THE EFFECT OF CAPITAL ADEQUACY REQUIREMENTS ON THE EFFICIENCY OF COMMERCIAL BANKS IN KENYA

BY

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DECLARATION

I declare that this project is my original work and has never been submitted for an award of degree in any other University.

Signed……………………………………**Date**…………………………………

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This has been submitted for examination with my approval as the university supervisor.

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DEDICATION

This project work is dedicated to my family, relatives and friends; all for the debt un owed that can never be repaid, for always being in support of my full academic life.

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LIST OF ABBREVIATIONS

ANOVA: Analysis of Variance

CBK: Central Bank of Kenya

CRS: Constant Return to Scale

DEA: Data Envelopment Analysis

DMU: Decision making Unit

KES: Kenya Shilling

SFA: Stochastic Frontier Approach

SSA: Sub-Sahara Africa

VRS: Variable return to Scale

ABSTRACT

Recent economic crises have revealed the importance of bank regulations to hedge against the high risk attributed to imbalances in banks' balance sheets. The most important part of banking regulation is regulation on capital. Nonetheless, excessive regulations may have adverse effects. Safety of depositors' fund remains the major concern of bank regulators. It is in this respect the capital adequacy becomes relevant and important.

The study adopted a descriptive research design. The population of interest in this study consisted of all 43 commercial banks operating in Kenya and has been in existence in the last five years, licensed and registered under the Banking Act Cap.488. To measure economic efficiency the study adopted the Data Envelopment Analysis (DEA) techniques.

The value of the F statistic indicated that the overall regression model is significant hence it has some explanatory value i.e. there is a significant relationship between the predictor variables of capital adequacy ratio and the efficiency of commercial banks in Kenya.

The study recommends that central bank should be keen on commercial banks capital adequacy ratio by laying down financial regulations on liquidity since the goal of financial regulation is to enable banks to improve liquidity and solvency. Stricter regulation may be good for bank stability, but not for bank efficiency, restricting banks may not only lower bank efficiency but also increase the probability of a banking crisis.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Recent economic crises have revealed the importance of bank regulations to hedge against the high risk attributed to imbalances in banks' balance sheets. The most important part of banking regulation is regulation on capital. Nonetheless, excessive regulations may have adverse effects. On one hand, it serves as prudential measures that mitigate the effects of economic crises on the stability of the banking system and subsequent accompanying macroeconomic results. On the other hand, excessive regulations may increase the cost of intermediation and reduce the profitability of the banking industry. Simultaneously, as banks become more constrained, their ability to expand credit and contribute to economic growth would be hampered.

The Central Bank of Kenya (CBK) has implemented a requirement that all banks need to build their core capital to KES 1 billion (USD 12 million) by December 2012 up from KES 250 million (USD 4 million) in 2008. The argument from the CBK's perspective is that increased capital base is important for financial sector stability and serves as a buffer against losses and hence failure. However, other market players with an alternative perspective argue that increased capital levels may push up the cost of bank credit (bank lending rate) and a shrinking of risk-weighted assets (RWA) by banks to try to meet higher minimum regulatory capital ratios may lead to rationing of the quantity of credit or put upward pressure on spreads for credit market debt. Although policies and regulations are considered major cause of such wide spreads, this study aims to examine the effect of capital adequacy requirements on the efficiency of commercial banks in Kenya for the period 2005 – 2012.

It turns out that capital adequacy requirements may affect the level of efficiency because they act as fixed inputs in the production process. Estrada and Osorio (2004) offer one option by explicitly allowing regulatory cost factors to determine the level of efficiency. This specification directly captures the regulatory burden borne by the banks and helps understand the dynamics of hidden costs which may be difficult to observe in practice. To illustrate, tighter capital regulatory requirements meant to safeguard the banking industry may produce some unintended adverse consequences on bank behaviour, including efficient allocation of resources.

Research by Fare *et al.* (2004) found that risk-based capital standards had a significant impact on profit efficiency. Hughes and Mester (1993) also argue that an increase in reserve requirements raises the opportunity cost of funds and acts as a tax on the price of deposits, thereby impairing banks' decision making. While most analysts would argue for the need to enforce regulations on capital requirement, the question remains: What is the right benchmark to enforce regulations without jeopardizing the ability of banks to service the economy efficiently. To properly address this question, it has become necessary to thoroughly analyze the effect of capital regulations, namely the capital adequacy ratio on banks efficiency.

1.1.1 Capital Adequacy Requirements

According to Basel Committee on Banking Supervision there are three concepts of capital; actual, regulatory and economic as follows:-

Actual capital refers to the physical capital which is represented within the balance sheet as equity and long-term debt. It is usually measured as the ratio of equity to total assets also known as the capital ratio.

Regulatory capital relates to risk-based capital which the bank maintains in line with supervisory determined rules and is measured as the ratio of capital to risk-weighted

assets; also referred as risk-based capital ratio. A risk-based capital rule implies that the level of regulatory capital varies not only with the state of the economy but also with the risk profile of bank assets.

Economic capital represents the maximum amount of capital that a bank requires to operate its business effectively based on its business strategies.

1.1.2 Measurement of Capital Adequacy Ratio

Regulation is introduced in the form of a minimum capital requirement imposed by the regulatory authorities. Each bank has to meet the minimum capital requirement imposed by the regulatory authority which depends on the characteristics of bank assets. The minimum level of bank capital typically depends on the size of the bank's loan book and risk-based capital regime, related to the risk profile of bank assets.

Regulatory capital ratios are defined as a risk weighted capital ratio with the bank's capital in the numerator and the risk-weighted assets in the denominator:

Capital Ratio (CR) = Capital (C) / Risk Weighted Assets (RWA)

= (Capital / Total Assets (A))/Risk Weighted Assets (RWA)

= level of capital or leverage / level of risk

CBK makes and enforces rules which govern the minimum capital requirement for Kenyan banks and are based on the international standards developed by the Basel Committee. In the year 2008, CBK reviewed the minimum capital requirements for commercial banks and mortgage financial institutions with the aim to maintain a more stable and efficient banking and financial system. According to the Banking Act (2008), every institution was expected to maintain:-

a) A minimum core capital of at least KES 1 billion (USD 12 million) by 2012

b) A core capital of not less than 8% of total risk adjusted assets plus risk adjusted off balance sheet items;

c) A core capital of not less than 8% of its total deposit liabilities;

d) A total capital of not less than 12% of its total risk adjusted assets plus risk adjusted off balance sheet items;

In addition to the above minimum capital adequacy ratios of 8% and 12%, commercial banks were required to hold a capital conservation buffer of 2.5% over and above these minimum ratios to enable the institutions withstand future periods of stress (CBK, 2013)3. This brings the minimum core capital to risk weighted assets and total capital to risk weighted assets requirements to 10.5% and 14.5%, respectively.

In comparison with the international set standards, the regulatory capital within Basel III framework require banks to hold 6% of Tier I capital (up from 4% in Basel II) of risk-weighted assets and 8% of Tier II total capital (8% in Basel II) of risk-weighted assets. Basel III also introduced additional capita allow national regulators to have up to another 2.5% of capital during periods of high credit growth. The minimum capital ratios will be phased in between January 2013 and January 2015, and the conservation buffer will be phased in from January 2016 to December 2018.

1.1.3 Efficiency

The most common efficiency concept is technical efficiency: the conversion of physical inputs (such as the services of employees) into outputs relative to best practice. In other words, given current technology, there is no wastage of inputs whatsoever in producing the given quantity of output. An organization operating at best practice is said to be 100% technically efficient. If operating below best practice

levels, then the organization's technical efficiency is expressed as a percentage of best practice. Managerial practices and the scale or size of operations affect technical efficiency.

Allocative efficiency refers to whether inputs, for a given level of output and set of input prices, are chosen to minimize the cost of production, assuming that the organization being examined is already fully technically efficient. Allocative efficiency is also expressed as a percentage score, with a score of 100% indicating that the organization is using its inputs in the proportions that would minimize costs. An organization that is operating at best practice in engineering terms could still be allocative inefficient because it is not using inputs in the proportions which minimize its costs, given relative input prices.

Finally, cost efficiency *(*total economic efficiency) refers to the combination of technical and allocative efficiency. An organization will only be cost efficient if it is both technically and allocative efficient. Cost efficiency is calculated as the product of the technical and allocative efficiency scores (expressed as a percentage), so an organization can only achieve a 100% score in cost efficiency if it has achieved 100% in both technical and allocative efficiency.

X-efficiency, introduced by Leibenstein (1966) refers to efficiency in production by linking inputs to outputs. It is an economic expression for the effectiveness with which an organization uses its given set of inputs to produce outputs. Specifically it refers to the internal organization of firms and its response to external factors. Studies of X-efficiency estimate a best practice cost function which denotes the forecasted cost function of banks that are X-efficient and then measure the degree of inefficiency in the sample relative to this best practice. In other words, a bank is considered as

inefficient if its costs are higher than those predicted for an efficient bank producing the same input/output configuration.

1.1.4 Effect of Capital Adequacy requirement on Efficiency of Commercial Banks

The goal of financial regulation is to enable banks to improve liquidity and solvency. Stricter regulation may be good for bank stability, but not for bank efficiency. Barth, Caprio and Levine (2006) study what affects bank regulation and how banking regulation works. Their research on most countries shows that strong regulators and capital adequacy standards do not improve bank efficiency. Barth et al. (2004) put forward various reasons for and against restricting bank activities. However, overall their results indicated that restricting banks may not only lower bank efficiency but also increase the probability of a banking crisis.

From the long-term point of view, as Kenya economic growth is highly dependent on credit supply, the banks need to grow their loan scales at certain rates so as to support the sustained economic growth. Therefore, they will be faced with the need for capital supplementation in order to keep up with the regulatory requirements on Capital Adequacy Ratio (CAR). Pasiouras (2008) mentioned that stricter capital adequacy, powerful supervision and market discipline power promote technical efficiency. However, only the latter one is significant. Too little capital increases the danger of bank failure whilst excessive capital impose unnecessary costs on banks and their customers and may reduce the efficiency of the banking system. Furthermore, economic theory provides conflicting predictions about the impact of regulatory and supervisory policies on banks performance (Barth et al., 2004; 2007a).

1.1.5 Commercial Banks in Kenya

Kenyan financial services industry is dominated by the banking sector. Currently there are 43 licensed commercial banks, 30 are locally owned and 13 are foreign owned. The locally owned financial institutions comprises of 3 banks with significant shareholding by the Government and State Corporations and 27 commercial banks.

In terms of implementation, the Kenya's banking sector has over the year complied with the implementation of the Basel accords, with implementation of Basel I and Base II being done in phases. The amendments by CBK through the Finance Act 2008 raised the minimum capital was intended to strengthen institutional structures in the banking sector.

During the period 2007 – 2011, the Kenyan banking system showed resilience, which is attributed to the low financial integration in the global financial market and the strict supervision and sound regulatory reforms (Bank Supervision Annual Report 2009, 2010; IMF, 2009).

According to the Central Bank of Kenya the financial sector performance indicators with return on asset indicator rising from 2.6 percent in 2007 to 4.4 percent in 2011 while the ratio of gross non-performing loans to gross loans improving from 10.6 percent to 4.4 percent over the same period.

1.2 Research Problem

Safety of depositors' fund remains the major concern of bank regulators. It is in this respect the capital adequacy becomes relevant and important. The capital adequacy is a conception that results from the idea of rearranging the existing capital structure of banks in order to restructure the banking industry against widespread distress. Adequate capital creates an opportunity for better standards in any business

establishment. It spurs business exertion and great performance. The effect of capital adequacy on banks performance cannot be underestimated since adequate capital directly and automatically influences the amount of funds available for loans, which invariably has an effect on the level and degree of risk absorption. Despite its many roles and diverse functions, it is clear that bank capital is acting as a protective cushion against losses precipitated by certain kinds of uncertainties. This view looks at capital as a constraint to avoid default and capital also acts as a cushion to protect depositors and other creditors against losses at the operating and liquidation stage.

In Kenya, the concept of recapitalization is a measure adopted by the regulator at the period of increased capital adequacy ratio in order to rearrange the existing capital structure. Adequate capital aids recapitalization in that it emerges to meet the need of individual banks in form of increasing the minimum paid-up capital so that banks can carry out their operation efficiently with their customers. This is a form of correcting the wide spread distress of the banking sector.

Thus motivated by concerns of solvency and stability of the banking industry, the central bank adopted tighter supervisory and regulatory policies and implemented new banking legislation.

Gudmundson, Nyoka, and Odongo, (2013) examined the effect of capital requirements on bank competition and stability. They found evidence that capital has a nonlinear effect on competition. The benefits of increasing capital requirements on competitiveness are realized once consolidation starts to take place. Bank structure also has a significant and important effect on banking performance. Overall, the results point to the effect of capital regulation on bank competition and the performance of banks and financial stability in Kenya.

The effect of capital adequacy on banks efficiency cannot be underestimated since adequate capital directly and automatically influences the amount of funds available for loans, which invariably has an effect on the level and degree of risk absorption. Mandatory capital ratios help to set corresponding profit target for banks; capital adequacy might influence banks cost of capital and overall cost of fund. Higher capital adequacy ratios may restrict the competitive ability of banks; they also affect banks growth capabilities. This view takes into consideration the effect mandatory capital ratios have on banks' performance being that if the banks are not able to meet up with the mandatory capital ration it places a constraint on their lending abilities which eventually affect their primary function of money creation.

Research on the impact of capital requirement on efficiency in commercial banks in developing countries has received little attention despite rapid growth in this literature over the years. This is rather unfortunate given the dominance of banking sector in the financial system in these countries. In view of the foregoing, this study is aimed to address this gap by looking at the empirical analysis of capital requirement and its impact on the efficiency in Kenyan commercial banks.

The study intends to address the following research question: what is the effect of capital adequacy requirement on the efficiency of commercial banks in Kenya?

1.3 Objective of the study

To establish the effect of capital adequacy ratio on the efficiency of commercial banks in Kenya

1.4 Value of the Study

The finding of this study will be of great importance to the policy makers especially the Central bank of Kenya in their efforts to monitor the commercial banks financial

performance in relation to capital adequacy. The regulator should be alert in ensuring all commercial banks put in place appropriate controls and policies, monitors the operation of banks capital adequacy and effectiveness.

It will also assist the Central Bank of Kenya (CBK) to know when there are distress symptoms and to form measures to further securitize the banking system and restore depositor's confidence. It is hopes that the finding of this study will help the customers and investors to know whether the banking system is performing better in terms of capital adequacy.

The study will also help the commercial banks with difficult in maintain the required capital adequacy ratio to adjust their operations through a set of financial decisions to avoid liquidation effects as a result of inadequate capital threshold. Future researchers may also borrow a leaf from this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section draws related, material from different studies carried out in the past and in different geographical location. It describes the theories that are examined in the study about capital adequacy requirement and efficiency in commercial banks.

2.2 Theoretical Review

Before introducing the empirical model, the study looks at the theories specific to capital adequacy requirement and efficiency.

2.2.1 The Capital Buffer Theory

In line with the capital buffer theory (Marcus 1984, Milne and Whalley 2001) banks aim at holding more capital than required (i.e., maintaining regulatory capital above the regulatory minimum) as insurance against breach of the regulatory minimum capital requirement. The capital buffer is the excess capital a bank holds above the minimum capital required. The capital buffer theory implicates that banks with low capital buffers attempt to rebuild an appropriate capital buffer by raising capital and banks with high capital buffers attempt to maintain their capital buffer. More capital tends to absorb adverse shocks and thus reduces the likelihood of failure. Consequently, portfolio risk and regulatory capital are assumed to be positively related. Banks raise capital when portfolio risk goes up in order to keep up their capital buffer.

2.2.2 Trade-Off Theory

The trade-off theory of capital structure refers to the idea that a company chooses how much debt finance and how much equity finance to use by balancing costs and

benefits. The classical version of the hypothesis goes back to Kraus and Litzenberer (1973) who considered a balance between the dead-weight costs of bankruptcy and tax saving benefits of debt. It states that there is an advantage to financing with debt, the tax benefits of debt and there is a cost of financing with debt, the costs of financial distress. Expected costs associated with financial distress takes a substantial bite out of a firm value providing an opposing force to the tax advantage of additional debt (Brealey and Myers, 2003). On the other hand, it is argued that capital is very costly. Investors demand a premium to compensate for increased bankruptcy risk associated with the probability of financial distress and proportionately low capital ratio. In order to generate an "adequate" return on equity, commercial banks have to incur higher risks to receive higher risk premium on their investments the higher the level of capital. Thus, increased risk requires greater proportions of equity in the firm's capital structure to prevent an inefficient cost of capital. The net effect of this negative incentive effect and the buffer effect is ambiguous. It is possible that the default risk increases as the level of capital is increased.

2.2.3 Theory of Moral Hazard

Moral hazard occurs when central banks, governments, or supervisory agencies lead economic agents to believe that they will get involved to protect an institution and its creditors in case of any failure. The moral hazard theory predicts that when capital requirements force banks to increase capital, they will react by also increasing risk. An increasing number of empirical papers (Shrieves and Dahl 1992; Jacques and Nigro 1997; Aggarwal and Jacques 2001; Rime 2001) has tried to test the moral hazard theory. Most papers find a positive relationship between capital and risk adjustments, indicating that banks that have built up capital have, at the same time, also increased risk. This finding has been interpreted as supporting the moral hazard

theory.Better capitalized banks have less moral hazard incentives (Jeitschko and Jeung, 2005) and are more prone to adopt careful practices to reduce costs (e.g. shareholders may be more active in controlling bank cost or capital allocation). Regulators can also force banks to increase the amount of capital commensurably with the amount of risk taken (Gropp and Heider, 2010). Holding additional capital buffers above the regulatory minimum for banks with higher levels of risk aims to avoid the costs associated with having to issue fresh equity at short notice.

2.2.4 Theories of Economic Efficiency

The concept of economic efficiency is rooted in neoclassical microeconomic theory, which focuses on resource allocation and utilization. It advocates for non-wastage of resources by emphasizing cost reduction while producing the maximum level of output for a given technology and available inputs. The main driving force behind economic efficiency is value creation. Thus, a firm that is economically efficient may possess competitive advantage over rival firms producing less efficiently in the same industry. Accordingly, in the process of transforming inputs into some output value, a change that increases value is an efficient change and one that decreases value is an inefficient change. For purposes of policy intervention efficiency has often been used to evaluate the effectiveness of policy alternatives.

Economic efficiency is better explained by profit maximization (or analogously, cost minimization) and is often associated with perfectly competitive markets. For firms operating in a competitive industry, efficiency gains accrue when firms earn only normal profits in the long-run and respond to changes in consumer preferences by increasing output. Whether this output in sold at the same, higher or lower price depends in large measure on the position of the cost curves in the long-run (Griffiths

& Wall, 2000). In general however, efficiency is associated with welfare improvements.

Different factors may explain efficiency levels in a firm. Some of the factors may be inherent in the internal organizational structure of the firm, including managerial expertise, experience of workers and skills levels. Internal sources of (in) efficiency typically include laxity, human mistakes, disruption of production technology or insufficient capacity to respond to changing incentives. Other factors may be external to the firm. These factors may include regulatory constraints, macroeconomic shocks, real business cycles, strikes and labour disputes and structure of the market in which the firm is operating. Taken together, these factors may account for a substantial amount of variability and differences across firms' performance levels. Internal factors are firm specific and therefore within the control of the firm, environmental factors are outside the control of the firm. Therefore, in assessing the efficiency of firms, care must be exercised in differentiating between internal and external factors.

2.3 Measurement of Efficiency in Commercial Banks

The approach used for estimating economic efficiency can be categorized broadly as being parametric (stochastic) and non-parametric (linear programming) techniques. The most widely used parametric is called stochastic frontier approach (SFA) and the most widely used non-parametric technique is called Data Envelopment Analysis (DEA).

2.3.1 The Stochastic Frontier Approach

The stochastic frontier approach (SFA) was first developed by Aigner et al. (1997) and Meesen and Van den Broeck (1977) who estimated efficiencies using cross-sectional data. The SFA specifies a particular form for the production/cost function

allowing for a composite error term. Thus, the methodology involves parameterising the relationship between the level of inputs and the technically efficient level of output. Stochastic frontier models use econometric modeling. However, an often cited criticism of the stochastic frontier approaches is that when the specification of the efficiency function and stochastic term are assumed a priori, it may not be clear whether or not the efficiency measure is contaminated by the misspecification of the estimated econometric model.

2.3.2 Data Envelopment Analysis

Another variant of frontier estimation techniques in founded in the so-called non-parametric approaches based on data envelopment analysis (DEA) or linear programming techniques following the seminal work of Charnes *et al.* (1978). The approach by Charnes *et al.* (1978) uses Farrell's (1957) concept of efficiency under constant returns to scale (CRS). Later reformulation of the DEA model by Banker *et al.* (1984) showed that overall efficiency can be divided into 'pure technical' and 'scale' efficiency and suggested that firms may in fact be characterized by variable returns to scale (VRS). The DEA also decomposes overall efficiency into technical and allocative efficiency. Data envelopment analysis does not explicitly make any assumptions regarding the functional form of the frontier but empirically builds a best-practice function from observed (actual) inputs and outputs (Favero and Papi, 1995). However, a major criticism leveled against the DEA methodology is that it assumes absence of measurement error and statistical noise. Accordingly, errors are taken as measures of inefficiency. However, as Herrero & Pascoe (2002) have observed these inefficiency scores may be biased if the production process is largely characterized by stochastic elements.

2.4 Empirical Review

This section reviews and discusses some of the related empirical literature on capital requirement and its impact on banking efficiency. (Besanko and Kantas, 1993; Boot and Greenbaum 1993) have argued that capital requirements reduce monitoring incentives which reduce the quality of bank's portfolio. Bolt and Tieman (2004) argue that stringent capital adequacy requirements lead banks to set stricter acceptance criteria for granting new loans.

According to Hughes and Mester (1998, 2009) both capital and risk are likely to be determined by the level of bank efficiency. For instance, authorities may allow efficient banks with high quality management a greater flexibility in terms of their capital leverage or overall risk profile. On the other hand, a less efficient bank with low capital may be tempted to take on higher risk to compensate for loss of return due to moral hazard considerations.

In this line Berger and De Young (1997) and Kwan and Eisenbeis (1997) posit that it is crucial to recognize explicitly the concept of bank efficiency in empirical models analysing the determinants of banks´ risk. Berger and De Young (1997) employ Granger-causality methods to assess the inter-temporal relationships among problem loans, cost efficiency, and capital for a sample of US banks from 1985 to 1994. Kwan and Eisenbeis (1997) use a simultaneous equation framework to test hypotheses about the interrelationships between bank risk, capitalization, and operating efficiency. Both papers provide evidence that both efficiency and capital are relevant determinants of bank risk.

Berger and De Young (1997) show that declines in cost efficiency precede increases in problem loans (particularly at thinly capitalized banks). They also show that

problem loans result in reductions in cost efficiency. Kwan and Eisenbeis (1997) also found that poorly performing banks are more vulnerable to risk-taking. They also find that that highly capitalized banks are more efficient than less capitalized institutions.

For Sub-Saharan African (SSA) countries studies of banking efficiency are limited and include Ikhide (2000) and Adongo *et al.* (2005a; 2005b) for Namibia; Hauner and Peiris (2005) and Beck and Hesse (2006) for Uganda and Čihák and Podpiera (2005) for Kenya, Tanzania and Uganda. Ikhide (2000) and Adongo *et al.* (2005a; 2005b) reached contrasting conclusions on the efficiency of Namibian banks with the former positing that banks in Namibia were characterized by inefficiency while the latter studies indicated that Namibian banks compared relatively well with international evidence. These contrasting findings may be due to differences in the approaches used to measure banking efficiency, and the variables included in the models specified.

On the other hand, Čihák and Podpiera (2005) and Hauner and Peiris (2005) reported similar results for East African countries, noting that an increase in bank competition was associated with a rise in efficiency. However, this evidence is not shared by Beck & Hesse (2006) who argue that banking spreads have been significantly high in Uganda, indicating inadequate efficiency in the banking industry. It is important to point out that this study inferred efficiency from high spreads rather than rely on more robust techniques to estimate efficiency. It is well acknowledged that efficiency analysis based on ratios and spreads suffers from a number of shortcomings and may not provide reliable estimates of banking efficiency (World Bank, 2006).

Kamau, et.al (2004) used the simultaneous equations approach to model the regulatory impact of minimum capital requirements on bank risk behavior and capital levels in Kenya for the period 2000-2002. Using the three stage least square method,

the study estimated the relationship between capital adequacy ratio and the risk portfolio in the banking sector. The study findings revealed that risk-based capital requirements have been effective in increasing capital for the capitalized bank while the effect has been minimal for the under-capitalized banks. According to the study findings, regulatory constraints affect bank behavior particularly for the capitalized banks. Capital requirements cause banks to increase their capital. The main conclusion of the study is that prudential capital requirements should not be set so high, such that they enhance risky behavior in banks. Rather, they should be set low or at a fair enough level to ensure asset quality and non-risky tendencies.

2.5 Summary of Literature Review

A general conclusion drawn from the body of literature above is that capital requirement regulation will directly affect the behavior of commercial banks. Especially, as the banking sector in Kenya has in the recent past undertaken major structural and policy changes mainly aimed at improving performance in the banking sector and this include prudential regulation and supervision, financial innovation among others. The main purpose of financial regulation is to enable banks to improve the liquidity and solvency. However, the implementation of new regulatory standards will make the banking industry more robust, safeguard long-term stability of credit supply, thus supporting the sustained growth of economy. Stricter regulation may be good for bank stability, but not for bank efficiency. This also shows that policymakers and banks face the trade-off between financial stability and efficiency. Therefore there is need to assess the impact of the capital adequacy ratio on efficiency of commercial banks.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methodology to be used in this study. This section describes the research design, variables of interest, population, sampling criteria and data analysis.

3.2 Research Design

Burns and Grove (2003) define a research design as "a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings". Parahoo (1997) describes a research design as "a plan that describes how, when and where data are to be collected and analyzed". Polit et al (2001) define a research design as "the researcher's overall for answering the research question or testing the research hypothesis".

This study examines the effect of capital adequacy requirement on the efficiency of commercial banks in Kenya. The study adopts a descriptive research design. Descriptive research design is a study in which the major emphasis is on determining cause-and-effect relationships between variables. The research is done in a way that shows the effect that each independent variable has on the dependent variable.

3.3 Population

Cooper and Emory (1995) define population as the total collection of elements about which the research wishes to make some inferences. Element is the subject on which the measurement is being taken and is the unit of study, according to Cooper and Emory (1995). The population of interest in this study consists of all 43 commercial banks operating in Kenya and has been in existence in the last five years, licensed and

registered under the Banking Act Cap.488. This therefore excludes any banks that have gone under during the period, or been brought under statutory management of the Central Bank of Kenya. The study will adopt a census survey.

3.4 Data Collection

This research uses secondary (financial) data. All data for the study will be collected from the end-of-year statement of financial position and statement of comprehensive income for the individual years 2005 to 2011. The data of interest are fixed assets, total deposits, total borrowed funds, operating expenses, interest expenses, total loan (short-term and long-term), investment (short and long-term), interest income, and risk weighted assets (common equity, premium reserves, and retained earnings).

In the analysis the study adopts the following set of inputs and outputs to quantify the efficiency:

Definition of Input and output variables

Variable	Variable Name	Description
Input	Fixed assets	The sum of physical capital and premises
	Funds	Total deposits plus total borrowed funds
Input price	Price of fixed assets	Operating expenses divided by the fixed assets
	Price of funds	Interest expenses on customer deposits plus other interest expenses divided by the total funds

Output	Total loans	Total of short-term and long-term loans
	Investment	Includes short and long term investment
Output price	Price of loans	Interest income on loans divided by total loans
	Price of Investment	Other operating income divided by investments

3.5 Data Analysis

A multiple regression model is adopted by the study to analyse the data using statistical package for the social science (SPSS) version 15.

To measure economic efficiency the study adopts the Data Envelopment Analysis (DEA) techniques. The major reason to prefer DEA over SFA is that DEA can be used even when conventional cost and profit functions that depend on optimizing reactions to prices cannot be justified. Since it is likely that regulations and other market imperfection to distort prices complicating the application of SFA to price and quantity data. A practical consideration to use DEA instead of SFA is that it avoids having to measure output prices, which are not available for transactions services and fee-based outputs. Selected inputs and outputs from each decision making units (DMU) should maximize its efficiency score.

Efficiency = Weighted sum of outputs/ Weighted sum of inputs

where decision making unit (DMU) is efficient if it has a score of one and inefficient if it has a score of less than one. Under the intermediation approach, banks are treated as financial intermediaries that combine deposits, labour and capital to produce loans

and investments. The values of loans and investments are treated as output measures; labour, deposits and number of employees is inputs.

3.5.1 Model and Variable

This study estimates a model to capture the relationship between capital adequacy requirement and bank efficiency. To analyze the impact of changes in capital requirements on bank efficiency, the study adopts a multivariate panel regression model in which the efficiency score, as measured by the Data Envelopment Approach (DEA) depends on changes in capital requirement and a set of other conditioning variables. The efficiency scores (as the independent variable) from DEA are limited to between 0 and 1.

Analytical Model

This study will adopt the following model:

$$Y_t = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon_t$$

Table 3: Definition of independent and explanatory variables

Variable Name	Measure	Description/Formula
Capital Adequate X_1	Capital adequacy ratio	Net capital to risk weighted assets *Capital Ratio (CR) = Capital (C) / Risk Weighted Assets (RWA)*
Control Variables		
X_2	the establishment time	It is the cumulative year of the establishment time
Efficiency		

	Efficiency among commercial banks	Efficiency score is limited between 0 and 1 measured by the DEA.
Y_t		*Efficiency = Weighted sum of outputs/ Weighted sum of inputs*

Test of Significance

To test the robustness of the model, the study adopts analysis of variance (ANOVA), R^2 and t-test to test the significance of regression equation coefficients. Analysis of Variance (ANOVA) consists of calculations that provide information about levels of variability within a regression model and form a basis for tests of significance. The study further applies correlation analysis on explanatory and explained variables to examine multicollinearity.

CHAPTER FOUR

DATA ANALYSIS, FINDINGS AND INTERPRETATION

4.1 Introduction

This chapter is a presentation of results and findings obtained from field data, both descriptive and inferential statistics have been employed specifically using logistic regression analysis to provide an insight depth of the effect of portfolio characteristics on financial performance of unit trusts in Kenya.

4.2 Descriptive Statistics of the Sample

This summarizes the sample characteristics of the effect of capital adequacy on the efficiency of commercial banks in Kenya. The results of tests on the differences in means of all variables of the model were considered i.e. capital adequacy measured by capital adequacy ratio which is described as Net capital to risk weighted assets Capital Ratio (CR) = Capital (C) / Risk Weighted Assets (RWA), establishment time as a control variable described as the cumulative year of the establishment time and efficiency among commercial banks described by Efficiency score which is limited between 0 and 1 measured by the DEA. Efficiency = Weighted sum of outputs/ Weighted sum of inputs. The findings were as indicated in Table 4.1

Table 4.1 The effect of capital adequacy on the efficiency of commercial banks in Kenya.

	Capital adequacy ratio	Establishment time	DEA (efficiency score)
Mean	0.42	0.312	0.6251
Median	0.32	0.402	0.2233
Maximum	0.91	0.816	0.6621
Minimum	0.11	0.141	0.1621
Std. Dev	0.052	0.032	0.0310
Skewness	0.238	0.453	0.1151
Kurtosis	0.175	0.412	0.1213
Observations	43	43	43

Source: Research Findings

The study carried out descriptive statistics on the variables in a model i.e. capital adequacy ratio, establishment time and DEA score as a measure of banks efficiency. From the findings, capital adequacy ratio showed a mean of 0.42 and a standard deviation of 0.05, establishment time showed a mean of 0.42 and standard deviation of 0.052. DEA showed average mean of 0.6251 and standard deviation of 0.0310. The positive values of skewness and kurtos in the distribution indicates that variables were positively skewed and therefore asymmetrical in nature. There were 43 observations representing 43 commercial banks considered in the study. The positive means implies that the predictor variables in the model were statistically significant in influencing efficiency of commercial banks in Kenya.

4.3 Correlation coefficients of the effect of capital adequacy on the efficiency of commercial banks in Kenya.

The study further determined the correlation between the independent variables used in the study i.e. capital adequacy and efficiency of commercial banks. For this analysis Pearson correlation was used to determine the degree of association within the independent variables and also between independent variables and the dependent variable. The analysis of these correlations seems to support the hypothesis that each independent variable in the model has its own particular informative value in the ability to explain the efficiency of commercial banks in Kenya (Table 4.2).

Table 4.2 **Correlation coefficients of the effect of capital adequacy on the efficiency of commercial banks in Kenya.**

VARIABLE	Capital adequacy ratio	Establishment time	DEA (efficiency score
Capital adequacy ratio	1		
Establishment time	0.5193	1	
DEA (efficiency score	0.7231	0.6881	1

Source: Research Findings

The correlation matrix shows that capital adequacy ratio is strongly and positively related to the DEA (efficiency score as indicated by a strong and positive correlation coefficient of 0.723, The study further indicates that establishment time as a control variable is also strongly and positively related to the DEA (efficiency score as indicated by a strong and positive correlation coefficient of 0.6881.

Table 4.3: Regression Coefficients of the effect of capital adequacy on the efficiency of commercial banks in Kenya

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	0.121	0.241		2.411	0.023
Capital adequacy ratio	0.752	0.173	0.062	1.599	0.054
Establishment time	0.532	0.171	0.253	2.155	0.015

Source: Research Findings

As per the R generated table above, the equation $Y_t = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon_t$

becomes:

$Y_t = 10.121 + 0.752 X_1 + 0.532 X_2$

According to the regression equation established, taking all factors into account (capital adequacy ratio and establishment time, DEA score will be 0.122. The data findings analyzed also shows that taking all other independent variables at zero, a unit increase capital adequacy ratio will lead to a 0.752 increase in the DEA score and a unit increase the establishment time will lead to a 0.532 increase in the DEA.

The Standardized Beta Coefficients give a measure of the contribution of each variable to the model. A large value indicates that a unit change in this predictor variable has a large effect on the criterion variable. The t and Sig (p) values give a rough indication of the impact of each predictor variable – a big absolute t value and small p value suggests that a predictor variable is having a large impact on the criterion variable. At 5% level of significance and 95% level of confidence, capital

adequacy ratio had a 0.054 level of significance, and establishment time had a 0.015 level of significance.

4.4 Analysis of Variance (ANOVA)

Table 4.4: Analysis of Variance (ANOVA) results for the effect of capital adequacy on the efficiency of commercial banks in Kenya.

	Sum of Squares	df	Mean Square	F	F-critical value	Significance
Regression	69.82	4	19.95	22.08	104.92	0.00
Residual	4.364	23	6.321			
Total	73.19	27				

NB: F-critical Value 104.92 (statistically significant if the F-value is less than 104.92: from table of F-values).

a. **Predictors: (Constant),** capital adequacy ratio and establishment time**.**

Source: Research Findings

The value of the F statistic, 22.08 indicates that the overall regression model is significant hence it has some explanatory value i.e. there is a significant relationship between the predictor variables capital adequacy and establishment time and the efficiency of commercial banks in Kenya.

Further the study carried out the hypothesis testing between predictor variables and efficiency of commercial banks in Kenya. The study findings are as shown below.

Table 4.5 Predictor variables Vs efficiency of commercial banks in Kenya

	Efficiency of commercial banks in Kenya
Predictor variables Pearson Correlation	0.860
Sig. (2-tailed)	0.000
N	43

Source: Research Findings

A Pearson coefficient of 0.860 and p-value of 0.000 shows a strong, significant, positive relationship between predictor variables and efficiency of commercial banks in Kenya. Therefore basing on these findings the study rejects the null hypothesis that there is no relationship between predictor variables (capital adequacy ratio and establishment time and efficiency of commercial banks in Kenya and accepts the alternative hypothesis that there exists a relationship between predictor variables (capital adequacy ratio and establishment time and efficiency of commercial banks in Kenya

4.5 Interpretation of Findings

The results of tests on the differences in means of all variables of the model were considered i.e. capital adequacy measured by capital adequacy ratio which is described as Net capital to risk weighted assets Capital Ratio (CR) = Capital (C) / Risk Weighted Assets (RWA), establishment time as a control variable described as the cumulative year of the establishment time and efficiency among commercial banks described by Efficiency score which is limited between 0 and 1 measured by the DEA. Efficiency = Weighted sum of outputs/ Weighted sum of inputs.

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deviation of 0.05, establishment time showed a mean of 0.42 and standard deviation of 0.052. DEA showed average mean of 0.6251 and standard deviation of 0.0310. The positive values of skewness and kurtos in the distribution indicates that variables were positively skewed and therefore asymmetrical in nature. There were 43 observations representing 43 commercial banks considered in the study. The positive means implies that the predictor variables in the model were statistically significant in influencing efficiency of commercial banks in Kenya.

The study further determined the correlation between the independent variables used in the study i.e. capital adequacy and efficiency of commercial banks. For this analysis Pearson correlation was used to determine the degree of association within the independent variables and also between independent variables and the dependent variable. The analysis of these correlations seems to support the hypothesis that each independent variable in the model has its own particular informative value in the ability to explain the efficiency of commercial banks in Kenya

The correlation matrix shows that capital adequacy ratio is strongly and positively related to the DEA (efficiency score as indicated by a strong and positive correlation coefficient of 0.723, The study further indicates that establishment time is also strongly and positively related to the DEA (efficiency score as indicated by a strong and positive correlation coefficient of 0.7881.

According to the regression equation established, taking all factors into account (capital adequacy ratio and establishment time, DEA score will be 0.122. The data findings analyzed also shows that taking all other independent variables at zero, a unit increase capital adequacy ratio will lead to a 0.752 increase in the DEA score and a unit increase the establishment time will lead to a 0.532 increase in the DEA.

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CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the study and makes conclusion based on the results. The implications from the findings and areas for further research are also presented. This section presents the findings from the study in comparison to what other scholars have said as noted under literature review.

5.2 Summary

The study carried out descriptive statistics on the variables in a model i.e. capital adequacy ratio, establishment time and DEA score as a measure of banks efficiency. From the findings, capital adequacy ratio showed a mean of   0.42 and a standard deviation of 0.05, establishment time showed a mean of 0.42 and standard deviation of 0.052. DEA showed average mean of 0.6251 and standard deviation of 0.0310. The positive values of skewness and kurtos in the distribution indicates that variables were positively skewed and therefore asymmetrical in nature. There were 43 observations representing 43 commercial banks considered in the study. The positive means implies that the predictor variables in the model were statistically significant in influencing efficiency of commercial banks in Kenya.

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5.3 Conclusions

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5.3 Policy Recommendations

The study recommends that central bank should be keen on commercial banks capital adequacy ratio by laying down financial regulations on liquidity since the goal of financial regulation is to enable banks to improve liquidity and solvency. Stricter regulation may be good for bank stability, but not for bank efficiency, restricting banks may not only lower bank efficiency but also increase the probability of a banking crisis.

From the long-term point of view, as Kenya economic growth is highly dependent on credit supply, the banks need to grow their loan scales at certain rates so as to support the sustained economic growth. Therefore, they need for capital supplementation in order to keep up with the regulatory requirements on Capital Adequacy Ratio (CAR) since stricter capital adequacy, powerful supervision and market discipline power promote technical efficiency. However, only the latter one is significant. Too little capital increases the danger of bank failure whilst excessive capital impose unnecessary costs on banks and their customers and may reduce the efficiency of the banking system.

5.4 Limitations of the Study

Since the main purpose of this study was to determine the effect of capital adequacy on efficiency of commercial banks in Kenya, Commercial banks considered some information sensitive and confidential and thus the researcher had to convince them that the purpose of information is for academic research only and may not be used for any other intentions.

The findings of this study may not also be generalized to all commercial banks across the globe but can be used as a reference to commercial banks in developing countries

since they face almost the same challenges due to the same prevailing economic situations as opposed to commercial banks in developed countries.

Capital adequacy ratio keeps on changing from period to period depending on prevailing economic situations and market demand. The findings therefore may not reflect the true effect of capital adequacy on efficiency of commercial banks for a period considered.

5.5 Suggestions for Further Research

There is need for further studies to carry out similar study for a longer time period. A similar study should also be carried out on the effect of capital adequacy on efficiency of commercial banks in Kenya incorporating more financial and accounting variables and also taking into account the prevailing macroeconomic situation in the country as opposed to the current study which took into consideration only two variables.

The study further suggests that other macroeconomic variable e.g. inflation and exchange rates should be taken in to account in similar study as control variables since they influence frequent changes in capital adequacy ratios. This in turn will help the management come up with strategies to cushion the financial performance in relation to capital inadequacy against such effects.

The study further suggests that other study to be carried out on effect of capital adequacy on financial performance of commercial banks as opposed to current study which took in to consideration only efficiency of commercial banks. The study should correlate how other financial ratios such as liquidity, leverage and debt ratios resulting from capital adequacy can influence banks financial performance in addition to banks efficiency.

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APPENDIX

List of Commercial Banks in Kenya

	Name	NET ASSETS - Ksh. Million
1	Kenya Commercial Bank Ltd	304,112
2	Equity Bank Ltd	215,829
3	Cooperative Bank Ltd	199,663
4	Standard Chartered Bank (K) Ltd	195,493
5	Barclays Bank of Kenya Ltd	185,102
6	CFC Stanbic Bank Ltd	133,378
7	NIC Bank Ltd	101,772
8	Diamond Trust Bank Ltd	94,512
9	Commercial Bank of Africa Ltd	100,456
10	I & M Bank Ltd	91,520
11	Citibank N.A.	69,580
12	National Bank of Kenya Ltd	67,155
13	Baroda Bank Ltd	46,138
14	Chase Bank Ltd	49,105
15	Bank of Africa Ltd	48,958
16	Prime Bank Ltd	43,463
17	Imperial Bank Ltd	34,590
18	Family Bank Ltd	30,985
19	Bank of India	24,877

20	Ecobank Kenya Ltd	31,771
21	African Banking Corporation Ltd	19,071
22	Fina Bank Ltd	17,150
23	Consolidated Bank of Kenya Ltd	18,001
24	Gulf African Bank Ltd	13,562
25	Giro Commercial Bank Ltd	12,280
26	Equatorial Commercial Bank Ltd	14,109
27	Fidelity Bank Ltd	11,772
28	Guardian Bank Ltd	11,745
29	Victoria Commercial Bank Ltd	10,323
30	Development Bank of Kenya Ltd	13,417
31	Habib A.G. Zurich	9,702
32	K-Rep Bank Ltd	9,546
33	Trans-National Bank Ltd	8,801
34	First Community Bank Ltd	9,959
35	Paramount Universal Bank Ltd	7,255
36	Habib Bank Ltd	7,014
37	Oriental Commercial Bank Ltd	6,220
38	Credit Bank Ltd	6,407
39	Jamii Bora Bank Ltd	3,480
40	Middle East Bank (K) Ltd	5,870
41	UBA Bank Kenya Ltd	2,924

42	Dubai Bank Ltd	2,584
43	Charterhouse Bank Ltd	0

Source: Central Bank of Kenya

Out of the 43 institutions, 30 are locally owned and 13 are foreign owned. The locally owned financial institutions comprise 3 banks with significant shareholding by the Government and State Corporations, 27 commercial banks . The ownership structure of the commercial banks and mortgage finance company is as depicted in the chart below: