CREDIT RISK, EFFICIENCY AND PERFORMANCE OF COMMERCIAL BANKS IN KENYA

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Declaration

This research is my original work and has not been presented for a degree in any other university

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Dedication

To my parents Mr. Charles Lakasia and Mrs. Ruth Lakasia for their upbringing and financial support

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I thank the almighty God for the gift of life and good health during the study period. It is by his grace and mercy that I have come this far.

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Abbreviations

AE	Allocative Efficiency
BCBS	Basel Committee on Banking Supervision
CBK	Central Bank of Kenya
CE	Cost Efficiency
CIS	Credit Information Sharing
DEA	Data Envelopment Analysis
DMU	Decision Making Unit
ECM	Error Component Model
GDP	Gross Domestic Product
KBA	Kenya Bankers Association
LLP	Loan Loss Provision
NI	Net Operating Income
NPL	Non Performing Loans
OLS	Ordinary Least Squares
ROA	Return on Assets
ROE	Return on Equity
SE	Shareholder Equity
SFA	Stochastic Frontier Analysis
TE	Technical Efficiency
TA	Total Assets

Operational definition of terms

Banking institutions; are institutions licensed to undertake banking business under the Kenyan banking act.

Credit Risk; is a possibility of losing the outstanding loan (extended by a bank) partially or totally due to default.

Efficiency; is the ratio of actual output to maximum potential output obtainable from a given input level or the ratio of minimum potential input to actual input required to produce the given output.

Inefficiency; is the amount by which actual output expected by a firm falls short of maximum potential output.

Performance; is the end result of the activities undertaken by the banking institutions in pursuit of their goals measured by their profitability (Return on Assets).

Technical efficiency; is the ability of a bank to obtain maximal output from a given set of inputs.

Abstract

Banking in Kenya is very dynamic and robust given its competitiveness in the East African region and contributes a lot to the economy of the region. Performance of this sector measured by profitability is very important and should be monitored closely. Kenyan commercial banks have posted very worrying trends on the level of nonperforming loans. An increase in nonperforming loans reduces the profitability of banks because it denies the industry interest income which forms a huge chunk of the income the banking industry. Kenya Vision 2030 envisages an increase of savings in 10% of GDP. The government of Kenya will rely on commercial banks to mobilize the savings that will lead to extension of loans to the public to fuel development. Credit creation is the main income generating activity of banks; however banking comes with a couple of risks including credit risk captured by the level of nonperforming loans among other factors. Recently the level of nonperforming loans in the Kenyan banking industry has been on the upward trend. There was a felt need to address this trend because it could hamper commercial banks from achieving their objectives. Therefore this study sought to establish the effect of efficiency and credit risk on performance of commercial banks in Kenya. This research is significant in the sense that it will help banks to place themselves strategically towards achievement of their goals. The study employed Data Envelopment Analysis to determine technical efficiency of commercial banks while panel data regression model was used to establish the effect of credit risk on performance of commercial banks. Based on the findings, the ratio of nonperforming loans to loans and advances affected return on assets negatively. This showed that an increase in nonperforming loans reduced profitability. Similarly an increase in loan loss provisioning decreased profitability by a substantial margin. Technical efficiency and loans and advances were found to affect profitability positively. The study recommends that every commercial bank in Kenya should strive to become technically efficient through efficient and optimal use of its inputs to attain maximum output. They should also enhance their capacity in credit analysis and loan administration curb increase in nonperforming loans because they hamper performance of commercial banks.

CHAPTER ONE: INTRODUCTION

1.1 Background

Banking is a critical sector in an economy and its performance should be monitored closely to safeguard the interest of a country or region. Banks are catalysts of economic growth through provision of financial services to the citizenry. Profitable performance of banks translates to economic growth and stability of an economy through financial stability. Kunt et al (1998) defines a bank as a financial intermediary whose liabilities are mainly short term deposits and whose assets are short and long term loans to businesses and consumers. Banking is the business activity of accepting and safeguarding money owned by other individuals and entities and then lending it out for profit making. Commercial banks in Kenya play a pivotal role in economic growth. The domestic economy grew by approximately 4.7% in 2013 compared to 4.6% in the year 2012. Financial services contributed 7.2% of the growth, up from 6.5%, during the same period (Republic of Kenya 2013).

Banking is a risky venture. The risks can either be borne by clients or banks. Those resulting from banks include interest rate risk (high interest rate spreads keeps out potential borrowers), credit risk, liquidity risk, operational risk, reputation risk while those borne by clients include risk of fraud among others. For the purpose of this study, credit risk will be studied in detail. Credit risk is captured by the asset quality (level of non-performing loans affected by the interest rate regime in the banking system). Credit risk factors include capital structure and adequacy (ratio of loans and advances to total deposits), liquidity and

asset quality (nonperforming loans/ gross loans). Capital structure determines availability of funds to cover risk; liquidity shows the ability of banks to avail cash to clients on demand while asset quality is measured by the level of nonperforming loans. If credit risk is high, it makes banks vulnerable to instability because loans form relatively a larger portion of a bank's assets thus becoming a major source of its income. The instability brings about destabilization in the entire financial sector since banks play a major role in financial stability. Credit creation plays a pivotal role in a banks' profitability as a result emphasis is placed on the same. Interest rate risk affects credit risk in various ways; high interest rates keeps away potential borrowers who are risk averse, it attracts borrowers who are risk takers and therefore likely to default and when the default rate is high banks tend to pass high rates to good customers causing them to become defaulters. Hence upsurge in interest rate risk increases probability of default on loan.

Increase in nonperforming loans could affect banks negatively since they pose a potential credit risk hence hampering banks' from achieving their objectives. Non-performing loans measure the percentage of loan values that are not serviced for three months and above (Ahmad and Ariff, 2007). If banks manage their credit risk exposure appropriately, they not only increase their profitability but also the benefits trickle down to economic stability and efficient capital allocation in the economy.

Ahmad (2006) observed that services in the banking industry have changed dramatically in recent years across the globe resulting in the diversification of bank products and portfolio. With diversification, banks are experiencing new challenges to risk management

and efficiency of afore mentioned commercial banks. Since banking and the associated risks are inseparable, there is need to study efficiency of banks along with the risks associated with banking. Ideally this study seeks to demystify the relationship between the two since earlier studies have disregarded the same.

1.1.1 Development of Banking Sector in Kenya

Kenya is a developing economy with a vibrant financial sector. The financial sector is largely comprised of commercial banks which contribute immensely in capital formation through lending to private and public sectors, deposit and saving mobilization and to a larger extent financial intermediation.

Commercial banks operate under the Banking act of Kenya (Chapter 488). They are supervised and regulated by the Central Bank of Kenya. The Companies Act (Chapter 486, 2010), the Central Bank of Kenya (CBK) Act and the Banking Act are the main regulators and governors of banking industry in Kenya. These Acts are used together with the prudential guidelines which Central Bank of Kenya issues from time to time. In 1995 the exchange rate controls were lifted after the liberalization of the financial sector in Kenya leading to increased competition amongst banks.

Development of banking in Kenya dates back to pre-independence era. It related to commercial connections in East Africa which existed towards the end of the 19th century. Until independence commercial banks were characterized by high degree of concentration in major towns, an exclusive financing of trade and elaborate system of branch banking and virtual lack of interest in involvement with the African population.

The banking system was energized in 1960's when Co-operative bank was formed in 1968 and business of Ottoman bank was taken over by National Bank of Kenya. National and Grind lays Bank that operated as a retail commercial bank was nationalized and renamed Kenya Commercial Bank (KCB) in 1971, with 60% government ownership. In Kenya there are 44 licensed banks, 43commercial banks and 1 mortgage and financial institution. Out of the 44; 31 are locally owned while 13 are foreign owned. Of the 31 locally owned banks, the government of Kenya has a significant shareholding in four banks namely; Consolidated Bank of Kenya (77.8%), Development Bank of Kenya (100%), The National Bank of Kenya (70.6%) and KCB (17.74%).

Vision 2030 (Republic of Kenya, 2007) puts banks at the forefront of economic growth through provision of financial services. Its aim is to have a vibrant and globally competitive financial sector driving high levels of savings and financing Kenya's investment needs. By the year 2030 savings rates are to rise from 17% to 30% of GDP. This has to be achieved through increase in bank deposits from 44% to 80% and reduce the cost of borrowed capital. Of importance also is to decrease total population without access to finance drastically. Saving of up to 10% of GDP for investment is targeted to be realized from remittances and FDI and foreign bonds. This blueprint was to be monitored through flagship projects of 2012.

Kenyan banks have realized tremendous growth in the last five years and have expanded to the East African region. The banking industry in Kenya has also involved itself in automation, moving from the traditional banking to better meet the growing complex needs

of their customer and globalization challenges. This has served the Kenyan economy well as the customers and shareholders are the ones who have benefited the most. Some key challenges for the banking industry in Kenya include; new regulations especially with the passing of the new constitution. Therefore the contribution of banking to GDP in Kenya cannot be overemphasized.

Banking Risk

A risk can be defined as a danger that a certain unpredictable contingency can occur which generates randomness in cash flow (Allen et al, 2005). Banking risk is the risk associated with the banking activity. When profitability is measured by return on investments, credit risk, liquidity risk and capital risk are the major factors that affect bank performance (Kolapo, 2012). Credit risk can be considered the most prominent because it defines the banks' asset portfolio. Therefore high exposure of banks to credit risk leads to a tendency of banks experiencing financial crisis vice versa. Major causes of serious banking problems continue to be directly related to low credit standards for borrowers and counterparties, poor portfolio management and lack of attention to changes in economic or other circumstances that can lead to deterioration in the credit standing of bank's counter parties (Nawaz and Munir, 2012). Kithinji (2010) defined credit risk as the possibility that the actual return on an investment or loan extended will deviate from that which was expected. Some of the sources of credit risk are limited institutional capacity, inappropriate credit policies, volatile interest rates, poor management, inappropriate laws, low capital, massive licensing of banks, inadequate supervision of central bank, poor loan underwriting, poor credit assessment, government interference, poor lending practices among others.

A close look at Kenya's financials show that, the stock of nonperforming loans increased by 42.1% to 80.3 billion in 2013 probably due to high interest rates experienced over one year resulting in defaults on loans (Central Bank of Kenya). The ratio of gross non-performing loans to gross loans increased to 5.4% in 2013. Quality of assets measured as a proportion of net non-performing loans to gross loans deteriorated from 1.5% in May 2012 to 2.6% in May 2013.

Table 1.1 Ratio of non-performing loans to total gross loans of Kenyan commercial banks.

Year	2008	2009	2010	2011	2012	2013
%	9.0	7.9	6.3	4.4	4.5	5.4

Source: World Bank, Kenya.

Table 1.1 shows that there is a fluctuating trend in the ratio of non-performing loans to gross loans in Kenya from 2008-2011 and thereafter an increasing trend from 2012 to present; why the sudden increasing trend is a topic of research?

Studies of different sectors show that nonperforming loans increased by 31.3% to Kes. 79.7 billion as at September 2013(CBK, 2013). Ratio of gross NPL's to gross loans increased from 4.6%to 5.2% in September 2013. Eight sectors experienced an increase in NPL's by Kes. 18.1 billion. This is illustrated in the figure 1.1

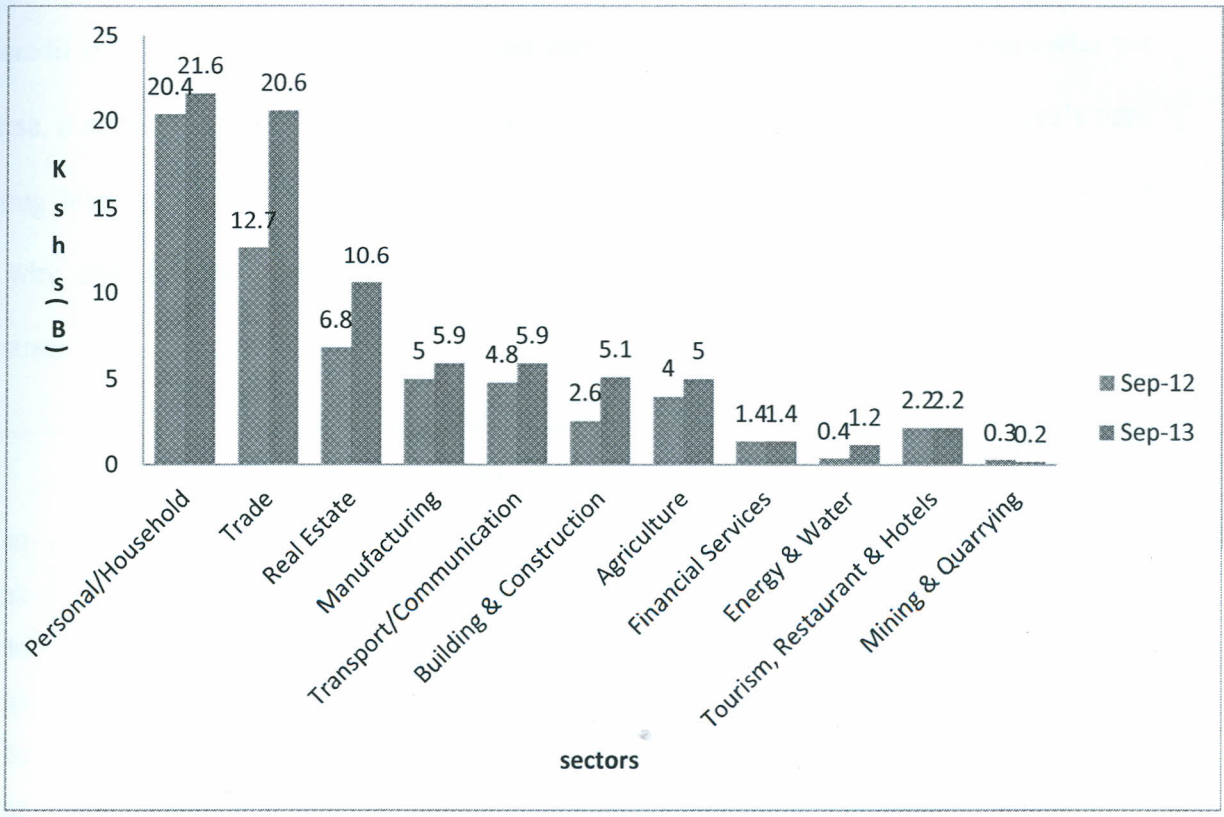

Figure 1.1 Distribution of NPL'S by sectors (Sep 2012 Vs. September 2013)

Source: Central Bank of Kenya (Bank Supervision Report)

Evidently there is a potential problem in the Kenyan banking system arising from the fact that non-performing loans have slightly increased from 4.4% in 2011 to 5.4% in 2013. This can not only be attributed to an upsurge in interest rates and growth in loan book since there is increased information sharing through credit reference bureaus and introduction of stringent credit policies by banks. Though several explanations have been given ranging from the heat of general elections that come with uncertainty and increased rate of interest, there is a felt need to address the sudden upward increase in NPL's experienced lately because they pose a potential credit risk. Increased rate of interest affects credit risk in

affects credit risk in various ways; high interest rates keeps away potential borrowers who are risk averse, it attracts borrowers who are risk takers and therefore likely to default. Kenya's non-performing loans touched a five year high at the end of June 2013 (CBK 2013). This is the reason why risk factors should be taken into account while studying commercial banks' performance.

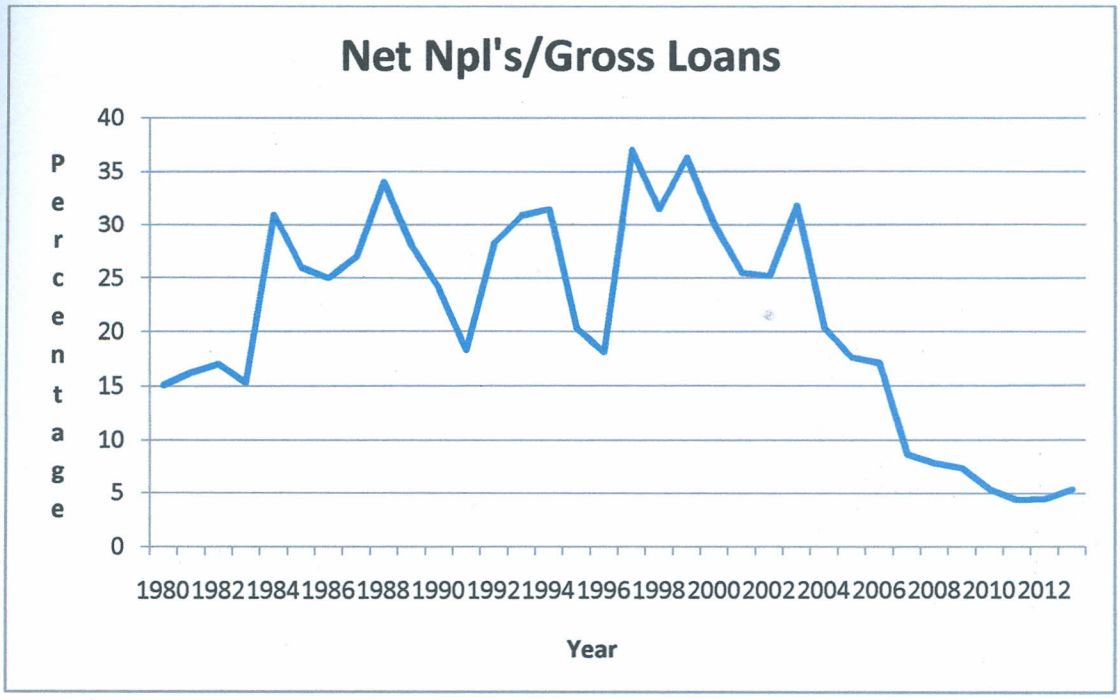

Figure 1.1 Net non-performing loans in Kenya

Source CBK (Bank Supervision Annual Reports-various issues).

Figure 1.2 shows that net NPL's increased from approximately 15% in 1980 to 36.1% in 2000 reduced gradually until 2008 and thereafter assumed an increasing trend from the year 2010 to date.

1.1.2 Credit Risk Management

Credit risk management is very important to banks as it is an integral part of the loan process, it maximizes bank risk adjusted rate of return by maintaining credit risk exposure with view to shielding the bank from the adverse effects of credit risk (Musyoki and Kadubo, 2011).

Risk management is defined as the process that a bank puts in place to control its financial exposures (Kithinji, 2010). It is a requirement of every bank worldwide to be aware of the need to identify measure, monitor and control credit risk while also determining how credit risk could be lowered. Basel Accord (2001) observes that banks engage in business activities like asset management, payments and settlement and other processing related businesses that earn them income. And at the same time they often contain important elements of operations risks. The Basel Committee on Banking Supervision (2001) identifies basic risk management tools as development of appropriate corporate policies and procedures, use of quantitative methods to measure risk, pricing products and services according to their risks, establishment of risk limits, active management of risk through diversification and hedging technologies and building of cushions (both reserves/provisions and capital) to absorb losses.

Kunt and Detragiache, (1998) observed that when the value of assets is less than the value of liabilities then the bank is insolvent. This may be due to credit risk which can be reduced through screening loan applicants and diversifying loan portfolios through lending to borrowers who are subject to different risk factors. If loan losses exceeds a bank's compulsory and voluntary reserves as well as its equity cushion then the bank is insolvent.

Kolapo (2012) identified strategies for hedging against credit risk as use of credit derivatives i.e. the ability of banks to lend more than they would at lower rates to riskier borrowers, credit securitization, and adoption of sound internal lending practices among others.

Banks have continued to use Credit Information Sharing (CIS) mechanism since July 2010 (CBK, 2013). Reports stood at 3,255,519 in September 2013 up from 2,907,375 reports in June 2013. The increase in demand for credit reports by banks demonstrates the importance of these reports in enhancing credit appraisal standards.

Bank Efficiency in Kenya

Efficiency of a firm usually means its success in producing as large as possible an output from a given set of inputs (Farrell, 1957). A bank is economically efficient if it operates with both technical and price efficiencies. Furthermore a firm is said to be more technically efficient than the other if it produces relatively larger output from the same set of inputs (Kamau, 2009).According to (Coelli et al, 2006) efficiency consists of two components; technical and allocative. Technical efficiency reflects the ability of a firm to obtain maximal output from a given set of inputs while allocative efficiency reflects the ability of a firm to use the inputs in optimal proportions given their respective prices and the production technology. Kenya exhibits low technical efficiency of financial intermediaries as evidenced by high interest spreads in the banking sector. High interest spreads and margins are the result of underlying deficiencies and impediments in the financial systems in Kenya. From a structural approach very few banks mostly belonging to tier one

(according to asset base) has a 50% and above efficiency scores (Muniu 2009). Kenya commercial banks rank fairly in allocative and profit efficiencies (though not fully efficient) but not in technical efficiency.

Bank Performance in Kenya

Performance in Kenyan commercial banks can be viewed from a profitability point of view. Profits are the major motive of every business and every firm's performance is pegged on its ability to make profits. Determinants of bank performance include; liquidity, credit quality, core capital, asset quality, earnings, capital adequacy among others. Bank earnings are measured by ratios like net interest income to average asset ratio. Low levels of this ratio are not good for the bank; similarly a high ratio may indicate high lending rates. Kamau (2009) observed that in efficient banking system market forces determine bank rates while inefficient system rates are misaligned to market fundamentals pertaining demand and supply widening the gap between lending and fixed deposits rates. Capital regulation reduces bank failures, for instance equity capital provides a cushion to absorb losses that would otherwise cause a bank fail which affects the entire financial system. Capital adequacy is measured by minimum core capital to total deposits and core capital/ total risk weighted assets.

Asset quality is another bank performance determinant. Credit quality is important for both resource allocation and growth. Poor credit quality synonymous to credit risk may cause volatility in the total credit with possible backward linkages to the same banking system. Quality of credit is a specific signal of the soundness of the efficient allocation of capital but bad credit may also impair the performance of banking institutions. Asset quality is

measured as a ratio of nonperforming loans net of provisions to gross loans. A high level of nonperforming loans shows that the bank is experiencing some inefficiency in the process of intermediation. Liquidity is also of great importance, it's measured by the ratio of the net liquid assets to total deposits. When the ratio is high it indicates that the bank is keeping excess reserves. In a credit needy country as Kenya, banks should not hold excess reserves unless it's pegged in the inefficiencies existing in the intermediation process.

Return on Assets (as a measure of profitability) is a common figure used for comparing the performance of financial institutions because a majority of their assets have a book value that is close to their actual market value.

An evaluation of the Kenyan banking as at December 2013, Return on assets increased from 1.66% in 2003 to2.74% in 2010 and decreased to 1.31% in 2013. Similarly NPL's increased by 30.91% to Ksh.80.59 billion in the year 2013. Ratio of NPL's net of provisions to gross loans decreased from 38.5% in 2003 to 4.4% in 2011 and started rising gradually to 5.4% in 2013. Since NPL's are indicators of credit risk their increases poses a potential risk to performance of commercial banks in Kenya.

1.2 Problem Statement

Performance of financial institutions measured by their profitability is a key component of economic growth of any region, country or geographical location because they contribute immensely to economic growth through provision of financial services. Many factors affect performance of banks including asset quality, credit risk, efficiency, capital structure among others. Recent studies have investigated efficiency, capital adequacy and non-

performing loans in banking industry (Kamau, 2009 and Kithinji, 2010) and observed that the aforementioned issues affect performance of financial institutions in one way or another. Liberalization of Kenyan banking industry in 1992 marked the beginning of intense competition among commercial banks, consequently, extending huge amount of credit in the view of increasing profitability. This led to increase in nonperforming loans and subsequently eroded profits due to increased loan provisioning to meet regulatory requirements. Kenya Vision 2030 blue print envisages savings to rise to 30% of GDP. These savings could translate to loans to both public and private sectors through intermediation role played by the banking industry. Asset quality of commercial banks in Kenya as measured by the ratio of total NPL's to total loans shows a worrying trend; the ratio recorded a fluctuating trend from the year 1980 reaching its highest in 2000, dipped in 2008 and thereafter assumed an upward trend (figure 1.2). This implies that although growth has been experienced in loans and advances, NPL's might have been growing at a faster rate. These trends necessitate research because an increase in nonperforming loans signals an increase in credit risk and this poses a potential risk to profitability of commercial banks in Kenya.

Ahmad (2006) observed that studying banking efficiency with exclusion of quality and risk factors may misguide the results of efficiency and performance of these banks. Risk and quality factors may explain the differences in efficiencies and hence performance across the banks significantly; calling for their inclusion in any study on commercial banks' performance. To conclude that efficiency is not sufficient to assess the overall performance of bank is quite in order hence risk factors should be taken into account. Therefore this

study introduces a measure of bank risk and quality factors into the banks' performance structure.

1.3 Research Questions

The study therefore sought to answer the following questions;

i. What is the effect of credit risk on the performance of banking institutions in Kenya?

ii. What is the relationship between efficiency and banking institutions performance in Kenya?

1.4 Objectives of the Study

The major objective of this paper was to investigate how commercial banks credit risk affected the performance of these institutions, specific objectives were to;

i. Establish the effect of credit risk on the performance of banking institutions in Kenya.

ii. Determine the relationship between efficiency and banking institutions performance in Kenya.

1.5 Significance of study

This study brought an insight into the efficiency of commercial banks particularly and performance generally having incorporated risk and quality factors, therefore enabling the Kenyan banking sector to place itself strategically in service delivery hence increasing their profitability. Since the structures of financial service industries were changing rapidly, it

was of considerable interest to measure efficiency involving institutions and explain measured variation in the efficiency of institutions.

1.6 Organization of the Study

This research project sought to establish the relationship between banking risk and efficiency in Kenyan commercial banks. The study employed panel data for commercial banks in Kenya for analysis purposes. The study was organized into five chapters, general introduction was captured in chapter one. Chapter two reviewed related literature both theoretical and empirical. Model specification, estimation procedures and sources of data were captured in chapter three. Chapter four presented research findings while chapter five presented summary, conclusion and policy implications.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This chapter looked at literature related to this study. It contains the theoretical literature review in section 2.2, empirical literature both general section 2.3.1 and specific to banking section 2.3.2, overview of literature and finally the critique of the literature in section 2.4

2.2. Theoretical Literature

2.2.1. Concept of Efficiency

Efficiency can be defined as the comparison of what is actually produced or performed with what can be achieved with the consumption of resources (money, time, labor e.t.c). It is an important aspect of productivity. Efficiency is a measurable concept, quantitatively determined by the ratio of output to input (production approach). According to (Coelli et al 2006) efficiency consists of cost efficiency and scale efficiency. Cost efficiency can be decomposed into allocative and technical while scale efficiency refers to the amount by which productivity can be increased by moving to the most productive scale size. To measure it we must have a method for identifying the most productive scale size. Efficiency can also be looked from a structural point which involves comparing an industry's performance with the efficient production function derived from its own constituent firms. It compares how an industry keeps up with the performance of its own best firms.

2.2.2. Production Approach to Efficiency

A. Concept of Output and Input Distance Functions,

Distance functions allow one to describe a multi-input, multi-output production technology without the need to specify the behavioral objective (such cost minimization or profit maximization). An input distance function characterizes the production technology by looking at a minimal proportional contraction of the input vector given an output vector. An output distance function considers a maximal proportional expansion of the output vector given an input vector (Coelli, 2006). These functions provide a conceptual underpinning for various efficiency and productivity measures.

Input distance function which involves scaling the input vector is defined on the input set L (q) as; $d_i(x,q) = Max\{p(x/p)\varepsilon L(q)\}$.

L (q) represents the set of all input vectors x, which can produce output vector q. output distance function can be defined on the output set P(X) as;

$$d_o(x,q) = Min\{\delta(x/\delta)\varepsilon p(x)\}$$

B. Technical Efficiency Measurement Using Distance.

According to (Coelli et al, 2005) efficiency consists of two components; technical and allocative efficiencies. Technical efficiency reflects the ability of a firm to obtain maximal output from a given set of inputs while allocative efficiency reflects the ability of a firm to use the inputs in optimal proportions given their respective prices and the production technology. Coelli further notes that a firm can be technically efficient but may still be able to improve its productivity by exploiting scale economies.

Technical efficiency refers to the ability of the firm to obtain maximum output from a given set of inputs while allocative efficiency reflects the ability of a firm to use the inputs in optimal proportions given their respective prices and the production technology, (Coelli et al, 2006). These two measures can then be combined to provide a measure of total economic efficiency. Input orientated measures were propounded by Farrell using a simple example involving firms that use two inputs to produce a single output assuming constant returns to scale. Technical efficiency can be measured if there is knowledge of the unit isoquant of fully efficient firms.

If a firm uses quantities of inputs, defined by the point P to produce a unit of output, the technical inefficiency of that firm could be represented by the distance QP. This represents the amount by which all inputs could be proportionally reduced without a reduction in output expressed as QP/OP- represents the percentage by which all inputs need to be reduced to achieve technically efficient production. Technical efficiency is measured by the ratio of OQ/OP= 1- QP/OP, $0\langle TE\langle 1$ If TE=1 then the firm is technically efficient. The input oriented measure of technical efficiency of a firm can be expressed in terms of input distance function d_i (x, q) as

$TE = 1/ \{d_i (x, q)\}$

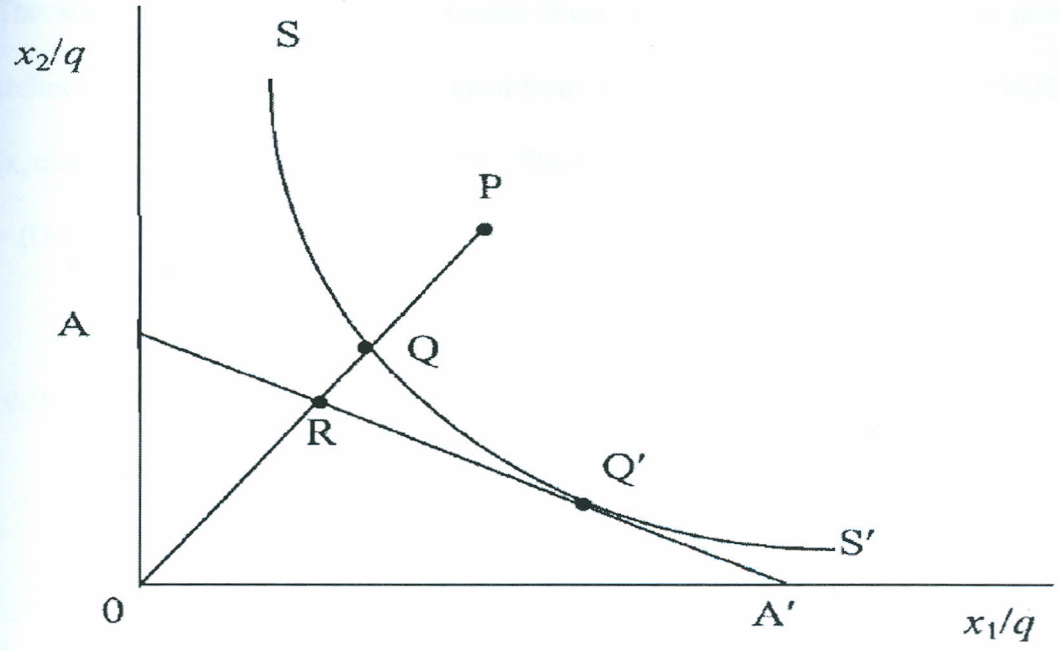

Figure 2.1 Input orientated technical and allocative efficiencies

The firm is technically efficient if it is on the frontier in which TE=1. If the price ratio represented by the slope of the iso-cost line AA' in the figure above is known then allocative efficiency and technical efficiency measures can be calculated using the iso-cost line.

AE = W'X*/W' $\dot{X}$ = OR/OQ and TE = W' $\dot{X}$ /W'X = OQ/OP.

The above equations assume that the distance RQ represents the reduction in production costs that would occur if production were to occur at the allocativelly (and technically) efficient point Q' instead of at the technically efficient, but allocativelly inefficient point Q. Given technical efficiency the total overall cost efficiency CE can be expressed as a product of technical and allocative efficiency measures:

The above efficiency measures assume constant returns to scale and that production technology is known. On the other hand from output oriented measure TE = OA/OB = d_o (x, q) as shown in the figure below. RE = OA/OC, AE = OB/OC. Therefore RE = (OA/OC) = (OA/OB) + (OB/OC) = TE*AE

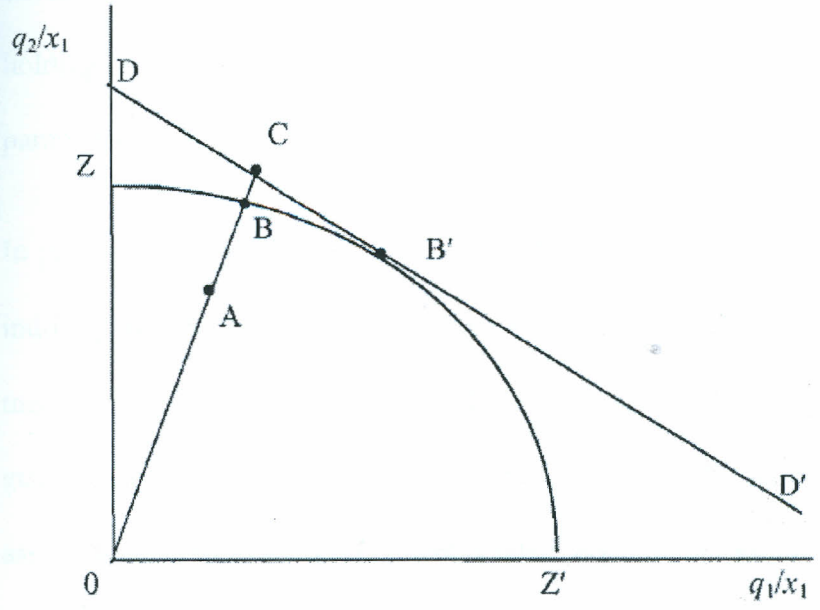

Figure 2.2 Output orientated technical and allocative efficiencies.

2.2.3. Structural Approach to Banking Efficiency

Structural bank efficiency can be can be categorized into X- efficiency and operational efficiency (Leaven, 1997). Operational efficiency is used to measure efficiency while X-efficiency explains the differences in efficiencies between banks. Operational efficiency can further be categorized into technical and allocative efficiencies. Technical efficiency shows how far the bank is from the isoquant and allocative efficiency captures inefficiencies due to the fact that the bank picked a sub optimal input combination given

input prices, both give rise to operational efficiency. X-efficiency may arise due to reasons outside the knowledge or capability of management.

Structural efficiency of a firm can also be evaluated using financial ratios, parametric approach and non-parametric approach (Muzafar et al, 2005). Frontier efficiency measures deviations in performance from that of firms with best performance on the efficient frontier holding constant a number of exogenous market factors like prices in local markets. The parametric and non- parametric measures of efficiency are discussed below

In providing services individual banks efficiency determines the efficiency of the entire industry which influences the effectiveness of the domestic financial intermediation mechanism. Banks are characterized by relatively low levels of overall efficiency and in general more allocativelly than technically efficient (Hassan et al 1990). Hassan further asserts that the technical component is relatively more important than allocative component as a source of inefficiency.

2.2.4. Stochastic Frontier Approach

This approach takes the form $\ln q_i = x'_i\beta + v_i - u_i$ where v_i is the statistical noise. It is called the stochastic frontier method because the output values are bounded from above by the stochastic (random) variable $\exp(x'_i\beta + v_i)$. The Cobb Douglas stochastic frontier model takes the form;

$$\text{Ln } q_i = \beta_0 + \beta_1 \ln x_i + v_i - u_i$$

$$q_i = \exp(\beta_0 + \beta_1 \ln x_i + v_i - u_i)$$

$$q_i = \exp(\beta_0 + \beta_1 \ln x_i) + (vi) + (- u_i)$$

Where:

$\exp(\beta_0 + \beta_1 \ln x_i)$ = is the deterministic component and

(vi) = is the noise and $(-u_i)$ is the inefficiency. (Coelli et al 2005).

Stochastic frontier approach is considered the best because it assumes that maximizing behavior is present and that it is exhibited by the most efficient firms.

2.2.5. Data Envelopment Analysis (DEA)

This method involves use of linear programming methods to construct a non-parametric piecewise surface (or frontier) over data. It evaluates the efficiency of a set of peer entities called Decision Making Units (DMUs) which convert multiple inputs into multiple outputs. Charnes, Cooper and Rhodes (1978) described DEA as a mathematical model applied to observational data that provides a new way of obtaining empirical estimates of relations. Assume data on N inputs and M outputs for each of *I* firms. For the i^{th} firm these are represented by the column vectors x_i and q_i respectively. The n x 1 input matrix x and m x 1 output matrix q which represent the data for all the I firms.

The optimal weights are obtained by solving the mathematical programming problem

$\text{Max}_{u,v} (u'q_j/v'x_i)$

S.t $u'q_j/v'x_i \leq 1 \quad j = 1, 2....I$

$u,v \geq 0$ values for u and v are found such that the efficiency measure for the i^{th} firm is maximized subject to the constraints that all efficiency measures must be less than or equal

to one. The DEA model can be input or output oriented, but under the assumption of constant returns to scale, the results are invariant

2.2.6. Credit Risk Analysis

Credit risk is the probability of incurring losses resulting from nonpayment of loans and other forms of credit by debtors. Creation of credit forms a larger chunk of income for the banks but involves large risk to both the lender and borrower. This further reduces banks' profitability. The risk of customers or counter party default is the biggest credit risk facing banking and financial intermediaries (Munir and Nawaz, 2012).

There are several ways of analyzing and mitigating risk. They range from securitization, derivatives and sound lending policies among others. Credit derivatives provides banks with an approach which does not require them to adjust their loan portfolio. They give banks new sources of income and offer banks the opportunity to reduce their regulatory capital (Shao and Yeager, 2007). The most common form of credit derivatives is the credit swap whereby a seller agrees to shift the credit risk of a loan to the protection buyer. Recent innovations in credit derivatives markets have improved lenders' abilities to transfer credit risk to other institutions while maintaining relationship with borrowers (Marsh, 2008)

Credit securitization is a form of credit risk management tool. It is the transfer of credit risk to a factor or insurance firm and this relieves the bank from monitoring the borrower and fear of hazardous effect of classified assets. The growing popularity of credit risk securitization can be put down to the fact that banks typically use the instrument of securitization to diversify concentrated credit risk exposures and explore an alternative

source of funding by realizing regulatory arbitrage and liquidity improvements when selling securitization transactions (Michalak and Uncle, 2009)

Kithinji, 2010 observed that banks should adopt sound internal lending policies. Lending policies guide banks in disbursing loans to customers, strict adherence to the policy is the cheapest and easiest method of risk management according to Kithinji. The policy should be in line with overall bank strategy and the factors considered in designing a lending policy should include the existing credit policy, industry norms, general economic conditions of a country and prevailing economic climate.

Credit analysis is a way by which lenders ascertain the credit worthiness of borrowers (Simkovic and Kaminetzky, 2011). Lenders do so by assigning a risk rating derived by estimating the probability of default by the borrower at a given level of confidence over the life of the facility and estimating the amount of loss the lender will suffer in case of default. Credit analysis involves; ratio and trend analysis, creation of projections and detailed analysis of cash flows, examination of collateral, credit history and managerial ability. Most lenders use credit ratios and scores which are numerical expression based on a level analysis of a person's credit files, to represent the creditworthiness of that person. Lenders use these scores to ascertain the potential risk posed by lending money to consumers and to mitigate losses due to bad debt. Some of the credit ratios include gearing ratio, liquidity ratio, cash flow ratio, profitability ratio among others. Gearing ratio provides an indication of the long term solvency of the firm. Liquidity ratio attempts to measure a company's ability to pay off its short term debt obligations, it also a measure of

financial leverage demonstrating the degree to which a firm's activities are funded by owners funds versus creditors funds. Credit bureaus are also used as a form of credit risk management. It is an institution which compiles customers' information and sells this information to banks as regards the lending profile of a borrower. The bureau awards a credit score called statistical odd to the borrower which makes it easier for the banks to make instantaneous lending decisions. Examples in Kenya include Transunion and Metropol.

The importance of analysis cannot be overemphasized, for prudence purposes where the lender ensures that their actions are prudent because excessive credit is detrimental to every party involved. Analysis is also important because incidences of bankruptcies are high during recessions hence need for accurate analysis to avoid losses.

2.3. Empirical Literature

This section is divided into literature of risk related to efficiency and that related to performance. Performance is pegged on efficiency hence their analysis goes hand in hand.

2.3.1. Risk and Efficiency

Kamau (2009) investigated efficiency and productivity in the banking sector in Kenya using both Data Envelopment Analysis and Stochastic Frontier Analysis and found out that though the banks were not fully efficient in all respects they performed fairly well in the period under review, hence need to explore more ways of making the banks more efficient. He identified some of the causes of inefficiency in the banking sector as productive inefficiency whereby a firm produces a given output at a lower cost or more output at the

same cost, allocative inefficiency where resource allocation to alternative uses doesn't fit well with consumers taste and agency problem which is a consequence of management styles (operations under own-manager increases productivity as opposed to employee manager control).

Leaven (1997) while seeking to establish risk and efficiency of East Asian banks found out that the efficiency for all the banks he studied in the five countries did not increase significantly. For Philippine, Indonesia and Thailand there was a substantial increase in efficiency. In Korea and Malaysia they stayed roughly constant. Banks experienced extremely high loan growths, since a substantial part of those loans were actually non-performing and therefore risky. In conclusion leaven said that apart from efficiency measures, there is need for evaluation of risk factors. The study found out that performance is a combination of high efficiency with low risk taking. Foreign banks took little risk relative to other banks in East Asia, family banks were the most risky as well as company banks.

Ahmad (2006) while investigating how banks' capital structure, liquidity and non-performing loans affect the efficiency of commercial banks in Pakistan observed that, asset quality and capital structure raise particularly important research and policy questions regarding the banking industry as they control for quality and risk factors of financial institutions. Ahmad used the stochastic cost frontier i.e. an input output vector that incorporates a proxy for risk measurement, he was able to calculate the efficiency of individual banks using the trans-log cost stochastic frontier and compared the results with

the restricted function excluding risk and quality factors from the model. From the findings he observed that inclusion of risk and quality factors improve efficiency of commercial banks of Pakistan.

Jackson et al (2000) in his investigation of the performance of Turkish commercial banks used Data Envelopment Analysis to evaluate technical efficiency of individual Turkish commercial banks and used the Tobit model to investigate determinants of efficiency. He found out that banks with low-risk portfolios as measured by a higher capital adequacy ratio are likely to be less efficient. This was probably because they rather preferred safer and lower earning portfolios over riskier but high earning portfolios. He therefore concluded that significance of bank size is an indication of higher efficiency of large banks. That more profitable banks achieved higher efficiency while those with higher capital adequacy ratio are less efficient since they're risk averse and prefer safer and lower earning portfolios. State ownership and the branch expansion policies may be an impediment for being efficient in the Turkish commercial banking sector. However they noted that there were relatively little empirical investigations into the determinants of (in) efficiency using censored regression techniques, this necessitates further research.

2.3.2. Risk and Performance

Nonperforming loans leads to credit risk which leads to banking crisis (Kunt et al, 1998). Kunt analyzed the determinant of banking crises in developed and developing countries in 1980's and 1990's using a multivariate logit specification model using annual data, he aimed at investigating the features of economic environment that tend to breed banking sector fragility and leading to systemic banking crises. They observed that banks could

hedge some of the credit risk due to fluctuations of the domestic economy by lending abroad to diversify the risk. However the study left open the question of how sensitive the correlations were to different aspects of the methodology such as estimation technique, the treatment of crisis years and the set of other explanatory variables included in the regression. These among other factors alike puts much focus on macroeconomic and institutional variables at the expense of variables that captured the structure of the banking system warrants further research.

Hakim and Neaime (1998) studied performance and credit risk in banking; a comparative study of Egypt and Lebanon. Their motivation was their observation that banking efficiency models fail to account for risk taking behavior and their results may be misleading. They employed panel data estimation using 43 Lebanese and 62 Egyptian banks between the years 1993-1999. They used fixed effects model. The results showed that return on equity in banking is a direct and an increasing function of the banks' lending activities irrespective of Lebanon or Egypt. They conclude that the credit variable is a good predictor for profitability across all banks. Bank profitability was a positive and direct function of lending activities. High ratio of loans to assets (net provisions for doubtful accounts) indicates additional risk taking on the part of the bank and therefore would translate in a higher return on equity to the extent that higher calculated risk leads to higher return.

Kithinji (2010), sought to investigate the credit risk management and profitability of commercial banks in Kenya. Regression model was applied whereby profits measured as

the ratio of net profits to total assets was regressed against amount of credit (LA/TA) and level of nonperforming loans (NPL/TA). She found out that level of nonperforming loans decreased during the period 2004 to 2008. It might have been caused by the requirement by the Basle 2 for commercial banks to control their level of nonperforming loans thus reducing banks credit risk. On average the profit of the banking industry increased during the period 2004 to 2008.

Musyoki and Kadubo (2011) investigated the impact of credit risk management on the financial performance of banks in Kenya between the years 2000-2006. They assessed various parameters pertinent to credit risk management as it affects banks' financial performance. Ordinary least squares method was employed. The study found out that the default rate as one of risk management indicator is a major predictor of the bank financial performance.

Kargi (2011) sought to explain credit risk and performance of Nigerian banks, the study also sought to identify the relationship between the nonperforming loans and commercial banks profitability and evaluate the effect of loan ad advance on banks profitability of Nigerian banks. Using OLS method, the study found out that commercial banks profitability is inversely influenced by the levels of loans and advances, non-performing loans and deposits thereby exposing them to great risk of illiquidity and distress.

To examine the impact of credit risk on profitability of Nigerian banks (Nawaz and Munir, 2012) sought to determine the relationship between the non-performing loans and bank's profitability and evaluate the effect of loans and advances on profitability of Nigerian

banks. The research employed Ordinary Least Squares and found out that commercial banks profitability is inversely related or influenced by levels of loans and advances, non-performing loans and deposits thereby exposing them to great risk of illiquidity and distress. Improper credit risk management reduces the bank profitability; affect the quality of assets and increase loan losses and non-performing loans which may eventually lead to financial distress.

Kolapo (2012) while assessing the impact of credit risk on performance of Nigerian banks over a period of ten years using panel model, found out that the effect of credit risk on bank performance measured by return on assets of banks is cross sectional invariant i.e. nature and managerial pattern of individual firms do not determine the impact. The study was significant because it provided policy measures to the various stakeholders on how to tackle the effect of credit risk in order to enhance the quality of banks' risk assets. Further he found out that loans and advances ratio exerts most significant positive effect on the profitability. He also found out that loans and advances ratio exerts most significant positive effect on the profitability across banking firms.

2.4. Overview of Literature

Studies on banking risk suggest that exclusion of quality and risk factors may misguide the results of efficiency of these banks. Recent studies carried out to measure performance of banking sector in Kenya; however they are limited to investigate the efficiency of banks in one or the other hand. They do not focus on risk and quality factors which explain the differences in efficiencies across the banks significantly. Again when looking at the efficiency from either cost minimization or revenue maximization perspective fails to

capture the goal of banks to maximize profits by raising revenues as well as reducing costs and doesn't account well for unmeasured changes in output quality. To conclude that efficiency isn't sufficient to assess the overall performance of banks is quite in order hence risk factors should be taken into account. Therefore this study introduces a measure of bank risk and quality factors into the banks' cost structure.

CHAPTER THREE: METHODOLOGY

3.1. Introduction

This chapter consists of theoretical framework in section 3.3 under which there are different panel data regression approaches i.e. fixed and random, technical efficiency and financial ratios. Then the empirical model in section 3.4, data and measurement of variables in section 3.5 and data analysis in section 3.6

3.2. Research Design

The study sought to establish the effect of credit risk on efficiency of banking institutions and thereafter determine the relationship of credit risk and performance of banking institutions in Kenya. The study employed a non-experimental research design. Quantitative data from commercial banks was used; cross sectional data from the same banks was used for the efficiency model. For the performance model panel data for three years was used. Coefficients for non-performing loans, loan loss provision, loans and advances and technical efficiency were used to determine relationship between credit risk and performance of banking institutions. Technical efficient scores were used to analyze the effect of efficiency on performance of banking institutions.

3.3. Theoretical framework

A. Technical Efficiency Model,

Efficiency of a firm is closely related with the concept of profitability. Theoretically firms choose levels of inputs and outputs to maximize profits. Technical efficiency reflects the ability of a firm to obtain maximal output from a given set of inputs (Coelli et al, 2005). It reflects the quality of a firm's inputs as well as the efficiency of it management

Suppose a firm uses an N dimensional vector of non-negative real input x to produce an M dimensional output vector q, production possibilities can be represented by the technology set S.

$S= \{(x,q):x \text{ can produce } q\}$.....3.1

This set contains all input-output vectors such that x can produce q. The production technology can be defined as;

$P(x) = \{q:x \text{ can produce } q\} = \{q: (x, q) \epsilon S\}$.....3.2

To know whether the firm was efficient in production process the output distance function is used. It is defined as the maximum scaling $(1/\delta)\ \theta$ such that θ defines the amount by which output could have been expanded given the inputs used if technology for a certain period had been fully utilized.

$d_o (x, q) = \min \{\delta: (q/\delta) \epsilon P (x)\}$.....3.3

$d_o(x, q)$ measures technical efficiency at the observed input vector x and the observed output vector q.

B. Financial Ratios

Firm's management mostly uses profits as a performance measure (Gibson, 2009). Entrepreneurs make decisions that are geared towards profit maximization. A multi-input, multi-output firm solves the problem

$\Pi (p, w) = \max pq - wx$.....3.4

Such that $T (q, x) = 0$

Where Π (p, w) is profit which varies with output prices (p) and input prices (w)

q is a vector of outputs

x is a vector of inputs

T (q, x) = a transformation function for a firm that uses n- inputs to produce m-output. Therefore bank performance can be studied under the theory of profit maximization. Financial ratios can be used as a proxy for measuring profitability. These are accounting ratios used to evaluate performance of a firm. The ratios used are Return on Assets (ROA) and Return on Equity (ROE). These ratios are advantageous since they comprise an aspect of efficiency (Hays et al, 2009).

ROA = NI/TA.....3.5

ROE = NI/SE Where ROA is return on assets, ROE is return on equity, NI is net operating income and SE is shareholder equity. ROA ratios indicate how many shillings can a firm get from a shilling of the asset it has. This ratio is useful for competing firms. ROE measures rate of return on ownership of interest of the common stock. It measures a firm's efficiency at generating profits from every unit of shareholders' equity (Hays et al, 2009). It shows how well a company uses investments funds to generate earnings growth. This study used ROA due to scarcity of data on shareholder equity.

C. **Credit Risk**

Credit risk is based on the Hawley risk theory of profit which stipulates that risk taking is an inevitable component of dynamic production and those who take risk in business have

a right to a reward known as profit. Credit risk measures include ratio of nonperforming loans to loans and advances, ratio of loans and advances to total deposits and the ratio of loan loss provision to classified assets. Therefore measures of asset quality, capital structure and credit quality respectively are shown as follows;

Asset quality =NPL/TOTAL LOANS AND ADVANCES

Capital structure = LOANS AND ADVANCES/DEPOSITS

Credit quality = LLP/ASSETS

Where NPL is nonperforming loans and LLP is loan loss provision.

The three measures of credit risk formed independent variables and the study ascertained their effect on performance of Kenyan commercial banks.

3.3.1. Estimation of Panel Data Regression Model

1. Fixed Effects Approach

In this approach estimation of panel data regression model depends on the assumption made about the intercept, the slope coefficients and the error term. The assumptions include; intercept and slope coefficients are constant across time and space, error term captures differences over time and firms. Slope coefficients are constant but the intercept varies over individuals, slope coefficients are constant but the intercept varies over individuals and time and the intercept as well as slope coefficients vary over individuals and time. For instance if the slope coefficients are constant but the intercept varies across individual banks, then the difference across the firms may be brought about by special features of each company e.g. managerial style or philosophy. The model is written as

$Y_1t = \beta_{0i} + \beta_1X_{1i}t + \beta_2X_{2i}t + \beta_3X_{3i}t + \mu_{it}$ 3.6

Subscript i on the intercept term suggest that the intercepts of the banks may be different. The above model is known as the fixed effects regression model. The fixed effect intercept is allowed to vary by introduction of dummies for each firm. For instance if we have 4 firms the model becomes;

$Y_it = \alpha_1 + \alpha_2D_{2i} + \alpha_3D_{3i} + \alpha_4D_{4i} + \beta_1X_{1i}t + \beta_2X_{2i}t + \beta_3X_{3i}t + \mu_{it}$.....3.7

The equation intercept $\alpha 1$ represents the reference firm, α_2, α_3, α_4 represent the differential intercept coefficients, which show by how much the intercepts of other firms differ from that of the reference firm.

2. Random Effects Approach

This approach assumes that the intercept has a random variable. Gujarati (2004) observes that if the dummy variables do in fact represent a lack of knowledge about the true model, then the ignorance can be expressed through the disturbance term μ_{it}. B_{1i} is no longer fixed; it is assumed that it is a random variable with a mean value of $\beta 1$. Intercept value for each company can be expressed as $\beta_{1i} = \beta_1 + \varepsilon_i$, where i = 1, 2... N. the model becomes;

$Y_it = \beta_0 + \beta_1X_{1i}t + \beta_2X_{2i}t + \beta_3X_{3i}t + \varepsilon_i + \mu_{it}$.....3.8

Where Y_it = the cross sectional observation of independent variable Y at time t.

X_it = the cross sectional independent observable variable at time t

μ_{it}= unobserved effects of the independent variable over the period of observation.

$Y_it = \beta_0 + \beta_1X_{1i}t + \beta_2X_{2i}t + \beta_3X_{3i}t + w_{it}$, where $w_{it} = \varepsilon_i + \mu_{it}$ 3.9

In random effects model the intercept β_0 represents the mean value of the (cross sectional) intercepts and the error component ε_i represent the (random) deviation of the individual intercept from this mean value; ε_i is the unobservable variable. The independent variables will be measures of credit risk, technical efficiency while the dependent variable is bank performance.

3.4. Empirical Model/Model Specification

This study used cross sectional data for three years (2011-2013) to estimate technical efficiencies for all commercial banks in Kenya. The study chose the years above because this the period when nonperforming loans started rising gradually as shown in figure 1.2. Then the study used panel data estimation method to determine the effect of credit risk on the performance of the banks. The study preferred panel model because a set of banks were studied for a period of three years.

A. Technical Efficiency Model

DEA model with variable returns to scale was used to measure technical efficiency. DEA was preferred over SFA because it does not require a priori estimated frontier function as it generates its own from the given data. DEA is ideal in the banking industry because the industry is a multi-input and multi-output, there is non-linearity of its input-output relationships, there is non-physical nature of fundamental resource and products and the impossibility of drawing on market prices for some of them. DEA is also useful where there is lack of competitive pricing mechanism as is the case with Kenyan commercial banks. Cross sectional data for commercial banks in Kenya was used for a period of 3 years. Efficiency scores for the banks were determined through the following model and

there after a technical efficiency variable will be introduced in the performance model through panel data regression method.

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

s.t $\quad q_{it} + Q_t\lambda \geq 0,$

$\theta x_{it} - X_t\lambda \geq 0,$

$I1'\lambda = 1$

$\lambda \geq 0$.....3.10

Where;

θ is a scalar and λ is a Ix1 vector of constraints

x_{it} is a Nx1 vector of input values of the i^{th} firm in period t

q_{it} is a Mx1 vector of output value for the i^{th} firm in period t

Q_t is 1xM matrix of output values for all I firms in period t

X_t is a 1xN matrix of input values for all I firms in period t

$I1'\lambda = 1$ is the convexity condition that provides for VRS

B. Performance Model Specification

The study employed the Return on Assets model of bank performance as used by Kargi (2011) and Kolapo (2012). The choice of whether to use Random Effects Model or Fixed Effects Model was based on the test statistics during data analysis. The first and second

objectives were answered by equation 3.11. For the second objective, a technical efficiency variable was introduced in the performance model to determine its effect on the performance of banks. The model for this study was;

ROA=f (NPL/LA, LLP/TA, LA/TD, TE)..... 3.11

Where;

ROA: Return on Assets

NPL: Non-Performing Loans

LA: Loans and Advances

LLP: Loan Loss Provision

TA: Total Assets

TD: Total Deposit

TE: Technical Efficiency

The model functionally becomes;

$ROA = \alpha_0 + \alpha_1 (NPL/LA)_{it} + \alpha_2 (LLP/TA)_{it} + \alpha_3 (LA/TD)_{it} + \alpha_4 (TE)_{it} + w_{it}$..... 3.12

Where; α_0 is intercept, α_1-α_3 are coefficients of independent variables and w_{it} is the error term. The composite error term $w_{it} = \varepsilon_{it} + u_{it}$. $\varepsilon_{it}$is the individual specific error component and u_{it} is the combined time series and cross section error components. w_{it} was assumed to have a mean of zero and a constant variance. Also it was assumed that individual error components are not correlated with each other and are not auto correlated across both cross section and time series units.

3.5. Data and Measurement Variables

The study used time series and cross sectional data, pooled in panel data set and the parameters estimated using panel data estimation. Data was collected from all the commercial banks in Kenya for a period of three years from 2011 to 2013. For the DEA model data on inputs and outputs was collected for the same period. The inputs were customer deposits, staff costs were used as a proxy for labour and capital, while outputs were loans and advances and other investments of the banking industry. Data on loan loss provision, ratio of loans and advances to total assets and non-performing loans was collected from individual commercial bank's annual profit and loss accounts and also from the central bank's annual reports. Inputs and outputs for the DEA model were as shown in the Table 3.1

Table 3.1 Model Variables

	Variable	Description
Inputs	Deposits	Customer deposits
	Labour	Number of employees in each bankir institution
	Capital	Physical capital- equipment, property and oth fixed assets
Outputs	Loans and advances	Value of total aggregate loans and advances
	Other investments in banking institutions	Government securities and deposits placed other financial institutions
NPL	Nonperforming Loans	Gross nonperforming loans less interest suspense at a given time
LA	Loan Advances	Total loans and advances to customers
LLP	Loan Loss Provision	Specific provisions for bad debts
TA	Total Assets	All the assets held by a bank at a particular tim
TD	Total Deposits	Customer deposits in terms of cash and fixe deposits.

3.6. Data Analysis

The study used panel data (secondary) for 43 commercial banks in Kenya for a period of 3 years. The study employed statistical packages for data analysis. Packages included E-Views and STATA for the panel data regression model which represents the performance model to answer objective one while DEAP was used for computation of technical efficiencies of commercial banks in Kenya to answer objective two. The analysis was presented in chapter four of the project.

CHAPTER FOUR: RESEARCH FINDINGS

4.1 Introduction

This chapter presents the study findings. Two approaches were used to determine the effect of credit risk on performance of the banks and also the effect of efficiency on performance of Kenyan banks. The chapter starts by presenting technical efficiency scores for the banks. Credit risk effects as measured by non-performing loans, loans and advances and loan loss provision are presented thereafter.

4.2 Data Envelopment Analysis Results

Results from the DEA model are presented in this section. Technical efficiency scores for commercial banks in Kenya are calculated. The study settled on technical efficiency because Kenyan banks are believed to be more allocativelly efficient than technically efficient (Hassan et al, 1990). Outputs used included loans and advances and other investments in banking institutions while inputs were customer deposits, labour (staff costs) and physical capital.

4.2.1 Technical Efficiency Scores for Kenyan Banks

Table 4.2 shows technical efficiency scores for the 43 Kenyan commercial banks. The scores were calculated for three consecutive years using the output oriented model under variable returns to scale.

Table 4.1 Technical Efficiency Scores for Kenyan Banks

	Variable Returns to Scale			
	2011	2012	2013	**MEAN**
Kenya Commercial Bank	1.000	1.000	1.000	**1.000**
Commercial Bank of Africa	1.000	1.000	0.936	**0.979**
Citibank	1.000	1.000	0.793	**0.931**
Barclays	1.000	1.000	0.863	**0.954**
Standard Chartered Bank	1.000	1.000	1.000	**1.000**
National Bank of Kenya	1.000	0.993	0.528	**0.840**
NIC Bank	1.000	1.000	1.000	**1.000**
CFC Stanbic Bank	0.955	0.976	1.000	**0.977**
I & M Bank	1.000	1.000	1.000	**1.000**
Equity Bank	0.984	1.000	1.000	**0.995**
Diamond Trust Bank	1.000	1.000	1.000	**1.000**
Gulf African Bank	0.545	0.576	0.853	**0.658**
First Community Bank	0.490	0.513	0.811	**0.605**
Co-operative Bank	0.941	1.000	0.875	**0.939**
Imperial Bank	0.858	0.752	0.800	**0.803**
Bank of Africa	0.959	0.889	0.935	**0.928**
Eco Bank	0.987	0.860	0.565	**0.804**
Fina Bank	0.682	0.695	1.000	**0.792**
Bank of Baroda	1.000	1.000	1.000	**1.000**
Bank of India	1.000	1.000	1.000	**1.000**
Housing Finance	1.000	1.000	1.000	**1.000**
Prime Bank	0.935	0.912	0.779	**0.875**
Middle East Bank	0.683	0.739	0.888	**0.770**
Guardian Bank Ltd	0.913	0.749	0.944	**0.869**
Transnational Bank	1.000	1.000	0.866	**0.955**
Consolidated Bank	0.590	0.704	0.691	**0.662**
Giro Commercial Bank	0.585	0.680	0.630	**0.634**
Family Bank	0.623	0.647	0.660	**0.643**
ABC Ltd	0.592	0.669	0.552	**0.604**
Habib Bank	0.910	1.000	0.411	**0.774**
Paramount Bank	1.000	1.000	1.000	**1.000**
United Bank of Africa	0.705	0.623	1.000	**0.776**
Habib Bank Ltd	1.000	1.000	1.000	**1.000**
Development Bank	1.000	1.000	1.000	**1.000**
Victoria Commercial Bank	0.667	0.692	1.000	**0.786**
Fidelity Commercial Bank	0.695	0.693	0.683	**0.690**
Credit Bank	0.497	0.550	0.571	**0.539**
Equatorial Commercial Bank	0.696	0.549	0.596	**0.614**
Chase Bank	0.801	0.714	1.000	**0.838**
K-Rep Bank	0.380	0.475	0.720	**0.525**
Dubai Bank	1.000	1.000	1.000	**1.000**
Oriental Commercial Bank	1.000	0.931	0.909	**0.947**
Jamii Bora Bank	1.000	1.000	0.987	**0.996**

Source: Author Computations.

Table 4.1 shows that most of the Kenyan banks are fairly efficient. The mean efficiency scores for the banks are over 0.500 with Kenya Commercial Bank, Standard Chartered bank, NIC Bank, I & M Bank, Diamond Trust Bank, Bank of Baroda, Bank of India, Housing Finance, Paramount Bank, Habib Bank Ltd, Development Bank and Dubai Bank having a mean efficiency score of 1.00. Most of them maintained a score of 1.00 for the three consecutive years. K-Rep Bank is the least efficient bank with a mean efficiency score of 0.525 followed by ABC Bank Ltd with a score of 0.604.

The results also showed that in the year 2013, most banks had output slacks in other investments (government securities) meaning they could increase their output using the same inputs. This showed that the inputs were underutilized (Appendix 1). These banks included but not limited to Barclays, Imperial, Eco bank, Middle East, Consolidated, Giro Commercial Bank, Family Bank, ABC, Fidelity Commercial Bank, Credit Bank and Chase Bank.

4.3 Regression Results

This section presents overall results obtained by running a regression on both dependent and independent variables. The efficiency scores from the DEA results are used as an independent variable in the regression model.

4.3.1 Descriptive statistics for dependent and independent variables

Table 4.1 shows the descriptive statistics for the dependent and independent variables. The dependent variable is return on assets while the independent variables are ratios of loan loss provision to total assets, loans and advances to total deposits, non-performing loans to loans and advances and technical efficiency.

Table 4.2 Descriptive Statistics

	ROA	NPL/LA	LLP/TA	LA/TD	TE
Mean	0.049720	0.087668	0.031994	0.585110	0.847922
Median	0.046050	0.056010	0.005580	0.581550	0.940000
Maximum	0.164240	0.555820	0.437800	1.313620	1.000000
Minimum	-0.295530	0.005770	0.000000	0.150490	0.246000
Std Deviation	0.050393	0.100353	0.072069	0.165711	0.185397
Skewness	-2.327087	2.588987	3.451753	0.860076	-0.944552
Kurtosis	18.95636	10.26257	15.81610	6.638979	2.735642
Sum	6.413840	11.30918	4.27220	75.47936	109.3820
Sum Sqd Dev	0.0325047	1.289061	0.664820	3.514878	4.399621
Observations	129	129	129	129	129

Source: Author Computations

Table 4.2 shows that for all the ratios of the variables both dependent and independent under consideration, the standard deviations for all the ratios are higher than the mean. This implies that Kenyan banks are highly heterogeneous. Since the variations are on inputs and outputs, the high standard deviation shows heterogeneity in operation scales by banks. It's worth noting that this will not pose a problem to the estimation method since DEA ignores the scale differences among decision making units (Coelli et al, 2005).

After efficiency scores for the commercial banks were obtained, they were used as independent variable in the panel regression model together with the following ratios; NPL/LA, LLP/TA, and LA/TD. The results of both Random Effects Model and Fixed Effects Model are presented in Table 4.3 and 4.4 respectively

Random Effects Model Estimates

This model assumes that the intercept has a random variable. The intercept C represents the mean value of the (cross sectional) intercepts and the residues represent the (random) deviation of the individual intercept from this mean value.

Table 4.3 Random Effects Model Estimates

Dependent Variable = ROA				
Variable	Coefficient	Std Error	t-statistic	Probability
NPL/LA	-0.040551	0.058147	-0.697385	0.4852
LLP/TA	-0.03976	0.249894	-0.225600	0.0119
LA/TD	0.050800	0.026365	1.926830	0.0563
TE	0.063535	0.022364	2.841010	0.0053
C	-0.031833	0.024641	-1.291856	0.1985

R^2 = 43.59%, D.W = 2.45, Prob (F) =0000, N = 129

Source: Author Computations

Table 4.3 shows that the coefficients of LLP/TA, LA/TD and TE are individually statistically significant as the *p* values of the estimated *t* coefficients are small. The coefficient of NPL/LA is not significant at either 10% or 5% because of the high p value. The value of the constant (-0.031833) represents the mean value of the cross sectional intercepts. The intercept value is negative hence not significant meaning it is same across all the Kenyan banks. The coefficients of NPL/LA, LLP/TA, LA/TD and TE are -0.040551, -0.03976, 0.050800 and 0.063535 respectively.

Fixed Effects Model Estimates

This model assumes that intercepts vary for each bank but still assume that the slope coefficients are constant across all the banks. The term fixed effect is due to the fact that although the intercept may differ across individual firms (43 banks) each bank's intercept does not vary over time i.e. time invariant.

Table 4.4 Fixed Effects Model Estimates

Dependent Variable = ROA				
Variable	Coefficient	Std Error	t-statistic	Probability
NPL/LA	-0.116374	0.049104	2.369951	0.0202
LLP/TA	-0.075689	0.057003	-1.327802	0.1880
LA/TD	0.020997	0.041373	0.507479	0.0100
TE	0.091196	0.030225	3.017207	0.0034
C	-0.047674	0.038225	-1.247179	0.2160

R^2 = 75%, D.W = 2.52, Prob. (F) =0000, N = 129

Source: Author Computations.

Table 4.4 shows that the coefficients of NPL/LA, LA/TD and TE are significant as the probability values and the estimated t values are small. The intercept value is negative showing that the intercepts across all banks are the same. The coefficient of LLP/TA is not significant at both 10% and 5% levels of significance.

4.3.2 Diagnostic Tests

The choice between REM and FEM is not arbitrary as they both present different and significant results based on the firms being studied. This study used two tests to determine the appropriate methodology. The Haussmann Test H0: FEM and REM estimators do not

differ substantially. If the null hypothesis is not rejected then FEM is preferred over REM though the estimates may not differ significantly.

The study settled on Fixed Effects Model because after running a Haussmann Test H0: FEM and REM estimators do not differ substantially, the null hypothesis was not rejected hence FEM preferred over REM since χ^2 was 4.98 which > 0.05. The R^2 = 75% is high enough making estimates statistically significant. A high Durbin Watson value of 2.52 shows that the variables are not auto correlated. Another justification of FEM over REM comes from the number of time series observations (T) compared to the number of cross sections (N). If T>N then FEM is preferred over REM (Gujarati. 2004). Preference of FEM over REM means that the effect of credit risk on bank performance in Kenya is cross sectional invariant. That credit risk has similar impacts on Kenyan banks.

4.3.3 Interpretation of Estimates

The findings show that there is a linear relationship between return the dependent and independent variables of the model. Based on the diagnostic test in section 4.3.2 the Fixed Effects Model estimates will be adopted. The R^2 = 75% is high enough making estimates statistically significant. A Durbin Watson value of 2.52 shows that the variables are not auto correlated. The coefficients of NPL/LA, LLP/TA, LA/TD and TE are -0.116374, -0.075689, 0.020997 and 0.091196 respectively. Non-performing loans affected ROA negatively while loans and advances and technical efficiency affected ROA positively. The results show that if NPL/LA increased by 100%, ROA decreased by 11.33%. Therefore non-performing loans affected return on assets negatively. Commercial banks that had high levels of nonperforming loans were bound to experience a decrease in their return on assets

as compared to their counterparts with low levels of non-performing loans. This result is similar to those found by Kolapo (2012) which showed that loans and advances had a significant relationship with return on assets. On the contrary Kargi (2012) stipulated that nonperforming loans did not have a significant impact on the performance of commercial banks in Nigeria.

On the other hand a 100% increase in LA/TD increases ROA by 2.09%. This means that commercial banks with a high ratio of loans and advances to total deposits will have higher returns to assets as compared to their counterparts with low ratios. These results are similar to those found by Munir and Nawaz (2012) which found out that loans and advances is a major variable in determining the asset quality of a commercial bank. Therefore loans and advances have a significant influence on the return on assets of commercial banks in Kenya. These findings indicate risk items are important in determining profitability of commercial banks in Kenya. Where commercial banks do not manage their risks effectively, their profits will be unstable.

Similarly technical efficiency (TE) has a significant positive relationship on the performance of commercial banks in Kenya. If technical efficiency increases by 100% then return on assets will increase by 9.12%. A high technical efficiency of commercial banks will attract a high level of return on assets. The study found out that there was no significant relationship between return on assets and loan loss provisions (LLP/TA).

The first objective of this study was to establish the effect of credit risk on the performance of banking institutions in Kenya. This objective is answered by Table 4.4 whereby the

coefficients of nonperforming loans, loan loss provisioning and loans and advances are used to show the effect of these variables on the performance of commercial banks. Non-performing loans had a significant negative effect on the performance of commercial banks in Kenya. Banks that experience increasing nonperforming loans will undoubtedly have their profits declining. On the other hand those banks with a high deposit structure as compared to loans and advances will experience increases in their return on assets as a measure of profitability. These results indicate that credit risk has a negative influence on the performance of commercial banks in Kenya.

The second objective was to determine the relationship between efficiency and banking institutions performance in Kenya. The answer to this lies in Table 4.4 whereby an increase in technical efficiency increases profitability of commercial banks in Kenya. If technical efficiency increases by 100%, ROA increases by 9.12%. Therefore technical efficiency has a significant effect on return on assets of commercial banks in Kenya. Commercial banks with high technical efficiency scores are bound to be more profitable than those with low levels of technical efficiency.

CHAPTER FIVE: SUMMARY CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Introduction

This chapter summarizes the study findings and makes conclusions. Policy implications from the findings and areas of further research are also presented.

5.2 Summary

The study sought to determine the effect of credit risk on the performance of commercial banks in Kenya and also the relationship between technical efficiency of commercial banks and performance of the same banks. Data on non-performing loans, loan loss provision, total assets, total deposits, profit before tax, inputs(physical capital, labour and deposits) and outputs (loans and advances and other investments) for 43 commercial banks in Kenya was collected for a period of 3 years.

Technical efficiency for the banks was determined and panel regression was done. The study revealed that more than a third of Kenyan commercial banks are technically efficient with a score of above 0.5000. Further regression results showed that performance of commercial banks as measured by return on assets is positively related to the ratio of loan and advances, deposits and technical efficiency, but there is a negative relationship between performance of commercial banks and the ratio of loan loss provision to total assets though not significant while the ratio of nonperforming loans to loans and advances are negatively related to return on assets.

Ratio of NPL/LA exerted most pressure on return on assets of banks at 11.33% followed by TE at 9.12%. Loans and advances increase return on assets of commercial banks; same to technical efficiency. The study found out that there was a linear relationship between dependent and independent variables.

5.3 Conclusion

The study concludes that during the period of study the banking sector's return on assets was adversely affected by credit risk measured by nonperforming loans. Return on assets

is inversely influenced by levels of nonperforming loans therefore exposing commercial banks in Kenya to great risk of illiquidity and financial distress. The asset quality (NPL/LA) deteriorated eating into the banks' profits. This puts banks at great risk of illiquidity and probability of loss. Therefore increase in nonperforming loans is detrimental to the performance of commercial banks in Kenya.

Loans and advances (LA/TD) and technical efficiency (TE) improved return on assets (profitability) of the Kenyan banks. Commercial banks with high levels of technical efficiency experienced high returns on assets as compared to those with low levels of technical efficiency. High efficiency ensures optimal and prudent allocation of bank inputs translating to better performance by commercial banks in Kenya.

The study also established that banks with large and elaborate deposit base experienced better performance in terms of return on assets as compared to those with low deposits. This is because their capital structure was aligned with their lending activities hence could not suffer from illiquidity and financial distress. The effect of loan loss provision on return on assets wasn't significant.

5.4 Policy Implications

Based on the research findings the study recommends that every bank should strive to become technically efficient through efficient and optimal use of its inputs to attain maximum output.

Secondly, Kenyan banks should enhance their capacity in credit analysis and loan administration while Central bank of Kenya should pay more attention to strict adherence to relevant provisions of the banks and other financial institutions.

Thirdly banks' management need to be cautious in setting up credit policy that will not negatively affect their profitability and they also need to know how credit policy affects the operation of their banks to ensure prudent utilization of deposits to maximize profits.

Finally improper credit management reduces bank's profitability, affects asset quality because it increases nonperforming loans which may eventually lead to financial distress. Therefore proper credit risk management tools should be put in place, like continuous monitoring of loan books to mitigate the adverse effects of non-performance of loans.

5.5 Areas of Further Research

The study proposes an extension of the current study to estimate the causes of loan default among borrowers in Kenya and also take into consideration the tools used in credit management by Kenyan banks and determine their effectiveness. Productivity and efficiency studies do not focus on technical efficiency alone; therefore the study proposes estimation of other forms of efficiency such as profit efficiency and cost efficiency of Kenyan commercial banks.

Further research on performance of financial sector in Kenya should be directed to other financial institutions like insurance, SACCO's, microfinance institutions and even mobile transfer services by some institutions as the play a crucial role in the financial sector in Kenya.

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APPENDICES

Appendix 1

Table A1 Output Slacks of the DEA model

	OUTPUT SLACKS					
	2011		2012		2013	
	LA	INVST'S	LA	INVST'S	LA	INVST'S
Kenya Commercial Bank	0	0	0	0	0	0
Commercial Bank of	0	0	0	0	0	0
Citibank	0	0	0	0	0	0
Barclays	0	0	0	0	0	5172120
Standard Chartered Bank	0	0	0	0	0	0
National Bank of Kenya	0	0	1022	0	0	0
NIC Bank	0	0	0	0	0	0
CFC Stanbic Bank	0	0	0	0	0	0
I & M Bank	0	0	0	0	0	0
Equity Bank	0	4995	0	0	0	0
Diamond Trust Bank	0	0	0	0	0	0
Gulf African Bank	0	0	0	1262	0	0
First Community Bank	0	0	0	0	0	0
Co-operative Bank	0	5030	0	0	0	0
Imperial Bank	0	0	0	0	0	114842
Bank of Africa	0	0	0	0	0	0
Eco Bank	0	0	0	0	0	2086298
Fina Bank	0	0	0	0	0	0
Bank of Baroda	0	0	0	0	0	0
Bank of India	0	0	0	0	0	0
Housing Finance	0	0	0	0	0	0
Prime Bank	0	0	0	0	0	0
Middle East Bank	0	0	0	0	0	294565
Guardian Bank Ltd	0	0	0	0	0	0
Transnational Bank	0	0	0	0	0	0
Consolidated Bank	0	0	0	0	0	2769478
Giro Commercial Bank	0	0	0	0	0	45744
Family Bank	0	0	0	0	0	2515133
ABC Ltd	0	0	0	0	0	1732879
Habib Bank	811	0	0	0	0	0
Paramount Bank	0	0	0	0	0	0
United Bank of Africa	0	0	3922	0	0	0
Habib Bank Ltd	4319	0	0	0	0	0
Development Bank	0	0	0	0	0	0
Victoria Commercial	0	0	0	0	0	0
Fidelity Commercial	0	0	0	0	0	1101520
Credit Bank	0	0	0	0	0	557638
Equatorial Commercial	0	0	0	0	0	0
Chase Bank	0	0	0	0	0	1931432
K-Rep Bank	8719	0	0	0	0	0
Dubai Bank	0	0	0	0	0	0
Oriental Commercial	0	0	0	299	0	0
Jamii Bora Bank	0	0	0	0	0	0

Appendix 2
Table A2 Kenyan commercial banks

Kenya Commercial Bank
Commercial Bank of Africa
Citibank
Barclays
Standard Chartered Bank
National Bank of Kenya
NIC Bank
CFC Stanbic Bank
I & M Bank
Equity Bank
Diamond Trust Bank
Gulf African Bank
First Community Bank
Co-operative Bank
Imperial Bank
Bank of Africa
Eco Bank
Fina Bank
Bank of Baroda
Bank of India
Housing Finance
Prime Bank
Middle East Bank
Guardian Bank Ltd
Transnational Bank
Consolidated Bank
Giro Commercial Bank
Family Bank
ABC Ltd
Habib Bank
Paramount Bank
United Bank of Africa
Habib Bank Ltd
Development Bank
Victoria Commercial Bank
Fidelity Commercial Bank
Credit Bank
Equatorial Commercial Bank
Chase Bank
K-Rep Bank
Dubai Bank
Oriental Commercial Bank
Jamii Bora Bank