BANK SPECIFIC FACTORS AND RISK TAKING AMONG COMMERCIAL BANKS IN KENYA

BY

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university or any other award.

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We confirm that the work reported in this thesis was carried out by the student under our supervision.

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DEDICATION

This research work is dedicated to my loving family for their support and encouragement during the entire period of study, without you I would not have come this far.

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OPERATIONAL DEFINITION OF TERMS

Bank size   it refers to a bank's capital as shown in the annual statement of financial position

Bank specific factors   means bank performance indicators including credit growth, profitability, risk appetite, and bank size

Non-performing loans   means undesirable outputs or costs to a bank, which decrease the bank's performance, expected revenues and profitability.

Operating commercial bank   means a commercial bank that has been publishing its annual audited financial statements

Risk appetite   refers to the ratio of outstanding loans as a percentage of total assets. A higher value shows that a bank is loaned up and has a high risk

Risk-taking   means the extent to which a bank is exposed to distress level

Z-score   is a measure of bank's distress level as a result of banking activities

ABBREVIATIONS AND ACRONYMS

BC   Basel Committee

CBK   Central Bank of Kenya

EUT   Expected Utility Theory

FE   Fixed Effects model

HHI   Herfindahl-Hirschman Index

KES   Kenya Shilling

LD   Listwise Deletion

NPL   Non-performing loans

RE   Random Effects model

ROA   Return on Assets

SEU   Subjective Expected Utility

SME   Small and Medium enterprises

USA   Unite States of America

VNM   Von Neumann-Morgenstern Theory

ABSTRACT

Commercial banks' role of intermediation between borrowers and lenders plays a critical role in money creation process. The taking of deposits and lending it to borrowers makes banking industry a special business. However, this unique banking characteristic exposes banks to risk-taking. Lending may lead to accumulation of risky loan portfolio that may eventually affect the stability of the whole banking industry. Banks performance can be measured using different key performance indicators that are unique to banking industry. The management of a bank can deliberately alter these performance indicators based on their intended goals and objectives. However, these bank specific factors can expose banks to increased risk taking. Available literature show that bank specific factors affect risk taking. However, how these factors affect risk-taking is contradictory. Some studies show that bank-specific factors positively affect risk-taking. This means that as commercial banks performance measures grow, risk-taking increases. Other studies have showed that bank specific factors negatively affect risk-taking. This means that as banks performance measures grow, commercial banks take less risks. Most recently, new study has shown that the relationship between bank specific factors and risk-taking is U-shaped, meaning that as bank performance measures grow, risk-taking starts to decline but after sometime, the growth in performance measures leads to growth in risk-taking. To provide empirical evidence that would ensure stability in the banking industry in Kenya, it was necessary to undertake this research to establish how bank specific factors contributed to risk taking among commercial banks in Kenya. The study examined the effect of credit growth on risk-taking among commercial banks in Kenya, the effect of bank size on risk-taking among commercial banks in Kenya, the effect of bank risk appetite on risk-taking among commercial banks in Kenya, and the effect of banks profitability on risk taking among commercial banks in Kenya. The study was done for period 2006 to 2013. The choice of 2006 as starting period for this study was based on Central Bank of Kenya's risk management guidelines that were issued in August 2005.A descriptive research design was used in this research. The target population for this study was a census of all commercial banks operating in Kenya for the period 2006 to 2013. Commercial banks in Kenya are required as a regulatory measure to submit audited financial statements to Central Bank of Kenya. This study, therefore, used secondary data which was collected from each commercial bank. The analysis of data was done using both descriptive statistics and panel data regression analysis. Descriptive statistics including mean and standard deviation were done to give a summary of the variables while panel regression models were used in testing the hypothesis. The findings show that bank specific factors affect risk taking among commercial banks in Kenya. The study established that bank capital had a positive significant coefficient of 0.0006632 and probability of 0.000, credit growth had a positive significant effect on risk taking among commercial banks in Kenya with coefficient of 6.79468 and probability of 0.043. Bank risk appetite had a negative significant effect on risk taking among commercial banks in Kenya with a coefficient of -45.53013 and probability of 0.007. However, bank's profitability and credit growth lagged two periods had probability of 0.127 and 0.161 respectively. Thus, profitability and credit growth lagged two periods did not significantly affect risk taking. This study, therefore, recommends effective determination of optimal bank size among commercial banks in Kenya reduce risk taking. Additionally, this study recommends that commercial banks need to reassess their assets quality and diversify from traditional banking activities to reduce risk taking.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The banking industry in any economy suffers unique risks in the course of its business operations. These industry specific risks occur as a result of the nature of operations undertaken by the industry players, regulatory influence in the industry, number and size of firms in the industry among other reasons. The size of a bank has an impact on its overall performance. Kiyota (2009) explains that the smaller the bank, the higher the profit efficiency while larger banks tend to be more cost efficient. Compared to large banks, small banks in developed countries serve smaller, mostly local customers and provide retail financial services Berger and Udell (2004). Large banks on the other hand have a comparative advantage in lending technologies including lending based on hard information. The definition of size of a bank is subject to debate because there are many aspects which can be factored in to consider a bank as large or small. These aspects includes the capital size, loan portfolio, number of customer accounts/deposits, number of branches, profitability of a bank, number of employees or a combination of all or any of the above. For the purpose of this study, bank size was taken as core capital. Despite this, the banking sector as a whole has faced different issues which have threatened the stability of the financial system.

There have been financial crisis in the banking sector at different periods in history in the world. This has been the case as there is no economy that is exempt from financial crisis Wiley (2005). According to Acharya &Naqvi (2011) the period 2007-2009 saw the world economy undergo a strenuous financial crisis. Its origin can be traced to rapid defaults on sub-prime mortgage loans in the USA housing market and the contagion effect spread to other sectors of the economy Masha

(2009). The speed of the spread of the financial crisis to the whole world was aided by financial linkages across national boundaries and then by inter-sectorial linkages within countries. Masha explains that countries that did not hold USA securities experienced the crisis through exchange rate and financial markets.

The definition of a financial crisis is subject to debate. Several scholars have endeavored to define what constitutes a financial crisis. Schwartz (1987) argued that there had been just two genuine financial crises in history; one in Britain and the other in USA, all other crises were just "pseudo crises" because of timely intervention by the regulators. The first one occurred in Britain in 1866 when the Overend Gurney limited failed. After changes in management in 1856-1857, the bank failed to manage its loan portfolios by taking bills of dubious quality and lending with poor collateral to speculative firms. The second one occurred in USA between 1930 and 1933. The stock market crash of October 1929 precipitated a serious depression and created uncertainty. In the USA, banking crisis began in November 1930 when 256 banks failed, and as a result of contagion effect, another 352 more banks failed in December, the same year.

A common characteristic of banks failure is risk-taking. According to Kroszner & Strahan (1999) NPL are closely associated with banking crises. Sultana (2002) links the Japanese financial crisis to NPL. Chang (1999) defines non-performing loans as undesirable outputs or costs to a bank, which decrease the bank's performance, expected revenues and profitability. Prudent management of NPLs is very important for both the performance of an individual bank (McNulty, Akhigbe, &Verbrugge, 2001) and the industry's financial operating environment. The financial crisis in Kenya has been associated with high level of NPLs Murugu (1998).

Kenya has experienced banking problems since 1986 when a number of commercial banks failed Kithinji and Waweru (2007). Murugu explains that these crises were as a result increased risk-taking.

The central bank of Kenya and treasury interventions was not sufficient to stop the banking crisis. This is contrary to Schwartz (1987) who argued that banking crisis in the USA and Britain was as a result of failure by the respective central banks to provide liquidity. During a period of distress, the government, through the regulator (CBK, in the Kenyan case) has to come in place to provide confidence to the depositors and help protect economic destabilization as a result of excessive withdrawals.

Risk-taking is a big threat to stability of the banking industry and eventually the whole economy. Commercial banks in the world face various risks due to the nature of their business transactions. It may seem impossible to fully eliminate risk-taking for commercial banks and this call for a well-informed management of risks. The banking industry in Kenya has many barriers to entry, and the carrying on of banking business has many strict regulations to be observed. These barriers fall under both endogenous and exogenous categories. The barriers to entry in the banking industry in Kenya includes licensing for any firm intending to undertake banking business, Banking Act (2010), minimum core capital requirements, regulation on ownership, lending restrictions and vetting of officials to run a bank. This has made the banking industry in Kenya to be relatively concentrated as compared to other industries. According to Bain (1956), economies of scale have been identified as one key barrier to entry but some industries have high levels of concentration and do not enjoy the economies of scale Sutton (2006).

When market concentration is high, competition is low and firms enjoy high profits. The few large firms operating in the industry can collude (Sutton, 2006) to set prices very high. This will limit the number of buyers of the product put in the market holding other factors constant. This means that in the banking industry, there will be no incentive to lend to individuals who may default repayment as determined by a bank loan officer's due diligence. If new firms enter the market and the level of

concentration reduces, firms operating in that industry will have to do their best to maintain their market power and in so doing they will compete for any available customers. This may lead to credit risk exposure and NPLs are most likely to occur.

Increased competition in the banking industry can be disastrous, Chan, Greenbaum and Thakor (1986). When there is high competition, the surplus that banks would earn in a lesser competitive environment are eroded. This leads to reduction in franchise value which affects the loan applicants' vetting process and ultimately exposes the loan portfolio of a bank. In the long-run, increased competition will negatively affect the aggregate credit-worthiness of the banking industry, Broecker (1990). This means high competition in the banking industry leads to increased risk-taking in the banking industry. However, Boyd & De Nicolo (2005) have challenged this narrative. In challenging the franchise value argument, Boyd & De Nicolo (2005) postulate that increased competition in the banking industry would lead to reduction in the level of risk taking. A more recent study by Martinez-Miera & Repullo (2007) introduces a more contradicting argument. As competition in the banking industry increases, there is an initial decline in risk taking but the risk will eventually increase as the competition continues to increase. Martinez-Miera & Repullo (2007) proposes a U-shaped relationship between competition and risk-taking in the banking industry.

1.1.1 Credit growth

Credit growth is a component of loans that a bank advances to customers over a specific period. Businesses generally expect their annual sales to grow annually and in the case of commercial banks, loans advanced to customers should follow the same growth trend. In the Kenyan banking industry, the amount of total loans has been increasing. In 2006, the aggregate loans by commercial banks in Kenya was KES: 382 million and continued to grow to reach KES: 1,497 million in 2013 CBK.

As per the CBK bank supervision report (2012) the amount of gross loan advanced to households was highest (24.6%) and the corresponding level of NPL is highest in the same category (33.2%). Commercial banks in Kenya rely heavily on loan advances (which accounted for 78.72% in 2012) to generate revenues. The CBK has reviewed the asset risk classification to eliminate the sectors originally grouped under "others". The main goal was to enhance monitoring of risks CBK report (2009). Following the review, three sectors were found to account for large proportion of NPLs in 2009 (63.9%). These sectors are personal/households, trade, and manufacturing sectors, (CBK 2009).

Credit growth is computed as difference between loans in current period (t_0) less loans advanced in previous period (t_{-1}) all divided by loans in current period (t_0). In the commercial banking industry in Kenya, credit growth fluctuated from a low of 24.08 in 2011 to a maximum value of 34.07 in 2008 see figure below:
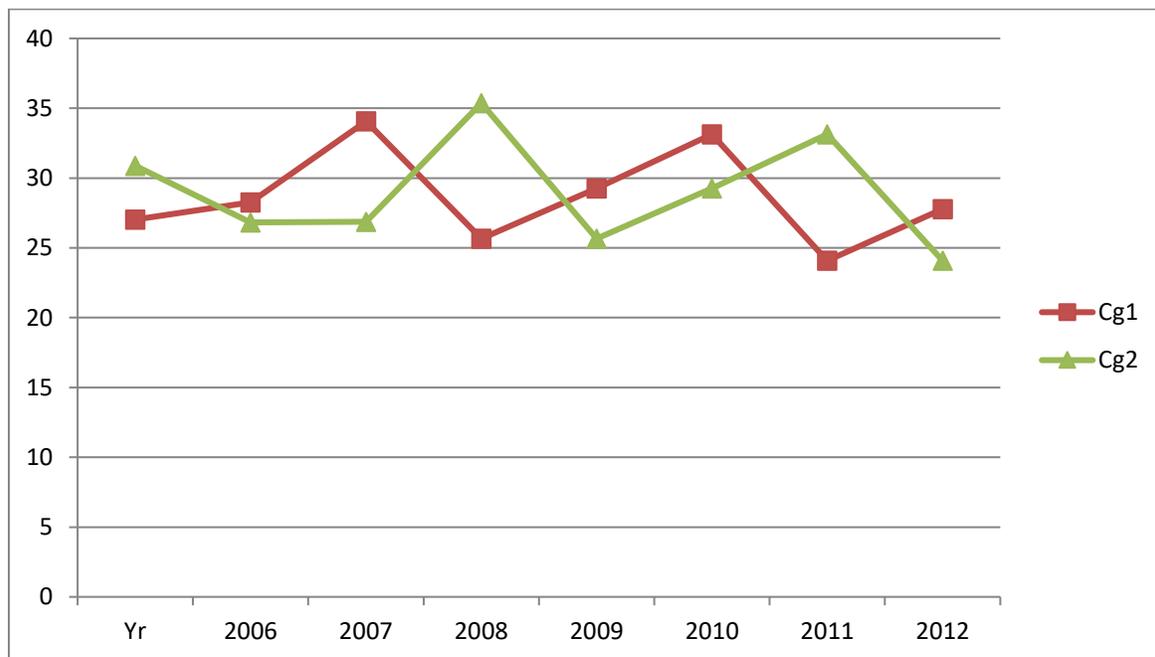
Figure 1.1 Credit growth in Kenya

This means that although total loans advanced to borrowers maintained a steady increase, credit growth did not maintain a steady rise. In 2011, Kenya experienced high inflation rates (18.93), exchange rate volatility, and high interest rate CBK Bank Supervision Report (2011). These three parameters are attributable to credit shrinkage in 2011.

Kohler (2012), Altunabas et al. (2011), Foos et al. (2010) show evidence that credit growth is positively related to risk-taking in the banking industry. Kohler (2012) posit that for banks to grow their credit, they lower their lending standards. Foos et al. (2010) show that banks that grow their credit so fast usually attract risky customers who could not qualify for credit from other banks. With continued growth of credit among commercial banks in Kenya, it is important to investigate whether the banking industry in Kenya is taking more risks.

1.1.2 Bank size

Kiyota (2009) explains that the smaller the bank, the higher the profit efficiency while larger banks tend to be more cost efficient. Compared to large banks, small banks in developed countries serve smaller, mostly local customers and provide retail financial services Berger & Udell (2004). In the Kenyan case, bank size was measured as the size of capital. Capital in the banking industry in Kenya was found to increase over the period 2006 to 2013. In 2006 aggregate capital was KES: 1,938 million and rose to KES: 8,510 million in 2013. This is a 339% increase in capital for a period of eight years. This increase was in compliance with CBK legislation on minimum core capital. The increase was to ensure stability of banking industry and as a response to world financial crisis Basel Framework, pillar 1. Bank capital is a bank specific factor and creates a pool of resources that the bank can lend from. Holding all factors constant, the higher the capital the higher the amount of loans a bank can lend.

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Barrell *et al.* (2011) show that there exists a relationship between bank size and risk-taking in the banking industry. As banks continue to grow in size, they are probably taking on business that other banks are not willing to take or they are offering a better charge than what the competitors do. This behavior may expose banks to risk-taking. Hakenes & Schnabel (2006) show that regulatory capital increase has two key effects: it affects banks profitability due to cost of capital and, it affects critical interest rate. These costs will increase aggregate risk-taking in the banking industry. As regulatory capital continues to grow in the Kenyan banking industry, it is therefore critical to establish how this increase in capital is affecting risk-taking.

1.1.3 Bank risk appetite

The ratio of loans to assets shows how much a bank liquidity is converted to loans. High levels of this ratio reflects high risk levels. In the Kenyan banking industry, both loans and assets have continued to increase.

Table 1.1 Loans and Assets in Kenya

	2006	2007	2008	2009	2010	2011	2012	2013
Total Loans	381,540	479,680	611,486	692,140	876,357	1,126,788	1,266,158	1,497,171
Total Assets	731,988	928,947	1,157,769	1,315,937	1,648,786	1,988,846	2,289,649	2,656,639

Source: CBK Data

However, the ratio of the two variables shows that the increase has not been a steady one.
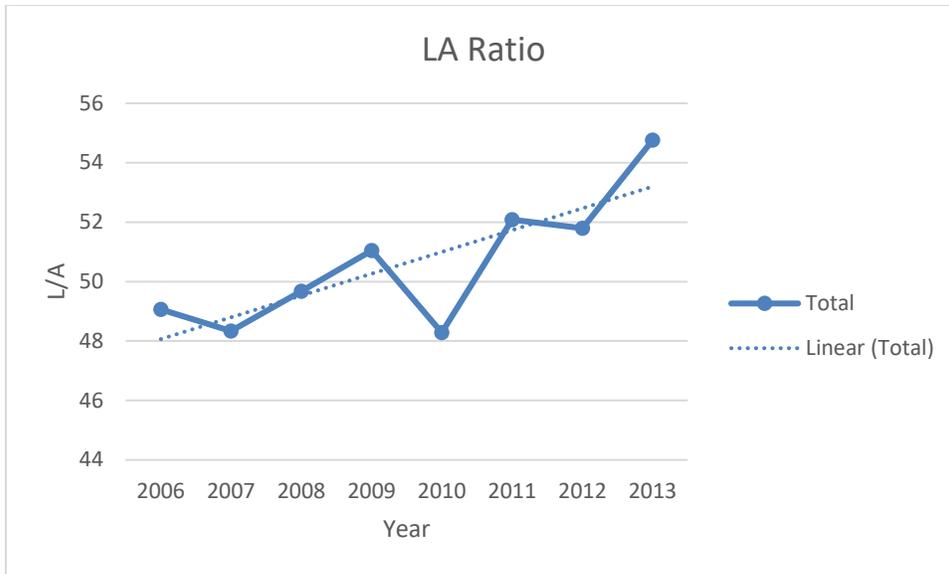
Figure 1.2 Loan to Asset ratio

This means that over the study period, commercial banks have continued to adjust their lending behaviors. In 2011 when interest rates were soaring, inflation, and exchange rate were very volatile, commercial banks in Kenya ended up taking more risks compared to 2008 during the post-election violence.

1.1.4   Bank profitability

Commercial banks in Kenya have continued to experience profitability. In 2006, commercial banks in Kenya posted profits of KES 84411M in 2006 and reached KES 411908M in 2013. The lowest profit value was a loss of KES 1534M in 2012 and a maximum profit of KES 18233M in 2013. A recent study by Chaudron (2016) posit that bank profitability has a positive influence on risk-taking by making bank managers to be more confident when lending as well as less risk averse. Profitable banks can take more risks by borrowing Martynova, Ratnovski, & Vlahu (2015). However, Jensen & Meckling (1976) suggest that increase in bank profitability is expected to reduce risk-taking among commercial banks.

1.2 Statement of the problem

From the foregoing background and studies by Chaudron (2016), Martynova, Ratnovski, & Vlahu (2015), Kohler (2012), Altunabas *et al.* (2011), Barrell *et al*. (2011), Foos *et al.* (2010), Martinez-Miera and Repullo (2007), Hakenes & Schnabel (2006), Boyd and De Nicolo (2005), Berger and Udell (2004), Jensen & Meckling (1976) bank specific factors contribute to risk-taking among commercial banks. In the Kenyan banking industry, bank specific factors have been increasing in the period under study. Specifically, commercial banks in Kenya are required to comply with legal capital minimum requirements. Increase in capital mean that banks are able to lend more than before, and therefore increasing loan portfolio. Credit growth has been associated with risk-taking Kohler (2012), Altunabas et al. (2011), Foos et al. (2010). In absence of empirical evidence in this field, it is important that this study is done to investigate how bank specific factors contribute to risk-taking among commercial banks in Kenya.

1.3 Objectives of the study

1.3.1   General objective

The general objective for this study was to investigate how bank specific factors contributed to risk-taking among the commercial banks in Kenya.

1.3.2   Specific objectives

1. To determine the effect of credit growth on risk-taking among commercial banks in Kenya.

2. To establish the effect of bank size on risk-taking among commercial banks in Kenya.

3. To establish the effect of bank risk appetite on risk-taking among commercial banks in Kenya

4. To determine the effect of bank profitability on risk-taking among commercial banks in Kenya

1.4 Research hypothesis

In this research, the following hypotheses were tested:

H_{0-1} There is no statistically significant relationship between credit growth and risk-taking among commercial banks in Kenya.

H_{0-2} There is no statistically significant relationship between bank size and risk-taking among commercial banks in Kenya.

H_{0-3} There is no statistically significant relationship between bank risk appetite and risk-taking among commercial banks in Kenya.

H_{0-4} There is no statistically significant relationship between banks profitability and risk-taking among commercial banks in Kenya.

1.5 Significance of the study

It is very critical that all stakeholders in the banking industry share a common understanding as pertains to the effect bank specific factors on risk-taking. Bank managers, investors, customers, suppliers, policy makers, regulator(s) and other stakeholders in the banking industry in Kenya desire to see a banking industry that is stable and supports the economy as per desired macroeconomic policies.

Different stakeholders have unique interests in any business. In the banking industry, bank managers will be risking their careers if they fail to understand the implications bank specific factors poses to their firms. Banking business includes risk taking on a day-to-day basis and the rewards of successful

risk taking forms a major part of banks revenue. However, excessive or poorly managed portfolio of risky assets by a bank may lead to major losses through NPLs and eventually bring about bank failure which constitutes a financial crisis.

Wealth maximization is a major goal for shareholders and requires bank managers to develop and implement sound financial decisions taking into consideration the level of risk. Investors are a major source of finances to business and therefore wealth maximization is very important as long as their support is needed by the firm. Every firm has a responsibility to ensure that their investors have confidence that they will get a good return for their investments. This means that if the investors are aware of excessive risk taking by a firm, they will be safer by failing to invest in that particular firm and investing in others which they are convinced will earn them the expected returns.

Policy makers and regulators will be better of knowing the effect of bank specific factors on risk-taking by banks as they develop and implement new or enforce existing policies. Relevant legislations, regulations and other control measures will be more effective if made with clear knowledge and understanding of the probable consequences they have on risk taking. Customers purely depend on trust when they leave their money in the banks. When this trust is eroded, it may take long for depositors to accept to leave their monies in the banks. If depositors are aware of the underlying risk involved in a certain bank, or they are suspicious that the level of risks may jeopardize their deposits, assuming rationality, they will fail to deposit their funds there and will not encounter losses in case the bank becomes insolvent.

1.6 Scope of the study

This study was done on commercial banks operating in Kenya in between 2006 and 2013.There were forty two commercial banks operating in Kenya CBK (2013), see Appendix III. The choice of the study period was based on the CBK's introduction of Risk Management Guidelines in August 2005.

These guidelines sought to guide financial institutions on minimum requirements for risk management systems and framework CBK Bank Supervision Report (2005). The source of data for this study was audited financial statements for each commercial bank for period 2006 to 2013.

1.7 Organization of the study

This study has been structured in the following order where chapter one provides background information followed by a detailed statement of the problem under study. The general and specific objectives and research hypothesis are explained followed by significance and scope of the study. The next chapter is literature review where agency theory and expected utility theory are discussed. Empirical review on the effect of credit growth, bank size, bank risk appetite, and bank profitability on risk-taking is covered in chapter two as well as summary of literature gaps to be filled and a conceptual framework. Chapter three presents the research methodology where research philosophy and design, target population and data collection instruments is explained. Chapter four presents data analysis and presentation where each objective is thoroughly examined while chapter five gives a summary of the study, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Many studies have been done on the relationship between bank specific factors and risk-taking in the banking industry. In this section, the research evaluated two theories that appear relevant to the statement of the problem. These theories are agency theory and expected utility theory. In this chapter, the study also evaluated research work done by other scholars on the field of risk-taking in the banking industry. The empirical review took cognizance of the models used in past studies and their empirical findings. The literature review was concluded by identification of literature gaps.

2.2 Theoretical review

The effect of bank specific factors on risk-taking among commercial banks in Kenya can be explained theoretically by examination of the reasons as to why bank managers might be lured to lend to parties who will default repayment. Market structure has a direct influence on the performance and conduct of firms in that specific industry Bain (1956). This means that bank managers may be forced to act in a particular way and take greater risks to ease pressures of market structure influences. The behavior of bank managers taking excessive risks through lending can be explained by different theories. In this section, the study considered two theories which seek to explain the possible reasons as to why commercial bank managers may indulge in excessive lending behaviors. These theories are principal-agent theory and expected utility theory.

2.2.1 Agency theory

The agency theory was formally documented by Ross (1973) and Mitnick (1973), and is defined as a relationship which exists when one party, the agent acts for, as a representative of, or on behalf of another, the principal. Jensen & Meckling (1976) defines agency relationship as a contract under which one or more persons (principal) engages another person (agent) to perform some service on their behalf which involves delegating some decision making authority to the agent. This theory was found to be very important in this study in defining the NPL in the banking industry because of its links with moral hazard issue (Ross 1976). The agency theory has been discussed by researchers including Fama & Jensen (1983) and they argue that an organization is a "nexus of contracts" which results into a number of agency relationships. Both the principal and the agent are seen as rational decision makers who seek to maximize their utility. The needs of these two parties (agent and the principal) are not the same and this allows the agent, who should act on the best interest of principal to divert into his own interest in an attempt to maximize his own utility.

According to Goetz (2010), a bank's organizational structure affects its lending behavior and hence its own risk taking behavior and the risk taking behavior of the competing banks. Using the principal-agent theory Goetz (2010) takes the bank manager as the principal and the loan officers as the agents. The loan officers choose a certain level of risk, acting on behalf of the managers. There arises a moral hazard in such a case, and two types of information are identified: hard information which is quantitative and verifiable and soft information which is qualitative and non-verifiable Petersen (2004). The soft information, for example, the relationships between a loan officer and a borrower, is hard to communicate and may not be transferred.

When the agent, acting on behalf of the principal is faced with decision making based on soft information, his actions can lead to a huge risk to the principal. In the banking context Lopez (2010)

established that there existed a link between lending, the organizational structure of the bank and NPLs. In order to make good sales and earn high commissions, the loan officer (agent) with soft information may fail to communicate their gathered due diligence to the credit manager that a borrower does not qualify for a loan. Although there is delegation of authority, the responsibility for the actions of the agent is borne by the principal. This may complicate the whole lending business because the loan officer may act less careful because he will not bear ultimate responsibility if the borrower defaults the loan.

Acharya & Naqvi (2011) introduce a new dimension of the agency issues in the banking industry. They argue that when there is excess liquidity in the banks, the managers will have an incentive to misprice the loans based on the underlying risk. This happens because the probability of experiencing liquidity shortage is very low. This ultimately leads to excessive lending which is based on under-estimation of the underlying risks. Excess liquidity aggravates risk-taking by commercial banks through excessive lending and asset price bubbles Acharya & Naqvi (2011). With excessive lending (in this case associated with underpricing of risks), there is excess demand for assets in the real sector which leads to prices rising above their fundamental values. This is what is referred to as a price bubble Acharya & Naqvi (2011). The emergence of the price bubbles makes depositors to prefer to save their money in bank deposits which are perceived to be safer rather than invest in the real sector. This marks the beginning of crisis in the financial sector.

Considering that firms should aim at maximization of shareholders wealth, the bank manager, faced with high liquidity will seek to maximize that opportunity with an expectation that all the loans advanced will yield the expected results. This may lead to excessive lending. Although most banks diversify their loan portfolios to reduce the effect of bad loans, competition may force the bank to have a few alternatives to choose from. With the existence of price bubbles, the whole economy will

be at risk. The price bubbles have been suggested as one of the major causes of the recent financial crisis Masha (2009).

In conclusion, this study established that agency problem can force bank managers to lend excessively and accumulate more risky loan portfolio which may lead to growth on NPLs. Banks specific variables are usually as a result of individual's decisions. The relevance of agency theory in this research is that as bank manager acts as an agent of the equity owners, the two have different interests. The bank manager may experience unnecessary pressure from the stakeholders and as the manager works on satisfying the principal's desires, he might take excess risks. Agency theory fits in well in the effect of bank control variables and risk-taking.

2.2.2 Expected utility theory

The expected utility theory (EUT) states that a decision maker chooses between risky prospects by comparing their expected values Mongin (1997). The banking business involves making a choice between many risky alternatives. Every loan advanced by a bank to a borrower involves a certain level of risk. Although the borrower may certainly be creditworthy, which means that credit risk is not part of the bargain, other risks may form part of the factors to consider before the loan is given or they may form part of the pricing mechanisms adopted by a bank. The EUT is measured by summing up the weighted utility values of outcomes multiplied by their respective probabilities. Utility is the level of satisfaction derived from consumption of a product (a good or service). This theory in its simplest undertakes to look into the level of satisfaction derived by a decision maker when they make choice between risky alternatives. Usually, consumers (decision maker) are assumed to be rational and therefore will seek to maximize utility. The alternative chosen will be the one that will bring maximum satisfaction, assuming rationality of the decision maker.

This EUT has two versions; Von Neumann-Morgenstern Theory (VNM) under risk and subjective expected utility theory (SEU) under uncertainty. In the VNM theory, probabilities were assumed to be objective and that they followed the classical view that randomness and probabilities existed naturally (William, Davis, Ebrill & Lindgren, 1997).The classical view argues that the probability of an event in a particular random trial is the number of equally likely outcomes that lead to that event divided by the total numbers of outcomes. As a result of the deficiencies in the classical view, especially the meaning of symmetry and non-addictive and often counterintuitive principles, there were serious criticisms in its application.

The SEU theory argues on the contrary, that one cannot discuss the probability of events that are inherently unique. Many statisticians and philosophers have objected the view of probability arguing that randomness is not an objectively measurable phenomenon but rather a knowledge phenomenon. De Finetti (1973) argues that probability does not exist in any substantial sense. The researcher continues to argue that probability does not even necessarily exist in the subject's mind; it might just be numerical expression as perceived by an outside observer, such that the subject behaves coherently when choosing between uncertain prospects. According to SEU theory, probabilities are epistemological (knowledge based) and not ontological (related to natural existence).

Ramsey (1926) introduced another aspect of epistemic probabilities. The researcher argued that the knowledge from which a probability is deduced from is not disembodied knowledge but knowledge possessed by a particular individual alone. According to Ramsey (1926), probabilities are thus subjective. The subjectivity of probabilities had been proposed even by economists such as Fisher (1906). The challenge came when mathematical expressions were not possible to be derived from the subjective view point, especially probabilities from personal beliefs. The argument was that if

the allocated probabilities were subjective, it would be impossible to construct a consistent and predictive theory of choice under uncertainty.

This study was based on the view that decision makers were subjective in making choices when faced with an uncertainty but they were more objective when making decisions based on known facts. The researcher defined the relevance of this theory on lending to be closely tied to the decisions bank managers make. The EUT relates to how a decision maker chooses between risky prospects. The quality of decisions made by a bank manager and the opportunity cost have a bearing on the bank's exposure to NPLs among other risks. This study was of the thought that a bank manager's decisions regarding risk are a hybrid of both objective and subjective probabilities. On the objective aspect, that there existed some facts categorized as hard information (facts which are quantifiable and verifiable Petersen (2004) and soft information which is qualitative and non-verifiable. To make decision based on soft information, a decision maker will be subjective. Studies by Goetz (2010) and Lopez *et a.l* (2007) show that as banks grow in size, they shift from relying on soft information to hard information.

The perception of a decision maker or the intuitive character they possess may determine the outcome. In a highly competitive market structure setting, the pressure to generate revenues may induce a bank manager to take risky decisions. The bank manager may accept to advance credit to a borrower who will default in repayment of the loan. On the same setting, a bank may not be able to charge interest which covers total loan cost. The market structure forces may push banks into risky activities which will lead to excess risk taking. For a concentrated market structure, Berger & Hannan (1989) found that USA banks charged higher rates on SME loans and pay lower rates on retail deposits and that their deposit rates were slow to respond to changes in open-market interest rates.

This study borrowed heavily from both theories in establishing how market structure affects the level of NPLs. Bank managers were seen as agents representing the shareholders and this relationship coupled with market structure forces was seen to push banks into excess risk taking. The information levels available to bank managers in advancing loans to borrowers makes the expected utility theory relevant in this study. Banking business involves taking risks and there is need to determine the optimal level of risk beyond which a bank may not be able to accept more risks. This requires managers to be intuitive and if necessary rely more on hard information rather than soft information.

In summary, agency theory explains how a bank manager (agent) may be forced to act in a certain way to meet the needs of the shareholders (principal). This means that the bank manager's behavior alters the performance of bank specific factors and ultimately leads to risk-taking. Expected utility theory focuses on the fact that expected value of a risky prospect is very critical in decision-making. If the expected value for a risky choice is higher, assuming rationality, bank manager will choose it. If the assumptions underlying the choice are not fulfilled, then the bank manager will have taken a great risk. These two theories supports the research area and therefore, it was necessary to review them.

2.3 Empirical literature review

The effect of bank specific factors on risk-taking can be explained based on previous research work done in different parts of the world in the area of banking. In this section, the researcher reviewed past studies done, their findings and relates that to the Kenyan operating environment. This section is divided into credit growth, bank size, banks risk appetite and finally bank profitability.

2.3.1 Credit growth

A study by Stein (2002) found out that organizational structure affects the lending behavior of banks. This is because of the different information levels - soft information and hard information Petersen (2004) that existed from the time a borrower applies for a loan to the time a loan is credited to their account. Soft information originates from a loan officer's interaction with a borrower and is qualitative. Soft information is not verifiable and is harder to communicate between a loan officer and the bank manager. Most banks in Kenya have a team dedicated to selling their products. The loan sales team interaction with the potential borrowers is classified as soft information. Goetz (2010) and Lopez *et al* (2007) suggested that as banks grow, they should shift from soft information and rely more on hard information. Large banks have complex organizational structures and are better placed to lend to borrowers based on hard information.

Hard information is quantitative and verifiable (Petersen, 2004) and includes financial statements analysis. Goetz (2010) explains that small banks increase their loan portfolios by lending to individuals whereas large banks concentrate on secured real estate loans. Under this argument, lending to individuals is primarily based on soft information and real estate loans use hard information Zarutskie (2007). If this argument holds, then large commercial banks in Kenya are taking more risks by lending based on soft information. This study attributed this behavior to powers of the market structure in the banking industry in Kenya.

Growth of credit has a direct impact on risk-taking in the banking industry, Altunbas, Manganelli & Marques-Ibanez (2011), Foos, Norden & Weber (2010), Jimenez & Saurina (2007). This makes credit growth an important determinant of NPLs. Kohler (2012) found evidence that banks with high growth of credit were more risky. Kohler argues that banks may reduce their lending standards to grow credit and as such they may attract risky customers who have been denied loans by other banks.

Commercial banks in Kenya were found to have positive credit growth across the period under study. However, all commercial banks showed inconsistent movements on the growth of credit. A few commercial banks showed negative credit growth over the period under study.

2.3.2 Bank size

The size of a firm determines the influence it has on that industry. Hellmann, Murdock & Stiglitz (2000) expressed the view that financial market liberalization in Japan in the 1990s increased competition and reduced profitability of commercial banks. This has been suggested as one of the factors which led to the East Asian financial crisis and a weaker financial system in Japan (Jimenez, Lopez & Saurina 2007). In the Spanish financial system, Salas & Saurina (2003) replicated Keeley (1990) arguments that financial system liberalization reduces banks' revenues and therefore banks will be left with only one alternative: pursuing riskier lending policies to maintain their former profits. Salas & Saurina (2003) found that greater market power was correlated with higher bank solvency ratios and lower credit risk.

The role of a bank's capital in risk management is very important. During the recent financial crisis which began in 2007, the failure of a number of large, global financial institutions sent shocks through the financial system which affected the real economy seriously. As a response, the Basel Committee (BC) on banking supervision adopted a series of reforms to improve the resilience of banks and banking systems. One major reform was to raise the quality and quantity of capital. Other reforms included improving risk coverage, introduction of leverage ratio to serve as a back-stop to the risk based regime, introduction of the capital conservation and countercyclical buffers and global standards for liquidity risk. The Basel framework (2013) addresses the issue of banks capital requirement. Similarly the Banking Act, Chapter 488, Laws of Kenya gives guidelines as pertains to capital.

Bank's capital structure affects liquidity creation and credit creation functions in addition to its stability Diamond (2000). This means that an optimal capital structure is necessary for efficient operations of any bank. A bank's capital also known as equity is the margin by which creditors are covered if the bank's asset were liquidated. Bank's capital should be enough to protect lenders and depositors from losses and also allow the bank to meet its customers' requirements. There exists a debate as to the effect capital has on the level of non-performing loans by banks. Some researchers have argued that higher bank capital will eventually reduce the level of NPLs. Morrison and White (2005) focus on the moral hazard. They argue that if banks do not have enough equity at stake, they may be tempted to make risky loans, meaning higher capital levels reduces moral hazard and therefore lowers risk-taking behavior in the banking sector. Other supporters of this proposition are Holmstrom & Tirole (1997) who focused on strengthened bank monitoring incentives that accompany higher bank capital.

On the contrary, some researchers argue that higher bank capital may be accompanied by an increase in the level of NPLs. This may occur if banks react to higher capital by shifting into riskier loan portfolios and are not prevented from doing so by the regulators, Koehn & Santomero (1980). Allen & Santomero (1998), Allen & Gale (2004) argue that liquidity creation exposes banks to risk and that higher capital improves banks' ability to absorb risk. Repullo (2004), Von Thadden (2004) argued that high capital levels may allow banks to create more liquidity. The 'feeling' by banks that they have huge levels of capital to absorb risk may misguide banks to venture into risky lending which in the end will result into high levels of NPLs.

2.3.3 Bank risk appetite

In the commercial banking industry set up, the market consists of borrowers and lenders Goetz (2010). Borrowers differ on the degree of information available from them to enable a loan officer make a decision; this information can either be hard information or soft information, Petersen (2004). Goetz (2010) in his model of risk-taking, showed that the expected loan returns are concave with respect to information, meaning lending to soft information borrowers provides a higher return than lending to hard information borrowers. This occurs because the cost associated with lending based on hard information is lower and the decision is based on quantitative data and facts. Interest charged will therefore be lower as compared to lending based on soft information.

This study reviewed evidence from research work by Khemraj & Sukrishnalall, (2010), Sinkey & Greenwalt (1991) and adopted loan to asset ratio as a measure of banks risk appetite. Past studies suggested a strong positive relationship between NPLs and banks' risk appetite as measured by the ratio of loans to assets. These researchers argued that banks that value profitability more than the cost of higher risk are likely to incur greater levels on NPLs, Altunbas, Manganelli & David (2011). A higher level of loan to assets ratio indicates higher levels of risk taking. A study by Sinkey & Greenwalt (1991) found out that a bank's risk appetite affects non-performing loans. Risk appetite was measured as a ratio of total loans to total assets. The return on assets (ROA) was used to establish whether banks with high profits hide NPLs Altunbas, Manganelli & David (2011).

2.3.4 Bank profitability

The study was done to determine whether commercial banks which make huge profits minimize their strict lending rules which may expose banks to NPLs. Boyd, De Nicolo & Al Jalal (2006) applied the risk shifting model whereby they used the Z-score based on banks returns on assets

(ROA), its dispersion and the ratio of equity to total assets as a measure of risk. They also applied Herfindahl-Hirscmann Index (HHI) as a measure of market concentration and their final findings clearly showed that there was a positive and significant relationship between Z-score and HHI, which meant that high concentration in the banking industry was associated with greater risks in the banks. De Nicolo & Loukoianova (2007) found out that this result was even stronger when bank ownership was taken into consideration. Berger, Klapper & Tuk-Ariss (2009) showed that banks with a higher market power have more loan portfolio risk but have overall risk exposure due to higher equity levels.

Keeley (1990) established that competition is highly influenced by market structure. Keeley (1990) used the Tobin's q measure of the degree of competition, which is a measure of the market power. The researcher applied the ratio of bank's equity market valuation to its book value (Tobin's q). The findings of the study revealed that reduction in market power led to a reduction in Tobin's q and that bank risks were correlated with market power. The study also showed that solvency ratios, defined as the ratio of market value of capital to market value of assets had a positive relationship such that higher market power was correlated with greater solvency.

2.3.5 Z score as a measure of risk taking in the banking industry

This study used Z score as a measure of risk-taking among commercial banks in Kenya. Previous studies have used NPLs ratio, see Lopez *et al.* (2007), Heimdal & Solberg (2015) while others used Z-score as a measure of risk-taking, Boyd & Graham (1986), Boyd & Graham (1988), De Nicoló (2007), Mercieca, Schaeck, & Wolfe (2007). This study adopts Z score as a measure of risk taking in the commercial banking industry in Kenya.

2.4 Summary of literature gaps to filled

Empirical evidence available in this field is contradictory and leaves interested parties in confusion. Commercial banks' regulators often make policies that are expected to be based on scientific evidence and commercial banks are expected to comply with the policies. These policies are mainly implemented to foster soundness and stability of the financial sector. Issah & Antwi (2017) posit that micro-economic factors are controllable by organizations while macro-economic variables extend beyond control of a single organization. Ikram *et al.* (2016) postulate that most research work on NPLs has incorporated both micro and macro-economic variables to establish their effect on NPLs. Ikram *et al.* explains that little research work has been done to explore the relationship between bank specific factors and NPLs.

Table 2.1: Combined Macro and micro economic variables

Author(s)	Year	Bank control variables	Macro variables
Lopez et al	2010	ROA, Size, Loan Ratio	GDP
Abid et al	2014	Size, solvency ratio, ROE, inefficiency	GDP, inflation
Ferri et al	2014	Loans, Capital, Size	Real GDP, Liquidity
Chaudron	2016	Duration of equity, Size of bank, ROE	Interest rate, volatility of interest rates
Boyd et al	2006	Loans, ROA, Profit, Assets	Labor, unemployment, Agriculture, income

Source: Author compilation

In the Kenyan banking industry, there is paucity of scientific evidence regarding bank specific factors and risk-taking. This research work contributes to literature in two main ways. First, it sought to fill the existing literature gaps by examining how bank specific factors contribute to risk taking among commercial banks in Kenya. Secondly, it adds empirical evidence in the banking industry in Kenya.

2.5 Conceptual framework

The dependent variable in this study risk-taking in the commercial banking industry in Kenya as measured using Z-score. The independent variables were credit growth, bank size, risk appetite, and banks profitability. Credit growth was measured as the change in total loans between period one and the previous period. The study also applied a lag for the second period. Banks size was measured as bank capital while bank profitability was measured as pre-tax profits. Banks' risk appetite was taken as the ratio of total loans and total assets.

Figure 2.2: Conceptual framework

Independent variables   **Dependent variable**
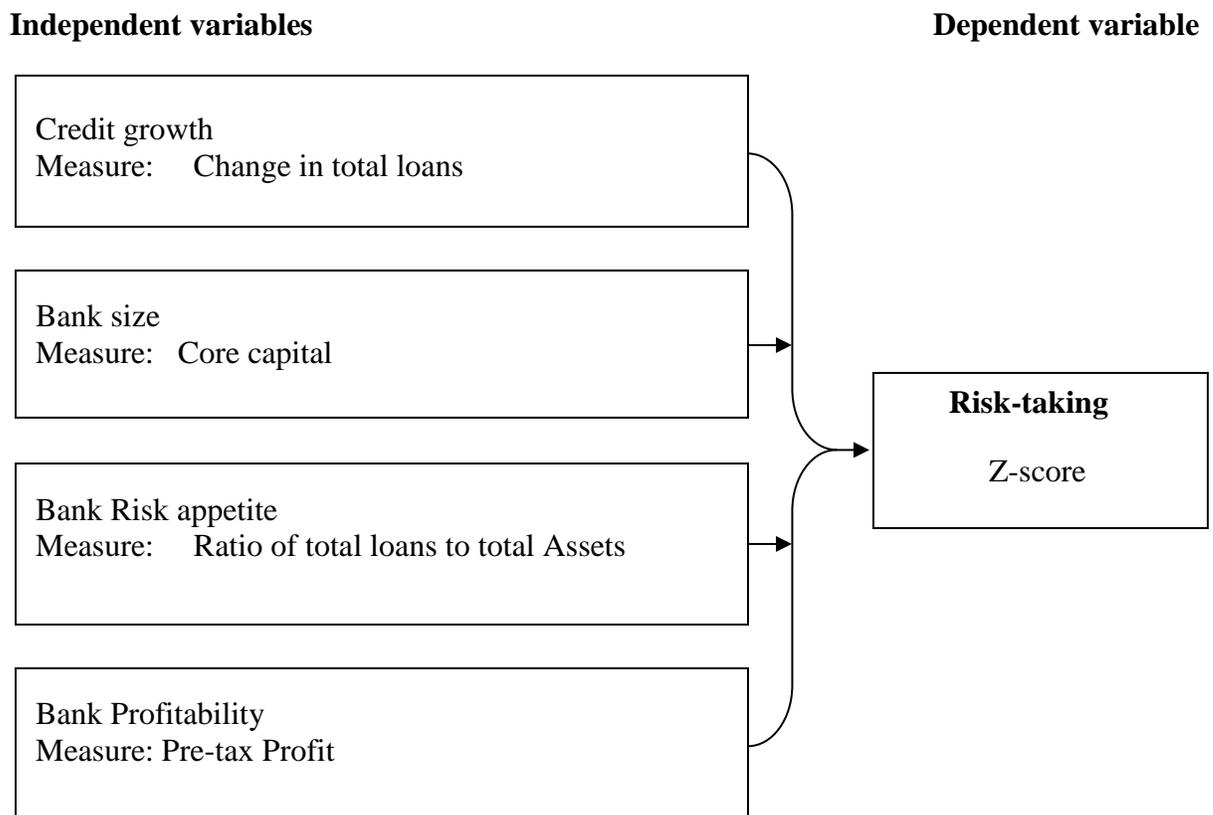
Source: Author (2018)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives a detailed outline of how research was conducted. It shows data collection method, sources of data, tools used in data collection and how the data was analyzed. This section also shows the target population, the study model description followed by explanation of the model variables and expected output.

3.2 Research philosophy

This research adopted positivism research philosophy that argues reality is stable and can be observed and described from an objective viewpoint. The researcher believed that the available quantitative data was factual and that the research would unveil the truth on how bank specific factors affected risk-taking among commercial banks in Kenya. As with positivist research philosophy, the researcher believed that there was an objective reality that could be observed and measured without bias. The researcher carried this study in a neutral position and evaluated the success of this research based on how closely the findings match or otherwise with previous studies. Data collection instruments used in this research work was standard tools that have been used before and can be used in the future. The tools used in data collection were valid in that they actually were able to measure the underlying concept they were meant to measure, Rubin & Rubin (2012). The study applied theories that are relevant to the problem. The research was designed to test the hypothesis holding external factors constant.

3.3 Research design

Descriptive research design was used in this study with quantitative data analysis. This research design describes what exists and may help uncover new facts and meaning, Polit & Hungler (1999). This choice of this design was based on the fact that quantitative data would be useful to provide an account of elements under consideration and that there was no experimental manipulation to the elements. Descriptive research design describes the current status with respect to variables or conditions in a situation and therefore providing information on characteristics of a phenomenon.

3.4 Target population

The study took a census of all commercial banks operating in Kenya between 2006 and 2013. There were 42 commercial banks in Kenya CBK (2013), see Appendix III. The researcher collected financial statements for each commercial banks for period 2006 to 2013.The financial statements collected were statement of financial position for each bank for the same period 2006 to 2013.

3.5 Data collection instruments

This study used secondary data sources. The researcher was responsible for gathering the relevant secondary data materials that were audited statement of financial position for each bank for the period 2006 to 2013. All relevant data was extracted from the above documents and recorded in a data collection sheet for each bank for the years 2006 to 2013, see Appendix II for data collection instrument.

3.6 Data analysis and presentation

The collected data was compiled in a panel data format. In compiling the data, there were four commercial banks which did not operate for the whole period under study. Listwise deletion (LD) can be applied to handle missing data, allowing for only available cases to be used in regression.

However, according to Howell (2008) LD method may provide parameters that are biased. Fung (2006) postulates that in handling missing data it is necessary to estimate the missing values as this will provide more accurate results. Based on this argument, the research applied extrapolation method to estimate the missing data for the four commercial banks.

Data analysis was done by doing descriptive analysis, correlation analysis, diagnostics analysis, and regression analysis. In descriptive statistics, the study data described the basic features of the data as well as summaries of the data. The analysis computed the mean, median, standard deviation, minimum and maximum, as well as skewness of the data. Correlation analysis was done to establish direction and strength of the relationship between the dependent and independent variable. Diagnostic tests were done to ascertain that data was ready for use in regression analysis. Diagnostics test included a determination of fixed effects model or random effects model for the panel data. This included Hausman test to decide which model was applicable for this research. Modified Wald test for GroupWise heteroscedasticity was done to establish whether the data was homoscedastic. Wooldridge test for autocorrelation as well as stationarity tests were done on the data before regression analysis was done. The tools used in analysis were Stata and Microsoft Excel.

3.7 Study model

The general study model used in this research was as shown below:

$$Y = \beta_0 + \beta_1 X_{1i, t} + \beta_2 X_{2i, t} + \beta_3 X_{3i, t} + \beta_4 X_{4i, t} + \varepsilon$$

Where Y is the dependent variable, X are independent variables, β are coefficients, and ε is the error term. The dependent variable for this study was risk-taking as measured by Z-score. The independent variables in this study were credit growth with a lag of two periods, bank size measured by capital, bank risk appetite measured by loan to asset ratio, and bank profitability measured by pre-tax profit. The relationship between bank specific factors and risk talking among commercial banks in Kenya in comparison to what other researchers in different markets had found is done in chapter 4, data analysis and presentation.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 Introduction

This chapter presents the research analysis findings and discussion of the findings. Section 4.2 presents descriptive analysis for variables used in this study. This includes the mean, standard deviation, maximum and minimum value for the variables while 4.3 shows the correlation analysis. Section 4.4 shows the diagnostic tests results including estimation of the fixed effects (FE) model and random effects (RE) model, and the Hausman test result that was used to decide between the two models. Section, 4.5 presents the regression analysis findings based on the objectives of the study. Finally, section 4.6 presents an optimal conceptual framework.

4.2 Descriptive analysis

The study analyzed research data for descriptive statistics and results are in Appendix IX. Credit growth was found to have a mean of 1087.58 for the period under study, see Appendix IX. Median was 1053.53 while standard deviation was 168.57. In terms of skewness, credit growth data showed a positive value of 0.46. According to Bulmer (1979), a skewness value of -0.5 to 0.5 is fairly symmetrical, while skewness between -1 and -0.5 or 0.5 and 1 is moderately skewed. Skewness value of between less than -1 or greater than 1 is highly skewed. At 0.46, credit growth was fairly symmetrical. The minimum value was 874.19 and the maximum value was 1392.24.

Bank size was measured as bank capital. The mean value for bank size was 182167.73 see Appendix IX. The median value was 160033 and a standard deviation of 105728.21. Skewness was found to be 0.40, which means the data was fairly symmetrical. The minimum value was 39834.6 while the

maximum value was 357451. Bank risk appetite was measured as the ratio of loan to assets. The mean value was found to be 159.04 see appendix IX. The median was 161.28 with a standard deviation of 7.0. Skewness was found to be -0.95 meaning the data was moderately skewed, Bulmer (1979). The minimum and maximum value was 147.22 and 166.90 respectively. Bank profitability had a mean value of 61749.31 with a standard error of 12905.73. Skewness was 0.43 (fairly symmetrical) while median value was 48287. Standard deviation was 38717.20 while minimum and maximum values was 11620.80 and 124543 respectively.

4.3 Correlation analysis

The study performed correlation analysis to establish strength of relationship between the variables. The analysis results are in table 4.1 below:

Table 4.1 Correlation results

	Z_SCORE	C_CAPITAL	CGROWTH1	CGROWTH2	LA_RATIO	PROFIT_B4_TX
Z_SCORE	1.0000	0.0562	0.0937	0.0546	-0.0013	0.0768
C_CAPITAL	0.0562	1.0000	-0.1023	-0.0654	0.1659	0.9636
CGROWTH1	0.0937	-0.1023	1.0000	0.3163	-0.0482	-0.1134
CGROWTH2	0.0546	-0.0654	0.3163	1.0000	-0.0332	-0.0810
LA_RATIO	-0.0013	0.1659	-0.0482	-0.0332	1.0000	0.1803
PROFIT_B4_TX	0.0768	0.9636	-0.1134	-0.0810	0.1803	1.0000

Source: Author (2018)

The results showed that bank capital (0.0562), credit growth lagged one period (0.0937), credit growth lagged two periods (0.0546) and bank profitability (0.0768) had a positive relationship with risk-taking. This means that an increase in either bank capital, credit growth, or profitability leads to increase in risk-taking. On the contrary, bank risk appetite (-0.0013) was found to be negatively related to risk-taking, meaning that increase in risk-appetite reduces banks' risk-taking.

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4.4 Fixed effect model and Random effects model

Panel data analysis is done using fixed effects (FE) model or random effects (RE) model. The estimation of FE was done and results are presented in Appendix IV. The F-statistic was 0.0007. RE was also estimated and results are provided in appendix V. The RE model result showed Chi-square 0.0439. In determining which model was appropriate between the FE and RE, Hausman test was done. The null hypothesis was RE is appropriate while the alternative hypothesis was FE is appropriate. Hausman test results are in appendix VI and the probability Chi-Square was 0.0134. At five percent (5%) significance level, the null hypothesis was rejected and concluded that FE model was appropriate.

4.5 Diagnostic tests

4.5.1   Heteroscedasticity

A test for heteroscedasticity under FE model was done. Modified Wald test for groupwise heteroskedasticity in fixed effect regression model was done. This test was necessary to ensure that variance of the residuals was homoscedastic. The null hypothesis was there is no heteroskedasticity.

Table 4.2: Modified Wald test for GroupWise heteroskedasticity

```
Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model
--------------------------------------------
H0: sigma(i)^2 = sigma^2 for all i

chi2 (42) =   2.5e+05
Prob>chi2 =    0.0000
```

The null hypothesis was rejected and concluded that there was heteroskedasticity. In order to correct for heteroskedasticity, the estimation was done using robust standard errors as postulated by Driscoll and Kraay (1998), GonÁalves (2011).

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4.5.2 Autocorrelation

The data was tested for serial correlation to ensure that residuals were correlated over time. The test was done using Wooldridge test for autocorrelation. The null hypothesis was that there was no correlation. The results are as shown in table below:

Table 3.3: Autocorrelation test

```
Wooldridge test for autocorrelation in panel data
---------------------------------------
H0: no first order autocorrelation
  F(  1,    41) =    4.792
      Prob > F =    0.0343
_____
```

The probability $F = 0.0343$. This meant that the null hypothesis was rejected and concluded that the data had serial correlation. In order to correct for autocorrelation, the estimation was done using robust standard errors as postulated by Driscoll and Kraay (1998), GonÁalves (2011). The fixed effects model was estimated using the robust standard errors and results are in appendix VIII.

4.5.3 Stationary

The data was tested for stationarity using ADF - Fisher Chi-square and found to be stationary. The tests results are in appendix VII. These diagnostic tests were necessary to ensure that data was ready for regressions analysis to be done.

4.6 Regression analysis

Regression analysis was done after the diagnostic tests had been done. These tests were necessary to ensure that data was reliable to be used in analysis. The specific objectives were examined and results are presented below.

4.6.1 Effect of credit growth on risk-taking among commercial banks in Kenya.

This parameter was measured in terms of growth of loans between the current period (t) and previous period (t-1). Credit growth for the current period was computed as follows:

Credit growth$_1$ (Cg1) = {(Total loans $_{i, t}$ -Total loans $_{i, t-1}$) / Total loans $_{i, t-1}$}*100

This variable was also lagged one period (t-2) because empirical findings had suggested that credit growth from previous period had an impact on risk-taking in the current period. Credit growth for lagged period was computed as follows:

Credit growth$_2$ (Cg2) = {(Total loans $_{i, t-1}$- Total loans $_{i, t-2}$) / Total loans $_{i, t-2}$} * 100

Previous studies had indicated that high rates of credit growth directly impacted risk-taking in the banking industry; Kohler (2012), Altunbas, Manganelli & Marques-Ibanez (2011), Foos, Norden & Weber (2010), Jimenez & Saurina (2007). Kohler (2012) shows that banks with higher credit growth are riskier compared to those with low credit growth. Commercial banks might lower the lending rules to attract more borrowers who might turn out to be risky borrowers Foos *et al.* (2010). The correlation coefficient was positive for both first and second lags at 0.0937 and 0.0546 respectively. This positive relation agrees with previous studies that credit growth has an impact on risk-taking. The regression analysis was done using Driscoll-Kraay standard errors with a lag of 7 and found that credit growth$_1$ had a positive coefficient of 6.7968 while credit growth$_2$ had a positive coefficient of 2.4248, see table below:

Table 4.4: Credit growth regression results

Regression with Driscoll-Kraay standard errors		Number of obs			=	336	
Method: Fixed-effects regression			Number of groups =			42	
Group variable (i): Bank				F(5, 7)	=	147.68	
Maximum lag: 7				Prob > F	=	0.0000	
				within R-squared	=	0.0706	

Zscore	Coef.	Drisc/Kraay Std. Err.	t	P>|t|	[95% Conf. Interval]	
Cg1	6.79468	2.753192	2.47	0.043	0.2844165	13.30494
Cg2	2.424767	1.545203	1.57	0.161	-1.229059	6.078593
_cons	37.4561	5.577693	6.72	0.000	24.26695	50.64525

Source: Author (2018)

The null hypothesis was there is no statistically significant relationship between credit growth and risk-taking among commercial banks in Kenya. At five percent significance level, regression result was found to be 0.043 for Cg1 and 0.161 for Cg2. Based on these results, null hypothesis for Cg1 was rejected and concluded that credit growth$_1$ directly affects risk-taking among commercial banks in Kenya. For lagged credit growth (t-2), the null hypothesis was not rejected, and therefore, concluded that there was a statistically significant relationship between credit growth$_2$ and risk-taking among commercial banks in Kenya. The regression analysis agrees with research work done by Kohler (2012), Altunbas, Manganelli & Marques-Ibanez (2011), Foos, Norden & Weber (2010), Jimenez & Saurina (2007). However, this study same as others does not find any evidence to define what level of credit growth would not expose banks to higher risk taking.

A graphical presentation showing the annual mean values of credit growth and Z-score is shown below.

Figure 4.1: Credit growth and Z-score
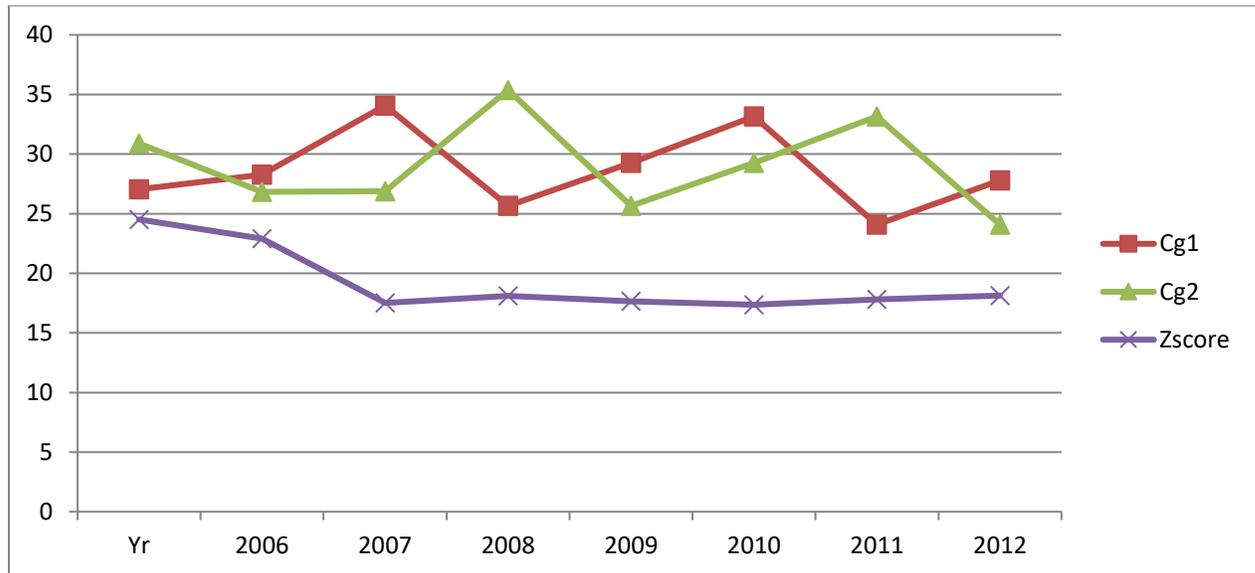
Source: Author (2018)

The results show that commercial banks in Kenya are increasing their risk taking as credit grows from one period to the next. This requires commercial banks to establish an optimal level for credit growth to minimize risk-taking.

4.6.2 Effect of bank size on risk-taking among commercial banks in Kenya.

This variable was measured using bank core capital. The study found that banks' capital continued to increase over the period under study and that the aggregate mean value was KES 225493 million with a standard deviation of 113492. The increase in core capital was in compliance with the banking Act (2010).

Table 4.5 Minimum Core capital requirements

Year	Minimum Core Capital
2009	350
2010	500
2011	700
2012	1000

Source: Banking Act (2010)

Bank's capital affects liquidity creation Diamond (2000) and some past studies had showed that higher bank capital would reduce risk-taking Morrison & White (2005), Holmstrom & Tirole (1997). On the contrary, Koehn & Santomero (1980) showed that high capital level would lead to increase in risk-taking. Allen & Santomero (1998), Allen & Gale (2004) argue that liquidity creation exposes banks to risk and that higher capital improves banks' ability to absorb risk. Repullo (2004), Von Thadden (2004). However, the "feeling" by banks that they can absorb risks could lead to risky choices and affect a bank's loan portfolio. Correlation analysis found that Z-score and core capital had a positive relationship with a 0.0562 coefficient.

Figure 4.2 Core capital growth 2006-2013
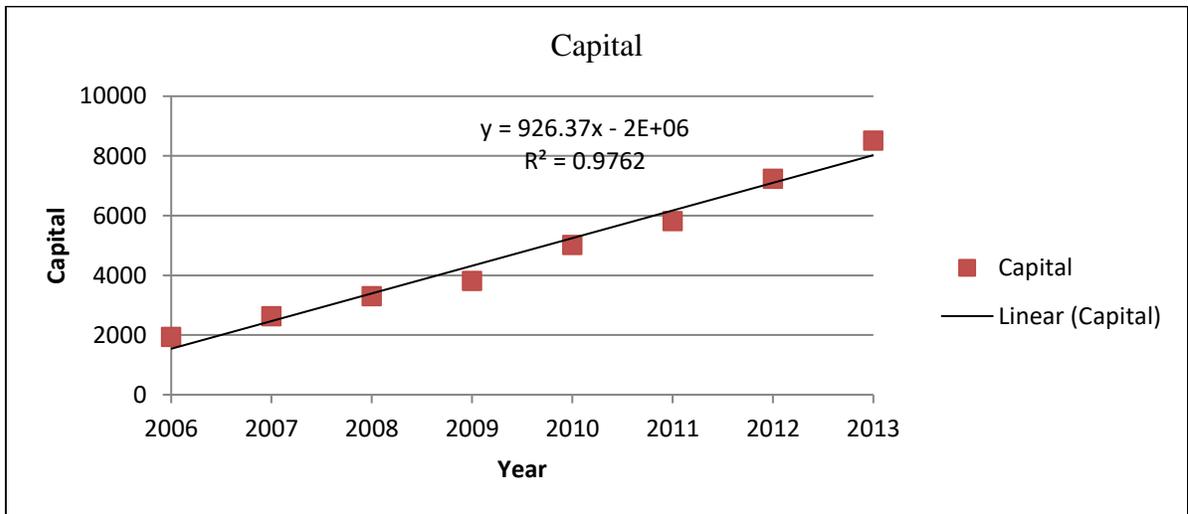
Source: CBK data (2006-2014)

Regression analysis found that capital had a positive coefficient of 0.0006632 and a probability value of 0.000. The null hypothesis was that there was no statistically significant relationship between bank size and risk-taking among commercial banks in Kenya.

Table 4.6: Bank size regression results

Regression with Driscoll-Kraay standard errors	Number of obs	= 336			
Method: Fixed-effects regression	Number of groups =	42			
Group variable (i): Bank	F(5, 7) =	147.68			
Maximum lag: 7	Prob > F =	0.0000			
	within R-squared =	0.0706			
Zscore	**Coef.**	**Drisc/Kraay Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**
Cap	0.0006632	0.0001057	6.27	0.000	0.000413	0.0009131
_cons	37.4561	5.577693	6.72	0.000	24.26695	50.64525

Source: Author (2018)

At five percent significance level, the null hypothesis was rejected and concluded that there was a statistically significant relationship between bank size and risk-taking among commercial banks in Kenya. This study results agrees with studies by Allen & Gale (2004), Repullo (2004), Von Thadden (2004), Allen & Santomero (1998), and Koehn & Santomero (1980) who showed that increase in capital lead to increase in risk-taking. The study results show that commercial banks in Kenya have responded to mandatory increase in capital to in two main ways; first increase in capital increases banks liquidity and as a result banks are finding themselves with excess cash available to lend. Secondly, in order to generate returns from this excess liquidity, commercial banks in Kenya are accumulating risky loan portfolios. To tame increase in risk-taking, commercial banks need to exercise caution in lending based on soft information, Petersen (2004).

4.6.3 Effect of bank risk appetite on risk-taking among commercial banks in Kenya

Bank risk appetite was measured as the ratio of loans to assets. This study found that total loans and total assets in the banking industry in Kenya have been rising in the period under study, see figure 4.3 below.

Figure 4.3 Total loans and total assets in the banking industry
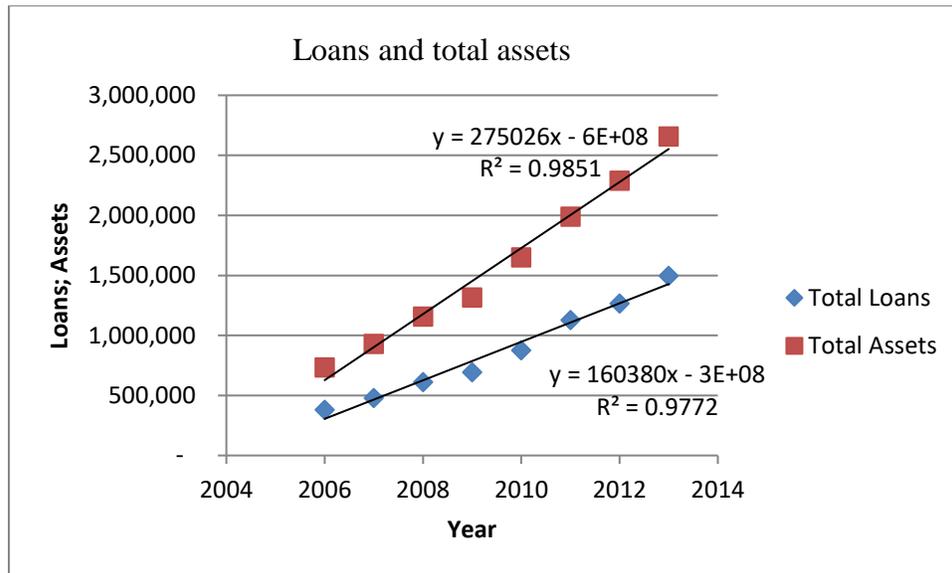
Source: CBK Data (2004-2014)

Studies by Altunbas, Manganelli & David (2011) and Sinkey & Greenwalt (1991) had showed evidence that banks' risk appetite had an impact on risk-taking. Altunbas, Manganelli & David (2011) showed a positive relationship between the risk-taking and loans to assets ratio. Correlation analysis results showed that Z-score and bank risk appetite had a negative coefficient of - 0.0013. The results do not agree with previous studies by Altunbas, Manganelli & David (2011). Regression analysis showed that bank risk appetite had a negative coefficient of -45.53013. The regression estimation was done at five percent (5%) significance level and results show that bank risk appetite had a probability value of 0.007. The null hypothesis for the study was that there is no statistically significant relationship between bank risk appetite and risk-taking among commercial banks in Kenya. However, based on the results of regression estimation the null hypothesis was rejected and concluded that there was a statistically significant relationship between bank risk appetite and risk-taking among commercial banks in Kenya.

Table 4.7: Bank risk appetite regression results

Regression with Driscoll-Kraay standard errors	Number of obs	=	336			
Method: Fixed-effects regression	Number of groups	=	42			
Group variable (i): Bank	F(5, 7)	=	147.68			
Maximum lag: 7	Prob > F	=	0.0000			
	within R-squared	=	0.0706			

Zscore	Coef.	Drisc/Kraay Std. Err.	t	P>|t|	[95% Conf. Interval]	
LA	-45.53013	12.21974	-3.73	0.007	-74.42523	-16.63504
_cons	37.4561	5.577693	6.72	0.000	24.26695	50.64525

According to Altunbas *et al.* (2011) loans to asset ratio is a measure of bank's asset structure and show to what extend a commercial bank is involved in traditional lending activities. Traditional banking business is a process that involves borrowing for short-term and lending for long, Mishkin & Edwards (1995). The study results means commercial banks in Kenya need to diversify their operations from traditional banking to modern banking activities in order to minimize risk-taking.

4.6.4 Effect of bank profitability on risk-taking among commercial banks in Kenya

Profitability was measured as the profit before tax for the banks. Commercial banks in Kenya have witnessed continued growth in aggregate profitability from KES 84411M in 2006 to KES 411908M in 2013. This study sought to establish how banks respond to increase in profitability in regard to risk-taking. Do commercial banks in Kenya lower lending terms when the profits go up or do they tighten the terms when they make losses? De Nicolo & Loukoianova (2007) and Boyd, De Nicolo & Al Jalal (2006) had showed that there was a positive relationship between market concentration and risk-taking. The correlation analysis found that there was a positive relationship (0.0768) between the Z-scores and banks profitability.

Table 4.8: Bank profitability regression results

Regression with Driscoll-Kraay standard errors Number of obs = 336						
Method: Fixed-effects regression Number of groups = 42						
Group variable (i): Bank F(5, 7) = 147.68						
Maximum lag: 7 Prob > F = 0.0000						
within R-squared = 0.0706						
Zscore	**Coef.**	**Drisc/Kraay Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
Pbt	-0.0006098	0.0003527	-1.73	0.127	-0.00144	0.0002241
_cons	37.4561	5.577693	6.72	0.000	24.26695	50.64525

Source: Author (2018)

Regression analysis results show a negative coefficient of -0.0006098. However, the probability value was 0.127. The null hypothesis was not rejected and therefore concluded that there was no statistically significant relationship between banks profitability and risk-taking among commercial banks in Kenya.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study highlighting the areas of focus in the research work. Section 5.2 gives a summary of the research objectives based on research findings; data collection and analysis. Section 5.3 gives a conclusion of the study while section 5.4 and 5.5 show recommendations and suggestions for further research respectively.

5.2 Summary of the study

This research work was done to establish the effect of bank specific factors on risk-taking among commercial banks in Kenya. The research took a census forty two commercial banks operating in Kenya for period 2006 to 2013. The objectives of this research were first to determine the effect of credit growth on risk-taking among commercial banks in Kenya. Secondly, to establish the effect of bank size on risk-taking among commercial banks in Kenya, thirdly to establish the effect of bank risk appetite on risk-taking among commercial banks in Kenya; and finally to determine the effect of bank profitability on risk-taking among commercial banks in Kenya. Risk-taking among commercial banks in Kenya was measured as banks Z-scores.

Descriptive research design was used in this study with quantitative data analysis. Data used in this research was secondary data collected from each bank's audited financial statements for period 2006 to 2013. Data was collected and extracted in a tabular format for analysis. This being panel data, data analysis required a choice between FE and RE. The research relied on the estimation results in deciding to use FE model for regression estimation. Data diagnostics were done prior to regression

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analysis being done. The results have been presented using descriptive statistics; that is mean and standard deviation, minimum and maximum as well as correlation and panel data regression models. Credit growth was measured in terms of change in amount of loans between current period and previous period and the study has established that there was a positive and significant relationship between credit growth and risk-taking for the period under study. However, when credit growth was lagged for two periods (t-2), the study found that even though there was a positive relationship it was not significant. These research findings agree with previous research by Kohler (2012), Altunbas, Manganelli & Marques-Ibanez (2011), Foos, Norden & Weber (2010), Jimenez & Saurina (2007). In bank size variable, the study used bank core capital and the research has established that there has been continuous growth for banks' capital. The relationship between bank capital and risk-taking was found to be positive and significant. The study findings agree with findings by Koehn & Santomero (1980), Allen & Santomero (1998), Allen & Gale (2004), Repullo (2004), Von Thadden (2004). However, the study findings do not agree with research work by Morrison & White (2005), Holmstrom & Tirole (1997). The third objective was bank risk appetite and it was measured as the ratio of loans to assets. The research established that there was a negative and significant relationship between bank risk appetite and risk-taking in Kenya for the period under study. Altunbas, Manganelli & David (2011) and Sinkey & Greenwalt (1991) had showed evidence for a positive relationship between risk appetite and risk-taking. The findings in this research disagree with their findings. The relationship between profitability and risk-taking was negative. However, it was not significant. The study findings agree partially with previous work by De Nicolo & Loukoianova (2007) Boyd, De Nicolo & Al Jalal (2006) in that there was a positive relationship between profitability and risk-taking. However, this research findings shows that the relationship is not significant.

5.3 Conclusion

The analysis showed that bank specific factors affects the risk-taking in the commercial banking industry in Kenya. The study results agrees with some of the previous researchers who found out that less competition among commercial banks increased risk taking. The researchers argued that as the banking market structure changed, banks increased the loan interest rates therefore taking more risks that ultimately lead to riskier loan portfolio. Banks' capital plays critical roles in absorbing risks but introduces moral hazard issues. Commercial banks in Kenya are regulated by the CBK and each bank is required to comply with capital requirements as per legal provisions. Commercial banks with huge capital base may "feel" they are too large to fail and continue to accumulate risky loan portfolio. To reduce the level of NPLs in Kenya, commercial banks have to re-examine the quality of their assets. Both bank risk appetite and credit growth affect risk-taking among commercial banks in Kenya and both touch on the banks' assets. Diversification from the traditional banking activities as well as optimal balance between capital growth and lending will yield positive results in minimizing risk-taking in Kenya banking industry.

5.4 Recommendations

The study has established that minimum regulatory capital is contributing to risk-taking among commercial banks in Kenya. This presents a new challenge since the minimum capital requirement was implemented to enhance stability of the banking industry. Past studies have attributed this scenario to liquidity challenges. To manage the risk-taking in the banking industry, the regulator should put in place mechanisms to manage liquidity in the banking industry.

The banking industry asset quality requires keen monitoring. Bank risk appetite as well as credit growth are contributing to risk-taking in the Kenyan banking industry. These two measures touch on banks assets portfolio and there is need for commercial banks in Kenya to examine their asset

portfolio in a bid to manage risk-taking. This risky loan portfolio is attributed to high competition that leaves banks with fewer options than to advance a loan at a higher cost which will end up unrecoverable.

5.5 Suggestion for further research

Risk-taking in the banking industry may be caused by factors other than bank specific factors. The study focused on bank specific factors to establish its effect on risk-taking. Similar researchers factored in macro-economic variables including Gross Domestic Product, interest rates, inflation and exchange rate fluctuations in establishing how bank specific factors affected risk-taking. There is, therefore, need for further research to be undertaken covering both macro-economic variables and bank indicators to establish the relationship between bank specific factors and risk-taking. The increase in risky loan portfolio accompanied with high interest rates have been suggested by researchers as a main cause for NPLs and this study did not consider interest rates. The study recommends further study to establish whether high interest rates on loans have any effect on risk-taking. The introduction of credit reference bureaus is an area of interest and more research work should be carried to establish how it affects risk-taking.

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APPENDICES

Appendix I: Data collection schedule

Date	Firm	Document(s)	Variables
08.09.14	**Individual banks**	**Balance sheet**	
			Core capital
			Total loans
			Total assets
		Profit and loss statement	
			Profit before tax
			Profit after tax
			Gross NPL

Appendix II: Data collection sheets

Bank										
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
C Capital										
Total Loans										
Total Assets										
Profit b4 tax										
Profit after tax										
Gross NPL										

Appendix III: Commercial banks operating in Kenya

1	Kenya Commercial Bank Ltd
2	Equity Bank Ltd
3	Cooperative Bank Ltd
4	Standard Chartered Bank (K) Ltd
5	Barclays Bank of Kenya Ltd
6	CFC Stanbic Bank Ltd
7	NIC Bank Ltd
8	Diamond Trust Bank Ltd
9	Commercial Bank of Africa Ltd
10	I&M Bank Ltd
11	Citibank N.A.
12	National Bank of Kenya Ltd
13	Baroda Bank Ltd
14	Chase Bank Ltd
15	Bank of Africa Ltd
16	Prime Bank Ltd
17	Imperial Bank Ltd
18	Family Bank Ltd
19	Bank of India
20	Ecobank Kenya Ltd
21	African Banking Corporation Ltd
22	Fina Bank Ltd
23	Consolidated Bank of Kenya Ltd
24	Gulf African Bank Ltd
25	Giro Commercial Bank Ltd
26	Equatorial Commercial Bank Ltd
27	Fidelity Bank Ltd
28	Guardian Bank Ltd
29	Victoria Commercial Bank Ltd
30	Development Bank of Kenya Ltd
31	Habib A.G. Zurich
32	K-Rep Bank Ltd
33	Trans-National Bank Ltd
34	First Community Bank Ltd
35	Paramount Universal Bank Ltd
36	Habib Bank Ltd
37	Oriental Commercial Bank Ltd
38	Credit Bank Ltd
39	Jamii Bora Bank Ltd
40	Middle East Bank (K) Ltd
41	UBA Bank Kenya Ltd
42	Dubai Bank Ltd

Source: CBK (2015).

Appendix IV: Fixed effects estimation

```
  xtreg $ylist $xlist, fe
Fixed-effects (within) regression              Number of obs     =        336
Group variable: Bank                           Number of groups  =         42
R-sq:                                          Obs per group:
     within  = 0.0706                                         min =          8
     between = 0.0055                                         avg =        8.0
     overall = 0.0032                                         max =          8
                                               F(5,289)          =       4.39
corr(u_i, Xb)  = -0.4970                        Prob > F          =     0.0007
------------------------------------------------------------------------------
      Zscore |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         Cap |   .0006632   .0005036     1.32   0.189    -.0003279    .0016543
         Pbt |  -.0006098    .001217    -0.50   0.617    -.0030051    .0017855
          LA |  -45.53013   11.61072    -3.92   0.000    -68.38242   -22.67785
         Cg1 |    6.79468   2.720962     2.50   0.013     1.439266    12.15009
         Cg2 |   2.424767   2.448115     0.99   0.323    -2.393629    7.243163
       _cons |    37.4561    5.66919     6.61   0.000     26.29796    48.61424
-------------+----------------------------------------------------------------
     sigma_u |  12.177901
     sigma_e |  12.758985
         rho |  .47671047   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(41, 289) = 5.24                   Prob > F = 0.0000
```

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Appendix V: Random effects estimation

```
. xtreg $ylist $xlist, re

Random-effects GLS regression              Number of obs     =        336
Group variable: Bank                       Number of groups  =         42

R-sq:                                      Obs per group:
    within  = 0.0642                                     min =          8
    between = 0.0009                                     avg =        8.0
    overall = 0.0068                                     max =          8

                                           Wald chi2(5)      =      11.40
corr(u_i, X)   = 0 (assumed)               Prob > chi2       =     0.0439

------------------------------------------------------------------------------
      Zscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         Cap |   .0002804   .0004608     0.61   0.543    -.0006228    .0011836
         Pbt |   4.68e-06    .001113     0.00   0.997    -.0021767     .002186
          LA | -21.76605   8.855256    -2.46   0.014    -39.12203   -4.410067
         Cg1 |   5.336059   2.607642     2.05   0.041     .2251743    10.44694
         Cg2 |   1.508223   2.375978     0.63   0.526    -3.148608    6.165053
       _cons |   26.94805   4.693281     5.74   0.000     17.74939    36.14671
-------------+----------------------------------------------------------------
     sigma_u |  9.0473595
     sigma_e |  12.758985
         rho |  .33458375   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

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Appendix VI: Hausman test

```
        ---- Coefficients ----
       |      (b)          (B)           (b-B)     sqrt(diag(V_b-V_B))
       |     Fixed        Random       Difference         S.E.
-------------+------------------------------------------------------------
    Cap |   .0006632     .0002804       .0003827        .000203
    Pbt |  -.0006098     4.68e-06      -.0006145        .0004923
     LA |  -45.53013    -21.76605     -23.76408        7.509537
    Cg1 |    6.79468     5.336059       1.458621        .7770684
    Cg2 |   2.424767     1.508223       .9165445        .5899138
------------------------------------------------------------------------
                    b = consistent under Ho and Ha; obtained from xtreg
        B = inconsistent under Ha, efficient under Ho; obtained from xtreg

   Test:  Ho:  difference in coefficients not systematic

             chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                     =         10.71
           Prob>chi2 =       0.0134
           (V_b-V_B is not positive definite)
```

Appendix VII: Diagnostic tests

```
xttest3
```

Modified Wald test for **groupwise heteroskedasticity**
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (42) =   2.5e+05
Prob>chi2 =   0.0000

. xtserial $ylist $xlist

Wooldridge test for **autocorrelation** in panel data
H0: no first order autocorrelation
    F(1,   41) =   4.792
           Prob > F =   0.0343

Unit root tests

Unit root test – **Capital** 2nd diff
Panel unit root test: Summary
Series: D(C_CAPITAL,2)
Date: 01/16/17   Time: 12:25
Sample: 2006 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-38.2619	0.0000	42	210
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.41053	0.0000	42	210
ADF - Fisher Chi-square	202.700	0.0000	42	210
PP - Fisher Chi-square	271.480	0.0000	42	210

** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.

Unit root – Credit growth 1 (level)

Panel unit root test: Summary
Series: CGROWTH1
Date: 01/16/17   Time: 12:27
Sample: 2006 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

```
                                               Cross-
Method                    Statistic Prob.**  sections Obs
Null: Unit root (assumes common unit root process)
Levin, Lin & Chu t*       -11.0569  0.0000    42      281


Null: Unit root (assumes individual unit root process)
Im, Pesaran and Shin W-
stat                       -3.34339  0.0004    42      281
ADF - Fisher Chi-square   163.010   0.0000    42      281
PP - Fisher Chi-square    195.483   0.0000    42      294
```

** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.

Unit root – **Credit growth 2** (level)
Panel unit root test: Summary
Series: CGROWTH2
Date: 01/16/17   Time: 12:28
Sample: 2006 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

```
                                               Cross-
Method                    Statistic Prob.**  sections Obs
Null: Unit root (assumes common unit root process)
Levin, Lin & Chu t*       -16.7059  0.0000    40      266


Null: Unit root (assumes individual unit root process)
Im, Pesaran and Shin W-
stat                       -5.10437  0.0000    40      266
ADF - Fisher Chi-square   168.847   0.0000    40      266
PP - Fisher Chi-square    181.519   0.0000    40      280
```

** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.

Unit root **LA ratio** (1st difference)
Panel unit root test: Summary
Series: D(LA_RATIO)
Date: 01/16/17   Time: 12:30
Sample: 2006 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

```
                                               Cross-
Method                    Statistic Prob.**  sections Obs
Null: Unit root (assumes common unit root process)
Levin, Lin & Chu t*       -24.2696  0.0000    42      252
```

```
Null: Unit root (assumes individual unit root process)
Im, Pesaran and Shin W-
stat                        -8.73270  0.0000    42       252
ADF - Fisher Chi-square  245.834   0.0000    42       252
PP - Fisher Chi-square   359.043   0.0000    42       252
```

** Probabilities for Fisher tests are computed using an asymptotic Chi
      -square distribution. All other tests assume asymptotic normality.

Unit root – **Profit before tax** 1st difference
Panel unit root test: Summary
Series: D(PROFIT_B4_TAX)
Date: 01/16/17   Time: 12:31
Sample: 2006 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| | | | Cross- | |
Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.71188	0.0000	42	252

```
Null: Unit root (assumes individual unit root process)
Im, Pesaran and Shin W-
stat                        -3.00733  0.0013    42       252
ADF - Fisher Chi-square  149.975   0.0000    42       252
PP - Fisher Chi-square   188.911   0.0000    42       252
```

** Probabilities for Fisher tests are computed using an asymptotic Chi
      -square distribution. All other tests assume asymptotic normality.

Unit root - **Z-Score** (1st difference)

Panel unit root test: Summary
Series: D(Z_SCORE)
Date: 01/16/17   Time: 12:33
Sample: 2006 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| | | | Cross- | |
Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-18.3887	0.0000	42	252

```
Null: Unit root (assumes individual unit root process)
Im, Pesaran and Shin W-
stat                        -7.06201  0.0000    42       252
ADF - Fisher Chi-square  218.956   0.0000    42       252
```

```
PP - Fisher Chi-square   297.734   0.0000   42        252
```

** Probabilities for Fisher tests are computed using an asymptotic Chi
      -square distribution. All other tests assume asymptotic normality.

Unit root test **Residuals**

```
Panel unit root test: Summary
Series:  RESID
Date: 01/16/17   Time: 12:43
Sample: 2006 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
```

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-41.3096	0.0000	42	276
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.55892	0.0000	42	276
ADF - Fisher Chi-square	182.893	0.0000	42	276
PP - Fisher Chi-square	188.661	0.0000	42	294

** Probabilities for Fisher tests are computed using an asymptotic Chi
      -square distribution. All other tests assume asymptotic normality.

Appendix VIII: Fixed effects model with Driscoll-Kraay standard errors

```
Regression with Driscoll-Kraay standard errors    Number of obs     =        336
Method: Fixed-effects regression                  Number of groups  =         42
Group variable (i): Bank                          F(  5,      7)    =     147.68
maximum lag: 7                                     Prob > F          =     0.0000
                                                  within R-squared  =     0.0706


------------------------------------------------------------------------------
             |             Drisc/Kraay
      Zscore |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         Cap |   .0006632   .0001057     6.27   0.000     .0004132    .0009131
         Pbt |  -.0006098   .0003527    -1.73   0.127    -.0014437    .0002241
          LA |  -45.53013   12.21974    -3.73   0.007    -74.42523   -16.63504
         Cg1 |    6.79468   2.753192     2.47   0.043     .2844165    13.30494
         Cg2 |   2.424767   1.545203     1.57   0.161    -1.229059    6.078593
       _cons |    37.4561   5.577693     6.72   0.000     24.26695    50.64525
------------------------------------------------------------------------------
```

Appendix IX: Descriptive statistics

	Credit growth	*Bank size*	*Bank risk appetite*	*Bank Profitability*
Mean	1087.58	182167.73	159.04	61749.31
Standard Error	56.19	35242.74	2.33	12905.73
Median	1053.53	160033.00	161.28	48287.00
Standard Deviation	168.57	105728.21	7.00	38717.20
Sample Variance	28417.12	11178454450.99	48.98	1499021884.67
Kurtosis	-0.37	-0.84	-0.41	-1.11
Skewness	0.46	0.40	-0.95	0.43
Range	518.05	317616.40	19.68	112922.20
Minimum	874.19	39834.60	147.22	11620.80
Maximum	1392.24	357451.00	166.90	124543.00
Sum	9788.22	1639509.60	1431.32	555743.80