBK) for the years 2008-2013. The data collected was from inputs (total employee cost, total deposits, interest expense and other operating costs) and outputs (direct credit facilitation (loans and overdrafts), other earning assets (investments and securities) and interest income) of commercial banks.

3.4 Data Analysis

Data Envelopment Analysis (DEA) was used to measure technical efficiency of the commercial banks. Data Envelopment Analysis (DEA) was used to measure technical efficiency of the commercial banks where coefficients were calculated from the most efficient commercial bank that have the ability to produce maximum output from a given set of inputs. In this research, intermediate approach of DEA was adopted. According to the research point of view, it was more representative of research objectives and it measures technical efficiency rather than capital investment efficiency.

Inputs:

1. Labor (LAB), which is represented by the total employee cost

2. Total Deposits (TD),

3. Interest Expense (IE)

4. Other Operating Costs (OOC)

Outputs:

1. Direct Credit Facilitation (DCF), which includes loans and overdrafts

2. Other Earning Assets (OEA), which represents mainly investments in securities

3. Interest Income (II)

In addition to the DEA model, the research conducted regression statistical test to identify any common features of the efficient banks and to investigate the significance

of the relationship between the technical efficiency score and various determinants. Efficiency was the dependent variable while the determinants were the independent variables. The results were subjected to test the extent of relationship using the following linear regression equation model:

$Y = \beta 0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$

Where Y = Efficiency (Output/ Input).

$\quad$ X_1 = Size (Logarithm of total assets)

$\quad$ X_2 = Capitalization (Equity / total assets)

$\quad$ X_3 = Credit Risk (Loans / total assets)

$\quad$ X_4 = Management quality (Non-interest expense / total asset)

$\quad$ $\beta 0$ = Constant, the value of Y when the value of X is zero.

$\quad$ βi (i= 1, 2, 3, 4)   = Coefficients of determinants of efficiency.

$\quad$ ε = Error term

The coefficient of determination (R^2) was used to measure the extent to which the variation in efficiency is explained by the variations in its determinants. F-statistic was also computed at 95% confidence level to test whether there is any significant relationship between efficiency and its determinants. This analysis was done using SPSS (V 21) software and the findings presented in form of a tables and graphs to aid in the analysis and with which the inferential statistics were drawn.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the information processed from the data collected during the study on the determinants of efficiency of commercial banks in Kenya. The sample composed of 44 commercial banks in Kenya which had audited reports for the period year ended 31st December 2009 to 31st December 2013.

4.2 Efficiency of the Commercial Banks in Kenya

Table 4. 1: Summary of the DEA Coefficients for the commercial banks in Kenya

Year	N	Minimum	Maximum	Mean	Std. Deviation
Efficiency 2013	44	.17	1.00	.7086	.20212
Efficiency 2012	44	.22	1.00	.7637	.16515
Efficiency 2011	44	.03	1.00	.5724	.65265
Efficiency 2010	44	.24	1.00	.6262	.21836
Efficiency 2009	44	.04	1.00	.5685	.24668
Average				**0.64788**	**0.29699**

Source: Author (2014)

Table 4.1 shows the efficiency of the commercial banks in Kenya for the five years as measured by the DEA coefficients. From the findings, the commercial banks in Kenya had an average DEA coefficient of 0.64788 with a standard deviation of 0.29699 showing that they were generally operating above average. However, the highest

efficiency was recorded in 2012 (DEA coefficient of 0.7637) with the lowest being registered in 2009 (DEA coefficient of 0. 5685).

4.3 Regression Results

The study conducted a cross-sectional multiple regression on several determinants over the period 2009 - 2013 and of efficiency of the commercial banks in Kenya. Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (efficiency of the commercial banks in Kenya) that is explained by all the four independent variables (Size, capitalization, credit risk and management quality).

Table 4. 2: Results of multiple regression between efficiency of the commercial banks in Kenya and the combined effect of the selected predictors

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.829	0.687	0.654	0.163

Source: Author (2014)

The four independent variables that were studied, explain 65.4% of the efficiency of the commercial banks in Kenya as represented by the adjusted R^2. This therefore means the four variables contribute to 65.4% of efficiency of the commercial banks in Kenya, while other factors not studied in this research contributes 34.6% of efficiency of commercial banks in Kenya. Therefore, further research should be conducted to

investigate the other (34.6%) factors influencing efficiency of commercial banks in Kenya.

Table 4. 3: Summary of ANOVA Results

Summary of One-Way ANOVA results of the regression analysis between efficiency of the commercial banks in Kenya and predictor variables

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.453	4	0.613	21.354	0.00216
	Residual	1.12	39	0.029		
	Total	3.573	43			

Source: Author (2014)

From the ANOVA statistics in table 4.3, the processed data, which are the population parameters, had a significance level of 0.00216 which shows that the data is ideal for making a conclusion on the population's parameter. The F calculated at 5% Level of significance was 21.354. Since F calculated is greater than the F critical (value = 2.612), this shows that the overall model was significant i.e. there is a significant relationship between efficiency and its determinants.

Table 4. 4: Regression coefficients of the relationship between efficiency of the commercial banks in Kenya and the four predictive variables

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.645	0.311		2.074	0.0447
	Size	0.521	0.145	0.384	3.593	0.0304
	Credit Risk	-0.023	0.009	0.004	-2.556	0.0371
	Management quality	0.736	0.151	0.529	4.874	0.0186
	Capitalization	0.547	0.143	0.493	3.825	0.0360
Dependent variable: efficiency of the commercial banks in Kenya						

Source: Author (2014)

The coefficient of regression in table 4.4 above was used in coming up with the model below:

EFF = 0.645+ 0.521 SIZE - 0.023 CR + 0.736 MQ + 0.547 CAP

Where EFF is Efficiency, CR is Credit Risk, MQ is Management Quality and CAP is Capitalization. According to the model, all the variables were significant as their

significance value was less than 0.05. However, credit risk was negatively correlated with efficiency of the commercial banks in Kenya while size, capitalization and management quality were positively correlated with efficiency of the commercial banks in Kenya. From the model, taking all factors (size, credit risk, management quality and capitalization) constant at zero, efficiency of the commercial banks in Kenya was 0.645. The data findings analyzed also shows that taking all other independent variables at zero, a unit increase in size will lead to a 0.521 increase in efficiency of the commercial banks in Kenya; unit increase in credit risk will lead to a 0.023 decrease in efficiency of the commercial banks in Kenya; a unit increase in management quality will lead to a 0.736 increase in efficiency of the commercial banks in Kenya while a unit increase in capitalization will lead to a 0.547 increase in efficiency of the commercial banks in Kenya. This infers that management quality contributed most to the efficiency of the commercial banks in Kenya followed by capitalization then size while the credit risk had a negative significant effect on the efficiency of the commercial banks in Kenya.

4.4 Summary and Interpretation of Findings

From the above regression model, the study found out that there were factors influencing the efficiency of commercial banks in Kenya, which are size, credit risk, management quality and capitalization. They either influenced it positively or negatively. The study found out that the intercept was 0.645 for all years.

The four independent variables that were studied (size, credit risk, management quality and capitalization) explain a substantial 65.4% of efficiency of commercial banks in Kenya as represented by adjusted R^2 (0.654). This therefore means that the

four independent variables contributes 65.4% of the efficiency of commercial banks in Kenya while other factors and random variations not studied in this research contributes a measly 34.6 % of the efficiency of commercial banks in Kenya.

The study established that the coefficient for size was 0.521, meaning that size positively and significantly influenced the efficiency of commercial banks in Kenya. This is in line with MakDonald and Koch (2006) who state that one of the most important questions underlying bank policy is whether size optimizes bank efficiency. They also add that the effect of a growing size on efficiency has been proved to be positive to a certain extent. However, for banks that become extremely large, the effect of size could be negative due to bureaucracy and other reasons. Hence, the size-efficiency relationship may be expected to be non-linear. The findings also correlate with Dietrich and Wanzenried (2011) who state that the relationship between size and efficiency is an important part of the firm's theory. Since larger banks are more able to realize economies of scale and reduce the cost of gathering and processing information, the bank size should be positively associated with its efficiency.

The study also deduced that management quality positively influenced efficiency of commercial banks in Kenya as it had positive coefficient (0.736). The result was consistent with prior research Goddard et al (2009) who state that competent management in banks is expected to be more efficient. Hicks (1935) hypothesis argues that a bank management unit with a large market share is less centered on efficiency as the exploitation of market power in terms of fixing prices allows deriving automatically benefits.

The study found out that the coefficient of the credit risk to be negative (-0.023). This depicts that, according to findings, credit risk negatively influences the efficiency of commercial banks in Kenya. This concurs with Ab-Rahim et al. (2012) who found a negative relationship between credit risk and the measures of efficiency. The findings are in line with Bourke (1989) and Molyneux and Thornton (1992) who posit that the level of credit risk tend to be negatively associated with bank's efficiency. Miller and Noulas (1997) suggest a negative relationship between credit risk and efficiency. This result might reflect the fact that the higher the loans-to-assets ratio (as a proxy for credit risk) is, the more financial institutions are exposed to high-risk loans and by far the greater accumulation of nonperforming loans will be. However, the findings contradict Kosmidou at al. (2005) and Fernandez (2007) who provide the evidence that credit risk affect positively the bank efficiency.

The study further found out that the coefficient for capitalization was 0.547, which was strong, positive and significant. This means that capital positively influenced the efficiency of commercial banks in Kenya. This is consistent with Farhana, Shabri and Rossazana (2013) who found out in their study on cost efficiencies of the selected Islamic and conventional commercial banks over the period of 2006 to 2009 in Malaysia that capitalization and bank sizes are positively and significantly associated to efficiency.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary, conclusion and recommendations of the main findings on the determinants of efficiency of commercial banks in Kenya.

5.2 Summary of Findings and Discussions

In any economy, the financial sector is the engine that drives economic growth through efficient allocation of resources to productive units. The key pillar of a successful economy is financial efficiency and therefore all the stakeholders in the economy should put it into consideration at all times to ensure stability in the financial sector. Commercial banks play an important role in facilitating the economic growth. In the microeconomic level they represent the tool by which the government monetary policy is applicable. Bank deposits represent the most liquid form of money such as the mandatory reserves held by government, and hence can control the money supply in the economy. On the microeconomic level commercial banks represent the primary source of credit to most businesses and individuals (MakDonald & Koch, 2006).

Bank inefficiency has generally been found to consume a large portion of funds and to be a great source of problems in performance. The study sought to establish the relationship between microeconomic variables and efficiency of commercial banks in Kenya. The study used descriptive research design which was appropriate since the study was interested in the state of affairs in the banking industry without manipulating any variable. The population of the study comprised of 44 active commercial banks in Kenya from which a census approach was taken to collect data

from the commercial banks. The secondary data in this analysis covered a period of 5 years (2009– 2013) and extracted from the audited financial statements which included comprehensive income statement and Statement of financial position. The study collected data on inputs (total employee cost, total deposits, interest expense and other operating costs) and outputs (direct credit facilitation (loans and overdrafts), other earning assets (investments and securities) and interest income) of commercial banks. Data Envelopment Analysis (DEA) was used to measure technical efficiency of the commercial banks where coefficients were calculated from the most efficient commercial bank that have the ability to produce maximum output from a given set of inputs. Data was analyzed using a linear regression equation model to test the extent of relationship.

From the regression model, the study found out that there were factors influencing the efficiency of commercial banks in Kenya which are size, credit risk, management quality and capitalization. They either influenced it positively or negatively. The four independent variables that were studied (size, credit risk, management quality and capitalization) explain a substantial 65.4% of efficiency of commercial banks in Kenya as represented by adjusted R^2 (0.654). The study concludes that size, management quality and capitalization positively and significantly influenced efficiency of commercial banks in Kenya while credit risk adversely affected the efficiency of commercial banks in Kenya.

5.3 Conclusions

This study examined the determinants of efficiency of commercial banks in Kenya. The four independent variables that were studied (size, credit risk, management

quality and capitalization) explain a substantial 65.4% of efficiency of commercial banks in Kenya. The coefficient for size was 0.521 meaning that size positively and significantly influenced the efficiency of commercial banks in Kenya. This is consistent with MakDonald and Koch (2006) who posit that one of the most important questions underlying bank policy is whether size optimizes bank efficiency. They also add that the effect of a growing size on efficiency has been proved to be positive to a certain extent. However, for banks that become extremely large, the effect of size could be negative due to bureaucracy and other reasons. Hence, the size-efficiency relationship may be expected to be non-linear. The findings also correlate with Dietrich and Wanzenried (2011) who state that the relationship between size and efficiency is an important part of the firm's theory. Since larger banks are more able to realize economies of scale and reduce the cost of gathering and processing information, the bank size should be positively associated with its efficiency. The study concludes that size positively and significantly influences the efficiency of commercial banks in Kenya as larger firms are able to spread the fixed costs of production over more production units leading to lower average costs.

The study also established that management quality positively influenced efficiency of commercial banks in Kenya as it had positive coefficient (0.736). The result was consistent with prior research by Goddard et al (2009) who state that competent management in banks is expected to be more efficient. Hicks (1935) hypothesis argues that a bank management unit with a large market share is less centered on efficiency as the exploitation of market power in terms of fixing prices allows deriving automatically benefits. The study therefore concludes that management quality as depicted in degree of commitment towards clients and staff, effectiveness

47

of the marketing strategies, the level of experience and effectiveness of training programs positively and significantly influenced efficiency of commercial banks in Kenya.

The study further found out that the coefficient for capitalization was 0.547, which was strong, positive and significant. This means that capital positively influenced the efficiency of commercial banks in Kenya. This is consistent with Farhana, Shabri and Rossazana (2013) who found out in their study on cost efficiencies of the selected Islamic and conventional commercial banks over the period of 2006 to 2009 in Malaysia that capitalization and bank sizes are positively and significantly associated to efficiency. The study therefore concludes that capitalization positively and significantly influences the efficiency of commercial banks in Kenya.

The study found out that the coefficient of the credit risk to be negative (-0.023). This depicts that, according to findings, credit risk negatively influences the efficiency of commercial banks in Kenya. This concurs with Ab-Rahim et al. (2012) who found a negative relationship between credit risk and the measures of efficiency. The findings are in line with Bourke (1989) and Molyneux and Thornton (1992) who posit that the level of credit risk tend to be negatively associated with bank's efficiency. Miller and Noulas (1997) suggest a negative relationship between credit risk and efficiency. This result might reflect the fact that the higher the loans-to-assets ratio (as a proxy for credit risk) is, the more financial institutions are exposed to high-risk loans and by far the greater accumulation of nonperforming loans will be. However, the findings contradict Kosmidou at al. (2005) and Fernandez (2007) who provide the evidence that credit risk affect positively the bank efficiency. The study finally concludes that

the relationship between credit risk and efficiency of commercial banks in Kenya is negative and significant.

5.4 Limitations of the Study

There were challenges which were encountered during the study. Some officers who are concerned with safe custody of commercial banks in Kenya files containing audit reports were initially reluctant to release them. That reluctance delayed the completion of data collection.

There was also limited availability of local literature with respect to the relationship between macroeconomic variables and operational efficiency of commercial banks in Kenya which was overcome by consultation of foreign literatures and reference to other relevant locally published materials.

Further, the data was tedious to collect and compute as it was in its very raw form. Due to lack of standardization of financial statements from various commercial banks in Kenya, data computation was made even harder.

In addition, time and resources allocated to this study could not allow the study to be conducted as deeply as possible in terms of other predictor variables for operational efficiency of commercial banks in Kenya.

Finally, the study had a draw back from most financial institutions which lacked proper reports that showed records of the benefits directly accrued from the microeconomic variables. This posed a challenge on data collection process.

5.5 Recommendations and Suggestions

5.5.1 Policy Recommendations

From the limitations the study recommends that in future studies of microeconomic variables should be conducted in other sectors with less strict regulations on the privacy of audit reports and other relevant data for microeconomic variables. Such sectors to be explored can be telecommunications, insurance, manufacturing among others. This will enable the data collection process to be smooth and fast.

The study also recommends that local researchers and academicians should increasingly study the microeconomic variables to add on to the limited literature in the area. This will ensure that there will be adequate local literature that can be used to relate to local situation. Foreign studies may not be reliable to explain the case of the effect of microeconomic variables in Kenya.

The study further recommends that there should be a policy set to standardize the presentation of financial statements commercial banks in Kenya. This will make it easier for all the parties interested in using the data from these statements. Further studies can also use primary data to collect data from the commercial banks in Kenya.

The study also recommends that future studies should allocate more time to the data collection process and sponsors step in to support the studies. This will make it possible for researchers to study other factors that affect the operational efficiency of commercial banks in Kenya that the study did not address.

Finally, the study recommends that financial institutions should relate the macroeconomic variables to their financial reports. This should indicate the

appropriate effect of each microeconomic variable. This will make it easier for other researchers to collect and relate data on microeconomic variables.

5.5.2 Suggestions for Further Research

Since the study focused on the determinants of efficiency of commercial banks in Kenya, further studies should be done on companies in micro finance institutions to find out whether the study will yield the same information.

This study was confined to commercial banks in Kenya yet there are many players in the financial sector. There is therefore need to study determinants of efficiency on micro finance institutions, insurance companies, commercial banks and other financial institutions, and how these factors affects their operational efficiency and performance in general.

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APPENDICES

Appendix I: List of Commercial Banks in Kenya

1. African Banking Corporation Limited
2. Bank of Africa Kenya Ltd
3. Bank of Baroda (K) Ltd.
4. Bank of India
5. Barclays Bank of Kenya Ltd
6. CFC-Stanbic Bank Ltd
7. Charterhouse Finance Bank Ltd
8. Chase Bank Ltd
9. Citibank N.A. Kenya
10. City Finance Bank Ltd
11. Commercial Bank of Africa Ltd
12. Consolidated Bank of Kenya
13. Co-operative Bank of Kenya Ltd
14. Credit Bank
15. Development Bank of Kenya
16. Diamond Trust Bank Ltd
17. Dubai Bank Kenya Ltd
18. Eco Bank Limited
19. Equatorial Commercial Bank
20. Equity Bank
21. Family Bank Ltd
22. Fidelity Commercial Bank Ltd
23. Fina Bank Ltd
24. First Community Bank Ltd
25. Giro Commercial Bank Ltd
26. Guardian Bank Limited
27. Gulf African Bank Limited
28. Habib Bank A.G. Zurich
29. Habib Bank Ltd
30. Imperial Bank Ltd

31. Investment & Mortgages Bank Ltd

32. Kenya Commercial Bank Limited

33. K-Rep Bank Ltd

34. Middle East Bank (K) Ltd

35. National Bank of Kenya Ltd

36. NIC Bank Ltd

37. Oriental Commercial Bank Ltd

38. Paramount Universal Bank Ltd

39. Prime Bank Ltd

40. Southern Credit Banking Corporation Ltd

41. Standard Chartered Bank (K) Ltd

42. Transnational Bank Ltd

43. United Bank of Africa Kenya Bank Limited

44. Victoria Commercial Bank Ltd

Source: CBK Report, 2013

Appendix II: Commercial banks Data

Size 2013	Size 2012	Size 2011	Size 2010	Size 2009
7.233771	7.24345	7.250932	7.134634	7.145493
7.33125	7.183112	6.90195	6.512503	6.54114
6.99618	6.983123	6.885754	6.852642	6.778868
7.110094	7.033109	7.168662	6.971897	7.012986
7.072478	6.957258	6.573719	6.447146	6.091499
6.464294	6.687868	6.671727	6.444039	6.564857
6.651256	6.651763	6.001178	5.809428	6.038909
6.732565	6.625145	6.120379	5.991452	6.025654
6.734861	6.256266	5.607234	5.549485	6.33417
6.661404	5.723647	6.702948	6.353667	6.395827
6.717967	6.790777	6.225174	6.008654	5.87617
6.782268	6.296618	6.870676	6.767163	6.815169
6.393718	6.621781	6.600008	6.466759	6.566076
5.766822	5.602717	5.541809	5.525457	5.336729
6.39339	5.80377	5.661186	5.567627	5.80502
5.668179	6.424088	6.377566	6.294284	6.466719
5.947949	5.86158	6.577774	6.567309	6.710972
6.480878	5.617728	5.791953	5.695123	5.849883
5.887888	5.644062	5.585885	5.491888	5.067528
5.648262	6.650321	5.748579	5.728312	5.772872
6.469269	6.345986	6.594707	6.441832	6.513107
6.15465	6.258703	6.262764	6.122185	6.183752
5.848332	5.70607	6.142779	5.898638	6.054555
5.173932	4.621944	5.623704	5.497035	5.652892
5.933396	5.847176	4.596146	4.487181	5.578039
6.250448	6.060526	5.787404	5.724563	4.726295
6.277865	6.137443	6.136475	5.733787	5.444497
5.923282	5.829927	6.035463	5.767094	5.850291
6.290934	6.085519	5.73907	5.611111	5.468959
5.602095	5.494808	5.942857	5.711312	5.876653
6.265088	6.197667	5.425836	5.298532	5.769693
5.836973	6.481237	6.102307	6.029909	6.13373
6.02339	5.646103	6.519596	6.396768	6.558674
5.51694	5.942087	5.66951	5.577871	5.650823
6.158529	5.283333	5.852561	5.769879	5.351158
5.702476	5.957171	5.071466	4.884784	5.065897
5.458187	5.757435	5.84962	5.808466	5.931173
6.022368	5.402437	5.702599	5.630004	5.182569
5.627221	6.10145	5.421573	5.463337	5.323642
5.171645	5.585328	6.078392	6.006597	6.187515
5.837335	5.140209	5.49666	5.449165	4.974974

5.611546	5.693313	5.27497	5.152612	4.503321
6.402508	5.411564	5.175486	5.965183	5.919579
6.447039	8.081454	4.261025	6.021267	5.983889

Capitalization 2013	Capitalization 2012	Capitalization 2011	Capitalization 2010	Capitalization 2009
1.8367727	1.382117555	1.1482538	1.2881939	0.862882
1.90643839	1.469248328	2.4486466	4.5832038	1.2217372
2.03890235	1.443159928	1.4958876	1.5325766	1.0915591
2.1968875	2.122727485	1.4300521	1.4087391	0.9311723
1.70972591	1.776870948	1.4742533	1.6920934	2.1070965
4.42287874	1.285100391	1.2575666	1.6797396	0.3216958
1.66829934	1.763138491	0.9903512	1.352884	2.1650198
1.49151936	1.525224672	2.7682233	1.4889884	0.6999226
1.8284014	2.263833045	1.8859988	1.8536653	1.8188531
1.72185057	1.76582715	1.4107121	1.486911	1.1931137
2.48488761	1.318205969	1.8311806	1.8878482	4.0249462
1.65667599	1.548031779	1.884782	1.1718589	1.3521963
1.72449546	1.516510982	1.3015848	1.6112633	1.4057711
1.88679687	1.816585373	1.9133016	1.6769365	1.5839629
1.5756474	1.456213205	1.8451274	2.0240913	1.2192882
2.03435757	0.846221958	0.8013734	0.8024086	0.704033
1.66513801	1.200838426	1.6412194	1.3452595	1.4265524
1.02292086	3.196188033	1.3477334	1.6248472	0.4593094
1.22764543	-0.0112138	3.2053994	3.5533385	10.66867
3.46309508	1.659706783	0.8621027	1.0461671	0.0521054
1.61016833	1.156549267	1.3167317	1.3980973	1.2531506
0.93582813	0.772289507	1.0432103	1.1565886	1.1918142
1.13628139	0.963214302	0.970353	1.330608	1.1703407
6.83465321	7.52392893	1.0087147	1.0168749	0.0475273
1.56185396	1.218136736	8.1785651	10.615673	0.4824652
1.65452532	2.184233602	0.9914932	0.9947167	12.042397
1.64931399	1.350216646	1.3254588	2.3312265	2.1800589
1.7762978	2.023793955	1.4352874	2.183958	1.8517258
0.87755432	1.000756382	2.2470107	2.8006802	3.0656337
1.962438	1.686110667	0.9642266	1.3521664	0.9640978
1.49695869	1.312489652	1.8474108	2.2919795	1.1489038
1.31904324	3.657346971	1.3351585	1.224896	1.2524097
1.61519007	1.63891907	2.7778903	2.9398374	3.0589336
3.46117163	1.457140409	1.443111	1.7715751	0.9794394
3.47389093	5.115694689	1.55592	1.378958	5.0625295
2.2174315	2.370774836	8.0082961	11.676302	6.9487864

3.5764166	1.675179311	2.4639926	2.6242598	2.3976343
1.09942309	3.577829946	1.5355517	1.7403694	3.6173467
2.11444844	0.876225619	3.3217315	3.0250114	4.126822
4.01349076	1.940519432	0.9426717	1.0025618	0.8341259
1.7798801	3.349205315	1.9754497	1.8545879	2.3275512
1.38259876	2.330051527	2.1814794	2.8382757	10.235302
2.03800989	2.569158071	8.5005441	1.684457	0.461048
2.0297824	1.604641758	42.499287	2.8042263	0.5102194

Credit Risk 2013	Credit Risk 2012	Credit Risk 2011	Credit Risk 2010	Credit Risk 2009
1.8367727	1.407475583	1.38432588	1.3363469	0.981998
4.00512267	2.398118401	11.4557948	6.1163675	1.976256
2.12164656	1.553513193	3.10162748	1.7086901	1.659973
2.52806386	3.012459973	1.85947035	2.6073355	1.899071
1.70972591	2.473952662	6.89433359	3.8768298	48.57195
6.87850505	1.63672369	2.33768847	1.8113667	0.367733
2.73940778	2.730657305	9.35027839	1.9826379	5.0253
1.72230873	1.914326676	25.3766739	2.0467638	2.005354
2.0896016	2.851619246	21.4626624	2.6007132	5.69835
2.56227763	3.890338279	1.90526559	6.3057785	4.418688
3.06776249	1.800738762	12.3663835	2.8862984	12.45685
1.65667599	2.144655074	3.74916704	2.6415922	6.935104
3.05220435	2.037508672	1.71428964	1.7445591	6.784141
3.0679624	2.326991171	5.8129695	1.7720665	1.971602
9.05544481	1.765877442	11.6452743	4.2587341	2.608091
3.06841262	0.944206188	1.68398349	2.7244971	1.961563
2.37876858	1.479073659	1.73858361	1.4562696	3.116789
1.04273279	3.372169698	6.32576042	1.7765134	0.865553
1.61320031	-0.01190496	12.5003901	12.310277	12.25441
4.44556493	2.324872932	0.91083101	1.6125075	0.07113
1.61016833	1.595521265	2.0970897	3.1086464	1.640921
2.22816222	0.908688493	1.33009705	1.4495528	2.579991
2.69260994	1.15726211	1.22889383	3.1203223	2.049188
16.5088242	10.36387242	0.32354448	2.6792854	0.052924
1.56185396	2.815912543	160.252579	22.027882	0.791833
3.73482014	2.2969219	8.1811645	2.1677109	15.10028
1.64931399	1.86312418	3.12211565	5.1872892	13.48373
1.7762978	2.887932966	1.55281375	5.4387941	5.091231
0.87755432	1.390066245	10.1712809	6.3670834	60.91404
4.341677	2.677656209	1.34671274	1.6747316	1.027207
2.61706064	1.401480888	15.0515178	7.6144488	1.504321

1.96276774	4.697551579	2.32699602	1.383912	1.49816
2.4172853	2.151796222	7.15840324	3.4379248	6.047649
5.20998188	1.619117531	1.88212773	3.1722643	1.128523
5.25959903	6.838414446	7.38090321	1.6501067	8.287858
3.3769513	2.604712771	20.5389645	18.319723	9.727542
5.47867749	1.747079961	4.89553591	4.0434077	3.682461
1.69418423	11.96726722	48.65607	3.4122538	6.059854
3.27775358	1.009070585	5.34077111	3.3021386	5.15589
6.2589337	2.116865505	1.92788825	1.6131972	1.396065
2.79243685	3.866546938	17.1770196	3.7031959	2.791451
2.18232355	2.702243193	8.26301568	4.6539045	11.29453
3.23650031	11.77345615	14.9604525	5.1618223	1.149579
3.24325776	2.146121605	78.4392179	3.2249509	1.179305

Management quality 2013	Management quality 2012	Management quality 2011	Management quality 2010	Management quality 2009
0.890125	0.821784	0.876032	0.864116	0.855775
0.78581	0.934385	0.954649	1.062725	0.33281
0.652056	0.592735	0.709939	0.657542	0.695575
0.844517	0.968881	1.080736	1.132798	1.275802
0.833138	0.86375	0.455571	0.480131	2.206803
0.637124	0.371912	0.436203	0.40338	0.331656
0.738836	0.79759	0.495974	0.524938	0.976265
0.498556	0.503842	0.637916	0.7574	0.172651
0.810585	0.555582	0.351154	0.328043	0.932886
0.491991	0.3222	0.654613	0.641125	0.792248
0.37463	0.816838	0.435805	0.494026	0.144326
1.072978	0.383986	0.847388	1.01833	0.895875
0.441545	0.603238	0.610631	0.580305	0.643353
0.363465	0.648368	0.626186	0.501062	0.786595
0.419084	1.245062	1.343956	1.615595	0.605644
0.944914	0.408948	0.40014	0.447239	0.388489
1.117543	0.534522	0.863533	0.831719	0.818762
0.488598	0.956177	0.671754	0.599294	0.330943
0.486137	2.466474	0.903546	1.069877	2.725495
1.087957	0.330282	0.830153	0.769602	0.678757
0.206804	0.250777	0.368123	0.384267	0.454739
0.761475	0.714167	0.397066	0.320658	0.160362
0.458838	0.514321	0.769902	0.66083	0.790468
1.783613	1.782777	0.576094	0.566283	0.368839
0.477668	0.478518	2.492765	2.252614	0.228636
0.567937	0.66208	0.521774	0.711359	0.594897
1.380805	1.346576	0.798533	0.792467	1.196921
0.346126	0.304509	1.309189	1.432474	1.980641
0.61559	0.607318	0.356589	0.430682	1.113303
0.513036	0.527971	0.588999	0.607619	0.621907
0.097201	0.225023	0.519478	0.657596	0.187834
0.97172	0.473623	0.245054	0.232324	0.051568
0.616559	0.625666	0.397627	0.492789	0.431259
0.716349	0.667249	0.763394	0.585013	0.629878
1.168821	0.828539	0.709903	0.782678	0.571814
0.516454	2.304822	1.063798	2.275887	0.920222
0.789047	0.43346	0.855441	0.883028	0.88741
1.08449	0.730022	0.501831	0.528593	1.437765
0.371734	1.289027	0.83528	0.582029	0.952216
1.63909	0.424496	1.379462	0.899333	1.050398
1.177772	1.782311	0.470467	0.595943	1.731585

1.578999	1.49006	1.380686	1.576281	0.980779
0.795405	1.727349	4.205453	0.298644	0.498418
0.792145	0.745443	17.81634	56.15203	60.21687

Efficiency 2013	Efficiency 2012	Efficiency 2011	Efficiency 2010	Efficiency 2009	Average
1	0.981983	0.829468	0.963967	0.878701	0.930824
0.476	0.612667	0.213747	0.749334	0.618208	0.533991
0.961	0.928965	0.482291	0.896931	0.657576	0.785353
0.869	0.704649	0.769064	0.540298	0.49033	0.674668
1	0.718232	0.213836	0.436463	0.043381	0.482382
0.643	0.785166	0.537953	0.927333	0.874809	0.753652
0.609	0.645683	0.105917	0.682366	0.430824	0.494758
0.866	0.796742	0.109085	0.727484	0.349027	0.569668
0.875	0.793876	0.087873	0.712753	0.319189	0.557738
0.672	0.453901	0.740428	0.235801	0.270015	0.474429
0.81	0.732036	0.148077	0.654072	0.323111	0.533459
1	0.721809	0.50272	0.443618	0.194979	0.572625
0.565	0.744297	0.759256	0.923593	0.207214	0.639872
0.615	0.780658	0.329144	0.946317	0.803389	0.694902
0.174	0.82464	0.158444	0.47528	0.467502	0.419973
0.663	0.896226	0.47588	0.294516	0.358914	0.537707
0.7	0.811885	0.943998	0.923771	0.457699	0.767471
0.981	0.947814	0.213055	0.914627	0.530654	0.71743
0.761	0.941943	0.256424	0.288648	0.870598	0.623723
0.779	0.713891	0.946501	0.648783	0.732533	0.764142
1	0.724872	0.627885	0.449745	0.763687	0.713238
0.42	0.849895	0.784311	0.797893	0.461945	0.662809
0.422	0.832322	0.789615	0.426433	0.571124	0.608299
0.414	0.725977	0.6177	0.379532	0.898033	0.707048
1	0.43259	0.051035	0.48192	0.609301	0.514969
0.443	0.950939	0.121192	0.458879	0.797495	0.554301
1	0.724706	0.424539	0.449411	0.161681	0.552067
1	0.700776	0.924314	0.401552	0.363709	0.67807
1	0.719934	0.220917	0.439869	0.050327	0.486209
0.452	0.629696	0.715985	0.807393	0.938562	0.708727
0.572	0.936502	0.122739	0.301004	0.763736	0.539196
0.672032	0.778565	0.573769	0.885097	0.835965	0.749086
0.668183	0.761652	0.38806	0.85512	0.505805	0.635764
0.664335	0.89996	0.766744	0.558458	0.867895	0.751478
0.660486	0.748082	0.210803	0.835678	0.610837	0.613177
0.656637	0.910187	0.389907	0.637362	0.714341	0.661687

0.652788	0.958845	0.503314	0.649022	0.651096	0.683013
0.64894	0.298968	0.031559	0.510035	0.596936	0.417288
0.645091	0.868349	0.621957	0.916076	0.800409	0.770377
0.641242	0.916695	0.488966	0.621475	0.597483	0.653172
0.637393	0.866201	0.115005	0.500807	0.833814	0.590644
0.633544	0.862266	0.264005	0.60987	0.906217	0.65518
0.629696	0.218216	0.568201	0.32633	0.401058	0.4287
0.625847	0.747694	0.541812	0.869541	0.432644	0.643507