DETERMINANTS OF COMMERCIAL BANKS' INVESTMENT PORTFOLIOS IN KENYA: 2007 TO 2012

JOHN KARIUKI MUCHOMBA

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DECLARATION

I certify that this research paper is my original work and has not been presented for a degree in any other university.

Signature: _____ _____

John Kariuki Muchomba Date

Reg No. X50/8608/2003

This research paper has been submitted for examination with our approval as University Supervisors.

Signature:_____ _____

Dr. Thomas Ongoro Date

Signature:_____ _____

Prof. Nelson Wawire Date

DEDICATION

To my dear wife, Glory Kariuki and our two children, Eunice Wangui and El Lohe Muchomba.

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ABSTRACT

In the Kenyan economy, commercial banks have expanded and opened many branches over the last few years. This has resulted in a tremendous increase in loans, government securities and placements portfolios. The question of what determines the level of investment portfolios of commercial banks in Kenya is therefore an important one. Nonetheless, decisions pertaining to investment portfolios especially in a developing economy like Kenya require a critical consideration of both internal and external factors. The study aimed to test and support the effects of the determinants of commercial banks' investment portfolios and how they affect investment decisions of commercial banks in Kenya. The determinants included rate of return, deposit asset ratio, cash reserve ratio, liquidity reserve ratio, bank risk, interest rate elasticity, non-performing loans, fee income ratio, bank size and rate of inflation. The study used secondary data which was collected from banks' annual balance sheets, income statements, Central Bank annual reports and Banking Survey 2012. Hausman and Lagrange multiplier tests were conducted to assess whether to use the fixed effects estimation or random effects estimation. The latter was favored and random effect maximum likelihood estimation was used. The study supported that there exists a functional relationship between the commercial bank's investment portfolios and the determinants in the Kenyan context. It also established that cash reserve and deposit asset ratios have the greatest impact on the investment portfolios. The study recommended that commercial banks need to consult with the government whenever a policy regarding cash reserve requirement is made. The banks should also mobilize deposits to enhance their investments. Therefore, a critical, realistic and comprehensive strategic and financial plan should be formulated.

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ABBREVIATIONS AND ACRONYMS

APR	Annual Percentage Rate
CAPM	Capital Asset Pricing Model
CBK	Central Bank of Kenya
CIS	Credit Information Sharing
CPI	Consumer Price Index
CRB	Credit Reference Bureau
FE	Fixed Effects
GDP	Gross Domestic Product
GOVPORT	Government Securities Portfolio
ICT	Information Computer Technology
KBA	Kenya Bankers Association
KNBS	Kenya National Bureau of Statistics
LM	Lagrange Multiplier
LOANPORT	Loan Portfolio
MLE	Maximum Likelihood Estimation
NIC	National Industrial Credit Bank
NPL	Non-Performing Loan
OLS	Ordinary Least Squares
PAAT	Portfolio Asset Allocation Theory
PLACPORT	Placements with other commercial banks Portfolio
RE	Random Effects

CHAPTER ONE

INTRODUCTION

1.1Background

Commercial banks derive their incomes from a combination of investments that are undertaken on the basis of the perceived viability. Usually, the allocation of banks' investible funds is done in accordance with risk considerations and expected yields (Akinlo and Ogo-Temi, 2002). Banks observe this principle to ensure that they remain profitable and competitive in the midst of the other enterprising counterparts. In addition, the banking industry, like any other oligopolistic industry, is composed of firms that aim at maximizing their earnings, liquidity and safety (Jhingan, 1993). This is achieved through strategic and tactical asset allocation, and, above all, differentiation of their products to entice customers. Strategic asset allocation plays a vital role in converting the investor's objectives, constraints, and long-term capital market expectations into an appropriate portfolio. Tactical asset allocation is a major discipline for attempting to capitalize on perceived disequilibria among asset-class relative values (Maginn *et al*., 2007).

At times banks may sacrifice some elements of safety and liquidity to seek high profits. However, to have some assurance of the appropriate move, it is imperative that commercial banks remain barometric to prevailing portfolio determinants in order to know which direction to take in adjusting their investment portfolios.

In most cases the objective of profitability conflicts with those of safety and liquidity; and therefore, a wise investment policy is needed to strike a judicious balance among them. Thus, a bank should lay down its investment policy based on the portfolio determinants so as to uphold the safety and liquidity of its funds and at the same time maximize profits (Rana, 2009).

Investment portfolios tend to be associated with rate of return, bank size, deposit liabilities, banking sector concentration, credit risk levels, and banks' income from fee-based activities, market share, and the rate of inflation. In addition, tight bank regulations and

restrictions on bank activities inhibit the freedom of bankers to conduct their business leading to inefficiencies in the financial sector. However, from a positive point of view, bank regulations reflect broader, national institutions associated with the protection of private property rights (deposit liabilities) and unfair competition among banks (Centre for Corporate Governance, 2004).

1.2 Investment Policy of Commercial Banks

A balance sheet which is a statement of assets and liabilities reflects financial position of a bank as at a given date. The assets of the bank are distributed in accordance with certain guiding principles which underline the investment policy of the bank.

Firstly, being liquid enable banks to honor the claims of the depositors as well as the ability of the bank to convert its non-cash assets into cash easily and without loss. It is a well known fact that a bank deals in deposits entrusted to it by the public. Thus, the bank should always be on its guard in handling these funds, and, have enough cash to meet the demands of the depositors. In fact, the success of a bank depends to a considerable extent upon the degree of confidence it can instill in the minds of its depositors. If the depositors lose confidence in the integrity of their bank, existence of such a bank will be at stake.

Secondly, a bank must earn income to enable it meet salaries of its staff, interest to the depositors, dividends to the shareholders and the day-to-day expenditure. Cash is the least profitable asset to the bank and therefore, there is no point in keeping much assets in the form of cash on hand. The bank has to earn income and, hence, most of the items on the assets side are profit yielding assets. These include money at call and short notice, bills discounted, investments, loans and advances. Loans and advances, though the least liquid asset, constitute the most profitable asset to the bank. As such, much of the income of the bank accrues by way of interest charged on loans and advances. However, the bank has to be highly discreet while advancing loans (Jhingan, 1993).

Apart from liquidity and profitability, a bank looks to the principle of safety and security of its funds for its smooth working. While advancing loans, a bank considers credit character, capacity and the collateral of the borrower. The bank cannot afford to invest its funds

recklessly without considering the principle of safety which ensures minimisation of credit risk.

Diversification of investment is necessary to avoid dangerous consequences of investing in one channel. If the bank invests its funds in different types of securities or makes loans and advances to different objectives and enterprises, there is a possibility of permanent and regular flow of income.

Further, the bank invests its funds in such types of securities as can be easily marketed at a time of emergency. The bank cannot afford to invest its funds in very long term securities or those which are unsaleable. It is necessary for the bank to invest its funds in government or in first class securities or in debentures of reputed firms. It should also advance loans against stocks which can be easily sold.

The bank invests its funds in those stocks and securities whose prices are more or less stable, not in securities, whose prices are subject to frequent fluctuations. Central bank intervenes in this by helping in the operations of the commercial banks through a judicious credit control policy.

Finally, the investment policy of a bank is based on the principle of tax exemption of investments. The bank should invest in those government securities which are exempted from income and other taxes to enhance its profits (Jhingan, 1993).

1.3 Structure of Banking Sector in Kenya

The Banking Sector is composed of the Central Bank of Kenya as the regulatory authority, Commercial Banks, Non-bank financial Institutions and Forex Bureaus. As at 1st Jan.2007, the banking sector comprised of 45 commercial banks. Commercial banks are licensed and regulated under the Banking Act, Cap 488 and Prudential Regulations issued there under. Out of the 45 institutions, 33 were locally owned and 12 were foreign owned. The locally owned financial institutions comprised 3 banks with significant government shareholding, 28 privately owned commercial banks and 2 mortgage finance companies. The foreign owned financial institutions comprised 8 locally incorporated foreign banks and 4 branches of foreign incorporated Kenya's banking sector (Central Bank of Kenya, 2008).

In the year 2008 commercial banks continued to be vibrant and dynamic in embracing changes amidst local (contested elections) and global (mortgage and Euro) turbulences. On the ICT front, banks continued to embrace new technology by upgrading and replacing their core banking systems enabling them to reach many clients, both depositors and loanees.

On the consumer front, the Central Bank and the banking sector continued with initiatives to enhance communication of bank charges and lending rates. This has given the public a forum to express its concern on the perceived high level of bank charges and lending rates which hampers borrowings. Whereas there are legislative provisions on the approval of bank charges, the Central Bank also continues to lay emphasis on the promotion of competition in the banking sector through market discipline.

In 2007, the Kenya Bankers Association (KBA) and CBK formed a Joint Taskforce to enhance communication of bank charges and lending rates. One of the key initiatives being undertaken by the Taskforce is the possible adoption of an Annual Percentage Rate (APR) as a measure of the cost of credit by the Kenyan banking sector. An APR is a measure of the cost of credit that incorporates the interest rate on credit facilities plus other charges e.g. commitment fees. It is therefore an all inclusive measure of the cost of credit that facilitates comparison of credit facilities by customers. It is widely used in the US and UK (Central Bank Kenya, 2008).

Towards the end of 2009, Kenya's economy started to recover more strongly and this positive momentum was sustained into the year 2010. The resilience of the Kenya economy was evident in 2010 when real GDP expanded by 5.6% after suppressed growths of 1.5 and 2.6% in 2008 and 2009 respectively (Central Bank of Kenya, 2010).

These developments were attributable to among other factors low inflationary pressure and relatively stable domestic environment. The pro-active government policies also led to encouraging developments in the economy. These factors encouraged a steady growth leading to a turnaround in the agriculture, electricity and water sectors and a rebound in

most of the other sectors such as manufacturing, construction and service industries. Consequently, there was an increase in bank deposits which triggered a tremendous investment through borrowings from commercial banks (Central Bank of Kenya, 2010).

1.4 Credit Reference Bureaus

The Banking Regulations, 2008, became effective in February 2009 and requires all licensed banks to share information on Non-Performing Loans (NPLs) through a Credit Reference Bureau (CRB) licensed by CBK. The role of licensed CRBs is to collect, collate and process data received from approved sources of information and generate credit reports to be used by lenders. During the year 2010, CBK in partnership with Kenya Bankers Association (KBA) undertook a number of workshops and media campaigns. These initiatives were aimed at sensitizing and encouraging banks to utilize the services offered by credit reference bureaus in their operations as well as to enhance public awareness on the credit information sharing mechanism (Central Bank Kenya, 2010).

Credit reports help banks stem out malpractices in the banking sector since customers whose credit reports indicate as having been involved in malpractices are subjected to stringent terms and conditions. This is also expected to help banks suppress the levels of NPLs while increasing their active loans.

To bank customers, Credit Information Sharing (CIS) is expected to minimize the problem of information asymmetry between banks and borrowers. The effect of information asymmetry is that banks tend to load a “risk premium” to borrowers because of lack of customer information. The CIS mechanism is therefore expected to facilitate the development of information capital to increase information symmetry and allow cost of credit to decline substantially. In turn, more Kenyans will be able to access credit from institutions and the building of information capital should also serve as a key substitute to physical collateral (Central Bank of Kenya, 2010).

As at 30th June, 2011, there were 728,553 credit reports requested by institutions compared to 284,722 reports in December 2010. The uptake of credit reports by banks is expected to increase as use of credit referencing is entrenched in the banks' credit appraisal processes. CBK granted Metropol Ltd a license in April 2011 to operate as a credit reference bureau, thus, becoming the second bureau after CRB Africa which was licensed in 2010.

1.5 Structure of the Balance Sheet

The balance sheet which is a financial statement of assets and liabilities highlights the financial position of a bank at a given point in time. It reflects the bank's management policies and decisions in the allocation of resources (Vong and Chan, 2008).

Table 1.1: Balance Sheet (KShs mn)

	June – 11	June – 10	% Change
Cash	36,319	29,641	23%
Balances at CBK	80,298	89,860	-11%
Placements	115,954	102,614	13%
Government Securities	421,570	392,702	7%
Other Investments	46,550	36,439	28%
Loans and Advances	1,083,053	828,891	31%
Foreign Assets	6,218	3,744	66%
Other Assets	128,004	106,817	20%
Total Assets	**1,873,766**	**1,548,408**	**21%**
Deposits	1,412,841	1,219,531	16%
Foreign Liabilities	45,211	22,500	101%
Other Liabilities	150,803	84,038	79%
Capital and Reserves	264,911	222,339	19%
Total Liabilities and Shareholders' Funds	**1,873,766**	**1,548,408**	**21%**

Source: CBK (2011), Annual Report

The banking sector aggregate balance sheet grew by 21% from Kshs.1, 548.4 billion in June 2010 to Kshs.1, 874.8 billion in June 2011. The major components of the balance sheet were loans and advances, government securities and placements, which accounted for 55.0%, 22.0% and 6.0% of total assets respectively.

The banking sector gross loans and advances increased from KShs. 828.9 billion in June 2010 to KShs. 1,083.1 billion in June 2011 translating to a growth of 31%. The growth was registered in all the 11 sectors as indicated in table 1.2.

Table 1.2: Sectoral Distribution of loans (KShs bn)

Sectors	June – 11	June -10	% Change
Personal /Household	296.0	235.5	26%
Trade	198.5	151.3	31%
Manufacturing	151.2	118.7	27%
Real Estate	130.8	92.2	42%
Transport/Communication	88.3	66.6	33%
Agriculture	57.6	46.4	24%
Financial services	48.7	42.8	14%
Building/Construction	33.0	22.7	45%
Energy and water	38.5	24.4	58%
Tourism, Restaurant/Hotels	24.4	18.7	30%
Mining and Quarrying	16.1	9.6	68%
Total	**1,083.1**	**828.9**	**31%**

Source: CBK (2011), Annual Report

Deposits from customers were the main source of funding for the banking sector, accounting for 75% of total funding liabilities. The deposit base increased by 16% from Kshs. 1,219.5 billion in June 2010 to Kshs. 1,412.8 billion in June 2011 mainly due to branch expansion, remittances and receipts from exports. This translated into a higher commercial bank portfolios.

1.6 Banks Market Share Analysis

To determine the proportion of the market controlled by each bank, CBK uses a weighted composite index comprising assets, deposits, capital size, number of deposit accounts and loan accounts to classify banks into three peer groups namely; large, medium and small (CBK, 2011). Based on the weighted composite index, a large bank has a market share of 50% and above; medium bank between 10% and 50% and a small bank has less than 10% of the market share.

Table 1.3: Banks Market Share Analysis

Size	Weighted Market Size	No. of Institutions	Total net Assets (KShs m)	Customer Deposits (KShs m)	Capital and Reserves (KShs m)
Large	54.6%	6	1,098,750	795,517	161,126
Medium	36.0%	15	735,819	551,639	102,841
Small	9.4%	22	186,249	141,012	27,265
Total	**100.0%**	**43**	**2,020,818**	**1,488,168**	**291,232**

Source: CBK (2011), Annual Report

As at 31st December 2011, there were 6 large banks, 15 medium banks and 22 small banks. This was the same classification registered in 2010. However, banks changed positions within their respective peer groups, with Equity Bank moving to second position from third position and Barclays Bank moving to position three from position two in 2011. The changes in positions were mainly driven by levels of customer deposits (CBK, 2011).The large banks accounted for 54% of total assets, 53% of customer deposits, 55% of capital and reserves.

1.7 Commercial Banks Interest Rates and Spreads

Changes in interest rates resulting from tight liquidity conditions are normally transmitted to the commercial banks' interest rates. This is depicted by table 1.4.

Table 1.4: Commercial Banks Interest Rates and Spreads (%)

	Lending Rates				**Deposit rates**				**Interest rate spreads**			
	All banks	Small banks	Medium banks	Large banks	All banks	Small banks	Medium banks	Large banks	All banks	Small banks	Medium banks	Large banks
Mar 11	13.92	14.47	14.11	14.93	3.47	4.46	3.33	2.1	10.45	10.01	10.78	12.84
April 11	13.92	14.34	13.99	15.01	3.47	4.5	3.37	2.1	10.45	9.84	10.63	12.9
May11	13.88	14.37	14.06	14.97	3.57	4.45	3.76	2.12	10.31	9.92	10.3	12.86
Jun 11	13.91	14.27	14.02	14.93	3.68	4.55	3.84	2.09	10.23	9.72	10.19	12.84
Jul 11	14.14	14.35	14.58	15.08	3.85	4.59	4.2	2.32	10.29	9.76	10.38	12.76
Aug 11	14.32	14.61	14.85	15.07	4.07	4.65	4.36	2.62	10.25	9.96	10.5	12.45
Sep 11	14.79	14.78	15.13	15.51	4.21	4.91	4.69	2.43	10.58	9.88	10.44	13.08
Oct 11	15.21	15.17	15.52	15.95	4.83	5.14	5.29	3.04	10.39	10.03	10.24	12.91
Nov 11	18.48	17.57	19.37	18.82	5.75	6.66	6.41	2.99	12.73	10.9	12.96	15.83
Dec 11	20.04	19.12	20.59	20.95	6.99	7.24	7.54	3.63	13.05	11.88	13.05	17.32

Source: CBK (2011), Annual Report

As result of a rise in short term interest rates, the average commercial banks lending rates increased from 15.21% in October 2011 to 20.04% in December 2011 before dropping slightly to 20.22% in 2012. The average deposit rates almost doubled in the period rising from 4.83% to 8.56% due to an increase in the cost of funds and competition for deposits. Consequently, average interest rates spreads increased from 10.39% in October 2011 to 13.05% in December 2011.

However, interest rate spreads have generally decreased since December 2011. Medium and Small banks have generally maintained competitive deposit rates and therefore had lower spreads. The decline in the interest rate spread towards the end of 2011 was partly attributed to the impact of the measures announced by the Kenya Bankers Association to cushion borrowers from high interest rates as well as reduce the threat of accumulating non-performing loans. The CBK has also been working with the Kenya Bankers Association (KBA) to address the high spreads through the operationalisation of Credit Reference Bureaus and establishment of Currency Centers around the country. This has reduced credit risk levels and the operation costs of banks.

1.8 Mobilization of bank deposits

In 2007, the Government of Kenya unveiled the country's "Vision 2030", which aims to transform Kenya into a newly industrialising, "middle-income country providing a high quality life to all its citizens by the year 2030" (Republic of Kenya, 2007:15). The vision of the financial sector is to "Create a vibrant and globally competitive financial sector, driving high levels of savings and financing Kenya's investment needs" (Republic of Kenya, 2007:15). To achieve this, the Banking Sector is expected to be more efficient and increase penetration through a number of reforms. The goal of financial sector by 2030 is to ensure there is increase in mobilization of bank deposits from 44% to 80% of GDP, which is the average amongst benchmark countries, and to significantly reduce the cost of capital (Republic of Kenya, 2007).

In this regard, the banking industry structure will be strengthened through enactment of reforms to facilitate transformation towards stronger large-scale banks. In addition, the Vision 2030 will aim at extending Credit Referencing System from negative information sharing to also include positive information sharing towards improving status of loans. Lastly, there will also be a process of deepening penetration of banking services, especially in rural areas through "streamlining informal finance and Savings and Credit Co-operative Organisations (SACCOs), as well as micro-finance institutions," (Republic of Kenya, 2007:15).

1.9 The Statement of the Problem

In the Kenyan economy, commercial banks have expanded and opened many branches over the last few years. This has resulted in a tremendous increase in deposit liabilities and in turn, an increase in volumes of investment portfolios (KNBS, 2011). Proper investment portfolio management ensures efficiency, liquidity and safety in the use of resources among other objectives. At each decision point, the portfolio manager has an inventory of investment opportunities at hand and must decide where to invest based on market conditions and the assessment of determinants.

Traditionally, monetary authorities influenced the investment portfolios of financial institutions by changing the discount rate and reserve requirements. Many developing countries had their Central Banks supplement these instruments by a more direct intervention. For instance, ceilings or floors on the holdings of certain assets were imposed to strengthen the effects of monetary policies (Cihak and Podpiera, 2005). Other factors which could enhance sound allocation of assets have been neglected by banks. Worse still, most of the studies carried out on commercial banks, have concentrated on the performance, and, specifically performance of loans (Balandler *et al.*, 2008). Portfolios such as government securities and placements with other banks have also been overlooked. As matter of fact loans and advances, government securities and placements form the most proportion of commercial banks' portfolios. Failure and imbalance in consideration of other determinants on overall investment portfolios leads in misallocation and poor management of resources.

Many studies have been carried out on diversification and determinants of profitability. They have also made recommendations on how banks can diversify their products in addition to measures they need to use to maximize profits (Nelson and Victor, 2009; Molyneux and Thornton 1992; Elyasiani, 2008; Bourke, 1989 and Vong and Chan, 2008). For instance, Nelson and Victor (2009) explain how National Industrial Credit Bank (NIC) has expanded its scope of its activities by offering more general commercial banking facilities to reduce over reliance on interest income. This study aimed to deviate from that, and instead, identified and examined determinants of commercial banks' investment portfolios so as to provide a practical guide on investment in the Kenyan context.

1.10 The objective of the study

The main objective of this study was to analyze the determinants of commercial bank investment portfolios in Kenya. Specific objectives were as follows:

i) To identify the determinants of commercial banks' investment portfolios in Kenya.
ii) To specify and estimate the functional relationship of the determinants of commercial banks' investment portfolios.
iii) To draw policy implications based on the results of the study.

1.11 Working hypotheses

H_0: There is no relationship between commercial banks' investment portfolios and rate of return, deposit asset ratio, cash reserve requirement, liquidity reserve requirement, bank risk, non-performing loans, interest rate elasticity, fee income, bank size and inflation.

H_1: There is relationship between commercial banks' investment portfolios and rate of return, deposit asset ratio, cash reserve requirement, liquidity reserve requirement, bank risk, non-performing loans, interest rate elasticity, fee income, bank size and inflation.

1.12 The significance of the study

The study contributes to the literature in several ways. Firstly, the findings of this investigation are important for portfolio managers and economic policy makers. Identification of factors influencing commercial bank investment portfolios in Kenya was essential to the institution of public and private policies geared towards improving the efficiency, safety, liquidity and stability of the commercial banks. The study was useful for the banking industry and other policy makers in creating an appropriate environment for enhancing the operations of the banking industry. The findings of this study were also important to investors as it provided information on investment portfolios.

This study expanded literature on the influence of the macro-economic and specific variables on the banking industry. The study provided literature from a developing country

perspective on the determinants of commercial bank investment portfolios. Most of studies conducted had focused either on performance and profitability or were based on developed countries leaving a huge literature gap for developing countries.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter a review of both the theoretical and empirical literature relevant to this study was undertaken. The review covers the relationship between loans and advances, government securities and placements and their determinants. The review also focused on the explanations behind the relationship and results of studies on the effects of those determinants on investment portfolios.

2.2 Theoretical Literature

Investors focus on assessing and quantifying risks and rewards of individual portfolio. Standard investment advice is based on identifying those investments that offer the best opportunities for a gain with the least risk. In order to build a portfolio model, Markowitz derived the expected rate of return for a portfolio of assets and their expected risk measure. The variance of the rate of return was a meaningful measure of portfolio risk under a reasonable set of assumptions. The theory indicated the importance of diversifying the investments to reduce the total risk of the portfolio.

Capital Market Theory extended the portfolio theory and developed a model for pricing all risky assets in a “Capital Asset Pricing Model” (CAPM). This model allows investors to determine the required rate of return for any risky assets. The theory helps investors and analysts predict behaviour in the real world but not on the assumptions postulated.

Arbitrage Pricing Theory which was created in 1976 by Stephen Ross is defined as an asset pricing model and is based on the idea that an asset's returns can be predicted using the relationship between that same asset and many common risk factors. It predicts a relationship between the returns of a portfolio and the returns of a single asset through a linear combination of many independent macro-economic variables.

Portfolio Asset Allocation Theory, (PAAT), is based on the distribution of investor’s resources among different investment opportunities. Asset allocation decision is a critical component of the portfolio management process for which the decision for the asset

allocation should be done in the light of factors such as performance, macroeconomic and liquidity (Mohammad, 2007).

Optimal management of bank resources revolves around maintaining a balance between liquidity, profitability, and risk. Commercial banks need liquidity because such a large portion of their liabilities are payable on demand by their clients. However, as the asset becomes more liquid, it tends to have a higher opportunity cost. Thus, the decision to choose one combination of assets over another, given the liability accounts of a bank, has a direct and significant effect on bank portfolios (Steinberg and Forscher, 2008).

Bank regulations have had a tremendous effect in controlling banking operations. However, apart from U.S., most of the countries adopted regulations after World War II (White, 1983; Calomiris, 1990; and Wheelock, 1992). In Kenya, the banking industry is governed by the Companies Act, the Banking Act and the Central Bank Act and other prudential guidelines which are normally issued by the Central Bank. The Central Bank and the Capital Markets Authority are the main regulators of banks in Kenya. The Central bank of Kenya is the regulating and supervising agency and the manager of monetary policy operations in Kenya.

Bank regulation is based on the argument that banks are inherently flawed institutions, being prone to banking malpractices, such as over lending at the expense of the depositors and, above all, interfering with macroeconomic environment. They are therefore controlled through monetary policy instruments namely reserve and liquidity requirements besides selective credit controls. In fact, most of the vast literature on bank regulation is within this paradigm of over- and under-lending. Consequently, the government regulates commercial banks by laying down reserve and liquidity coefficients that need to be observed. For instance, the Central Bank may require banks to remit a given percentage (reserve requirement) of their deposits with it and hold part of deposits in cash form to serve demands from their clients. In Kenya, the legal reserve requirement and the liquidity ratios on the deposit liabilities depend on the monetary policy that central bank wants to pursue. These requirements limit the amount that commercial banks can invest with the public and

the government. The cash reserve and liquidity requirements, mandatory investment levels and interest rate controls are therefore categorized as implicit taxes.

As a result, banks are forced to adjust their investment portfolios and undertake other fee based activities to compensate for the lost earnings. However, Fry (1995) observed that the impact of mandatory requirements depends on the elasticity of loan and deposit interest rates. Nevertheless, the reserve requirement is used as an instrument of monetary policy, because the higher the rate, the less funds banks will have to loan out, leading to lower money creation and perhaps ultimately to higher purchasing power of the money previously in use. The effect is multiplied, because money obtained as loan proceeds can be re-deposited and a portion of those deposits may again be loaned out, and so on.

Besides quantitative control mechanisms, supervision of banks is another concept that can have both positive and negative impact on the performance of banks depending on the objectives of the banks' management. The Basel Committee on Banking Supervision (1999) upheld that banking supervision cannot function efficiently if sound corporate governance is not in place. Consequently, banking supervisors have strong interests in ensuring that there is effective corporate governance at every banking organization to ensure implementation of deliberations from the monetary authority. However, governments are frequently the biggest problem as regulators and supervisors because their agendas may not coincide with the desired bank's composition of investment portfolios (Boot and Thakor, 1993).

Market structure, which is all about the degree of competition, reflects the number of market players and the diversity of financial assets, the market share of individual participants, ownership structure and control and the adequacy of the legal and regulatory framework. In a market where the government sets interest rates and credit ceilings, allocation of resources is inefficient because of uneven credit rationing criteria and the lack of incentive by banks to compete for public deposits. In addition, the allocation of funds to poor performing sectors increases the credit risk for commercial banks. Worse still, the

presence of government owned and controlled banks create an uncompetitive environment making enforcement of regulatory framework impossible.

Liberalization, with minimal government control and ownership, is seen as process that would promote a competitive environment. Though the liberalization of the financial management and market structure has intensified competition, a lot needs to be done to fully promote efficient allocation of banks resources. Even with deregulation of interest rates, there lacks accompanying institutional and structural reforms hence, a lot of banks have come up with biased and idiosyncratic risks to back up claims for different portfolio holdings. Institutional and structural reforms would ensure and facilitate competition among commercial banks towards optimal investment portfolio holdings. However, this has not happened yet due to the aforesaid factor, over-subtlety of credit risks.

Yanelle (1989; 1997) and Winton (1995; 1997) focused on how the finiteness of the economy affects equilibrium banking sector structure. As Yanelle (1989) noted, one immediate problem is that when finite numbers of banks compete for finite numbers of depositors and borrowers, the paradigm of perfect Bertrand competition is not reasonable. If two banks were competing and are charging lending rates, then all at once, the bank with the higher rate offers a higher deposit rate; it would be expected to capture the deposit market. All else equal, a borrower that chooses the bank with lower lending rates might end up in a bank that has no funds to lend. If everyone expects this to be the case, the bank with higher rates may end up capturing the market.

On risk, Benjamin *et al*. (2010) argued that when the risks are low, banks may benefit more from specialization than from diversifying since there is a low probability of failure. Consequently, banks may tend to concentrate their resources on one or two portfolios. On the other hand, when risks are high, diversification may be profitable since the bank will be exposed to many sectors, and the downturn of one may be compensated by booms in the other sectors. The conclusion is that the typical risk-return trade off appears to be the solution of this analysis and banks are at their discretion to choose their own strategy in order to optimize allocation of their finances.

Alchin (1950) and Stigler (1958) stressed the importance of competition. On the same view, Berth *et al.* (2001) emphasize that competition among banks also do improve investment portfolios. For example, banking systems that permit foreign entry and that allow banks to compete along many dimensions enjoy higher levels of banking development and less banking sector fragility.

2.2 Empirical Literature

To determine whether bank assets are related to reserve requirements, Fama (1985) examined the incidence of the implicit tax due to reserve requirements. His argument was based on U.S. banks that are required to hold reserves against various kinds of liabilities. In particular, if banks must hold reserves against the issuance of certificates of deposit (CDs), then for each dollar of CDs issued, the bank will invest less than a dollar. The reserve requirement acts like a tax; commercial banks are denied an opportunity to invest this proportion. James (1987) revisited the issue and looked at portfolio changes around changes in reserve requirements and reached the same conclusion as Fama, that, reserve requirement acts like a tax.

King and Levine (1993) and Levine (1997) emphasized the importance of state regulation of banks in developing economies. They observed that banks have an overwhelmingly dominant position in developing economy financial systems, and are extremely important engines of economic growth through investment portfolios. In addition, as financial markets are usually underdeveloped, banks in developing economies are typically the most important source of finance for the majority of firms.

Bank-size literature has also focused on whether larger banks are less likely to lend to small firms or not. There are several overlapping motivations, one of which focuses on diseconomies of monitoring many loans. This would make larger banks prefer to focus their lending on large firms, since this requires fewer loans per dollar of assets. An alternative argument is that large organizations favor the use of “hard” information which may favor

lending to large firms, since more information is publicly available for them (Cerasi and Daltung, 2000).

Large firms as well, may prefer large banks simply because the level and complexity of their financial needs is beyond the capacities of a small bank or small group of small banks (Berger, Demsetz, and Strahan, 1999). The general finding is that large banks focus more on larger firms, and small banks on small firms. Thus, a number of studies show that small loans are a smaller fraction of total assets at large banks than at small banks. Berger and Udell (1996) noted that small firm loans at large banks have significantly lower rates and collateral requirements than those at small banks.

However, lending at small and large banks may target different types of borrowers. For instance, Berger *et al.* (2001) noted that large banks are better at evaluating hard information loan applicants and small banks are better at evaluating soft information loan applicants. Soft information implies informationally difficult credits as such firms do not keep formal financial records. Petersen and Rajan (2001) found empirical evidence that small banks lend to more localized firms than do large banks. However, none of these findings predict differences in the systematic risk of small versus large banks. In fact, many studies implicitly assume that bank betas are invariant to size and use them as a measure of overall bank risk. Brooks *et al.* (1997) examined the mean and variance of bank betas as a means of gauging the risk of banks across different regulatory time periods. Their study was similar to the previous studies by Allen and Wilhelm (1988), Aharony *et al*. (1988), Millon-Cornett and Tehranian (1989) and Dickens and Philippatos (1994).

Bank screening activities, on the other hand, seek to avoid making bad loans, commonly referred to as, non-performing loans (Boyd and Prescott, 1986). The emphasis is on avoiding or ameliorating bad outcomes which is in contrast to most non-financial firms, where firms' actions may also seek to improve good outcomes. Loans have limited upside, and the emphasis is on avoiding downside through monitoring. Since credit risk is correlated across loans in a given sector, the ex post gains from monitoring are greatest when a loan sector is in a downturn. In good times, the bank saves monitoring costs, while,

in bad times, the bank is more likely to fail, leaving its debt holders with much of the worse performance. In this case, diversifying across sectors can encourage and improve monitoring incentives.

In most instances it has been argued that given the special nature of banks and financial institutions some form of economic regulations are necessary. However, there is a notable shift from such regulations which have always been offered by governments over time in different economies all over the world. Arun and Turner (2002) observed that many governments around the world have moved away from economic regulations towards using prudential regulation as part of their reform process in the financial sector. They noted that prudential regulation involves banks having to hold capital proportional to their risk-taking (the Deposit Protection Fund in the Kenyan case), early warning systems, bank resolution schemes and banks being examined on an on-site and off-site basis by banking supervisors.

However, Brownbridge (2002) observed that the prudential banking reforms already implemented in many developing countries have not been effective in preventing banking crises such as wrong choices of portfolios and a question remains as to how prudential systems can be strengthened to make them more effective.

Arun and Turner (2002) joined the consensus by arguing that the special nature of banking requires government intervention through regulatory controls in order to restrain the behaviour of bank management as regards bank investment portfolios. According to Caprio and Levine (2002), regulatory restrictions on entry and takeovers also reduce competition among banks. Thus, from many angles, the opaqueness of the banking industry along with pervasive government regulations severely limits allocation of investible assets of banks.

Berger and Udell (2001) developed a complementary hypothesis in order to explain the markedly cyclical profile of loans and non-performing loan losses. They called it the institutional memory hypothesis and, essentially, it states that as time passes since the last loan bust, loan officers become less and less skilled in avoiding granting loans to high-risk borrowers. Firstly, the proportion of loan officers that experienced the last bust decreases as the bank hires new and younger employees, and, the former ones retire. Thus, there is a loss

of learning experience. Secondly, some of the experienced officers may forget about the lessons of the past, and the more far away is the former recession, the more they will forget and as a result tend to undertake similar investment portfolios.

Strong competition among banks erodes net interest and gross income margins as both loan and deposit interest rates get closer to the inter-bank rate. To compensate the fall in profitability, bank managers increase loan growth which may come at the expense of the quality of their future loan portfolios. Nevertheless, that will not impact immediately on problem loans and may encourage further loan growth. Credit growth satisfies managers' personal interests such as power and status and, even if it goes beyond reasonable levels, it might not trigger a response from them since they are subject to disaster myopia and fading memories of the last bust.

Empirically, in boom periods, when banks increase their lending at high speed, the seeds for rising problem loans in the future are being sowed. During recession periods, when banks curtail credit growth, they become much more cautious, both in terms of the quality of the borrowers and the loan conditions, that is, collateral requirements. Therefore, banking supervisors' concerns are well rooted both in theoretical and empirical grounds and deserve careful scrutiny and a proper answer by regulators. The former findings is known as procyclicality of ex ante credit risk as opposed to the behaviour of ex post credit risk (non-performing loans), which increases during recessions and declines in good periods. The main issue here is to realize that lending policy mistakes occur in good times and, thus, a prudential response from the supervisor might be needed at those times.

DeYoung and Roland (2001) showed that fee-based activities are associated with increased revenue volatility while Stiroh (2004) noted that a greater reliance on non-interest income, particularly trading revenue, is associated with more volatile returns and high risk investment portfolios. Chang and Elyasiani (2008) argue that diversification benefits exist for banks that expand into non-interest generating activities, that is, they are more competitive in investment opportunities. Incomes earned from those activities are deemed to compensate for low earning investment portfolios.

According to Boyd, Levine and Smith (2001), countries with high inflation have underdeveloped banking systems. Consequently, there is poor resource management. Huybens and Smith (1999) developed a theoretical model in which interest margins tend to rise in the presence of inflation interfering with investment portfolios. It is also notable that if investment opportunities in an economy are correlated with the business cycle, there may exist a positive relationship between business opportunities for banks and the growth rate of the economy. Economic growth would tend to increase incentives for private investments and hence bank credit portfolios. Constantinos and Sofoklis (2009) reiterated that as for the macroeconomic environment where the banks under review operate, the catalyst for their respective investment decisions and profitability could be perceived to be the inflation rate, which in this case was proxied by CPI.

According to Ndagire (2011), commercial banks may invest in either loans or government securities as alternate investment options. The two, that is, loans and government securities as alternate commercial bank assets, have different risk and return profiles. Therefore, commercial banks' volume of loans and volume of government securities could trade off each other given that yields and risks associated with them are varied. This hypothesis draws insights from portfolio theories (modern and classical), which analyze the risk-reward characteristics of investment portfolios.

Commercial banks in Kenya are faced with huge deposits and varied investment opportunities. Nevertheless, banking investment decisions generally are fraught with a great deal of risks, which calls for a great deal of caution and tact in this aspect of banking operations. The success of every investment activity to a great extent therefore, hinges on the investment appraisals. Felicia (2011) stressed that while a bank is irrevocably committed to pay interest on deposits it mobilized from different sources, the ability to articulate loanable avenues where deposit funds could be placed to generate reasonable income, maintain liquidity and ensure safety requires a high degree of pragmatic policy formulation and application. It is also clear that commercial banking by its nature is highly prone to volatility and fragility. This could be as result of factors arising from exogenous

shocks or endogenous policy measures and therefore, amenable to statutory regulations and supervision.

The importance of commercial banks in intermediation of funds is more pronounced in developing countries where financial markets are underdeveloped. They are typically the only major source of finance for investment by the majority of individuals and firms, are, usually the main depository of economic savings (Gongera *et al.,* 2013). These economic savings are held as deposit liabilities (held on behalf of customers) and are mainly invested as loans and advances, government securities and placements with other commercial banks. It is not surprising therefore, that governments all over the world, attempt to evolve an efficient banking system, not only for the promotion of efficient intermediation, but also for the protection of depositors, encouragement of efficient competition, maintenance of confidence and stability of the system and protection against systemic risk (Babalola, 2012). The main protective measures include maintenance of cash and liquidity reserve ratios.

2.3 Overview of the Literature

From the literature cited above it is clear that extensive research has been conducted in developed countries to examine the relationship between commercial banks' investment portfolios and their individual determinants. Specifically, there is a very strong consensus between theoretical and empirical literature on regulatory control. Prudential guidelines that guarantee safety and stability of the financial sector towards supporting efficient resource allocation, is clearly portrayed. Specifically, Felicia (2011) confirmed that commercial banking by its nature is highly prone to volatility and fragility. This could be as result of factors arising from exogenous shocks or endogenous policy measures and therefore, amenable to statutory regulations and supervision. Arun and Turner (2002) and the Basel Committee on Banking Supervision (1999) concurred by arguing that banking requires government intervention through regulatory controls in order to restrain the behaviour of bank management as regards bank performance.

However, most of the literature cited above have focused on developed countries with relatively well-developed financial markets and also seemed to consider each factor in isolation; more so, on performance or profitability of commercial banks rather than on allocation of assets. In addition, the existing literature did not give much on effects of deposit liabilities, inflation and reserve requirements on investment portfolios, and especially, government securities and placements. This leaves a huge literature gap on developing countries such as Kenya which this study sought to fill.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methodology employed to examine the determinants of commercial bank's investment portfolios in Kenya. A theoretical framework for the study is first outlined followed by the specification of the empirical model. The variables used in the study are explained, including sources of data and diagnostic tests employed on the data.

3.2 Theoretical Framework

Management of investment portfolio, which is a strategy to manage asset portfolio across various factor exposures in order to promote performance of commercial banks, has now become a great tenet of finance theory (Graham and Harvey, 2002). Deciding on how to allocate deposit liabilities on the basis of influencing factors is not a simple task because the relative profitability and safety among other objectives depend on the choice of specific portfolio structure. This creates controversy among both academicians and practitioners when considering investment portfolios to be pursued by banks. It also explains why it is not yet clearly established whether or not banks really do consider portfolio effects when adjusting the structure of their credit portfolios. The question of whether banks should adjust their investment portfolios to achieve an optimal combination of expected portfolio return, liquidity, safety and variance has not yet been answered in the economic literature.

According to Winton (1999), investment portfolio across sectors and regions based on the factors that influence portfolios, reduced the chance of costly financial distress and made it cheaper for financial institutions to achieve credibility in their role as screeners and monitors of borrowers. However, further argument stated that financial institutions like any firms should focus on a single line of business so as to take the greatest advantage of management expertise and reduce agency problems. The two views do not agree in that the former one assumed that the level of cost associated with portfolio adjustment by financial institutions is small, while the latter took it as significant and focused on specialisation.

The general consensus from the literature reviewed on commercial bank portfolios is that the appropriate functional form for analysis is linear. Short (1979) and Bourke (1989) considered several functional forms and concluded that the linear model produced results as good as any other functional form. In support of this, Balachandher *et al.* (2008) considered a linear model in their studies on bank profitability which could be extended to bank portfolios holdings. Thus, in this study as well, a linear model was used to analyze a pooled cross-sectional time series data to isolate the portfolio determinants of Kenyan commercial banks. However, it should be noted that some banks may be enjoying some firm specific advantages due to corporate image or relationships which may not be easily captured or quantifiable. These were accounted for by use of dummy variables.

In addition, economic booms and recessionary periods may also affect portfolio holdings of commercial banks (Balachandher *et al.* (2008)). These varying economic conditions from one year to another may have an impact on the commercial bank portfolios. Thus, regression parameters may be affected and change over time. An effort was made to capture the effect of temporal and cross-sectional differences on commercial bank portfolios by including dummy variables in the linear model. The implicit assumption in the model is that the effects of the temporal and cross-sectional differences are limited to the intercept term. This is a necessary assumption because if the slopes were to vary as well over time and cross-sectional units, then according to Pindyck and Rubinfeld (1991) each separate cross-section regression, would involve a distinct model and pooling would be inappropriate.

In line with the foregoing discussion and based on Pindyck and Rubinfeld (1991) the general unrestricted model for this study where the intercepts are not restricted to be equal over time and cross-sectional units may be stated as equation (3.1).

$$Y_{it} = \beta_0 + \sum_{i=2}^{N} \mathbf{y}_i \mathbf{D}_{it} + \sum_{t=2}^{T} \boldsymbol{\lambda}_t \mathbf{W}_{it} + \sum_{k=1}^{K} \beta_k X_{kit} + \boldsymbol{\varepsilon}_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Where,

Y_{it} = the portfolio measure of bank *i* in year *t*

X_{kit} = k_{th} independent variable for bank *i* in year *t*

D_{it} = the dummy variable to account for cross-sectional differences

W_{it} = the dummy variable to account for temporal differences

N = the total number of commercial banks included in the sample

T = the total number of time periods

k = the total number of independent variables

ε_{it} = the error term

The firm specific dummy variable, D_{it} assumes a value of one for *i*-th firm and zero otherwise, for the time period t=2 to T. On the other hand, the dummy variable, W_{it} assumes a value of one for the *t*-th year and zero otherwise for i=2 to N. It is worth noting that only N-1 dummy variables are included to account for cross-sectional differences and T-1 dummy variables for temporal differences. The reason for this is to avoid the problem of perfect multicollinearity among the dummy variables. A further necessary assumption for the model is that the $\varepsilon_{it's}$ are independently and identically distributed as N (0, σ2). Before applying the ordinary least squares (OLS) regression techniques, the general unrestricted model represented by equation (3.1) is tested for temporal and cross-sectional stability.

In the presence of both temporal and cross-sectional stability, the intercept would be equal over time and cross-sectional units and thus the dummy variables W_{it} and D_{it} would be irrelevant and hence be removed to yield the following model:

$$Y_{it} = \beta_0 + \sum_{k=1}^{K} \beta_k X_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

The decision whether or not to include the dummy variables in the portfolio model is based on statistical testing which engages the comparison of the error or residual sum of squares (RSS) of the unrestricted and the restricted models by using the following F-test (Doran and Guise, 1984; and Pinyck and Rubinfeld,1991):

$$F \quad \overline{\qquad\qquad} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

Where,

RSSr = Residual sum of squares of the restricted model

RSSur = Residual sum of squares of the unrestricted model

M = Number of linear constraints in the restricted model

N = Sample size

k = Number of parameters in the unrestricted model

The objective of the above test is basically to determine the joint significance of the omitted variables in the restricted model. If the omitted variables have no significant effect on the dependent variable then the error sum of squares of the restricted model will not be very different from the error sum of squares of the unrestricted model. The value of [RSSr-RSSur] will be small and hence result in a small F-value which would indicate that the omitted variables are jointly and statistically insignificant.

3.3 Empirical Model

In line with the above modeling, the study assessed the impact of interest rate, deposit liabilities, bank regulation (cash and liquidity reserve requirements), bank risk, non-performing loans and interest rate elasticity, bank-specific characteristics (fee income and bank size) and the macroeconomic and financial variable (inflation) on bank investment portfolios. This was done by estimating a system of simultaneous regression equations for each investment portfolio as specified under the empirical model. Regulations in form of guidelines were captured by the error term, ε_k.

Explicitly, the following panel regression equations were proposed for the bank panel data.

$$\text{LOANPORT, } L_{it} = \beta_0 + \beta_1 Rr_{it} + \beta_2 Da_{it} + \beta_3 Crr_{it} + \beta_4 Lrr_{it} + \beta_5 BR_{it} + \beta_6 NPL_{it} + \beta_7 Re_{it} + \beta_8 Bk_{it} + \beta_9 MF_{it} + \varepsilon_{it} \ldots (3.4)$$

$$\text{GOVPORT, } G_{it} = \beta_0 + \beta_1 Rr_{it} + \beta_2 Da_{it} + \beta_3 Crr_{it} + \beta_4 Lrr_{it} + \beta_5 BR_{it} + \beta_6 NPL_{it} + \beta_7 Re_{it} + \beta_8 Bk_{it} + \beta_9 MF_{it} + \varepsilon_{it} \ldots (3.5)$$

$$\text{PLACPORT, } Pit = \beta_0 + \beta_1 Rr_{it} + \beta_2 Da_{it} + \beta_3 Crr_{it} + \beta_4 Lrr_{it} + \beta_5 BR_{it} + \beta_6 NPL_{it} + \beta_7 Re_{it} + \beta_8 Bk_{it} + \beta_9 MF_{it} + \varepsilon_{it} \ldots (3.6)$$

Where,

LOANPORT, L_{it} is Loan portfolio ratio of bank *i* in year *t*

GOVPORT, G_{it} is Government Securities portfolio ratio of bank *i* in year *t*

PLACPORT, P_{it} is Placements portfolio ratio of bank *i* in year *t*

β_0 is constant term

Rr_{it} is rate of return

Da_{it} is deposit asset ratio

Crr_{it} is cash reserve ratio

Lrr_{it} is liquidity reserve ratio

BR_{it} is bank risk

NPL_{it} is Non-Performing Loans

Re_{it} is Interest rate Elasticity

Bk_{it} is a vector of bank specific characteristics, i.e. fee income and bank size

MF_{it} is macroeconomic and financial variable, i.e. rate of inflation.

ε_{it} is the residual.

$\beta_{1,.....}$ β_9 are the regressor coefficients that were estimated and their apriori expectations are as follows: β_2 and $\beta_8 > 0$ while β_1, β_3, β_4, β_5, β_6, β_7 and $\beta_9 < 0$

According to Ahamed (2012), cross-sectional data deals with different firms at a given point in time, and, as such firms may be of different sizes resulting in heteroskedasticity. Therefore, to check for the heteroskedasticity and autocorrelation problems, equations (3.4), (3.5) and (3.6) were tested. In the presence of positive autocorrelation and heteroskedasticity, the OLS estimation would provide biased and incorrect standard errors. Hausman test was also conducted to decide on whether to use fixed effects (FE) or random effects (RE).

3.4 Definition and Measurement of variables

LOANPORT: This is the yearly sum of assets invested in loans and advances expressed as proportion of the total portfolios.

GOVPORT: This is the yearly sum of assets invested in government securities expressed as proportion of the total portfolios.

PLACPORT: This is the yearly sum of assets invested in other banks expressed as proportion of the total portfolios.

Total portfolio is the sum of assets invested in loans and advances, government securities and placements with other banks.

Return (R): This measures the yield of investment portfolios held by the bank with other parties. It is measured as yearly interest income minus interest expense divided by interest-bearing assets. It is normalized by use of interest-bearing assets rather than total bank assets. Investment portfolios include loans and advances, government securities and placements with other financial institutions.

$$\text{Return (Yearly)} = \frac{\text{Interest income} - \text{Interest expense}}{\text{Interest bearing assets}}$$

Deposit asset ratio (Da): This stands for deposits expressed as percentage of bank's total assets. Deposits are received by financial institutions from their clients through current account, saving account and fixed account. Deposit liability is the main source of fund of the financial institutions.

Cash Reserve ratio (Crr): This is the proportion of commercial bank's deposits held as reserves at the CBK.

Liquidity reserve ratio (Lrr): This is the proportion of commercial banks' deposits that banks must hold in the bank as reserves. It remained 20% throughout the period.

The Crr and Lrr are regulatory controls that CBK imposes on commercial banks in their operations.

Bank risk (BR): Bank risk equals the standard deviation of the rate of return on bank assets each year.

Bank risk (Br) _____

Where i is year 1…6

Br is the mean return each year.

Br_i is the bank's return each year.

Non-performing Loans (NPL): This was measured by dividing non-performing loans by the total interest bearing assets of the bank each year, i.e.

$$\text{NPL} = \frac{\text{Sum of Non} - \text{performing Loans}}{\text{Interest Bearing Assets}}$$

Interest rate elasticity (Re): This is the responsiveness of demand for interest bearing assets towards changes in interest rate. Thus,

_____

_____

Bank-specific characteristics (Bk): This study used fee income and bank size as bank-specific variables for the fifteen banks:-

Fee income (Fy): This refers to income earned from products offered to clients by banks. A well-developed fee income sources will enable banks to lower interest margins and hence increase the investment portfolios. It was considered as proportion of interest bearing assets each year.

$$\text{Fee Income} = \frac{\text{Non} - \text{interest operating income}}{\text{interest bearing assets}}$$

Bank size (Bs): Bank size equals the average of each bank's assets in millions of Kenya Shillings each year. Size may be an important determinant of investment portfolio especially if there are increasing returns to scale in banking. However, this study did not explore issues relating increasing returns. i.e.

$$\text{Bank Size (Yearly)} = \frac{\text{Individual bank assets}}{\text{Total banks' assets}}$$

Macroeconomic and financial variable (MF): This measured by inflation rate and is an indication of macroeconomic instability which can have adverse effect on banks investment. High and unpredictable inflation distorts the information content of relative prices and increase the riskiness of longer-time investment. The impact of inflation depends on whether it is mild or serious. In this study, CPI was used as a measure of inflation rate.

3.5 Data Collection

The study used secondary data which was collected from a sample of 15 banks' annual balance sheets, income statements, Central Bank annual reports and Banking Survey 2012. The banking Survey is an annual publication of annual financial statement of all banks in Kenya covering a period 10 years, while the Central Bank of Kenya publishes annually major financial indicators of the sector. The main focus was on annual volumes of loans and advances, government securities and placements with other financial institutions by individual banks between 2007 and 2012. This provided the study with a panel data which is useful in controlling unobservable individual heterogeneity which would otherwise lead to biased and inconsistent estimator. Panel data also provided rich information about cross-sectional variations and dynamics, avoid problems such as multicollinearity, aggregation bias and non-stationarity encountered in time series data. It was also useful in identifying individual and time effects which could not be identified by pure cross-sectional or time

series data. In this case, panel data allowed a detailed account of the dynamic developments of the Kenya banking sector.

3.6 Diagnostic tests

Diagnostic tests are typically used as a means of indicating model inadequacy or failure. For example, in the case of a linear regression model which is estimated by OLS, a series of diagnostic tests could be used to indicate whether any of the assumptions required for OLS to be the best linear unbiased estimator (BLUE) appear to be violated. These assumptions include serially uncorrelated and homoscedastic error term, absence of correlation between the error term and the regressors and correct specification of the model. Diagnostic tests play an important role in the model evaluation stage of econometric studies (Otto, 1994). This study carried out Hausman test to confirm whether or not the unique errors (ui) were correlated with the independent variables.

Breausch-Pagan LM test of heteroscedasticity was also conducted to test if the variance of the residual term was constant over different values of the explanatory variables. The LM test helped to decide between random effects estimation and simple OLS estimation. The null hypothesis in the LM test is that variance across entities is zero. According to Torres-Reyna (2010), there is no significant difference across units and hence, there is no panel effect.

3.7 Data Analysis

Before embarking on complex data analysis, descriptive statistics of all variables was done to examine the trends in the data. Hausman test and Lagrange Multiplier test (Breusch-Pagan, 1980) were also conducted on the fixed and random effect models so as decide on whether to use fixed effect estimation or random effects estimation. This was followed by maximum likelihood estimation (MLE) to establish the relationship between the dependent variable and the independent variables. The data analysis was done using STATA econometric software.

CHAPTER FOUR

EMPIRICAL FINDINGS

4.1 Introduction

This chapter summarizes the study findings and is therefore organized in two sections: summary of explanatory variables, presentation, interpretation and discussion of results.

4.2 Descriptive Statistics

4.2.1 Loans and advances

In this section the characteristics of the sample used in the study are analyzed. Investment in loans and advances reflected the extent to which the sample banks mobilized their deposit liabilities in creating credit to their customers. Table 4.1 gives an in-depth description of the variables, the mean, standard deviation, minimum and maximum values.

Table 4.1: Descriptive statistics of the loans and advances' variables

Variable	Observation	Mean	Std. Dev.	Min	Max
Code (Bank)	90	8	4.345	1	15
Year	90	2009.5	1.717	2007	2012
Rate of return	90	0.082	0.041	0.018	0.179
Deposit asset ratio	90	0.794	0.065	0.590	0.879
Cash reserve ratio	90	0.051	0.005	0.045	0.060
Liquidity reserve ratio	90	0.200	0.000	0.200	0.200
Bank risk	90	0.014	0.008	0.003	0.038
Non-performing loans ratio	90	0.022	0.024	0.000	0.140
Interest elasticity	90	-2.674	5.553	-39.390	8.280
Fee income ratio	90	0.037	0.028	0.000	0.142
Bank size	90	0.065	0.100	0.009	0.940
Inflation	90	0.113	0.063	0.035	0.239
Loans and advances	90	0.637	0.129	0.231	0.816

Source: Panel results: 2007 - 2012.

As stated in the above, table 4.1, the loan portfolio (loans and advances) measurement indicates that, the Kenyan commercial banks had an average positive loan portfolio over the six years. From the total of 90 observations, the loan portfolio ratio mean was 0.637 with a minimum of 0.231 and a maximum of 0.816. This meant that the highest level of

investment in loans expressed as a proportion of total portfolio (loan and advances plus government securities plus placements with other banks) was 0.816 while the lowest was 0.231. Deposit asset ratio ranged between 0.59 and 0.879 giving an average of 0.794. This implied that commercial banks depended solely on the deposit liabilities from their customers. Cash reserve requirement ratio had a mean value of 0.051 with the lowest and highest cash reserve ratio (Crr) being 0.045 and 0.06 respectively. This meant that the government did not vary this ratio significantly just like liquidity reserve ratio which was held constant, (0.2), throughout the period. Possibly, this was to allow commercial banks to operate freely and maximize from credit creation.

The bank risk (Br) which is basically variability of bank returns had a mean of 0.014. Again, from the standard deviation, 0.008, it is clear that this did not vary much over the research period. Banks could easily predict the outcome of their investments. Non-performing loans, which is a proportion of dishonoured loans to the total loans issued to the customers, had a mean of 0.022 with the lowest and the highest rates being 0 and 0.14 respectively. This was an indication that there were some banks that used Credit Reference Bureaus (CBR) or hard information efficiently such that non-performing loans were reduced to zero over the period. CRB, provide creditors with reliable, relevant and comprehensive data on the repayment habits and current debt of their credit applicants. Under reciprocity agreements, credit bureaus obtain data from creditors and other sources, consolidate and package information into individual reports, and distribute it to creditors at a fee. They provide a number of benefits to the creditor and the applicant including more access to credit by allowing creditors to differentiate good and bad credit risks, reducing the cost of borrowing to good risks by increasing competition, and creating a credit culture as borrowers become aware that the market rewards and sanctions them based on their repayment history.

Interest rate elasticity fluctuated between -39.39 and 8.28 giving a mean of -2.67 with a standard deviation of 5.55. From the positive elasticity figure, it could be deduced that some banks are capable of adjusting incentives given to customers and retain them even when interest rates hiked. Fee income ranged between 0 and 0.142 giving an impression

that there were some banks that made zero net fee income from their non-funded activities. Fee income could enable a bank charge fair interest rates or even embark on an intensive up-market strategies. Bank size indicated that the lowest and biggest banks had asset ratios of 0.009 and 0.94 respectively giving a mean of 0.065. The banking industry was composed of small and big banks, the latter having an advantage of operating in large scale. From the 90 observations, inflation rate ranged between 0.035 and 0.239. On average, that was 0.113. Inflations cause speculations and could culminate into a hyper- inflation if it is not checked. The difference between the lowest and highest figures suggests that this might have happened during the period and, possibly tampered with financial institution systems.

4.2.2 Government Securities

Investment in government securities reflected the extent to which the sample banks were successful in mobilizing their deposit liabilities in purchasing securities to generate income. Government securities portfolio was estimated as a proportion of total portfolio. Table 4.2 gives a description of the government securities' variables, their mean, standard deviation, minimum and maximum values.

Table 4.2: Descriptive statistics of the government securities' variables

Variable	Observation	Mean	Std. Dev.	Min	Max
Code (Bank)	90	8	4.345	1	15
Year	90	2009.5	1.717	2007	2012
Rate of return	90	0.088	0.033	0.026	0.280
Deposit asset ratio	90	0.794	0.065	0.590	0.879
Cash reserve ratio	90	0.051	0.005	0.045	0.060
Liquidity reserve ratio	90	0.200	0.000	0.200	0.200
Bank risk	90	0.023	0.018	0.004	0.080
Non-performing loans ratio	90	0.000	0.000	0.000	0.000
Interest rate elasticity	90	-6.038	22.801	-192	5.720
Fee income ratio	90	0.094	0.064	0.001	0.332
Bank size	90	0.065	0.100	0.009	0.940
Inflation rate	90	0.113	0.063	0.035	0.239
Government Securities	90	0.283	0.137	0.073	0.664

Source: Panel results: 2007 - 2012.

With the government portfolio ratio, the mean is 0.283 from the 90 observations. Earnings from government securities were not as much as those from loans and advances where risks were high. Therefore, the proportion of assets invested in government securities was small.

The main advantage with government securities is that returns are guaranteed, hence no non-performing loans. Bank risk was also minimal and amounted to 0.023 on average. This could not affect much the commercial banks' rate of return holding all other variables constant. Interest rate elasticity fluctuated between -192 and 5.72 giving an average of -6.038. Inevitably, less would be invested in securities when interest decreases hence a positive interest rate elasticity of 5.72. Nonetheless, there are some banks that opted to invest more even with lower interest rates possibly because securities are safer. This resulted in negative interest rate elasticity (-192). Fee income ratio, on average was 0.094 with the lowest and the highest being 0.073 and 0.664 respectively. Fee income ratio was fee income expressed as a proportion of government portfolio. Therefore, fee income to government portfolio is smaller than it is to placement portfolio, but definitely higher than it is to loan portfolio.

4.2.3 Placements with other banks

Investment in placements with other banks reflected the extent to which the sample banks lent to other commercial banks. Placements portfolio was estimated as a proportion of commercial banks' investment portfolio. Table 4.3 gives a description of the placements with other banks' variables, the mean, standard deviation, minimum and maximum values.

Table 4.3: Descriptive statistics of the placements with other banks' variables

Variable	Observation	Mean	Std. Dev.	Min	Max
Code(Bank)	90	8	4.345	1	15
Year	90	2009.5	1.717	2007	2012
Rate of Return	90	0.048	0.023	-0.813	2.230
Deposit asset ratio	90	0.794	0.065	0.590	0.879
Cash reserve ratio	90	0.051	0.005	0.045	0.060
Liquidity reserve ratio	90	0.200	0.000	0.200	0.200
Bank risk	90	0.145	0.057	0.000	0.798
Interest elasticity	90	-7.533	38.967	-136	13.340
Fee income ratio	90	1.183	3.843	0.000	29.920
Bank size	90	0.065	0.030	0.009	0.940
Inflation	90	0.113	0.063	0.035	0.239
Placements	90	0.080	0.072	0.001	0.292

Source: Panel results: 2007 - 2012.

With placements portfolio ratio, the lowest and the highest ratios were 0.001 and 0.292 giving a mean of 0.0804. 0.292 indicated the highest level of proportion of total portfolios

committed to placements with other financial institutions over the period. Compared with loan portfolio ratio, that was relatively small. On average, the rate of return was 0.0486. From the lowest figure, it can be deduced that some banks made a negative rate of return (-0.813), implying that they earned less than what they paid to other banks for the placements. During crisis (specific or macro) some bank may be hit more than others and end up borrowing and paying more than what they have made. Bank risk, on the basis of return associated with placements varied between 0 and 0.798. Fee income ratio averaged to 1.183, meaning that compared with placements, it was about 1.2 times. Fee income coefficient is therefore, very significant during interest rate fluctuations.

4.3 Correlation Analysis Results

In table A2, A3, and A4 (see the Appendix II) the correlation matrix between variables is presented. The results supported some level of correlation between loans and advances, government securities and placements with other banks rate of return, deposit asset ratio, cash reserve ratio, liquidity reserve ratio, bank risk, non-performing loans, interest rate elasticity, fee income and bank size and rate of inflation. Overall, with the correlation coefficients between the variables in the range below 0.5, indicated that multicollinearity was not an issue in these estimations as no two variables were highly correlated. Hailer et al. (2006) supported that multicollinearity problem should only be corrected when the correlation is above 0.8 and 0.9 respectively.

Rate of returns exhibited a sizeable negative correlation with deposit asset ratio (-0.330).This implied that the rate of return that was realised as a result of high interest spreads could have discouraged depositors/ savers. More deposits could also have made acquired at the expense of rate of returns. Loans had also a negative correlation with fee income (-0.314) and bank risk (-0.435). Increase in fee income could discourage banks from being aggressive in loaning out their funds especially with fluctuation of interest rates. Nonetheless, productive loans would make banks relax and not embark on non-funded activities. Bank risk discourages issuance of loans while loan diversification reduces the bank risks. Inflation rate was also negatively correlated with interest rate elasticity, (-0.453), possibly because inflation and interest rates are macroeconomic variables and

would affect each other inversely. Non-performing loans (NPL) correlated with loans negatively (-0.227). High Non-performing loans discourage commercial banks from giving out loans while high volumes of loan based on diversification and hard information reduces chances of non-performing loans. Rate of returns on the other hand correlated positively with loans, (0.347), bank risk (0.214) and fee income ratio (0.359). Higher rate of returns would encourage banks to venture into more markets though it leads to higher bank risks. Well diversified loans with higher banks risks would in turn lead to high returns. Fee income ratio may enhance banks to undertake quality marketing strategies and make good returns.

4.4 Diagnostic Test Results

Diagnostic tests were based on the fixed and random effect models associated with loans and advances, government securities and placements with other banks. The F test and Wald test reported in the output of the fixed and random effect models respectively indicated overall goodness-of-fit (Appendix III, IV and V).

4.4.1 Hausman test results on loans and advances

The decision on whether to use fixed or random effects model in the study was reached through Hausman test where the null hypothesis was that, the preferred model was random effects versus the alternative the fixed effects. The test was carried to determine whether or not the unique errors (u_i) were correlated with the regresssors. The null hypothesis was that there was no correlation between the unique errors (u_i) and the regresssors.

Table 4.4: Hausman Test Results on Loans and advances

Variables	Coefficients			sqrt(diag(V_b-V_B)) S.E
	Fixed effects (b)	random effects (B)	Difference (b-B)	
Rate of return	-0.017	0.650	-0.667	0.260
Deposit asset ratio	-0.274	-0.278	0.004	0.088
Cash reserve ratio	1.552	1.358	0.194	0.000
Non-performing loans	-0.459	-0.529	0.070	0.030
Interest rate elasticity	0.002	0.001	0.001	0.000
Fee income ratio	-2.119	-1.866	-0.253	0.096
Bank size	-0.050	-0.022	-0.028	0.012
Rate of inflation	0.239	0.235	0.003	0.000

Test: Ho: difference in coefficients not systematic

Ha: difference in coefficients is systematic

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 6.93

Prob>chi2 = 0.544

Source: Panel results, Stata 12

The computed Chi-square value at 8 degrees of freedom was 6.93 which is less than the p-value at 54.4% which is greater than the 5% level of significance. Therefore, DWH test supported that there was no significant and systematic difference in the coefficients. That is, there was no correlation between the unique errors (u_i) and the regresssors. Hence, the null hypothesis was not rejected and random effects estimation was favoured against fixed effects estimation. The following LM test was therefore conducted to decide on whether to use OLS or random effects estimation.

4.4.2 Breusch-Pagan LM test results on Loans and Advances

The test was carried out using the Breausch-Pagan LM test and test null hypothesis Ho was no heteroscedasticity exist. The results were as shown by table 4.5.

Table 4.5: LM test results loans and advances

	Var	Sd = sqrt(Var)
Loan and advances	0.017	0.129
Error	0.004	0.066
Uncorrected total	0.008	0.087
Test: Var(u) = 0	chi2(1) = 40.36	Prob > chi2 = 0.000

Source: Panel results, Stata 12

The Chi-square value at 1 degree of freedom was 40.36, which is less than the p-value at 0.000. It therefore meant that the variance of the random component was not constant at 1% significant level. There was presence of random effects. Hence, the null hypothesis was rejected and random effects estimation was favoured against OLS estimation which could otherwise have given inconsistent and biased estimators.

4.4.3 Hausman test results on government securities

The decision on whether to use fixed or random effects model in the study was made through Hausman test where the null hypothesis was that the preferred model was random effects versus the alternative the fixed effects.

Table 4.6: Hausman test results government securities

Variables	**Coefficients**			**sqrt(diag(V_b-V_B)) S.E**
	(b) Fixed effects	**(B) Random effects**	**(b-B) Difference**	
Rate of Return	-0.583	-0.528	-0.055	0.048
Deposit asset ratio	-0.199	0.205	0.007	0.066
Cash reserve ratio	0.882	0.994	-0.112	0.197
Interest elasticity	-0.000	-0.001	0.000	0.000
Fee income ratio	-0.800	-0.863	0.063	0.053
Bank size	0.050	0.049	0.000	0.014
Inflation	-0.178	-0.169	-0.010	0.015

Test: Ho: difference in coefficients not systematic

Ha: difference in coefficients are systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 1.93

Prob>chi2 = 0.964

Source: Panel results, Stata 12

The computed Chi-square value at 7 degrees of freedom was 1.93 which is less than the p-value at 96.4% which is greater than the 5% level of significance. Therefore, DWH test indicated that there was no significant and systematic difference in the coefficients. That is, there was no correlation between the unique errors (u_i) and the regresssors. Hence, the null hypothesis was not rejected and random effects estimation was favoured against fixed effects estimation. The following LM test was therefore conducted to decide on whether to use OLS or random effects estimation.

4.4.4 Breusch and Pagan LM test results on government securities

The test was done using the Breusch-Pagan LM test and the null hypothesis Ho was no heteroscedasticity existed. The results were as shown in table 4.7.

Table 4.7: LM test results government securities

	Var	Sd = sqrt(Var)
Government Portfolio	0.019	0.137
Error	0.003	0.055
Uncorrected total	0.012	0.108
Test: Ho: Var(u) = 0	chi2(1) = 103.00	Prob > chi2 = 0.000

Source: Panel results, Stata 12

The Chi-square value at 1 degree of freedom was 103.00, which is less than the p-value at 0.000. It therefore meant that the variance of the random component was not constant at 1% significant level. There was presence of random effects. Hence, the null hypothesis was rejected in favour of the alternative hypothesis. Random effects estimation was therefore preferred to OLS estimation which could otherwise have given inconsistent and biased estimators.

4.4.5 Hausman test results on placements with other banks

The decision on whether to use fixed or random effects model in the study was made through Hausman test. The test was carried to determine whether or not the unique errors (u_i) were correlated with the regresssors. The null hypothesis was that there was no correlation between the unique errors (u_i) and the regresssors.

Table 4.8: Hausman Test Results on placements with other banks

Variables	**Coefficients**			**sqrt(diag(V_b-V_B)) S.E**
	(b) Fixed effects	**(B) random effects**	**(b-B) Difference**	
Rate of Return	-0.022	-0.019	-0.003	0.003
Deposit asset ratio	0.124	0.155	-0.031	0.065
Cash reserve ratio	1.455	1.400	0.054	0.169
Interest rate elasticity	-0.001	-0.001	-0.000	0.000
Fee income ratio	-0.001	-0.001	0.001	0.001
Bank size	0.027	0.011	0.016	0.014
Rate of inflation	0.103	0.104	-0.001	0.014

Test: Ho: difference in coefficients not systematic

Ha: difference in coefficients is systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 1.71

Prob>chi2 = 0.974

Source: Panel results, Stata 12

The computed Chi-square value at 7 degrees of freedom was 1.71 at p-value of 0.974. Therefore, DWH test indicated that there was no significant and systematic difference in the coefficients. That is, there was no correlation between the unique errors (u_i) and the regresssors. Hence, the null hypothesis was not rejected and random effects estimation was favoured against fixed effects estimation. The following LM test was therefore conducted to decide on whether to use OLS or random effects regression.

Table 4.9 Breusch-Pagan LM test results on placements with other banks

	Var	Sd = sqrt(Var)
Placements	0.005	0.072
Error	0.002	0.043
Uncorrected total	0.003	0.057

Test: Ho: Var(u) = 0 Ha: Var(u) ≠ 0

chi2 (1) = 56.66 Prob > chi2 = 0.000

Source: Panel results, Stata 12

The Chi-square value at 1 degree of freedom was 56.66, which is less than the p-value at 0.000. It therefore meant that the variance of the random component was not constant at 1% significant level. There was presence of random effects. Hence, the null hypothesis was not accepted and random effects estimation was favoured against OLS estimation which could otherwise have given inconsistent and biased estimators.

4.5 Regression test results

4.5.1 Loan Portfolio ratio

As a result of presence of heteroscedasticity, random effects maximum likelihood estimation was applied to the loan portfolio dataset for the period 2007 to 2012. Table 4.10 indicates the estimation results for the loan and advances.

Table 4.10: Loan Portfolio ratio random effects ML estimation results

Variable	Coefficient	Std. Error	z	p>|z|
Rate of Return	0.696	0.319	2.18	0.029**
Deposit asset ratio	-0.278	0.101	-2.75	0.006***
Cash reserve ratio	1.342	0.509	2.64	0.008***
Bank risk	-4.026	2.148	-1.87	0.061*
Non-performing loans ratio	-0.533	0.264	-2.02	0.043**
Interest elasticity	0.001	0.001	1.55	0.121
Fee income ratio	-1.844	0.444	-4.15	0.000***
Bank size	-0.020	0.011	-1.82	0.068*
Inflation	0.235	0.107	2.20	0.027**
Constant	0.849	0.185	4.58	0.000***

Log likelihood = 102.632 LR chi2(9) = 33.20 Prob > chi2 = 0.000
Likelihood-ratio test of sigma_u=0: chibar2(01) = 32.12 Prob>=chibar2 = 0.000

Note: *** 1% level of significance
** 5% level of significance
* 10% level of significance

Source: Panel results, Stata 12

The Wald test statistic implies that the coefficients of the explanatory variables are significantly different from zero, thus justifying their inclusion in the model. The Wald test assumes a chi-square distribution. This is also supported by the likelihood ratio (LR) test

statistic which is significant. The log likelihood statistic shows the point at which the sample mean converges to the population mean, that is, where the function is maximized. In this case log likelihood value is 102.632 and converged after 5 iterations.

Deposit asset, cash reserve and fee income ratio coefficients were significant at 1% while rate of return, non-performing loans and rate of inflation coefficients were significant at 5%. Coefficients of bank risk and bank size were significant at 10% level.

Bank risk, fee income and cash reserve ratios with coefficients of -4.026, -1.844 and 1.342 respectively are the main determinants of loans and advances. Bank size and interest rate elasticity did not influence loans and advances greatly as confirmed by their coefficients of -0.020 and 0.001 respectively. The negative coefficient associated with fee income is consistent with the empirical findings of DeYoung and Roland (2001) which supported that an increase in fee income would enable banks to meet their operational expense more effectively and hence avoid the temptation of investing in risky areas which can only be assessed from soft information. Hence there exists an inverse relationship between loan portfolio and fee income. Chang and Elyasiani (2008) supported that diversification benefits exist for banks that expand into non-interest generating activities, which enable them to become more competitive in investment opportunities. Incomes earned from those activities compensate for the cash reserve requirements and boost bank's investments portfolios, hence a positive coefficient. Bank screening activities as suported by Boyd and Prescott (1986) seeks to avoid bank risks and non-performing loans. There is therefore an inverse relationship between loan portfolio and bank risk.

4.5.2 Government Portfolio ratio

As a result of presence of heteroscedasticity, random effects maximum likelihood estimation was applied to the government portfolio ratio dataset for the period 2007 to 2012.

Table 4.11: Government portfolio ratio random effects ML estimation results

Variable	Coefficient	Std. Error	Z	p> | z |
Rate of Return	-0.517	0.211	-2.45	0.014**
Deposit asset ratio	-0.207	0.072	-2.88	0.004***
Cash reserve ratio	1.016	0.305	3.33	0.000***
Bank risk	-0.815	0.396	-2.06	0.039**
Non-performing loans	-0.001	0.000	-2.02	0.043**
Fee income	-0.876	0.153	-5.73	0.000***
Bank size	0.049	0.028	1.75	0.080*
Inflation	-0.167	0.040	-4.15	0.000***
Constant	0.553	0.148	3.75	0.000***

Log likelihood =115.054 LR chi2(8) = 54.97 Prob > chi2 = 0.000
Likelihood-ratio test of sigma_u=0: chibar2(01)= 74.07 Prob>=chibar2 = 0.000

Note: *** 1% level of significance
** 5% level of significance
* 10% level of significance

Source: Panel results, Stata 12

The Wald test statistic implies that the coefficients of the explanatory variables are significantly different from zero, justifying their inclusion in the model. The Wald test assumes a chi-square distribution. This is also supported by the likelihood ratio (LR) test statistic which is significant. The log likelihood statistic shows the point at which the sample mean converges to the population mean. In this case log likelihood value is 115.054 and converged after 4 iterations.

The deposit asset ratio, cash reserve ratio, fee income ratio and inflation rate had coefficients of -0.207, 1.016, -0.876 and -0.167 respectively and were all significant at 1% level, while, rate of return, bank risk and non-performing loans influenced the government securities through their coefficients at 5% significant level. Cerasi and Daltung (2000) supported existence of diseconomies of scale for large banks due to possible bureaucratic bottlenecks and managerial inefficiencies. This implies that as banks grow and deposit asset ratio increase, less is invested. Cash reserve ratio which acts like an implicit tax and reduces bank's investing capacity as was supported by Fama (1985). However, in this case the outcome was different and banks invest more with increase in cash reserve ratio. Chang and Elyasiani (2008) supported that diversification benefits exist for banks that expand into

non-funded activities, which enable them to become more competitive in investment opportunities. Incomes earned from those activities compensate for the cash reserve requirements and boost bank's investments portfolios.

4.5.3 Placements Portfolio ratio

As a result of presence of heteroscedasticity, random effects maximum likelihood estimation was also applied to the placements portfolio dataset for the period 2007 to 2012.

Table 4.12: Placements portfolio ratio random effects ML estimation results

Variable	Coefficient	Std. Error	Z	p>|z|
Rate of Return	-0.019	0.009	-2.02	0.043**
Deposit asset ratio	0.163	0.072	2.27	0.023**
Cash reserve ratio	1.384	0.424	3.27	0.000***
Bank risk	-0.053	0.022	-2.37	0.018**
Interest rate elasticity	-0.001	0.000	-4.30	0.000***
Fee income ratio	-0.002	0.001	-2.70	0.007***
Bank size	0.007	0.004	1. 56	0.118
Rate of inflation	0.104	0.041	2.56	0.010***
Constant	-0.125	0.053	-2.36	0.018**

Log likelihood = 143.87553 LR chi2(8) = 33.83 Prob > chi2 = 0.000
Likelihood-ratio test of sigma_u=0: chibar2(01)= 37.99 Prob>=chibar2 = 0.000

Note: *** 1% level of significance
** 5% level of significance
* 10% level of significance

Source: Panel results, Stata 12

The likelihood ratio statistic confirms that the coefficients of the explanatory variables are significantly different from zero and therefore justifies their inclusion in the model. It is reflected as 37.99 at p-value 0.000. The log likelihood statistic show the point at which the sample mean converges to the population mean. In this case it converged after 4 iterations.

Cash reserve ratio, deposit asset ratio and rate of inflation are the main determinants of placements with other banks with coefficients of 1.384, 0.163 and 0.104 respectively at 1% and 5% significance level. Interest rate elasticity and fee income ratio had the least and

negative impact on the placements as exhibited by coefficients of -0.001 and -0.002 respectively at 1% significance level. This positive relationship between placements and rate of inflation could also be influenced by the fact that interest rates on deposits usually decrease at a faster rate than those on loans, and hence the inflation may not be negatively consequential as was confirmed by Molyneux and Thornton (1992). Constantinos and Sofoklis (2009) supported that inflation rate is a catalyst for investment decisions and profitability in the macroeconomic environment. This leads to a positive relationship between placements and rate of inflation.

4.6 Determinants of commercial banks' investment portfolios

The size of the coefficient of each of the independent variable gives the size of the effect that variable is having on the dependent variable (loans and advances, government securities or placements with other banks). The sign of the coefficient (positive or negative) gives the direction of the effect. The coefficient tells how much the dependent variable is expected to increase or decrease when that independent variable increases or decreases by one holding all other variables constant.

4.6.1 Rate of return

Under loans and advances portfolio, returns exhibited a positive significant relationship as expected. An increase in the rate of return by one unit would lead to about 0.696 unit increase in loan and advances holding all other variables constant. Commercial banks would be motivated to lend more to maximize their overall returns and be able to meet their deposit interest rates and other operational expenses. Felicia (2011) stressed that banks must make returns from their investments so as to meet their deposit interest liabilities.

With government securities, the sign of the coefficient is negative contrary to the expectation. An increase in the rate of return by one unit would cause the investment in government securities to decrease by 0.517. Loans and government securities are alternate investment options and with a parallel increase in the rate of returns, banks would prefer to create more loans than invest in government securities. There would a trade-off based on

the risk-return principle. This is line with Ndagire (2011) findings, that, commercial banks' volume of loans and volume of government securities could trade off each other given that yields and risks associated with them are varied.

However, in placements with other banks, the rate of return had a negative coefficient meaning that for every one unit increase in the rate of return, banks would be expected to lower their placements by 0.019 units holding all other variable constant. Placements with other banks are an alternate investment option to loans and advances and banks would opt to go loans and advances that are likely to earn them more returns. The principle behind this argument is that, if there is an increase in the rate of return associated with placements, there will always be a simultaneous increase in the rate of return associated with loans and advances. Commercial banks would prefer to invest in loans and advances which are more lucrative. However, for banks that are risk averse, placements would continue to count as the risk involved is minimal. Hence, a very low rate of return coefficient of 0.019.

4.6.2 Deposit asset ratio

The inverse relationship between deposit asset ratio and loans and advances, implies that if deposit asset ratio increases by one unit, loans and advances ratio would fall down by 0.278 units holding all other variables constant. This suggests that as banks become larger and accumulate more deposits, there is a tendency of diseconomies of scale coming into play and less will be invested. This is consistent with prior empirical evidence which suggested that there are diseconomies of scale for large banks due to possible bureaucratic bottlenecks and managerial inefficiencies. This could mean that small banks may enjoy some managerial economies of scale (Cerasi and Daltung, 2000).

A similar observation was made from government securities empirical results. An increase in deposit asset ratio by one unit would reduce government securities by 0.207 units. This inverse relationship between deposit asset ratio and government securities suggested that larger banks tend to invest a relatively small proportion of their assets in government securities. This is an indication that the Kenyan commercial banking industry is

inconsistent with the Market-Power hypothesis, which stated that as relative size of a firm expands, its market power increases.

However, with placements with other banks, an increase in deposit ratio by one unit would be expected to increase placements by 0.163 units. Commercial banks placed more with each other with increase in deposits.

4.6.3 Cash reserve ratios

Cash reserve ratio acts like an implicit tax and reduces bank's investing capacity as was postulated by Fama (1985). However, in this case the outcome was different. For all the three investment portfolios, the coefficients bore positive signs. For instance, an increase in cash reserve ratio by one unit, loans portfolio would increase by 1.342 while government securities would be expected to increase by 1.016. Placements would rise up by 1.384 holding all other factors constant. With government regulations, commercial banks tend to focus on non-funded activities which earn them incomes to meet their operational expenses as well as investment purposes. Chang and Elyasiani (2008) confirmed that diversification benefits exist for banks that expand into non-interest generating activities, which enable them to become more competitive in investment opportunities. Incomes earned from those activities compensate for the cash reserve requirements and boost bank's investments portfolios.

4.6.4 Bank risk

Bank risk had an inverse relationship with loan portfolio. It had a negative coefficient of 4.026 which meant that for every one unit increase in bank risk, loans and advance would decrease 4.026 times holding all other variables constant. It is clear that commercial banks in Kenya are highly sensitive and implement risk-averse strategies through systematic controls and monitoring of bank risk. Bank screening activities as confirmed by Boyd and Prescott (1986) seeks to avoid bank risks and non-performing loans.

Under government securities, one unit change in bank risk discourage investments by 0.815 holding all other factors constant. Bank risk, which in this study refers to variability of returns, is a vital element to consider just as in loans and advances. Banks are very sensitive to changes in returns possibly due to the fact that they are cushioned by fee income from non-funded sources. This is in line with Stiroh (2004) findings that noted that there is a greater reliance on non-interest income due high bank risks.

With placements portfolio, the bank risk is not highly influential. The empirical analysis indicated that placements would decrease by only 0.053 for every one unit of risk. That is, the variability of placements associated with bank risk is very minimal. A bank that is risk averse would prefer to invest in placements with other banks where the returns are likely to remain constant. This is consistent Berger *et al.* 2001 empirical findings which confirmed that banks do not face any significant risk when they invest in each other.

4.6.5 Non-performing loans

From the empirical findings it was evident that an increase in non-performing loans (NPL) by one unit reduces loans by 0.533. The non-performing loans are normally associated with loans and advances though the effects may spill over to government securities and placements with other banks given that they are served from the same base. It could also be argued that NPL reduces the pace of credit creation as well as the image of bank. It could also lead into insolvency and collapse of banks as was experienced in the early 1990s. In connection with NPL, the Credit Reference Bureau (CRB) was launched in 2009 by the government with an aim of providing information on creditworthy of prospective borrowers. This was intended to alleviate NPL and problems associated with it. Petersen and Rajan (2001), in their findings, emphasized the importance of assessing loan applicants from hard information point of view.

In government securities, the coefficient (-0.001) of non-performing loans, means that NPL does not have any major impact on government securities. An increase in NPL by one unit could only reduce government securities investment by 0.001. However, it is also clear that though NPL emanates from loans and advances it does have some negative spill-over

effects on government securities. In general, it could be argued that the amount received back by banks in form of repayments determine further investments.

4.6.6 Interest rate elasticity

Interest rate elasticity exhibited a positive relationship with loan and advances at 10% significant level. A positive unit change in interest rate would cause loans to increase by 0.001. Ordinarily, loans and advances would be highly sensitive to changes in interest rates. However, commercial banks counteract this through differentiation of their loan products, thus, nullifying any possible negative effects of interest rate elasticity. In addition, with increase in economic growth, demand for loans and advances, would remain high even with increase in interest rates.

Interest rate elasticity bore a negative relationship with placements. Banks would be sensitive to changes in interest rate elasticity as they stand to lose their income. Coefficient of interest rate elasticity, though, not high meant that banks would lower their placement with other banks by 0.001 for every one unit increase in interest rate. This depicts commercial banks in Kenya as risk-averse and would rather stick to placements where risks are low

4.6.7 Fee income and bank size

Fee income coefficient revealed a negative impact on loan and advances at 1% significance level. Loans and advances would be reduced by 1.844 if fee income increases by one unit. This implies that commercial banks have gradually shifted from traditional saving and lending practice to modern service based financial activity. They are, in fact, trying to escape from interest rates fluctuations and loan default risk. This is consistent with the empirical findings of DeYoung and Roland (2001) who also confirmed that an increase in fee income would enable banks to meet their operational expense more effectively and hence avoid the temptation of investing in risky areas which can only be assessed from soft information.

Investments in government securities would be reduced by 0.876 if fee income increases by one unit holding all other factors constant. Besides enabling commercial banks to meet their operational expenses more effectively, fee income enhance screening of loans applicants and ameliorate bad outcomes as was supported by Boyd and Prescott (1986).

In addition, an increase in fee income discouraged banks from placing their deposit liabilities with other financial institutions, possibly, due to low returns expected. The coefficient of fee income, -0.002, also indicates that placements with other banks are not heavily affected by changes in fee income. This is due to the fact that risks associated with placements are minimal. In general, it can be concluded that commercial banks were likely to invest their funds selectively given that they enjoy fee incomes which could definitely cushion them from insolvency.

Bank size which bore a positive though low coefficient, implied that size was a determinant to both government securities and placements. That is, investment in government securities and placements would rise up by 0.049 and 0.007 respectively with an increase in bank size by one unit. Economies of scale apply in both investments unlike in loans and advances which decrease by 0.020 with one unit increase in bank size. It can be deduced that banks would be prefer to deal with larger institutions rather than individuals whose demands are risky and cumbersome to process. This is in line with Cerasi and Daltung (2000) empirical findings that confirmed that as banks become bigger they would prefer to lend to larger firms (banks) because fewer loans are to be processed besides availability of hard information.

4.6.8 Rate of inflation

The rate of inflation had a positive effect on loans and advances and placements with other banks. An increase in inflation by one unit would increase loans and placements by 0.235 and 0.104 respectively. This is contrary to the expectation. However, it could be ascribed to the ability of management to anticipate and forecast future inflation, which in turn implies an appropriate adjustment of interest rates to maintain and even increase their loans and advances to customers. This positive relationship between loans and inflation could also be

influenced by the fact that interest rates on deposits usually decrease at a faster rate than those on loans, and hence the inflation may not be negatively consequential as was confirmed by Molyneux and Thornton (1992).

Investment in the government securities would decrease by 0.167 with an increase in inflation rate by one unit. This could be as a result of the rigidity associated with governments in responding to changes in economic variables and hence banks would stand to gain low real returns during inflation. Constantinos and Sofoklis (2009) supported that inflation rate is a catalyst for investment decisions and profitability in the macroeconomic environment.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND IMPLICATIONS

5.1 Introduction

This chapter presents a summary of findings, conclusions, recommendations and areas of further research.

5.2 Summary of the Study

The determinants of commercial banks' investment portfolio are paramount and cannot be overlooked in investment decisions. This study supported that there is a relationship between commercial banks' investment portfolios and rate of return, deposits asset ratio, cash reserve requirement, interest rate elasticity, bank risk, rate of inflation, bank size and fee income ratio. The coefficients of these variables were estimated using maximum likelihood estimation (MLE) method.

According to the results rate of return, cash reserve requirement and rate of inflation exhibited positive coefficients while deposit asset ratio, bank risk and non-performing loans revealed negative coefficients with the dependent variable loan portfolio ratio. Fee income had a high negative impact on loan portfolio at 1% significant level. This implied that the commercial banks are gradually transforming away from traditional saving and lending practice to modern service based financial activity. They are trying to escape from interest rates fluctuations and loan default risk. The other variables, bank size and interest elasticity did not exhibit statistically significant coefficient with loan portfolio. For bank size, the inverse relationship between bank size and loan portfolio suggested that larger banks tend to invest a relatively small proportion of their assets with individual clients. This indicated that commercial banking industry in Kenya is inconsistent with the market-power hypothesis, which states that as relative size of a firm expands, its market power increases. This is probably due to the existence of bureaucratic bottlenecks systems and managerial inefficiencies to manage their assets.

With regard to government securities, bank risk and rate of inflation exhibited the anticipated negative relationship while rate of returns, deposit asset ratio and fee income ratio behaved uniquely and indicated a negative correlation. Bank size had a low positive relationship. The coefficient of non-performing loan ratio was statistically insignificant.

For placements with other banks, bank risk portrayed a negative relationship as expected. Rate of return exhibited a negative relationship contrary to the expectation. Deposit asset ratio and cash reserve requirement had positive coefficients. The coefficients of interest rate elasticity, fee income ratio and bank size variables also indicated some statistical significance on placements.

5.3 Conclusions

Based on the study findings, the coefficients supported that there is a relationship between commercial banks' investment portfolios and the determinants. Commercial banks' investment portfolios are heavily dependent on cash reserve ratio. In addition, bank risk, fee income ratios and rate of return have a major effect on loans and government securities. Deposit asset ratio has a negative relationship with loan and government portfolios unlike with placements. That is, an increase in deposit asset ratio leads to a decrease in loan and government portfolio while it increases the placements with other banks.

5.4 Policy Implications

Commercial banks need to consult with the government whenever a policy regarding cash reserve requirement is made. This is because cash reserve requirement which acts like implicit tax plays a very important role in determining the commercial banks' investment portfolios. The ratio should therefore be established on the basis of government and banking industry expectation perspectives.

Commercial banks in Kenya, should aim at formulating and implementing strategies that are likely to enhance rate of returns from their investment portfolios. They could do this by stepping up their effort in educating their clientele about the loan products and how they

can in turn invest. This would make loans more attractive and competitive thus widening the interest spreads and a higher rate of return. However, changes in interest rate should be done on the basis of interest rate elasticity though from the empirical results, interest rate elasticity does not play a major role in determining investment portfolios. They should also negotiate with the government towards making its securities more competitive, possibly, through by paying higher interest rates.

Large commercial banks should improve their managerial efficiency and the bureaucratic bottlenecks system to reduce diseconomies of scale of associated with large volumes of deposit and bank size. This would be necessitated by the fact that both deposit asset ratio and bank size have negative effects instead of the expected positive relationships. Improvement in this would also benefit placements with other banks, which in fact, is the only portfolio that relates positively with deposit asset ratio.

5.5 Limitations and areas for further research

The researcher did not include some variables in the model such as exchange rate, balance of payments, quality of management and political stability that may affect commercial banks' investment portfolios. The time period of study was relatively short.

Further studies can be done to establish the effects of the above mentioned variables on commercial banks' portfolios. A study could also be done on the effects of global economic crisis such as euro and mortgage crisis on investment portfolios in Kenya.

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APPENDIX I

Table A1: List of Commercial Banks used in the Sample

Bank	**2007 Assets (Kshs bn)**
Barclays Bank of Kenya	136,540
Kenya Commercial Bank	96,532
Standard Chartered	92, 743
Cooperative Bank of Kenya	58,712
CFC Stanbic Bank	55,534
National Bank of Kenya	42, 142
Commercial Bank Africa	36,217
Citibank of Kenya	36,147
Equity Bank	29,888
National Industrial Credit Bank	27,583
Investment & Mortgage Bank	24,494
Diamond Trust Bank	24, 484
Baroda Bank of Kenya	13,253
Imperial Bank	11,039
Prime Bank	10,773

Source: Bankelele, Nairobi writer on Banking, Finance, Technology and Investments.

Note: The sample selection was based on the Kenya bank asset rankings in 2007 and the fifteen biggest banks formed the sample. During the subsequent years it was observed that changed positions.

APPENDIX II

Table A2: Correlation matrix between variables (Loan and advances)

	Loan and advances	Rate of return	Deposit asset ratio	Cash reserve ratio	Bank risk	Non-performing loans	Interest elasticity	Fee income	Bank size	Rate of inflation
Loan and advances	1.000									
Rate of return	0.347	1.000								
Deposit asset ratio	-0.158	-0.330	1.000							
Cash reserve ratio	-0.040	-0.017	0.011	1.000						
Bank risk	-0.435	0.214	-0.317	0.000	1.000					
Non-performing loans	-0.227	0.050	0.161	0.034	0.137	1.000				
Interest elasticity	0.020	0.129	0.026	-0.132	0.046	-.137	1.000			
Fee income	-0.314	0.359	-0.183	0.175	0.322	0.360	0.059	1.000		
Bank size	0.047	0.161	-0.096	-0.115	0.038	0.063	-0.011	0.142	1.000	
Rate of inflation	0.033	-0.059	-0.007	-0.051	-0.000	0.207	-0.453	0.052	-0.022	1.000

Source: Panel results: 2007 - 2012.

Table A3: Correlation matrix between variables (Government Securities)

	Government Securities	Rate of return	Deposit asset ratio	Cash reserve ratio	Bank risk	Interest elasticity	Fee income	Bank size	Rate of Inflation
Government securities	1.000								
Rate of return	-0.142	1.000							
Deposit asset ratio	-0.024	0.165	1.000						
Cash reserve ratio	-0.005	-0.045	0.011	1.000					
Bank risk	-0.147	0.098	-0.120	0.000	1.000				
Interest elasticity	-0.270	0.144	0.031	-0.048	0.070	1.000			
Fee income	-0.603	0.119	-0.166	0.120	0.067	0.098	1.000		
Bank size	0.044	-0.060	-0.097	-0.115	-0.132	0.034	0.052	1.000	
Rate of inflation	-0.127	-0.027	-0.003	-0.051	0.000	0.090	0.105	-0.022	1.000

Source: Panel resultss: 2007 - 2012.

Table A4: Correlation matrix between variables (Placements with other banks)

	Placements	Rate of return	Deposit asset ratio	Cash reserve ratio	Bank risk	Interest elasticity	Fee income	Bank size	Rate of inflation
Placements	1.000								
Rate of return	-0.108	1.000							
Deposit asset ratio	0.336	-0.136	1.000						
Cash reserve ratio	0.079	0.184	0.011	1.000					
Bank risk	-0.269	0.378	-0.375	0.000	1.000				
Interest elasticity	-0.295	-0.020	-0.134	-0.029	-0.061	1.000			
Fee income	-0.281	0.078	-0.159	0.029	0.120	0.043	1.000		
Bank size	-0.168	0.054	-0.096	-0.115	0.293	-0.081	0.082	1.000	
Rate of inflation	0.184	0.007	-0.007	-0.051	0.000	-0.311	-0.052	-0.022	1.000

Source: Panel results: 2007 - 2012.

APPENDIX III

Table A5: Loans and advances Random effects GLS estimation results

Variable	**Coeff.**	**Std. Err**	**z**	**p>|z|**
Rate of Return	0.650	0.320	2.030	0.042**
Deposit asset ratio	-0.278	0.111	-2.500	0.012**
Cash reserve ratio	1.358	0.549	2.480	0.013**
Bank risk	-3.936	1.877	-2.100	0.036**
Non-performing loans ratio	-0.529	0.265	-1.990	0.047**
Interest elasticity	0.001	0.001	2.260	0.024**
Fee income ratio	-1.866	0.454	-4.110	0.000***
Bank size	-0.022	0.009	-1.700	0.089*
Inflation	0.235	0.108	2.530	0.011**
Constant	0.851	0.197	4.330	0.000***

Random effects u_i ~ Gaussian — Wald chi2(9) = 35.660
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.000

***1%,
**5%
*10% significant level

Source: Panel results, Stata 12

Liquidity was dropped because it was invariant over time.
The chi2(9) = 35.66 was less than p-value at 0.000 which is lower than the significant level of 1%. Hence, the covariates were jointly significant at 1%.

Table A6: Loans and advances fixed effects (within) estimation results

Variable	Coeff.	Std. Err	t	p>|t|
Rate of Return	-0.017	0.010	-1.810	0.074*
Deposit asset ratio	-0.274	0.221	-1.240	0.220
Cash reserve ratio	1.552	0.442	3.510	0.000***
Non-performing loans ratio	-0.459	0.248	-1.850	0.068*
Interest elasticity	0.002	0.002	1.260	0.211
Fee income ratio	-2.119	0.467	-4.540	0.000***
Bank size	-0.050	0.029	-1.710	0.094*
Inflation	0.239	0.132	1.810	0.074*
-const	0.848	0.200	4.230	0.000***
F test that all u_i=0:	F(14, 67) =	7.81	Prob > F = 0.000	
***1%				
*10% significant level				

Source: Panel results, Stata 12

F(14,67) = 7.81 which is less than the p-value at 0.000. Therefore, the *Ho*: ui = 0 was not rejected at 1% significant level. The independent variables had impact on the loans and advances.

APPENDIX IV

Table A7: Government securities Random effects GLS Estimation Results

Government Securities	Coefficient	Std. Err	Z	p>|z|
Return	-0.528	0.218	-2.42	0.015**
Deposit asset ratio	-0.205	0.073	-2.81	0.005***
Cash reserve ratio	0.994	0.304	3.26	0.000***
Bank risk	-0.817	0.256	-3.20	0.000***
Interest elasticity	-0.001	0.000	-1.91	0.056*
Fee income ratio	-0.863	0.157	-5.48	0.000***
Bank size	0.049	0.026	1.91	0.056*
Inflation	-0.169	0.041	-4.16	0.000***
Constant	0.553	0.156	3.55	0.000***

Random effects u_i ~ Gaussian — Wald chi2(8) = 69.25
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

***1%
**5% significant level
*10%

Source: Panel results, Stata 12

The chi2(8) = 69.25 was less than p-value at 0.000 which is lower than the significant level of 1%. Hence, the covariates were jointly significant at 1%.

Table A8: Government securities Fixed effects (within) Estimation Results

Variable	Coeff.	Std. Err	T	p>|t|
Rate of Return	-0.583	0.223	-2.61	0.011**
Deposit asset ratio	-0.199	0.107	-1.85	0.068*
Cash reserve ratio	0.882	0.487	1.81	0.075*
Interest elasticity	-0.000***	0.000	-1.70	0.094*
Fee income ratio	-0.800	0.166	-4.82	0.000***
Bank size	0.050	0.040	1.26	0.211
Inflation	-0.178	0.096	-1.85	0.068**
Constant	0.535	0.156	3.42	0.001***

F test that all u_i=0: F(14, 68) = 17.01 Prob > F = 0.000

***1%
**5%
*10%

Source: Panel results, Stata 12

At F(14,68) = 17.01, p-value is greater at 0.000 which is less than the significance level of 1% and therefore we should not reject *Ho*: ui = 0 at level of significance 1%. There is strong evidence that the independent variables are jointly and statistically significant.

APPENDIX V

Table A9: Placements Random effects GLS estimation Results

Variable	Coefficient	Std. Err	Z	p>|z|
Rate of Return	-0.019	0.009	-2.99	0.003***
Deposit asset ratio	0.155	0.074	2.10	0.035**
Cash reserve ratio	1.400	0.425	3.29	0.000***
Bank risk	-0.054	0.024	-2.29	0.022**
Interest Elasticity	-0.001	0.000	-4.21	0.000***
Fee income ratio	-0.001	0.000	-9.57	0.000***
Bank size	0.011	0.005	2.06	0.039**
Inflation	0.104	0.046	2.25	0.024**
-const	-0.120	0.053	-2.26	0.024**

Random effects u_i ~ Gaussian — Wald chi2(8) = 38.21
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.000

***1%
**5% significant level.

Source: Panel results, Stata 12

The chi2(9) = 38.21 was less than p-value at 0.000 which is lower than the significant level of 1%. Hence, the covariates were jointly significant at 1%.

Table A10: Placements Fixed effects (within) Estimation Results

Variable	Coefficient	Std. Err	T	p> | t |
Rate of Return	-0.022	0.016	- 1.42	0.160
Deposit asset ratio	0.124	0.069	1.81	0.074*
Cash reserve ratio	1.455	0.968	1.50	0.138
Interest elasticity	-0.001	0.000	-4.24	0.000***
Fee income ratio	-0.001	0.000	-4.82	0.000***
Bank size ratio	0.027	0.019	1.42	0.160
Inflation	0.103	0.077	1.33	0.190
-const	-0.108	0.041	-2.61	0.011***
F test that all u_i=0: F(14, 68) = 7.99 Prob > F = 0.000 ***1% *10% significant level				

Source: Panel results, Stata 12

F(14,68) = 7.99 and p-value is greater at 0.000 which is less than the significant level of 1% and therefore we should not reject *Ho*: ui = 0 at level of significance 1%. There is strong evidence that independent variables are jointly and statistically significant.