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A micro and macro prudential approach to financial soundness assessment of Commercial Banks in Kenya

Kolum, Micah Cheruiyot
Strathmore Business School
Strathmore University

A Micro and Macro Prudential Approach To Financial Soundness Assessment of Commercial Banks in Kenya

Micah Cheruiyot Kolum

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School of management and commerce
Strathmore University
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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree in this or any other University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Name: Micah Kolum

Signature:

Date:

APPROVAL

This thesis of Micah Kolum was reviewed and approved by the following:

Dr. Freshia Mugo Waweru,
Senior Lecturer
School of Management and Commerce
Strathmore University

Dr. David Wang'ombe
Dean, School of Management and Commerce
Strathmore University

Prof. Ruth Kiraka,
Dean, School of Graduate Studies
Strathmore University

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ABSTRACT

Financial soundness of the banking system is underpinned through effective bank assessment and monitoring. The prevalence of bank failures in Kenya raises the question on how best to identify vulnerabilities in financial condition of banks. This thesis aimed to identify the set of CAMELS-based financial soundness indicators that discriminate between sound and unsound banks, determine whether selected macro-economic indicators have an impact on bank financial soundness and to assess the performance of CAMEL as a tool for assessing bank soundness.

The thesis adopted explanatory and descriptive research designs. Secondary data on financial soundness indicators were obtained from bank balance sheets and income statements and those on macro-economic environment obtained from the CBK website. Data analysis and presentation was done using descriptive statistics, binary logistic regression, CAMEL, CAMELS and Z-score index models.

The results suggest that the statistically significant indicators discriminating between sound and unsound banks are capital adequacy, asset quality, management quality and liquidity. On the contrary, the selected macro-economic variables; inflation, GDP growth, interest spread and market concentration were found not to be significant. However, the inclusion of the selected macro-economic indicators improved the logistic regression model classification accuracy with a reduction in type II error though type I error remained the same. In addition, CAMEL and CAMELS achieved the same performance category rating as banks classified as sound fell under the same performance category likewise to those classified as unsound. This can be attributed to the range within a performance category of 0.5 and another 0.1 between performance categories. However, CAMELS performed better in terms of producing distinct ratings hence ranked higher than CAMEL and Z-score index. The study suggested that bank managers focus on ensuring that their banks are well capitalized, minimize nonperforming loans, quality management and adequate liquidity to achieve bank soundness. Similarly, investors and depositors should assess banks based on these significant factors when making their investment and banking decisions. In addition, the CBK should consider implementing CAMELS model for bank financial assessment.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BCBS	Basel Committee on Bank Supervision
BIS	Bank of International Settlement
CAMELS	Capital adequacy, Asset quality, Management quality, Earnings, Liquidity and Sensitivity to market risk
CBK	Central Bank of Kenya
ECB	European Central Bank
FDIC	Federal Deposit Corporation
FSIs	Financial Soundness Indicators
GDP	Gross Domestic Product
IMF	International Monetary Fund
Kshs	Kenya Shillings
MPI	Macro Prudential Indicators
NPLs	Nonperforming loans
ROA	Return on assets
ROE	Return on equity
UFIRS	Uniform Financial Institutions Rating System
US	United States of America

DEDICATION

This thesis is dedicated to my family members. Thank you for always believing in me and supporting me in all situations. May God always take care of you and always bless you.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Bank soundness has been defined as the health or condition of a bank either individually, or as a group or of the banking system, (IMF and World Bank, 2005). Lindgren, Garcia and Saal (1996) defined a sound banking system as one in which banks have a positive net worth, and that they are profitable, adequately capitalized and efficiently managed hence able to withstand unfavorable events. Further, they stated that banks with a negative net worth or with insufficient capital will be fragile and susceptible to failure exposing investors to losses. The importance of bank financial soundness in a country's economic development is widely recognized in literature and championed by authors such as Ross Levine and Gerry Caprio who noted that weak banking systems can inhibit economic development whereas strong banking systems enhance the achievement of economic growth, (Barth, Caprio, & Levine, 2001). Similarly, the International Monetary Fund, IMF, (1996) noted that bank financial soundness is a public policy concern not only in unstable banking sector economies but also those that can be affected by spillovers originating from elsewhere.

McKinnon (1973) and Shaw (1973) further pointed out that a strong correlation exists between economic growth and financial system development. Ongore and Kusa, (2013) also affirmed that commercial banks play the critical role of channeling funds from depositors to investors. Similarly, Oloo, (2010) explained that the banking sector in Kenya is a bond that holds the country's economy together. The Kenya Vision 2030 published in 2007 placed the financial services sector as a key driver to achieving economic growth through promotion of a vibrant and globally competitive financial sector that motivates savings and investment financing, (Beck et al., 2010). The Kenya Financial Sector Stability report 2014 noted that the banking sector assets accounted for 60.87% of the country's nominal Gross Domestic Product (GDP) as at end of 2014, (Kenya Financial Sector Stability report, 2014).

Given the key role played by banks in the economy, a disruption in the intermediation process could be costly not only to depositors and creditors but also the overall economy, hence it is vital to effectively evaluate bank soundness to ensure timely corrective action and mitigation against vulnerabilities that banks are exposed to, (Caprio and Klingebiel, 2003). Similarly, Altaee, Talo, and Adam, (2013) stated that the demand for assessment of commercial banks in terms of soundness increased in the wake of the 2007 – 2008 financial crisis where banks became vulnerable to failures exposing depositors and investors to losses. Cihak and Schaeck, (2007) state that the need to have appropriate tools to assess strengths and weaknesses of financial systems led to the development of financial soundness indicators (FSIs) by the International Monetary Fund (IMF) and the publication of FSIs Compilation Guide. The FSIs are categorized into two, namely the core set, (comprising banking sector indicators) and the encouraged set constituting bank and non – banking sector indicators. The core FSIs denote the six areas of banking business, that is Capital adequacy, Asset quality, Management quality, Earnings, Liquidity and Sensitivity to market risk summarized by the acronym CAMELS, (IMF, 2006). Further, various studies have been undertaken geared towards the establishment of early warning systems to forecast difficulties in banking systems taking either the micro or macro approaches, or both; where the micro approach focuses on bank-specific variables in assessing bank soundness and is used by regulators in the form of CAMEL rating system, whereas the macro approach considers both the role of macroeconomic and bank specific indicators in assessing soundness of the financial system (Shen and Hsieh, 2011).

While the CAMEL framework is widely used by commercial bank regulators, including the Central Bank of Kenya (CBK) as a bank assessment tool, banks are still failing globally as witnessed in the 2007 – 2008 financial crisis with the failure of banks such as Lehman Brothers (Christopoulos, Mylonakis, and Diktapanidis, 2011). Similarly, Kenya has not been an exception given the failure of 37 financial institutions since 1984 (Brownbridge, 1998), and two more banks (Dubai Bank Ltd and Imperial Bank) placed under receivership in August 2015 and September 2015 respectively, (Kenya Deposit

Protection Fund Board Annual report, 2014). This may be a pointer that bank assessment models such as CAMEL have either failed or are wrongly applied, as pointed out by the conflicting results of various researchers on the usefulness of CAMEL ratings. For example Barker and Holdsworth (1993) established that CAMEL could predict bank failures whereas those that disagreed with this view include Cole and Gunther (1998) and Hirtle and Lopez (1999) who argued that ratings based on CAMEL lost its usefulness within 6 months to 1 year. Further, Flannery (1998) suggested that while CAMEL provides useful information, further research needs to be done in view of the limited available evidence.

On the usefulness of macro-economic indicators, a cross-country study by Demirguc-Kunt and Detragiache (1998) established that the occurrence of banking crisis was heightened by macro imbalances such as slow economic growth. In addition, the Kenya Financial Sector Stability report, (2014) noted that though Kenya's financial system was stable in 2014, down side risks in the macro-economic environment were noted which included volatility of exchange rates, widening of the current account deficit to GDP ratio, a decline in real GDP growth from 5.7% in 2013 to 5.4% in 2014 resulting in increasing Non-performing loans (NPLs) in banks. Further, researchers such as Schou-Zibell, Albert, and Song (2010) and Crockett (2000) have proposed the marrying of micro and macro approaches in assessing bank soundness. This is with the realization that bank crises arise from changes in bank specific and macro-economic factors (Shen and Hsieh, 2011). Furthermore, they add that the micro approach does not explain why different banks with similar financial ratios fail neither does the macro approach explain why not all banks in a country facing the same macro-economic conditions fail.

The study thus sought to identify the factors that discriminate sound from unsound banks, determine the effect of selected macroeconomic variables on bank soundness assessment and to evaluate the performance of CAMEL as a tool for assessing bank financial soundness.

1.2 Problem Statement

Capturing early warning signals of potential bank financial unsoundness has become increasingly important after the 2007 Global financial crisis, (Navajas and Thegeya, 2013). In the quest to assess banking system soundness, two approaches have been considered. First, the IMF and the World Bank developed the FSIs which comprises of the core set for banking sector and the encouraged set for non-banking sector entities, (IMF and World Bank, 2005). The CAMEL model which is used by regulators including the Central Bank of Kenya (CBK) to monitor bank financial health employs the core set of FSIs which are micro or bank specific. Secondly, the macro approach which considers both institutional and economic indicators, (Schou-Zibell, Ramon and Song, 2010).

Researches such as Crockett (2000) and Borio (2003) argued that the micro-prudential approach is weak as it only focuses on institutional indicators and does not consider risks that macro-economic indicators can have on the financial system. Further, despite micro-based assessments being done, bank failures continue to be witnessed; for example in Kenya 37 financial institutions have failed since 1984, (Brownbridge, 1998), another two banks were placed under receivership, (Dubai Bank Ltd and Imperial Bank) in 2015 (Kenya Deposit Protection Fund Board Annual report, 2014). This raises the question whether micro indicators are effective in measuring bank soundness. On the other hand, macro-prudential approach considers the trend in the economy and the financial system as a whole and its impact on financial stability, (Schou-Zibell, Ramon and Song, 2010). Studies such as Demirguc-Kunt and Detragiache (1998) established that macro-economic imbalances such as slow growth heightened the occurrence of bank failures. Similarly, Mannasoo and Mayes (2005) posited that a weakening in the economic environmental factors precipitate bank crises. However, Shen and Hsieh (2011) stated that the macro approach does not explain why not all banks faced with the same macro-economic conditions fail. They also note that the micro approach does not also explain why different banks with similar financial ratios fail during different periods of time. Further, Cihak and Schaeck, (2007) noted that no full agreement has been reached on how to measure banking problems and the explanatory variables to be incorporated.

Additionally, researchers who have been involved in different studies to establish the leading indicators for banking problems have had different conclusions, (Cole and Gunther, 1998; Hirtle and Lopez, 1999 and Barker and Holdsworth, 1993). The differences may have been brought about by the different geographical locations in which the studies were undertaken or the timings of their studies. The study thus sought to identify the factors that discriminate sound from unsound banks, determine the effect of selected macroeconomic variables on bank soundness assessment and to evaluate the performance of CAMEL as a tool for assessing bank financial soundness.

1.3 Research objectives

1.3.1 General Objective

The overall objective of the study is to assess micro and macro financial indicators determining commercial banks soundness in Kenya.

1.3.2 Specific objectives

1. To identify the set of CAMELS-based financial soundness indicators that discriminate between sound and unsound banks.
2. To determine the effect of selected macro-economic indicators on bank financial soundness assessment.
3. To assess the performance of CAMEL model as a tool for assessing bank soundness.

1.4 Research Questions

1. Which financial indicators discriminate sound from unsound banks?
2. How do macro-economic factors affect bank financial soundness?
3. How does CAMEL compare to other models in assessing bank soundness?

1.5 Scope of the study

The study aimed to identify the set of indicators that discriminate between sound and unsound banks and determine whether macro-economic indicators have an impact on bank

financial soundness. It also sought to assess financial soundness of commercial banks in Kenya using the CAMEL, CAMELS and Z-score index. The statistical population to be studied is the 42 banks operating in Kenya for the period 2011 and 41 as at end of year 2015. This period enables the study to capture the key reforms undertaken in the banking sector so as to strengthen bank soundness. These reforms include implementation of Credit Information Sharing (CIS) in 2009; introduction of Prompt Corrective Action (PCA) in 2010 giving CBK powers to take swift action when an institution exhibited weak capital base. The impact of the reforms that took place in 2009 and 2010 were expected to manifest by 2011. In addition, enhancement of Capital adequacy and Corporate governance requirements in 2012; implementation of the revised Prudential and Risk management guidelines and enhancement of monetary penalty against institutions violating the Banking Act from Kshs. 1 million to Kshs. 5 million in 2013.

1.6 Significance of the study

Commercial bank soundness and stability is of critical significance for attaining country development objectives of resource mobilization and efficient credit allocation considering the role played by banks in Kenya's economy.

Commercial Banks: The study aims to provide information to bank managers to gain understanding on the significant bank soundness indicators which should be monitored more closely and given emphasis to ensure a healthy and sustainable bank.

Regulators: The study gives some opinion adding to what they already have on bank soundness appraisal. The study intends to shed some light on the significant factors that discriminate sound from unsound banks which can be focused on during on-site and off-site commercial bank examinations so as to mitigate against bank failure.

Investors, Depositors and Creditors: Since each bank is unique and potentially fragile, it is necessary for bank stakeholders to differentiate healthy banks from those that are likely to default or are under distress hence this study provides information on the indicators

which can be used to differentiate sound from unsound banks. The stakeholders can use this information to make informed investment decisions, or select a bank.

Researchers: The study contributes to the body of knowledge and adds to the sources of references for future research on appraisal and the impact of financial soundness indicators on commercial bank soundness.

1.7 Chapter Summary

The performance of overall economy is largely related with the banking system soundness as evidenced by (McKinnon, 1973) and (Shaw, 1973) hence the failure of banks can disrupt economic development as well as precipitate losses among depositors, creditors and investors. This study sought to identify indicators that discriminate sound from unsound banks, and to determine the impact of selected macro-economic variables on bank soundness.

The subsequent chapters of the research are organized as follows: Chapter two represents the literature review on the subject, Chapter three is dedicated to the data and methodology used, Chapter four concerns the analysis and discussion of findings of the study and Chapter five presents summary of the study, conclusions, recommendations and limitations encountered.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature on evaluation of bank soundness around the world, and specifically in Africa and in Kenya. The literature review further examines the theories put forward by scholars on the topic under study, and brings out the gap that still remains and the relationship between variables being studied.

The chapter is organized in the following sections: 2.2: Theoretical framework; 2.3: Bank Financial Soundness Indicators; 2.4: Bank Soundness Assessment Approaches; 2.5: Determinants of Bank Soundness and Hypothesized Relationships; 2.6: Gaps in Research; 2.7: Conceptual framework; 2.8: Operationalization of variables and 2.9: Chapter Summary.

2.2 Theoretical Framework

According to the World Bank and IMF (2005), three approaches exist for forecasting bank stability, namely: (i) the macroeconomic approach which uses both bank specific and macroeconomic variables; (ii) bank balance sheet approach (the microeconomic approach) which assumes that bank practices cause failures and uses balance sheet data to assess bank soundness, and (iii) market indicators approach, which supposes that bank equity and debt prices provides information on bank conditions over and above the balance sheet data. This study focuses on the macro and micro theories since not all banks in Kenya are listed in the Nairobi Securities Exchange.

2.2.1 Macro-prudential regulation

This approach is based on the general theory advanced by Keynes which was concerned with the economic system as a whole rather than parts or segments, (Keynes, 1936). Keynes noted the divergence in behaviour of individual components compared to aggregate system, and that the general theory sought to interpret the world as a state in which all actors were trying to do their best subject to constraints. Further, the Bank of International Settlement (BIS) proposed a broad approach to financial stability by which

combines both macro and micro-prudential dimensions (Crockett, 2000). The macro-prudential regulation focuses on monitoring financial soundness of a financial system, thus limits the probability of system-wide distress and avoids significant losses, (Schou-Zibell, Albert, & Song, 2010). Schou-Zibell, Albert, & Song, (2010) note that financial institutions can collectively influence economic transactions. Equally, Sere-Ejembi, Udom, Salihu, Atoi, & Yaaba, (2014) state that that macro-prudential regulation seeks to identify macroeconomic risks in the financial system which could impact on the stability of the system as a whole and advise on the mitigation measures. This is further supported by (Kaufman, 1992) who defined contagion as a term describing spillover effects of distresses from one or more firms to others. He also argued that a contagion is more likely to occur in the banking sector than in other sectors of an economy. He further states that undesirable shocks such as bank failures can be spread in domino fashion not only to other banks, banking system as a whole but beyond to the whole financial system and the macro-economy. Similarly, Hilbers, Jones, & International Monetary Fund, (2004) state that banking system focused assessment approach seeks to identify common weaknesses across institutions that could undermine the overall stability of the financial system.

In an analysis of bank failures in the US, Thomson (1991) employed bank specific variables and also included economic condition variables. Similarly, (González-Hermosillo, 1999) employed micro and macroeconomic variables to study bank failures in the US, Mexico and Colombia. This approach was also employed by Demirguc-Kunt and Detragiache (1998) who considered bank and macroeconomic variables and established that banking crisis is enhanced by macroeconomic imbalances. Following this theory, (Ndirangu, Ndung'u, Garcia, Nyamongo, & Gitau, 2014) developed an Early Warning Index for Macroeconomic vulnerability for Kenya which established the real effective exchange rate as the main driver of macroeconomic vulnerability.

Schou-Zibell, Ramon & Song, (2010) posited that macro-prudential frameworks can be customized to an individual financial institution depending on the extend it contributes to systemic risk, for example, macro-prudential tools such as capital requirements, provisioning on assets and leverage ratios may be used in dealing with common exposures.

2.2.2 Micro-prudential regulation

This approach has its basis on the agency theory where regulatory assessment is geared towards protection of public savings when it is endangered by a banks behaviour (Eisenhardt, 1989). Eisenhardt stated that agency problem arises when cooperating parties, (managers as the agents and shareholders as the principals) harbor divergent attitudes towards risk or different goals, and as a result, a breakdown in agency relationships results in increased financial risk and lower returns due to inadequate risk management. Eisenhardt further state that agency problems depict themselves moral hazard where the agent does not put the agreed effort or adverse selection referring to the misrepresentation of ability by the agent which ultimately affect the behavior of an organization, (Eisenhardt, 1989). Currie (2005) argued that agency theory warrants measuring of risks based on financial institution balance sheet ratios. The Micro-prudential regulation focuses on assessing individual institutions with the aim of reducing the likelihood of failure of individual institutions, (Schou-Zibell et al., 2010). Further, Sere-Ejembi et al., (2014) adds that micro-prudential regulation enhances safety and soundness of individual financial institutions and protect clients of these institutions through mitigation of contagion risk and the consequent adverse externalities such as confidence in the overall financial system. Shen and Hsieh (2011) posited that this approach employs CAMEL methodology to assess a bank's financial soundness. Equally, Evans, Blaschke, and Hilbers, (2000) concluded that indicators such as capital adequacy, asset quality, management soundness, earnings and profitability, liquidity, sensitivity to market risk and market based indicators such as market prices of securities and credit ratings are used as indexes of soundness of financial institutions. This view is supported by Saunders and Cornett (2004) who established that financial soundness of a financial institution is dependent upon factors such as asset quality, liquidity position, capital, management quality, market sensitivity and earnings. They concluded that mismanagement of these factors could adversely affect the financial soundness of a financial institution. In addition, Wirnkar and Tanko, (2008) also opined that financial ratios are often used to measure financial soundness of a bank and the quality of its management.

In an IMF survey of banking sector problems, Garvin, Haussmann and Lindgren (1996) advanced that shocks to bank specific factors such as income, asset quality or liquidity could make a bank insolvent or illiquid impacting on its ability to honour its short term obligations. On the same breadth, Altman (1977) examined financial problems in savings and loan institutions using ratios that represented asset quality, capital adequacy and earnings. Similarly, Popiel (1988) held the view that mismanagement played a significant role in bank insolvency at the micro-level especially in environments where bank supervision is ineffective.

2.3 Bank Financial Soundness Indicators (FSIs)

Bank soundness has been defined as the health or financial condition of a bank either individually, or as a group or of the banking system, (IMF, 2002), whereas a sound banking system is defined by Lindgren, Garcia and Saal (1996) as one in which banks have a positive net worth, profitable, adequately capitalized and efficiently managed hence able to withstand unfavourable shocks. On the other hand, failed banks are those that have been liquidated or have received assistance from the deposit insurance corporation (Gonzalez-Hermosillo, 1999). She further proposes that a bank is in distress if its coverage ratio is less than 1.5.

Gersl and Hermanek (2008) state that the objective of financial soundness indicators is to provide information on how sound the financial sector is. Further, the IMF in collaboration with national authorities from member countries formulated and published a guide for compiling FSIs, (IMF, 2006). In parallel to the work of the IMF, the European Central Bank (ECB) came up with the Macro-Prudential Indicators (MPIs) for monitoring financial soundness of banking sector. The difference between these two approaches is that MPIs consolidates indicators for related entities and uses more indicators hence tries to measure a larger number of factors affecting bank soundness compared to IMF FSIs' coverage, (Morttinen et al., 2005). There are 12 core and 14 encouraged FSIs for deposit takers, with the core set mainly focusing on the banking sector and the encouraged set covering FSIs for banking and non-financial sectors, (IMF, 2006). (Appendix I).

2.4 Indicators of bank soundness and hypothesized relationships

The section below will look at the bank specific (micro) and macro indicators and their hypothesized relationships with bank soundness.

2.4.1 Micro Indicators

Micro theory proposed that bank soundness is influenced by bank specific factors which are incorporates the core set of financial soundness indicators (Evans, Blaschke, & Hilbers, 2000).

2.4.1.1 Relationship between Capital adequacy and bank soundness

Capital is a key factor considered in evaluating the safety and strength of a bank. Capital adequacy and availability influences the robustness of financial institutions to withstand shocks to their balance sheets (IMF, 2006). Equity capital acts as a buffer against unexpected losses and thus assists banks to overcome insolvency risk. According to Theodore (1999), adequate capital enhances a bank's ability to pursue growth and diversification strategies whereas undercapitalization would be a hindrance to do so. The CBK requires banks to hold Kshs. 1 billion as core capital, capital conservation buffer of 2.5% above minimum capital adequacy ratio and a minimum of 12% total capital to risk weighted assets ratio, (Kenya Financial Sector Stability report, 2014).

In a study on liquidity, solvency and efficiency of Japanese banks for the period 1993 to 1999, Said and Saucier, (2003) established that bank failures were mainly caused by challenges in capital adequacy and poor asset quality. Similarly, in an investigation on financial strength ratings assigned by Moody's in 1997, Poon et al. (1999) noted that adequately capitalized banks rated highly than undercapitalized banks. Equally, Van-Roy, (2006) concluded that well capitalized banks will tend to be highly rated in terms of financial strength. Sangmi and Nazir (2010) also pointed out that capital adequacy ratio directly relates with a bank's resilience to crisis situations. Goodhart et al. (1998) adds that adequate capital funds decrease risk-taking whereas deficient capital prompts banks

to engage in high risk operations. Berger (1995) established a positive relationship between capital adequacy and return on equity (ROE) which he attributed to the costs of bankruptcy. Similarly, in a study on the effects of bank sectoral factors on profitability, Olweny and Shipho, (2011) established a positive relation between capital ratio and return on assets. They concluded that the higher the capital levels of a bank, the higher the profitability. Given the indications from the cited studies of a positive relationship between bank soundness and bank capitalization, the hypothesis so developed is:

H1: A significant positive relationship exists between Capital adequacy and bank soundness.

2.4.1.2 Relationship between Asset quality and bank soundness

Asset quality indicates the risk exposure from loans granted by a financial institution (Dardac and Barbu, 2005). The quality of bank loans is affected by the level of nonperforming loans, appropriateness of loan loss provisions, management and administration of loans. Dang, (2011) also adds that the highest risk faced by banks is the loss resulting from delinquent loans. Grier, (2007) agrees with this by noting that poor asset quality is the main cause of bank failures. Further, Chaudhry and Singh (2012) assessed the impact of financial reforms on the soundness of the Indian Banking sector and established that Nonperforming loans (NPLs) levels, risk management methods, effective cost management and financial inclusion as key players.

In a study on the causes of financial distress in local banks in Africa, Brownbridge, (1998) noted that most bank failures in Kenya was as a result of nonperforming loans and insider lending. Similarly, Waweru and Kalani, (2009) investigated the causes and remedies of commercial banking crises in Kenya. They concluded that non-submission of vital information by customers during loan application and inadequate debt collection policies were the key contributors to nonperforming loans in Kenya. González-Hermosillo, (1999) investigated occurrences of banking distress in Mexico and Colombia. The study concluded that nonperforming loans deteriorated before a bank fails. In a similar study on

liquidity, solvency and efficiency of Japanese banks for the period 1993 to 1999, Said and Saucier, (2003) confirmed that loan losses were the main cause of the downfall of ailing banks. Similarly, Berger and De Young, (1997) found that NPLs significantly predicted bank insolvency and thus concluded that sound banks had lower levels of NPLs. This view is supported by Podpiera (2006) who used the NPL ratio as an indicator of bank fragility and argued that high levels of NPLs indicates problems in the banking sector.

In a study on the effect of asset quality on profitability for 23 commercial banks in Greece, Kosmidou, (2008) found a negative significant relationship between asset quality and profitability. Olweny and Shipho, (2011) agreed with this when they established a strong negative relationship between NPLs and profitability in Kenyan banks. In view of the findings from the studies by researchers such as Olweny, Shipho and Brownbridge indicating that NPLs precipitated bank fragility in Kenya, the hypothesis to be tested is:

H2: There is a significant negative relationship between level of NPLs and bank soundness

2.4.1.3 Relationship between Management quality and bank soundness

This measure indicates the ability of bank management to employ the available resources to create maximum value for the stakeholders. Aziz (1999) indicated that management competence, integrity, quality of board and level of professionalism are critical in ensuring a sound banking system. Similarly, Grier, (2007) pointed out that management is deemed a significant element as it plays a role in a banks success. Pasiouras et al., (2006) noted that management efficiency in terms of revenue generation and control of expenses is an indicator of bank creditworthiness.

In a case study on the health of Joint venture banks in Nepal, (Baral, 2005) established that earning per employee and operating expenses ratios were above the Nepalese industry average indicating an efficient management hence a positively related to a healthy Nepalese joint venture banks. Similarly, in their study on whether the collapse of Lehman Brothers would have been predicted, (Christopoulos, Mylonakis, & Diktapanidis, 2011)

established that management quality declined prior to the collapse of the bank and that the banks management poorly assessed borrowers resulting in bad loans. Moreover, White, (1993) argued that mismanagement was one of the causes of bank failures. The hypothesis to be tested is:

H3: There is a significant positive relationship between Management quality and bank soundness.

2.4.1.4 Relationship between Earnings quality and bank soundness

Earnings or Profitability is defined by Kheechee, (2011) as the rate of return on funds invested. It is an indicator of bank management's ability to employ bank resources efficiently to generate value for stakeholders and to sustain the bank, Qin and Pastory (2012). Several studies such as Wheelock and Wilson, (2000); Lanine and Vennet, (2006) established a negative relationship between profitability and probability of bank failure.

Flamini et al. (2009) examined profitability of 389 banks in 41 Sub Saharan African countries and found that return on assets was substantially related with bank size, private ownership, and diversification and that these findings supported the need to enforce higher capital requirements to ensure bank stability. Similarly, Kheechee, (2011) undertook comparison of profitability of commercial banks in India and found out that profitability of public, private and foreign banks were significantly different. Erina and Lace, (2013) posited that bank profitability was influenced by asset portfolio composition, management quality and operational efficiency.

Wheelock & Wilson, (2000) find a negative, statistically significant relationship between profitability and the probability of bank failure. Using a multidimensional scaling approach to study bank failure in Spain, (Mar-Molinero & Serrano-Cinca, 2001) concluded that deteriorating bank earnings and liquidity explained the failure of banks. The hypothesis thus developed is:

H4: A significant positive relationship exists between profitability and bank soundness.

2.4.1.5 Relationship between Liquidity and bank soundness

Liquidity ratio indicates whether a bank is able to efficiently meet current and future cash flow requirements without negatively impacting on its daily operations or incurring losses, (Basel Committee on Bank Supervision, 2008). Banks in Kenya are required to maintain a liquidity ratio equal or above 20%, (Kenya Financial Sector Stability report, 2014).

In a study on how commercial banks managed liquidity risk during the 2007 – 2009 financial crisis, Cornett et al. (2011) established that banks with high liquidity continued lending during this period. Similarly, Ratnovski, (2013) posited that liquidity buffer acted as an insurance against small shocks during the crisis. In the assessment of Lehman Brothers', Christopoulos et al. (2011) established that the banks liquidity status was poor compared with its liabilities prior to its collapse. Further, Pasiouras et al, (2006) in a study on the impact of bank characteristics on financial strength ratings noted that banks with lower liquidity receive lower ratings compared to those with high liquidity.

According to Dang, (2011), the level of liquidity is positively related with bank profitability whereas Golovan et al. (2003) established that the probability of bank failing was negatively related to liquidity. Similarly, in a study on the effects of bank sectoral factors on profitability, Olweny and Shipho, (2011) established a positive relation between liquidity and bank performance as measured by profitability. The hypothesis to be tested is:

H5: There is a significant positive relationship between liquidity and bank soundness.

2.4.1.6 Relationship between Sensitivity to market risks and bank soundness

This ratio was added to the CAMEL rating in 1996 with the intention to measure the degree with which market prices such as interest and exchange rates and equity prices

affect commercial bank profitability and capital, (Sarker, 2006). This measure is geared towards assessing a bank's management's ability to identify, measure, monitor and control market risk, and it also considers a bank's size and complexity of its activities, (FDIC, 2006). In some studies such as Avkiran and Cai, (2012); Dincer et al (2011), this ratio is proxied by bank size measured by the specific bank assets to total banking sector assets ratio.

The Basel Committee on Banking Supervision emphasizes the material aspects such as changes in earnings due to movements in interest rates, volatility of foreign exchange, earnings or capital due to changes in market valuation of trading portfolios and ability of bank managers to control interest rate and foreign exchange risks, (Sahajwala and Bergh, 2000). Further, Baral, (2005) indicated that financial soundness of a bank which is highly sensitive is more hazardous than that of a financial institution which is less sensitive. Similarly, in the assessment of Lehman Brothers', (Christopoulos et al., 2011) found out that the bank suffered from inadequate management of risk sensitivity noting that the sensitivity ratio fluctuated peaking at almost 50 in 2004 indicating the bank was ill prepared to withstand unexpected market risks. Further, in a study on European commercial banks from 1993 to 2000, Capelle-Blanchard and Chauveau (2004) used an early warning system comprising CAMELS components and they found that proxies for sensitivity to market risk aided in the identification of banks that were likely to be insolvent. The hypothesis developed is:

H6: There is a significant negative relationship between Sensitivity to market risk and bank soundness

2.4.2 Macro-economic indicators

Macroeconomic indicators are risk oriented and provide the trends in the economic environment, IMF (2006). This section looks at the relationship between selected macro-economic variables and bank soundness.

2.4.2.1 Relationship between GDP growth and bank soundness

The Kenya Financial Sector Stability report (2014) indicated that economic slowdown in 2014 resulted in an increase in NPLs in banks by 5.3% from Kshs. 107.1 billion in December 2014 from Kshs. 101.7 billion in June 2014. Similarly, in a cross-country study of systemic bank distress, Demirguc-Kunt and Detragiache (2005) established that low Gross Domestic Product (GDP) was significantly correlated with bank crises. Similarly, Laina, Nyholm and Sarlin (2015) found that low GDP growth is a good indicator of bank crises. In a study on bank crises in 14 OECD countries, Barrell, Davis, Karim and Liadze (2010) also found that GDP growth was a significant indicator of bank crises. Further, in a study on the effects of macroeconomic developments on loan provisioning and earnings, Arpa et al. (2001) established that risk provisioning was increased by banks when real GDP growth rates fell and when net income increased.

Further, Mishkin (1978) posited that unfavorable macroeconomic environment adversely affect bank borrowers' ability to repay debts thus subsequently impacting negatively on bank solvency. Similarly, Gerlach et al. (2005) established that net interest income of small banks in Hong Kong were exposed to fluctuations in real GDP growth. Further, Eichengreen and Rose (1998) examined bank crises in developing countries and established that slow economic growth enhanced the probability of bank crises in emerging markets. The hypothesis so developed is;

H7: There is a significant positive relationship between GDP growth and bank soundness

2.4.2.2 Relationship between Inflation and bank soundness

With regards to inflation, Demirguc-Kunt and Detragiache (2005) determined that high inflation was significantly correlated with bank crises. Similarly, Arpa et al. (2001) established that inflation influenced Austrian banks' stability. Laina, Nyholm and Sarlin (2015) however found that inflation do not predict bank crises. The hypothesis developed is;

H8: There is a significant negative relationship between inflation and bank soundness

2.4.2.3 Relationship between interest spread and bank soundness

The interest spread measures competitiveness in the industry in that narrow spreads indicates high competition and reduced interest income to banks, (Shen and Hsieh, 2011). Kaminsky and Reinhart (1999) and Rojas-Suarez (2000) posited that a large spread enhances bank health. The hypothesized relationship is;

H9: There is a significant positive relationship between interest spread and bank soundness

2.4.2.4 Relationship between market concentration and bank soundness

Regarding market concentration, studies by Allen and Gale (2003) established that banking system concentration lowered bank fragility. They attributed this to the view that concentration results in less competition and subsequently greater market power and higher earnings. Similarly, Beck et al. (2007) studied the relationship between bank concentration and systemic crisis in 69 countries. They established a negative relationship between concentration and probability of bank crises. In contrast, De Nicolo et al. (2003) found that bank concentration was positively correlated with fragility.

H10: There is a significant negative relationship between Market concentration and bank soundness.

2.4.3 Control variable

In a study on diversification, size and risk at bank holding companies, (Demsetz & Strahan, 1997) found that large banks are better diversified in their business compared to the smaller counterparts hence reduce risks of dealing in a narrow product portfolio. In a similar study, (Hakenes & Schnabel, 2011) established that larger banks are able to adopt costly but efficient risk management techniques thus lowering the cost on capital requirements compared to small banks. This is further supported by Berger and Bouwman, (2013) who concluded that large banks can influence supervisory and government bodies and that stakeholders tend to place more trust in large banks for their investment financing

than on small banks. In addition, (Wheelock & Wilson, 2000) argued that small banks are likely to fail compared to their large counterparts.

2.4.4 Summary of Bank Soundness Indicators and Hypothesized relationship

Table 2.1 below presents a summary of reviewed literation on bank soundness indicators and the hypothesized relationships.

Table 2.1: Summary of Bank Soundness Indicators and Hypothesized relationship

Hypotheses	**Hypothesized sign**	**Supporting Literature**
Capital adequacy	Positive	IMF, 2006; Theodore, 1999; Said and Saucier, 2003; Sangmi and Nazir, 2010; Goodhart et al. 1998; Olweny&Shipho, 2011.
Asset quality (NPLs)	Negative	Said and Saucier, 2003; Dang, 2011; Grier, 2007; Chaudhry&Singh, 2012; Brownbridge, 1998; Waweru and Kalani, 2009; Olweny&Shipho, 2011.
Management quality	Positive	Baral, 2005;Aziz, 1999; Grier, 2007; Pasiouras et al., 2006; Christopoulos et al., 2011; White, 1993.
Earnings	Positive	Wheelock &Wilson, 2000; Lanine &Vennet, 2006; Mar-Molinero & Serrano-Cinca, 2001
Liquidity position	Positive	Cornett et al. 2011; Ratnovski, 2013; Christopoulos et al., 2011; Pasiouras et al, 2006; Olweny&Shipho, 2011.
Sensitivity to market risk	Negative	Sahajwala and Bergh, 2000; Baral, 2005; Christopoulos et al., 2011;

2.5 Bank Soundness Assessment Approaches

Two main approaches exist for bank soundness assessment, the micro and macro approaches, (Shen and Hsieh, 2011). The micro approach employs the bank specific factors and the tool commonly used is the CAMEL framework whereas the macro approach considers both institutional and macro-economic indicators, (Cihak and

Schaeck, 2007). This study considers three models, CAMEL, CAMELS and Z-score index.

2.5.1 CAMELS rating system

The CAMEL rating system was developed by the United States Federal Deposit Insurance Corporation (FDIC) for prompt identification of problems in bank operations, Uzhegova, (2010). The Uniform Financial Institutions Rating System, (UFIRS) was created in 1979 based on the CAMEL framework, and in 1996, UFIRS was revised by including the Sensitivity to market risk indicator hence forming CAMELS. The CAMELS model is based on the core set of Financial Soundness Indicators (FSIs) developed by the IMF (IMF and World Bank, 2005). CAMELS is an acronym for six components: Capital adequacy, Asset quality, Management quality, Earnings strength, Liquidity and Sensitivity to market risk. This model utilizes a rating system with a scale from 1 to 5 where 1 indicates a strong bank whereas 5 represents weakest bank, (FDIC, 1996) (Appendix IV). Further, every component in the model utilizes balance sheet ratios and then the weighted average of the components are summed up to obtain the overall composite rating for a bank, (FDIC, 1996) (Appendix V).

While the CAMEL framework is widely used by commercial bank regulators including the CBK as an on-site monitoring system, Cole and Gunther, (1995) have showed that CAMEL ratings rapidly decay and may become irrelevant six months subsequent to an examination. Similarly, Gilbert, Meyer and Vaughan (1999, 2002) established that off-site examination performed better in predicting bank failures than on-site CAMEL based assessments. Rojas-Suarez (1998) on the other hand concluded that CAMEL is not suited to emerging markets.

2.5.2 Z-Score Index

One of the measures of bank soundness adopted in research is the Distance-to-insolvency or the Z-score which is based on Roy (1952). The Z-score measures the number of standard deviations that bank returns may drop before a bank's capital is exhausted, (Boyd

and Runkle, 1993). The Z-score combines profitability (ROA), leverage (Equity to Total Assets) and bank return volatility (standard deviation of ROA), (Berger et al. 2008; Kohler, 2012). Berger et al. (2008) and Kohler (2012) note that Z-score rises when profitability and capitalization levels increase, whereas the Z-score decreases when returns are unstable. In their study on the relationship between concentration and risk of bank failure, Boyd, De Nicolo and Al Jalal (2006) employed the Z-score as a risk measure and established that market concentration and risk of failure were positively related. In a study on Basel Core Principles and Bank risk, Demirguc-Kunt and Detragiache (2010) relied on the Z-score index as a measure of bank soundness. It is however noted by Ivicic, Kunovac and Ljubaj (2008) that the Z-score index has a limitation in that the model does not have an intuitive passing benchmark nor a maximum score thus the results are interpreted based on whether the score is high or low.

Despite the noted limitation, Maechler, Mitra and Worrel (2005) and Cihak (2010) note that the Z-score offers several advantages over measures such as Value at Risk (VaR) and stress tests as it is not affected by the nature of bank activities. They further note that the Z-score measures insolvency risk which is more crucial than liquidity problems which other models focus on. A higher Z-score implies that a bank is farther from insolvency (Dermiguc-Kunt and Huizinga, 2010).

2.6 Gaps in research

The 2007-2009 financial crisis raised scepticism among researchers about the effectiveness of financial soundness indicators as a means to monitor and assess bank soundness, given that some of the banks that failed such as Bear Stearns were well capitalized (Barfield and Venkat, 2010). Furthermore, while CAMELS framework is widely used by commercial bank regulators including the CBK as an on-site monitoring system, the trend in bank failure is a pointer to rating systems weakness in identifying vulnerabilities in financial institutions or wrong application, (Cole and Gunther, 1995). This study seeks to evaluate CAMEL as a tool for measuring bank soundness.

2.7 Conceptual framework

The conceptual framework explains the relationship between the variables under study. For CAMEL and CAMELS models, bank soundness being the dependent variable is obtained by computing the composite ratings from the component independent variables, that is, capital adequacy, asset quality, management quality, liquidity and sensitivity to market risk. The composite ratings are then assessed on a five point scale where banks rated 1 and 2 are classified as sound whereas those rated 3, 4 and 5 are classified as unsound.

As for the Z-score model, the dependent variable is bank soundness measured by the Z-score index whereas the independent variables are return on assets, equity to assets ratio and standard deviation of return on assets. On the other hand, in Logistic regression, the dependent variable takes a dichotomous value of either '0' or '1' where 0 denotes unsound banks while '1' denotes sound banks. These classifications was achieved using the three models, CAMEL, CAMELS and Z-score index. Banks that were consistently rated as sound by the three models over the period 2011 to 2015 were classified as sound whereas those consistently rated as unsound for the same period were classified under the unsound group. The independent variables comprised total capital ratio, nonperforming loans ratio, interest expense to deposits, return on equity, loans to deposits ratio, interest rate spread, GDP growth, inflation and market concentration.

2.8 Operationalization of variables

This section presents the measurements used to operationalize the research variables before applying the multiple regression analysis.

2.8.1 Dependent variable

From the conceptual framework, Bank soundness is the dependent variable. In the Logistic regression model, the dependent variable takes a dichotomous binary value of either one (1) for sound bank or zero (0) for a sound bank. For CAMEL and CAMELS models, the dependent variable is given by the composite rating obtained from the average of the

weighted summation of component independent variables ratings. As for the Z-score model, the independent variable is given by the computed Z-score.

2.8.2 Independent variables

This section discusses how the independent variables were measured and the components involved.

2.8.2.1 Capital adequacy

Capital adequacy and availability influences the robustness of financial institutions to withstand shocks to their balance sheets (IMF, 2006). Studies by Said and Saucier, (2003); Makkar and Singh, (2012) and Sangmi and Nazir (2010) concluded that adequate capitalization was necessary for bank soundness. Dang, (2011) proposed that this measure can be obtained using the Total equity to Total assets ratio. Mishra, (2012) utilized four ratios, that is Capital adequacy ratio (CAR) given by (Tier I capital + Tier II capital)/Risk weighted assets; Debt to Equity ratio; Advances to Total assets ratio and Government securities to Total investments. The composite rating was obtained by getting an average of the four ratios. The Capital adequacy ratios used by the CBK are; Core capital/Total Risk weighted assets, Total capital/ Total Risk weighted assets and Total capital/Assets. This study employed ratios used by the CBK so as to capture the CAR regulatory requirement. The composite rating was obtained by getting an average of the three ratios.

2.8.2.2 Asset quality

Dardac and Barbu, (2005); Dang, (2011) and Gonzalez-Hermosillo, (1999) agreed that high levels of nonperforming loans cause the collapse of financial institutions. Dang, (2011) posited that Asset quality is measured by Nonperforming loans (NPLs) to Gross loans ratio. Similarly, Mishra, (2012) utilized the Net NPLs to Net Advances ratio. The CBK utilizes Gross loans/Net assets, Gross NPLs/Gross loans and Net NPLs/Gross loans. This study used Gross NPLs to Gross loans ratio as data is available for all banks under study.

2.8.2.3 Management quality

Grier, (2007) indicated that management is deemed a significant element as it plays a role in a banks success given decision making role by managers which affects the direction of a firm. Proxies proposed for measuring management quality are operating efficiency given by Operating expenses to Total assets ratio, Thomson (1989) and Operating profit to Income ratio, and Interest expense to Total deposits ratio, Sangmi and Nazir (2010). Mishra, (2012) employed Return on equity, Business per employee, Profit per employee and Total advances to Total Deposit. This study adopted Operating expenses to Total assets, Interest expense to Total deposits ratios and insider loans to core capital.

2.8.2.4 Earnings

Earnings reflect the rate of return on funds invested in a firm. Dang, (2011) utilized the Net income to Total assets ratio to measure earnings. The CBK uses Return on Assets (ROA) and Return on Equity (ROE) to measure bank profitability, (CBK Bank Supervision report, 2014). Further, IMF (2009) indicated that the ROA was higher for intervened banks before the onset of the global financial crisis indicating more uptake of debt by banks to improve profits. This approach was adopted in this research as it indicates how much net income is generated per shilling of assets. The higher the ROA the more profitable the firm.

2.8.2.5 Liquidity

Samad, (2004) summarises liquidity as the life and blood of a bank. In addition Ratnovski, (2013) posited that liquidity buffer acted as an insurance against shocks during the crisis. Dang, (2011) utilized Total loans to Total Deposits ratio to assess liquidity. This ratio points out the percentage of assets tied up in loans. The higher the ratio, the less liquid a bank is. Mishra, (2012) used Liquid assets to Total deposits, Liquid assets to Total assets, Liquid assets to Demand Deposits and Approved securities to Total assets. Liquidity ratio (Liquid assets/Total assets) and total loans to Customer deposits was used in this study to measure bank liquidity.

2.8.2.6 Sensitivity to market risk

This ratio measures sensitivity to changes in market risks. Baral, (2005) indicated that financial soundness of a bank which is highly sensitive is more hazardous that a financial institution which is less sensitive. Studies by Avkiran and Cai, (2012); Sarker, (2006) and Dincer et al (2011), employed the specific bank assets to total banking sector assets ratio. (Christopoulos et al., 2011) utilized Total securities to Total assets ratio. This study employed Net open position in foreign exchange to capital ratio.

2.8.2.7 Control variable

In their study on determinants of U.S bank failures, (Wheelock & Wilson, 2000) used the log of bank assets in place of bank size. This study will adopt the log of total assets of the banks as an indicator of bank size.

2.8.2.8 Macroeconomic factors

This study followed the studies of Gonzalez-Hermosillo, Pazarbosioglu and Billings (1996) in operationalizing the macroeconomic factors hence the prevailing data on the selected variables within the study period were adopted;

- GDP growth rates
- Inflation
- Interest rate spread
- Herfindahl Index

According to the Financial Soundness Indicators Compilation guide (2000), bank concentration can be measured using the Herfindahl Index, H, which is given by the sum of squares of market shares of all firms. If H is below 1,000, it indicates limited concentration whereas if H is above 1,800 points, it indicates significant concentration in a sector. H is given by the formula below;

$$H = \sum_{i=1}^{N} (\text{Share}i)2$$

A summary of the financial soundness variables employed are tabulated in appendix III.

2.9 Chapter Summary

Evidence from empirical studies indicates that bank soundness is critical for the wellbeing of the economy hence the need for frequent assessments of bank health. The studies highlight that capital adequacy, sufficient liquidity and asset quality are critical in ensuring bank soundness.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter defines the research design in section 3.2, population used in this study in section 3.3, data and data collection in section 3.4, variable and variable measurement, data analysis and research model in section 3.5, data presentation in section 3.6, research quality in section 3.7 and ethical considerations in section 3.8.

3.2 Research Design

This research adopts a pragmatic philosophical approach of knowledge claim which focuses on situations and consequences, (Creswell, 2003). Based on research objectives, the study adopts a mixed research design. Explanatory research is adopted so as to identify causal links between the variables under study. Through explanatory research, the causes and effect for assessing banks as sound or unsound are explored. A descriptive research design was used to describe the attributes of variables under study. Logistic regression was used to achieve objective two and three. Objective one sought to identify significant indicators that discriminate sound from unsound banks. This was achieved using the p-values of the selected FSIs from the logistic regression output. Indicators with p-values less than 0.05 were considered significant whereas those with p-values greater than 0.05 were considered statistically insignificant. Objective two was achieved by including both micro and macro-economic variables in the logistic regression and determining the effect on the classification accuracy and the signs of the regression coefficients. Objective three was achieved by classifying banks into two groups using CAMEL, CAMELS and Z-score models. CAMEL and CAMELS composite ratings were obtained by summing up the weighted component ratings and obtaining the average which was then interpreted using the CAMEL(S) rating scale (Appendix IV and V). On the other hand, the Z-scores were computed using return on assets, equity to assets ratio and the standard deviation of return on assets for each individual bank.

3.3 Target Population

The population of this research comprises of all licensed commercial banks in Kenya between 2011 and 2015. There were 42 banks operating as at end of December 2011 and 41 as at end of December 2015. Two banks which were in existence in 2011 were placed under liquidation in August and September 2015. This period was chosen in consideration of the key reforms undertaken in the banking sector so as to strengthen bank soundness such as introduction of Prompt Corrective Action (PCA) in 2010 giving CBK powers to take swift action when an institution exhibited weak capital base; enhancement of Capital adequacy and Corporate governance requirements in 2012; implementation of the revised Prudential and Risk management guidelines in 2013; and enhancement of monetary penalty against institutions violating the Banking Act from Kshs. 1 million to Kshs. 5 million. The study considered the whole population as this enhances generalizability of the research results.

3.4 Data collection methods

The study employed secondary data from bank income statements and balance sheets to achieve the first and third research objective. The secondary data collected was the IMF core and selected FSIs for each individual bank, namely; Regulatory capital, risk-weighted assets, Regulatory Tier 1 capital, Nonperforming loans, net of provisions, total capital, liquid ratios, total gross loans, Interest margin, gross income, Noninterest expenses, Customer deposits, nonperforming loans, bank leverage. Individual bank data was collected from CBK Bank supervision annual reports and annual financial statements published by banks in Kenya for the period 2011 to 2015. Macro-economic factors used were interest rate spread, real GDP growth, inflation and market concentration to achieve the second research objectives. This data was obtained from macroeconomic statistics published by the CBK.

3.5 Data analysis

To determine financial soundness of commercial banks, the secondary data obtained was analysed using descriptive statistics, and binary logistic regression using SPSS statistical analysis program. The descriptive statistics was used to compare selected FSIs for sound

and unsound banks as measured by CAMEL and CAMELS models. 42 banks operating in Kenya formed the initial population, however due to missing data, only 35 banks are finally included in the sample. For objective one and two, binary logistic regression was adopted since the dependent variable takes only limited values of 1 or 0 to signify sound or unsound. This was achieved by computing the Z-score index for each individual bank using profitability, leverage and bank return volatility. Those in the quartile four and three were classified as sound and assigned a dependent variable value '1' and those in the last two quartiles classified as unsound assigned value '0'. Logistic regression was then used to identify which micro or macro variables had significant influence on bank soundness. P-values were determined at 0.05 or 5% significance level to test the significance of the financial soundness indicators, and Cox and Snell R2 and Nagelkerke R2 and the -2 log likelihood statistic were used to test the strength of the model. Hosmer and Lemeshow test was used to check how well the data fits the model. To achieve objective three which sought to assess the performance of CAMEL in assessing bank soundness, CAMEL, CAMELS composite ratings and Z-scores for individual banks were computed and compared in terms of how the models rated the same banks. For CAMEL and CAMELS, rating scale of 1 to 5 was adopted where 1 and 2 signifies sound banks whereas 3, 4 and 5 denote unsound banks. The higher the Z-score, the farther a bank is from default hence those banks ranked on the top quartile were regarded as sound, while those in the lower quartiles as unsound.

3.5.1 Research Model

The models used in the research are CAMEL, CAMELS, Z-score index and Logistic regression. CAMEL is the model used by CBK to assess bank soundness whereas CAMELS is an advanced of CAMEL and incorporates a measure on sensitivity to market risk. Z-score measures the distance to default hence indicate level of insolvency. On the other hand, logistic regression model was adopted so as to identify statistically significant variables which discriminated sound from unsound banks. Based on the conceptual framework, the relationship between the variables can be expressed in the form of a function as shown below:

CAMEL (S) model

The CAMELS model is based on the core set of Financial Soundness Indicators (FSIs) developed by the IMF. CAMELS is an acronym for six components: Capital adequacy, Asset quality, Management quality, Earnings strength, Liquidity and Sensitivity to market risk. CAMEL (S) is computed using the function below;

Bsit = f (Cait, Aqit, Mqit, Eqit, Liqit, Sit)

Bsit = [(Cait *20%) + (Aqit *20%) + (Mqit *25%) + (Eqit *15%) + (Liqit*10%) + (S*10%)]

Where Bsit = Composite bank soundness rating

Ca= Capital adequacy

Aq=Asset quality

Mq=Management quality

Eq=Earnings quality

Liq=Liquidity

S=Sensitivity to market risks

The independent variables were computed from ratios generated from the financial statements of individual banks.

Z-Score Index

The Z-score measures the number of standard deviations that bank returns may drop before a bank's capital is exhausted. It is given by the formula below;

Z-index is = (ROA+EA)/δ (ROA)

Where ROA=Return on Assets; EA = ratio of equity to assets and δ (ROA) is an estimate of the standard deviation of the rate of return on assets. To calculate δ (ROA), data from two previous years are used. δ (ROA) expresses fluctuation of returns, whereas the ratio of capital to total assets indicates size of capital which can be used to cover unexpected losses.

Binary Logistic regression Model

Binary Logistic regression model takes a dichotomous value of either one (1) for sound bank or zero (0) for a sound bank. Following the studies of Shumway (2001) and Davis and Karim (2008), a multivariate logit estimation was applied on balance sheet and economic indicators for each bank. The regression model was as below;

Y_{it} = 0 if bank i is unsound

Y_{it} = 1 if bank i is sound

$Y_{it} = F\ (\alpha_0 + \beta_1 Micro_{it} + \varepsilon_{it})$…………………………………………………. *(1)*

$Y_{it} = F\ (\alpha_0 + \beta_1 Micro_{it} + Macro_{it} + \varepsilon_{it})$………………………………………. *(2)*

The first equation (1) considers the micro data only whereas equation (2) considers both the micro and macro data. Macro data are incorporated to determine whether macro-economic indicators have an impact on bank soundness assessment. The micro data is made of explanatory variables: capital adequacy C, asset quality A, management quality M, earnings quality E, liquidity L, sensitivity to market risks S, Bank size Sz, and loan growth. The macro factors included real GDP growth, GDPg, Interest rate spread Is. α represents a constant that takes into account influences not reflected by the explanatory variables, whereas β are the regression coefficients. If the sign of β is greater than 0, ($\beta>0$) in the model, then an increase in a variable increases the probability of bank unsoundness, whereas if the sign of β is less that 0 ($\beta<0$) then an increase in a variable reduces the probability of bank unsoundness.

3.6 Data presentation

The quantitative information was presented using tables and graphs after carrying out descriptive statistics on the quantitative data. Logistic regression analysis output was also presented in tables as generated by SPSS statistical tool.

3.7 Research Quality

This section looks at how research objectivity, generalizability of results and validity was achieved. This is discussed as follows;

3.7.1 Objectivity

The research findings and conclusion was based on the results from the analysis of actual data collected and free from the researcher's bias.

3.7.2 Generalizability

This study utilized data from 35 (85%) of banks operating in Kenya hence the research findings will be applicable to the Kenyan banking sector.

3.7.3 Validity

The researcher identified the appropriate research instruments and process necessary to measure the variables through extensive survey of the relevant literature.

3.8 Ethical considerations

The researcher considers anonymity of banks and their employees. The study used publicly available financial information hence no confidentiality breach. The researcher also used the university's introduction letter to gain confidence from relevant people consulted.

CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.0 Introduction

This chapter presents the data sought, the analysis undertaken and the results obtained. The data was analysed based on the specific objectives and the financial soundness variables selected for the study. The specific objectives which the analysis was based were; i) to identify indicators that discriminate sound from unsound banks ii) determine impact of macro indicators on bank soundness. and iii) to assess the performance of CAMEL in assessing bank soundness: The chapter is organized in the following sections : 4.2: Identification of significant indicators that discriminate sound from unsound banks; 4.3: Analysis of relationship between Micro FSIs and bank soundness; 4.4: Impact of macro-economic indicators on bank soundness; 4.5: Impact of macro-economic indicators on bank assessment; 4.6: Comparison of Micro FSIs for sound and unsound banks as classified by both CAMEL and CAMELS; 4.7: Comparison of CAMEL and CAMELS bank ratings 4.8: Comparison of CAMEL and Z-Score bank classification 4.9: Comparison of bank classification by CAMEL, CAMELS and Z-score; 4.10: Chapter summary.

4.1 Significant indicators that discriminate sound from unsound banks

Objective one of the study sought to identify the set of indicators that discriminate between sound and unsound banks. To identify the significant micro indicators, logistic analysis was carried out on micro indicators only. Table 4.1 below presents micro FSIs regression results;

Table 4.1: Test of significance of Micro FSIs

						95% C.I.for EXP(B)	
	B	S.E.	df	Sig.	Exp(B)	Lower	Upper
TCAPTA	27.890	13.134	1	.034	1.2E+12	8.563	1.9E+23
NPLLNS	-53.435	20.301	1	.008	.000	.000	.000
INTEXPDEP	-56.206	25.663	1	.029	.000	.000	.003
ROE	5.065	3.822	1	.185	1.006	.000	11.317
LNSDEP	12.197	4.837	1	.012	1.9E+5	15.124	2.5E+9
SENS	-.025	.610	1	.967	.025	.310	3.390
Constant	-2.479	4.287	1	.563	.084		

Table 4.1 displays the Sig. (p-value), as well as the Exp(B) and confidence interval for the Exp(B). The p-value is used to evaluate whether or not the logistic coefficient is different from zero. From the results, four bank specific indicators were found to be significant in discriminating sound from unsound banks. These were total capital to total assets ratio (TCAP/TA) which signifies capital adequacy, asset quality as measured by nonperforming loans to gross loans (NPLLNS), management quality as measured by interest expense to deposits (INTEXPDEP) and liquidity represented by loans to deposits ratio (LNSDEP).

To check on the fitness of the logistic model based on micro FSIs, Cox and Snell R2 and Nagelkerke R2, -2 log likelihood and Hosmer and Lemeshow tests were used. Table 4.2 shows the fitness statistics for micro indicators.

Table 4.2: Test of Fitness of the Micro FSIs logistic model

Model Summary			**Hosmer and Lemeshow Test**		
-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Chi-square	df	Sig.
30.041	.390	.633	4.466	7	.725

Table 4.2 contains the Cox and Snell R2 and Nagelkerke R2 both of which calculate explained variation in the dependent variable. It shows that the explained variation in the dependent variable based on the model ranges from 39% to 63.3% respectively. This indicates that the variables included in the model explain the variation in bank soundness up to 63.3% indicating a good fit. On the other hand, the -2 log likelihood statistic

measures how poorly the model predicts the decisions, that is the unexplained variance in the dependent variable hence the smaller the statistic the better the model. In the model, the -2 log likelihood is 30.041. In addition, the Hosmer and Lemeshow in table 4.2 tests the null hypothesis that predictions made by the model fit perfectly with observed group memberships and a chi-square statistic is computed comparing the observed frequencies with the expected ones. The p-value is 0.725 which is greater than 0.05 indicating a non-significant chi-square signifying that the data fit the model well hence the logistic model based on micro indicators used in this study is a good fit of the data.

4.2 Analysis of relationship between Micro FSIs and bank soundness

The hypotheses identified in research relating to micro FSIs were tested using the logistic regression. The results are as shown in table 4.3 below;

Table 4.3: Test of hypotheses for Micro FSIs influence on bank soundness

HYPOTHESIS	FSI	B	Sig.	Exp(B)	**TEST**
H1	TCAPTA	27.890	.034	1.2E+12	**Failed to reject**
H2	NPLLNS	-53.435	.008	.000	**Failed to reject**
H3	INTEXPDEP	-56.206	.029	.000	**Failed to reject**
H4	ROE	5.065	.185	1.006	**Rejected**
H5	LNSDEP	12.197	.012	1.9E+5	**Failed to reject**
H6	SENS	-.025	.967	.025	**Rejected**
	Constant	-2.479	.563	.084	

Logistic coefficient in column (B) for each predictor variable is the expected amount of change in the logit for each one unit change in the predictor. The closer a logistic coefficient is to zero, the less influence it has in predicting the logit. The predictors which increase the logit display Exp(B) greater than 1.0, those predictors which do not have an effect on the logit will display an Exp(B) of 1.0 and predictors which reduce the logit will have Exp(B) values less than 1.0.

The derived logistic regression function is given by -2.479 + 27.89TCAPTA – 53.435NPLLNS – 56.206INTEXPDEP + 5.065ROE + 12.197LNSDEP – 0.025SENS; where TCAPTA is total capital to total assets representing capital adequacy, NPLLNS is the nonperforming loans to gross loans ratio measuring asset quality, INTEXPDEP is interest expense to deposits representing management quality, ROE is return on equity representing profitability, LNSDEP is loans to deposits ratio measuring liquidity, SENS represents sensitivity to market risk.

H1: There is a significant positive relationship between Capital adequacy and bank soundness

The regression coefficient for TCAPTA which represents capital adequacy is a positive 27.89, indicating that total capital to total assets ratio is positively related to bank soundness. The odds ratio Exp(B) is large for total capital to total assets ratio indicating that a one unit change in TCAPTA makes a bank likely to be sound by number of times of odds ratio, 1.2E+12. In addition, TCAPTA has a p-value of 0.034 which is less than 0.05 hence it is statistically significant and contributes significantly to the model thus failed to reject hypothesis H1. This means that capital adequacy contributes to a bank being sound, whereas undercapitalization results in a bank not being sound.

H2: There is a significant negative relationship between level of NPLs and bank soundness.

The nonperforming loans to gross loans ratio (NPLLNS) has a p-value of 0.008 which is less than 0.05 hence it contributes significantly to the model hence failed to reject hypothesis H2. The Exp(B) for NPLLNS is less than 1 hence an increase in NPLs leads to a drop in the odds of a bank being sound. Further, the NPLLNS has a negative sign signifying that the higher the ratio of nonperforming loans which is due to bad loans, the poorer a bank's performance will be and therefore reduces its soundness. Poor credit quality and nonperforming loans indicate that a bank is not recovering on what it has lent hence loosing funds and resulting in capital erosion. Further, nonperforming loans may result in reduced liquidity in a bank, which may in the long result in bankruptcy and bank failure.

H3: There is a significant positive relationship between management quality and bank soundness

INTEXPDEP is the proxy for management quality and is measured by interest expense to deposits. The lower this ratio is, the better management is expected to be and the lower the probability that a bank will fail, thus the coefficient is expected to be negative. The coefficient for INTEXPDEP is negative 56 hence negatively related to bank soundness. Further, INTEXPDEP has a p-value of 0.029 which is less than 0.05 hence it is statistically significant thus failed to reject hypothesis H3. Effective management is necessary to ensure minimization of cost and maximization of revenue generation to ensure sustainability the bank. Further, bad management including poor corporate governance practices can impact negatively on bank performance.

H4: A significant positive relationship exists between profitability and bank soundness

Return on equity (ROE) with a p-value of 0.185 is not significant at 95% confidence level, thus H4 is rejected. However the positive regression coefficient signifies that a high ROE leads to bank soundness. The Exp(B) for ROE is greater than 1 indicating that an increase in profitability enhances the odds of a bank being sound. This is because profits contributes to capital growth which allows a bank to lend more and also be in a position to pursue strategies such as expansion.

H5: There is a significant positive relationship between liquidity and bank soundness

Loans to deposits ratio (LNSDEP) which is the proxy for liquidity is statistically significant with a p-value of 0.012 hence failed to reject hypothesis H5. The positive coefficient indicates that a higher liquidity position leads to a sounder bank as higher liquidity allows banks to continue pursuing their lending strategies hence more income unlike those banks with low liquidity.

H6: A significant negative relationship exists between Sensitivity to market risk and bank soundness

This is proxied by net open position in foreign currency to capital represented by SENS in table 4.3. The logistic coefficient has a negative coefficient of -0.025 denoting a negative relationship between bank soundness and sensitivity to market risk indicating that an increase in the sensitivity to market risk reduces the odds of a bank being classified as sound. However, the p-value is 0.967 hence does not significantly contribute to the model, and thus H6 is rejected.

4.3 Impact of combined micro and macro-economic indicators on bank soundness

To achieve objective three which sought to determine whether selected macro-economic indicators had an impact on bank assessment, real GDP growth rate, inflation rate, interest spread and market concentration were incorporated in the logistic regression model. This enabled the testing of hypotheses on the relationship between bank soundness and macro-economic environment. Table 4.4 below shows logistic regression results combining micro and macro indicators.

Table 4.4: Test of hypotheses for combined Micro and Macro Indicators

HYPOTHESIS	FSI	B	S.E.	Sig.	TEST
H1	TCAPTA	26.842	13.651	.049	**Failed to reject**
H2	NPLLNS	-54.547	20.966	.009	**Failed to reject**
H3	INTEXPDEP	-60.823	28.134	.031	**Failed to reject**
H4	ROE	5.082	4.125	.218	**Rejected**
H5	LNSDEP	12.745	5.108	.013	**Failed to reject**
H6	SENS	-.088	.639	.890	**Rejected**
H7	GDPGR	7.647	31.336	.807	**Rejected**
H8	INFLRT	-.994	4.443	.823	**Rejected**
H9	INTSPR	.330	1.335	.805	**Rejected**
H10	Herfindahl Index	-.109	.443	.805	**Rejected**
	Constant	-19.213	64.340	.765	

From table 4.4, the bank specific variables which remain significant after addition of macro variables are total capital to total assets, nonperforming loans to gross loans,

interest expense to deposits and loans to deposits ratio. Variables relating to macro-economic are GDPGR representing real economic growth, INFLRT representing inflation rate, INTSPR denoting average industry interest spread and market concentration measured by the Herfindahl index. Hypotheses identified shown in table 4.4 are tested as below;

H7: There is a significant positive relationship between GDP growth and bank soundness
GDPGR has a p-value of 0.807 hence not statistically significant, thus H7 is rejected. However the regression coefficient is positive hence it is positively related to bank soundness. This signifies that an increase in GDP growth results in an increase in the probability that a bank will be sound. This is so because economic growth results in increased opportunities for banks to lend hence generate more interest income which enhances its liquidity and capital.

H8: There is a significant negative relationship between inflation rate and bank soundness
Inflation rate (INFLRT) is not statistically significant as it has a p-value of 0.823, hence H8 is rejected; however INFLRT is negatively related to bank soundness given the negatively signed regression coefficient. This means that an increase in inflation causes a reduction in the chances of a bank being sound.

H9: There is a significant positive relationship between interest spread and bank soundness
Interest spread (INTSPR) is not significant with a p-value of 0.805 hence does not contribute to the model, thus H9 is rejected; it is however positively related to bank soundness given the positive regression coefficient. This is so because the higher the interest spread, the higher the interest margin income that a bank makes and hence profitability is likely to go up and subsequently improve on its soundness.

H10: There is a significant negative relationship between market concentration and bank soundness

Herfindahl index which is a measure of market concentration is not statistically significant in the model given that it has a p-value of 0.805 which is greater than 0.05, hence H10 is rejected. It is however negatively related to bank soundness given the negatively signed regression coefficient. This indicates that the higher the banking sector is concentrated, the higher the likelihood that a bank will become unsound. Market concentration increases competition for customers in the industry which may in turn result in pricing strategies that result in narrow interest spreads and subsequently low profitability. This would in turn make a bank more vulnerable or weaken its financial soundness.

4.4 Impact of macro-economic indicators on bank assessment

To determine whether the selected macro-economic indicators had an impact on the classification of banks whether sound or unsound, classification tables for micro and the combined micro and macro models were compared. The explanatory powers and classification accuracy of the two models were also compared. Table 4.5 shows the comparison of logistic model fitness for micro and the combined micro and macro models.

Table 4.5: Comparison of micro and combined model fitness

Model I: Micro FSIs Only				
Model Summary			**Hosmer and Lemeshow Test**	
-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Chi-square	Sig.
30.041	.390	.633	4.466	.725
Model II: Micro and Macro Combined				
Model Summary			**Hosmer and Lemeshow Test**	
-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Chi-square	Sig.
29.605	.394	.640	8.120	.322

Table 4.5 above shows the model fitness tests for model I (micro indicators only) and model II (combined micro and macro indicators). The -2 log likelihood for model I was higher compared to model II at 30 and 29 respectively. This shows that the unexplained variance in the independent variable in model I was higher than in model II. Similarly, Cox and Snell R2 and Nagelkerke R2 was at 39% and 63% respectively for model I and

39.4% and 64% for model II indicating a marginal improvement in explained variation in bank soundness after the addition of macro-economic indicators. It is however noted that the significance of model II as shown by the Hosmer and Lemeshow was lower at 0.322 compared to 0.725 for model I which indicates that the data fit the model well in model I.

Table 4.6 below shows the comparison of classification accuracy for model I and model II. Type I error where an unsound bank is classified as sound whereas type II error is where a sound bank is classified as unsound.

Table 4.6: Comparison of classification accuracy for model I and II

Model I: Micro Indicators					**Model II: Combined Micro and Macro**				
		Predicted					Predicted		
		SOUNDNESS		% Correct			SOUNDNESS		% Correct
		0	1				0	1	
SOUNDNESS	0	9	3	75.0	SOUNDNESS	0	9	3	75.0
	1	3	50	94.3		1	1	52	98.1
Overall %				90.8	Overall %				93.8

Table 4.6, shows type I and type II errors for model I were 3 cases each with an overall accuracy rating of 90%. On the other hand, model II had 3 unsound cases misclassified as sound and 1 case classified as sound and an overall classification accuracy of 93. In overall, the addition of the selected macro-economic variables improved the model.

4.5 Comparison of Micro FSIs for sound and unsound banks as classified by both CAMEL and CAMELS.

To ascertain whether sound and unsound banks have dissimilar FSI scores, a comparative descriptive analysis was undertaken. The following section presents a comparison of FSIs for sound and unsound banks as classified by CAMEL and CAMELS. Table 4.7 below displays the means for component CAMEL and CAMELS variables for sound and unsound banks. The first five components are similar for both CAMEL and CAMELS while the additional row on sensitivity to market risk represents the 'S' in CAMELS.

Table 4.7: Comparison of FSIs for sound and unsound banks as classified by both CAMEL and CAMELS.

	SOUND		UNSOUND	
FSI	Mean	Std. Deviation	Mean	Std. Deviation
Capital Adequacy	1.52	0.66	2.43	1.22
Asset quality	0.06	0.03	0.11	0.07
Management Quality	0.06	0.03	0.09	0.07
ROE	0.23	0.18	0.10	0.26
ROA	0.04	0.02	0.01	0.05
Liquidity	0.82	0.14	0.73	0.18
Sensitivity to market risk	0.32	0.74	0.89	0.58

Table 4.7 shows that the mean capital adequacy ratio for sound banks was better compared to unsound banks at 1.52 and 2.43 which are equivalent to rating of satisfactory and fair respectively. This means that sound banks were better capitalized compared to the unsound banks and hence sound banks can withstand shocks to their balance sheets by using capital as a buffer.

Similarly, sound banks had a better loan quality given a lower nonperforming loans to gross loans ratio of 6% compared to 11% for the unsound banks. This implies a higher level of impaired (bad) loans among the unsound banks and poor credit quality which could be attributed to poor lending practices.

In terms of profitability, unsound banks recorded lower mean Return on equity (ROE) of 10% compared to 23% for sound banks, whereas mean Return on assets (ROA) at 4% and 1% for sound and unsound banks respectively. ROE and ROA are earnings and profitability indicators signifying that sound banks are more profitable than unsound banks.

Likewise, sound banks were more liquid at a mean of 0.82 compared to 0.73 for unsound banks as measured by the loans to deposits ratio. Adequate liquidity enables a bank to

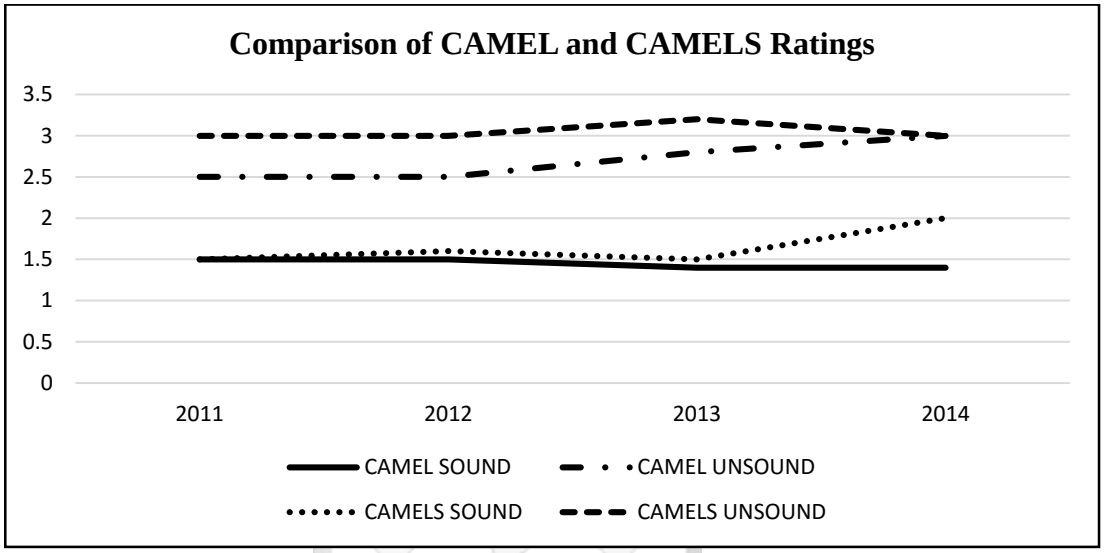
meet its payment obligations and to also pursue growth opportunities such as business expansion vis a vis a scenario of constrained liquidity which can inhibit business growth.

Table 4.7 further shows that management quality for sound banks was better at 6% compared to 9% for the unsound banks as measured by both interest expense to liabilities and interest expense to deposits ratios. These ratios represent the cost of funds and operational efficiency thus unsound banks incurred a higher cost of funds compared the sound banks. In terms of sensitivity to market risk, unsound banks had higher ratios compared to sound banks as measured by net open position in foreign exchange to capital ratio. The average sensitivity ratios were at 0.32 and 0.89 for sound and unsound banks respectively echoing conclusions by Baral (2005) that financial soundness of a bank which is highly sensitive is more hazardous than that of a financial institution which is less sensitive

4.6 Comparison of CAMEL and CAMELS bank composite ratings

To achieve objective one which sought to assess the performance of CAMEL in assessing bank soundness, computation of composite ratings for individual banks for all the two models was undertaken. Thereafter the overall performance category ratings were compared to determine how individual banks were rated by each model. Those banks with composite ratings of 1 or 2 were classified as sound whereas those rated 3, 4 and 5 fell under the unsound category as per the CAMEL rating scale (Appendix IV and V). Figure 4.1 below illustrates the difference in mean composite ratings between CAMEL and CAMELS.

Figure 4.1: Comparison of CAMEL and CAMELS ratings for sound and unsound banks



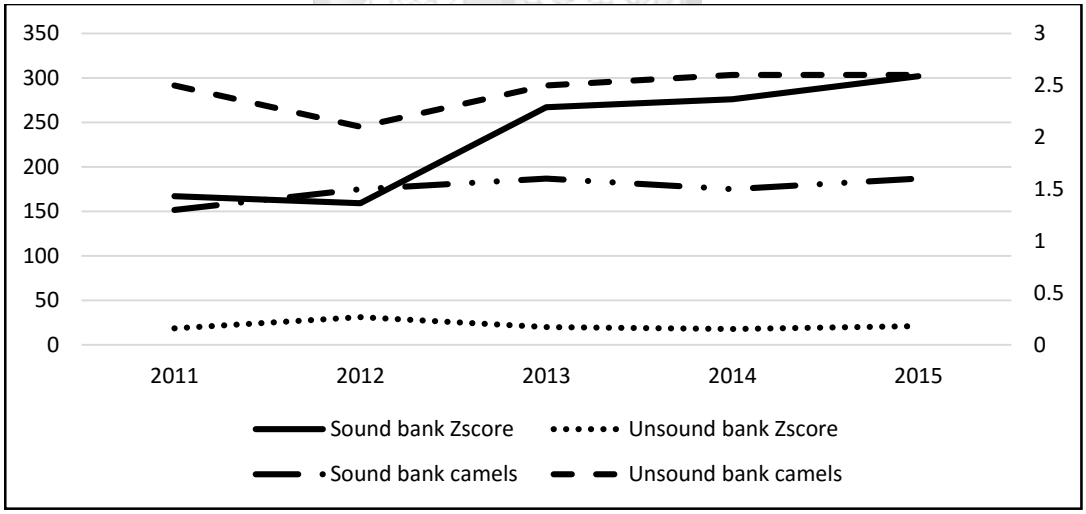
CAMEL approach ratings for sound banks were better than CAMELS ratings at 1.5 and 2 respectively though both ratings fall under the performance category rating of satisfactory. The difference between the two means is 0.5 which is attributed to the introduction of sensitivity to market risk indicator. In addition, the weightings for the component variables which add up to 100% change with the introduction of sensitivity to market risk which is weighted at 10% (Appendix VI). On the other hand, unsound banks were rated more adversely under CAMELS approach with a composite mean rating of 3 compared to CAMEL approach which had a mean of 2.48. The figure of 2.48 falls on the satisfactory performance category if not rounded off to one decimal point whereas if rounded off to one decimal point to obtain 2.5, the performance category will be fair hence classified as unsound. The findings showed that CAMEL and CAMELS achieve the same performance category rating as banks classified as sound fell under the same performance category likewise to those classified as unsound. This can be attributed to the range within a performance category of 0.5 and another 0.1 between performance categories. This means that the overall composite ratings output from the two approaches will fall under different performance categories if the variance between their composite ratings exceeds 0.6. From the analysis, CAMELS is better because it produces distinct performance ratings unlike CAMEL where ratings may fall on the boundaries between performance

categories. On the other hand, the Z-core does not have cut-off levels for different categories of performance hence subjectively determine as the higher the score, the lower the likelihood of default.

4.7 Comparison of CAMEL and Z-Score bank classification

The Z-score index indicates the distance to insolvency, a higher Z-score implies that a bank is farther from insolvency. Since the Z-score index does not have specific defined ranges for sound or unsound banks, the scores were analysed using quartiles where those banks which were on the quartile 4 and 3 were classified as sound whereas those in quartile 1 and 2 were classified as unsound. Figure 4.2 below illustrates the difference in mean ratings between CAMEL and Z-score index.

Figure 4.2: Comparison of CAMEL and Z-Score index ratings for sound and unsound banks



The findings indicated that sound banks had an average CAMEL rating of 1.5 which is equivalent to a performance rating of satisfactory on the CAMEL rating scale. In addition, sound banks had an average of 234.2 on the Z-score over the period 2011 to 2015. This shows that banks rated as sound in the CAMEL approach are identified with high Z-scores indicating a lower risk of insolvency. On the other hand, unsound banks had an average CAMEL rating of 2.5 which is equivalent to a performance rating of fair on the CAMEL rating scale. At the same time, unsound banks had a mean Z-score of 21.6 over the same

period 2011 to 2015. This reveals that banks classified by the CAMEL model as unsound are likely to fall into insolvency since they have low Z-score. From the findings, there is consistency in the identification of sound and unsound banks by the two models, however CAMEL model performs better in the identification as it has defined scale for rating banks in different performance categories. The scale (Appendix IV and V) helps in rating banks according to severity of unsoundness, on the other hand, the Z-score does not have inbuilt benchmark nor a maximum nor a minimum score thus the results are interpreted based on whether the scores are high or low.

4.8 Comparison of bank classification by CAMEL, CAMELS and Z-Score.

To check on the trend of classification of banks by the three approaches, an analysis on the number of banks classified as either sound or unsound was undertaken for the period 2011 to 2014. The table below shows the number of banks classified as sound or unsound by the different tools.

Table 4.8: Comparison of bank classification for CAMEL, CAMELS and Z-Score**.**

	2011		2012		2013		2014	
	Sound	Unsound	Sound	Unsound	Sound	Unsound	Sound	Unsound
CAMEL	31	4	32	3	32	3	31	4
CAMELS	30	5	32	3	32	3	31	4
Z-Score	22	13	23	12	24	11	23	12

Table 4.8 shows consistency in the classification of banks by CAMEL and CAMELS except for the year 2011 where one bank '1' was classified as sound in CAMEL whereas in CAMELS it was classified as unsound. This was an instance where bank '1' had a high sensitivity to market risk rating which adversely affected its rating resulting in a performance category rating of fair which falls under unsound category. For the years 2012, 2013 and 2014, CAMEL and CAMELS rated the same number of banks as sound or unsound, whereas the Z-score had a higher number of banks falling under unsound because the model does not have clearly defined benchmark for distinguishing unsound banks, hence for this study those banks falling in quartile 1 and 2 were classified as

unsound. Further analysis on the data indicated that 3 banks were consistently rated as unsound over the period under study indicating consistency in the performance of the models (Appendix VII).

4.9 Chapter Summary

This chapter has presented the key findings of the study. Bank-specific financial soundness indicators identified as significant in discriminating sound from unsound banks were capital adequacy, asset quality, management quality and liquidity. On the other hand, none of the selected macro-economic variables were significant hence all their related hypotheses were rejected. Further analysis on the impact of macro-economic factors on bank soundness indicated the model accuracy improved with a reduction in type II error. The findings indicate that micro FSIs are useful in monitoring bank soundness and identifying weak banks compared to inclusion of macro indicators. CAMEL and CAMELS achieved the same performance category rating as banks classified as sound fell under the same performance category likewise to those classified as unsound. This can be attributed to the range within a performance category of 0.5 and another 0.1 between performance categories. However, from the analysis, CAMELS is better because it produces distinct performance ratings unlike CAMEL where some ratings fell on the boundaries between performance categories. On the other hand, the Z-score does not have cut-off levels for different categories of performance hence soundness is subjectively determined as the higher the score, the lower the likelihood of default. Thus, of the three models, CAMELS ranks higher given the distinct ratings it produces.

CHAPTER FIVE

DISCUSSION, RECOMMENDATIONS, LIMITATIONS AND CONCLUSIONS

5.0 Introduction

This chapter presents a summary of the study providing the implications of the study based on the research objectives, conclusions and recommendations. The chapter is organized as follows: 5.2: Discussion of the findings; 5.3: Summary and implications of the study; 5.4: Recommendations for action and areas of further study; 5.5: Limitations to the study; 5.6: Conclusion and 5.7: Suggestions for further research.

5.1 Discussion of the findings

For objective two which sought to identify indicators that discriminate sound from unsound commercial banks, capital adequacy, asset quality, management quality and liquidity were found to be significantly related to bank soundness. Capital adequacy was found to be positively related to bank soundness and statistically significant. This is consistent with IMF (2006) view that capital adequacy and availability influences robustness of financial institutions to withstand shocks to their balance sheets. Similarly, the finding is consistent with the conclusions by Poon et al. (1999), Van-Roy, (2006) and Goodhart et al. (1998) and Gonzalez-Hermosillo (1999) that adequate capital funds decrease the risk of a bank going bankrupt and subsequently failing are confirmed. The finding is also in line with the push by CBK to increase minimum capital requirements to ensure banks are sound.

Asset quality was found to have a significant negative relationship with bank soundness. The implication of this is that good loan administration and control on the quality of the loan book are important for a bank in achieving a financial soundness rating. Poor asset quality could result in bank capital erosion and may subsequently end in bankruptcy. This is similar to the conclusions by Podpiera (2006) and Berger and De Young, (1997) that NPL ratio is an indicator of bank fragility and that high levels of NPLs indicates problems in the banking sector.

A significant positive relationship between Management quality and bank soundness was established. This is consistent with the findings by White, (1993) and Pasiouras et al., (2006) who noted that management efficiency in terms of income generation and expenses control is an indicator of bank health. Banks require competent management with integrity, quality boards and professionalism which are critical in ensuring a sound banking system.

Liquidity was found to be significant and positively related to bank soundness. This is consistent the findings by Mar-Molinero & Serrano-Cinca, (2001) who concluded that deteriorating bank liquidity explained the failure of banks. This finding also supports the regulatory requirements on liquidity which has been pegged at a minimum of 20%.

Sensitivity to market risk was found to be negatively related to bank soundness though not significant. This is consistent with findings by Baral, (2005) who established that a bank which is highly sensitive are more likely to be distressed compared to those that are less sensitive to market risk. Similarly, Christopoulos et al., (2011) linked the failure of Lehman Brothers to mismanagement of sensitivity risk.

As for objective two which sought to determine the impact of macro-economic indicators, the results indicated that the predictors that capture macro-economic environment were all not statistically significant hence all the related null hypotheses were rejected. However, the model was improved by adding these variables that capture the macroeconomic environment. Real GDP growth was found to be positively related to soundness. This echoes the findings by the Kenya Financial Sector Stability report (2014) which showed that economic slowdown in 2014 resulted in an increase in NPLs which is a factor that has been linked to deterioration of bank health.

With regard to interest spread, the findings revealed a positive relation to soundness. This is so because the higher the interest spread, the higher the interest margin income which echoes Kaminsky and Reinhart (1999) and Rojas-Suarez (2000) conclusion that a large spread enhanced bank health. Similarly, Shen and Hsieh (2011) had the same view that

narrow spreads resulted in reduced interest income which subsequently adversely affects bank health. On the other hand, inflation was negatively related to soundness. This is so because inflation impacts on interest income since high inflation is associated with high costs which may result in high interest rates hence low uptake of loans. This is however different from Demirguc-Kunt and Huizinga (1999) who established a positive relationship between inflation and bank performance. They argued that inflation comes with high costs and hence higher interest margins.

Market concentration was found to be negatively related to bank soundness, attributed to the resultant competition that impacts negatively on margins. This is consistent with Boyd and De Nicolo (2005) finding that concentration increases bank fragility. The finding however differs the results by Allen and Gale (2000, 2003) who argued that concentration reduces bank fragility arguing that concentration signals less competition and hence more profits and reduction in excessive risk taking.

Objective three sought to assess performance of CAMEL as a tool for assessing bank soundness. The findings indicated that CAMEL and CAMELS achieved the same performance category rating as banks classified as sound fell under the same performance category likewise to those classified as unsound. This can be attributed to the range within a performance category of 0.5 and another 0.1 between performance categories. CAMELS however produced more distinct results in performance category rating, and in cases where a bank had high adverse rating for sensitivity to market risk, the likelihood of being unsound increased.

5.2 Summary of the study

The study set out to identify indicators that discriminate sound from unsound banks and determine whether selected macro-economic variables had an impact on bank soundness. The study reviewed previous studies on the determinants of bank soundness and theories on bank soundness assessment. Explanatory and descriptive research designs were adopted. Secondary data on the selected FSIs were collected from bank balance sheets and income statements whereas macro-economic data was obtained from the CBK website.

Descriptive analysis and logistic regression was used to achieve both objective one and two. Objective three was achieved by computing soundness scores for individual banks using the CAMEL, CAMELS and Z-score models.

5.3 Conclusion

The robust micro indicators are capital adequacy, asset quality, management and liquidity whereas sensitivity to market risk and profitability were found not to be significant. The selected macro indicators were all not significant though rightly signed as anticipated. CAMELS performed better in terms of producing distinct ratings hence ranks higher than CAMEL and Z-score index.

5.4 Implications of the study

Based on the findings of this study, bank managers should focus on ensuring that their banks are well capitalized, minimizing levels of nonperforming loans, maintain sound management and ensure adequate liquidity so as sustain bank's financial soundness and mitigate against fragility.

Faced with a trend of unsound banks, the regulator should consider adopting CAMELS for commercial bank soundness assessment. In addition, put more emphasis on bank capitalization, asset quality, management quality and liquidity in its on-site and off – site bank examinations since these indicators are significant in discriminating sound from unsound banks.

For investors and depositors, they should consider investing in banks with good capital ratios, low levels of nonperforming loans, good liquidity and those which exhibit sound management. Likewise, creditors should use bank capital ratios, asset quality, management and liquidity information in their ratings before advancing facilities. This can assist them in pricing their facilities appropriately.

5.5 Limitations to the study

The study focused on the selected Financial Soundness Indicators and only four macroeconomic factors were selected. The results may have been different if the full set of FSIs were included.

5.6 Suggestions for further research

Further research can be conducted on the impact of market factors such as a bank being quoted in the stock exchange or market discipline. This will indicate whether multiple supervision results in bank soundness.

Further studies could also focus on the inclusion of bank ownership and the bank structures such as impact of holding companies. This is in relation to whether ownership has any effect on bank soundness.

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Appendix I: IMF Financial Soundness Indicators for Deposit takers

Category	Indicator
Capital-based	Regulatory capital to risk-weighted assets Regulatory Tier 1 capital to risk-weighted assets Capital to assets Net NPLs to capital Return on equity Large exposures to capital Net open position in foreign exchange to capital Gross asset and liability positions in financial derivatives to capital Net open position in equities to capital
Asset-based	Liquid assets to total assets Liquid assets to short-term liabilities Customer deposits to total (non-interbank) loans Return on assets Nonperforming loans to total gross loans Sectoral distribution of loans to total loans Residential real estate loans to total loans Commercial real estate loans to total loans Geographical distribution of loans to total loans Foreign currency denominated loans to total loans Foreign currency denominated liabilities to total loans
Income-based	Interest margin to gross income Trading income to total income Noninterest expenses to gross income Personnel expenses to noninterest expenses

Source: *Compilation Guide for Financial soundness indicators* (IMF, 2006)

Appendix II: Liquidated Financial Institutions

	Institution Name	**Liquidation Date**
1	Post Bank Credit Ltd.	20th May 1993
2	Meridien BIAO Ltd.	15th April 1996
3	Ari Bank Corporation Ltd.	5th December 1997
4	Reliance Bank Ltd.	12th September 2000
5	Trade Bank Ltd.	18th August 1993
6	Thabiti Finance Co. Ltd.	19th December 1994
7	Fortune Finance Co. Ltd.	14th September 2000
8	Daima Bank Ltd.	13th June 2005
9	Dubai Bank Kenya Ltd.	24th August 2015
10	Prudential Building Society	18th January 2005
11	Middle African Finance Ltd.	20th August 1993
12	Pan African Bank Ltd.	18th August 1994
13	Pan African Credit & Finance Ltd.	18th August 1994
14	Kenya Finance Bank Ltd.	29th October 1996
15	Prudential Bank Ltd.	5th May 2000
16	Trust Bank Ltd.	15th August 2001
17	Euro Bank Ltd.	21st February 2003
18	Chase Bank ltd	17th April 2016
19	Imperial Bank	October 2015
	Wound up Financial Institutions	
	Institution Name	**Winding up Date**
1	Allied Credit Ltd.	6th November 2007
2	International Finance Ltd.	6th November 2007
3	Diners Finance Co. Ltd.	7th November 2008
4	Trade Finance Ltd.	23rd September 2008
5	Nairobi Finance Co. Ltd.	16th August 2010
6	Central Finance (K) Ltd.	7th September 2012
7	Inter African Credit Finance Ltd.	7th September 2012
8	Heritage Bank Ltd.	21st November 2014

Source: Kenya Deposit Insurance Corporation, (2015)

Appendix III: Financial Soundness Indicators used

Identifier	Description of the ratios used
CCAP/RWA	Core capital to Risk weighted assets
TCAP/RWA	Total capital to Risk weighted assets
NNPL/CAP	Nonperforming loans net of provisions to capital
TCAP/TA	Total capital to total assets
NPL/LNS	Nonperforming loans to gross loans
ROA	Return on assets
ROE	Return on equity
LIQ	Liquidity
DEP/LNS	Deposit to loans
INTM/GI	Interest margin to gross income
CI	Cost to income ratio
OPEX/TA	Operating expenses to total assets
INTEXP/DEP	Interest expense to deposits
TI/GI	Trading income to gross income
BA/TBSA	Bank assets to total banking sector assets
Herfindalh Index	Herfindalh Index
LnAssets	Log of bank assets
INTINC/INTEXP	Interest income to interest expenses
LNS/DEP	Loans to deposits
GDPGR	Real Gross domestic product growth
INFLRT	Inflation rate

Appendix IV: Composite CAMEL rating and Interpretation

Composite Range	Soundness Description	Rating analysis interpretation
1 – 1.49	Strong	Sound in every aspect
1.5 – 2.49	Satisfactory	Fundamentally sound with modest correctable weakness, limited supervisory response
2.5 – 3.49	Fair	Combination of weaknesses if not redirected will become severe. Watch category. Requires more than normal supervision
3.5 – 3.49	Marginal	Immoderate weakness unless properly addressed could impair future viability of the bank. Needs close supervision
4.5 – 5.0	Unsatisfactory	High risk of failure in the near term. Under constant supervision/cease and desist order.

Source: FDIC, (1996)

Appendix V: CAMEL rating scale

Rating	Performance category (%)	Capital Adequacy (%)	Asset Quality (%)	Management	Earnings (%)	Liquidity (%)	Composite Rating
1	Strong	19.5- and above	0-5	1.0-1.4	Over 3	Over 34	1.0-1.4
2	Satisfactory	15.6-19.49	5.1-10	1.5-2.4	2.0-2.9	26-34	1.5-2.4
3	Fair	12.0–15.59	10.1-15	2.5-3.4	1.0-1.9	20-25	2.5-3.4
4	Marginal	8.31-11.99	15.1-20	3.5-4.4	0.0-0.9	15-19	3.5-4.4
5	Unsatisfactory	8.3 and below	Over 20	4.5-5.0	Net loss	Under 15	4.5-5.0

Appendix VI: CAMELS Component Weights

Name of Component	Weighting (percentage)
Capital Adequacy	20
Asset Quality	20
Management Quality	25
Earnings	15
Liquidity	10
Sensitivity to Market risk	10

Source: FDIC, 1996

Appendix VII: Bank Rankings by CAMEL, CAMELS and Z-Score

	2014			2013			2012			2011		
BANK	**CAMEL**	**CAMELS**	**Zscore**	**CAMEL**	**CAMELS**	**Zscore**	**CAMEL**	**CAMELS**	**Zscore**	**CAMEL**	**CAMELS**	**Zscore**
1	S	S	US	S	S	US	S	S	US	S	US	US
2	S	S	US	S	S	US	S	S	US	S	S	US
3	S	S	S	S	S	S	S	S	S	S	S	S
4	S	S	S	S	S	S	S	S	S	S	S	S
5	S	S	S	S	S	S	S	S	S	S	S	S
6	S	S	S	S	S	S	S	S	S	S	S	S
7	S	S	US	S	S	US	S	S	US	S	S	US
8	S	S	S	S	S	S	S	S	S	S	S	S
9	S	S	US	S	S	US	S	S	US	S	S	US
10	US	US	US	US	US	US	US	US	US	US	US	US
11	S	S	US	S	S	S	S	S	S	S	S	S
12	S	S	S	S	S	S	S	S	S	S	S	S
13	S	S	S	S	S	S	S	S	S	S	S	S
14	S	S	US	S	S	US	S	S	US	S	S	US
15	US	US	US	US	US	US	US	US	US	US	US	US
16	S	S	S	S	S	S	S	S	S	S	S	S
17	S	S	S	S	S	S	S	S	S	S	S	S
18	S	S	US	S	S	US	S	S	US	S	S	US
19	US	US	US	S	S	US	S	S	US	S	S	US
20	S	S	S	S	S	S	S	S	S	S	S	US
21	S	S	S	S	S	S	S	S	S	S	S	S
22	S	S	S	S	S	S	S	S	S	S	S	S
23	S	S	S	S	S	S	S	S	S	S	S	S
24	S	S	S	S	S	S	S	S	S	S	S	S
25	S	S	US	S	S	US	S	S	US	S	S	US
26	S	S	S	S	S	S	S	S	S	S	S	S
27	S	S	S	S	S	S	S	S	S	S	S	S
28	US	US	S	US	US	S	US	US	S	US	US	S
29	S	S	S	S	S	S	S	S	S	S	S	S
30	S	S	US	S	S	US	S	S	US	S	S	US
31	S	S	S	S	S	S	S	S	S	S	S	S
32	S	S	S	S	S	S	S	S	S	S	S	S
33	S	S	S	S	S	S	S	S	S	US	US	S
34	S	S	S	S	S	S	S	S	S	S	S	US
35	S	S	S	S	S	S	S	S	S	S	S	S

Source: Author's own computation: S represents Sound and US represents Unsound