DETERMINANTS OF MORTGAGE INTEREST RATES IN KENYA

BY

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DECLARATION

This research paper is my original work and has not been presented for any award in any other university.

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ABSTRACT

The main objective of this study was to determine the effects of the selected macroeconomic and financial variables on mortgage rates. The dependent variable was variable mortgage rate while the independent variables were inflation, Treasury bill rates, real GDP, interbank lending rate and money supply. The study utilized monthly time series data between 2000 and 2013. The method of analysis was multiple OLS regression. Variable mortgage data was collected from five main financial institutions which control at least 70 % of the mortgage market. Data for inflation, money supply, interbank lending rate and 182 Days T bills rate was collected from Central Bank while real GDP was collected from Kenya Bureau of Statistics. The findings showed that inflation, previous period mortgage rates and real GDP growth were found to have a significance influence on the variable mortgage rates. Inter-bank lending rate, treasury bill rate and money supply have negative and insignificant impact on mortgage rates. The policy implication based on these findings is that regulatory authority should endeavor to achieve lower rates of inflation. This in turn will lead to lower mortgage rates and promote mortgage loan uptake. Moreover, the Central Bank should seek monetary policies that promote supply of credit for mortgage market. The government should also provide a conducive environment that enhance competitiveness, disclosure of information and reduce uncertainty in the market.

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ABBREVIATIONS

ADF   - Augmented Dickey Fuller Test

BLUE   - Best linear unbiased estimator

CBK   -Central Bank of Kenya

CPI   -Consumer Price Index

ECM   - Error correction models

EGARCH   -Exponential general autoregressive conditional heteroskedasticity

FRM   - Fixed rate mortgage

GDP   - Gross Domestic Product

HFK   -Housing Finance Kenya

IMF   - International monetary fund

KBRR   - Kenya banks' reference rate

KNBS   - Kenya National Bureau of Statistics

OECD   - Organization for economic co-operation and development

OLS   -Ordinary least squares

SACCO   - Savings and credit cooperatives

US   -United States

VAR   -Variance

CHAPTER ONE
INTRODUCTION

1.0 Background of the study

Shelter is a basic human need. Article 43 (1) (b) of Kenya's constitution recognizes adequate access to housing as an economic and social right. High demand and low supply of housing has a negative impact on prices. Furthermore, it is an impediment in the achievement of development objectives and in particular promotion of equity and poverty eradication. The challenge in accessing land, credit facilities and materials has resulted to the influx of informal settlement in urban areas (Erguden, 2011). The universal declaration of human rights provides that everyone is entitled to a decent housing (United Nations, The Human Rights- article; 25, 1948). There is a need for governments to involve themselves in promoting access to housing and especially the Kenyan government. Compared to other economic goods, housing occupies a special place because it plays a central role in economic, social and psychological aspects in people's life (Oxley, 1996).

In Kenya housing finance is fragmented into a three tier markets (min.of housing 2013). The first category is composed of households that can afford high quality housing. In the middle, we have middle income earners who are not adequately catered for. The middle income earners have to compete with low income earners for the limited resources. Finally, at the bottom we have the low income earners who are adversely affected by housing problems and the scarcity of resources caused by inadequate resources for middle income earners. According to Kenyan Vision 2030 only 20 % of houses are produced to target the low income earners. The low investment and low demand among the low income earners is caused by the high cost of finance to investors and also home buyers among other constraints.The national housing policy under the sessional paper No. 3 of 2004 identified the following as some of its objectives among others: to facilitate housing development among the low income earners and vulnerable groups and secondly to facilitate access to housing funds.

However, to date housing demand outstrips its supply. Demand is very low because majority of the population either do not qualify or do not want to borrow (Ayitey et al, 2010). This is majorly influenced by the mortgage interest rates. The housing demand is driven by increasing population. According to (World Bank, 2011) the current urbanization level is 39.7 per cent and it is expected to hit 50 per cent by 2030. It is estimated that the annual housing demand in urban areas is about 150, 000 units and only 35, 000 units are provided. Consequently, only 23 per cent of the demand is met. Furthermore, it is estimated that 75.4 per cent of urban dwellers live in rented houses. Given that the recent census has shown that more than 60 per cent of Kenyan population is less than 25 years of age it is clear that demand in housing will continue to rise.

According to annual resident mortgage survey (2013) banks identified high mortgage rates as the main obstacle to mortgage uptake while low income was identified as the second constraint (Central bank annual report 2013) However, in 2012 access to long term funds was the main impendent while high mortgage rates came second.

Table 1: Annual Resident Mortgage Survey (2013)

Market Mortgage Obstacle	Frequency of Response
High interest rates	30
Low levels of income	25
Access to long term funds	20
Burden of banking regulations e.g. liquidity requirement	11
High cost of construction materials and land	11
High purchase price of properties	11
Difficulties with property registration / titling	10
Credit risk	8
Start up cost	7
Stringent laws	5
Lack of housing supply	4

Source: Central Bank Annual Report (2013)

1.1 Mortgage market in Kenya

Mortgage industry in Kenya dates back in 1965 when housing finance was incorporated. Its main goal was to carry out government's policy of promoting home ownership. In

1992 it offered part of it's equity to public and also became a quoted company in stock exchange (www.housing.co.ke). Mortgage lending in Kenya is dominated by commercial banks. As at December 2013 at least 25 banks were offering mortgage loans. Housing Finance is the only mortgage finance institution.

Mortgage market in Kenya presents a case of highly concentrated market given that only 5 out 44 banks control at least 70 % of the total mortgage market. These institutions are Kenya Commercial Bank, Housing Finance, CFC Stanbic Ltd, Standard Chartered Bank, and Cooperative Bank of Kenya (www.housingfinanceafricao.rg). Variable rate mortgage is preferred by most providers as opposed to fixed rate mortgage. Therefore, the adverse effects of macroeconomic environment have a negative effect on the mortgage rate. According to the Central bank supervision report (2013) as at December 2013 the total mortgages in Kenya stood at approximately 20, 000.

However, even though mortgage is seen as a major avenue for home ownership , Kenyan market presents a dynamic phenomenon in that majority of the home owners have financed their homes through avenues such as SACCOS, microfinance institutions personal savings and home loans as opposed to mortgage loans.

The mortgage market in Kenya is therefore underdeveloped with a lot of untapped potential. Mortgage lending has been left to commercial banks thus restraining growth in this sector. This is due to the fact that commercial banks rely on short term deposit to finance long term lending. Since commercial banks practice risk management on short term funds it has resulted to high mortgage rates to borrowers.

There are two types of mortgage rates.
1. The mortgage interest rate where the rate in question is fixed for a period exceeding 10 years. Fixed-rate mortgages are included in this category2. The mortgage interest rate where the rate in question is fixed for a period of less than one year. Variable-rate mortgages are included in this category.

1.1 Statement of the Problem

The role of loans for house purchase is significant in the expansion of the real estate sector, and therefore mortgages have become increasingly abundant. According to the survey by KNBS, the annual housing demand in 2010 was estimated at 206,000 with a projection of a rise to over 280,000 units by 2011. This is contrary to a supply of 50, 000 units annually as at 2009 Min. of housing. In addition there is a deficit of two million units. This means that many households are homeless; others live in temporary shelter or in low quality houses in slums. Besides the deficit, the standard and quality of a large proportion of the existing stock of houses is below the acceptable standards.According to (Muckova, 2000) mortgage market has proved effective in addressing housing scarcity. For instance, the mortgage debt to gross domestic product of some developed economies such as United Kingdom is more than 50 per cent compared to Kenya which stands at only 3 per cent. This is quite low compared to South Africa which has 30 percent mortgage debt to gross domestic product (World Bank, 2011).

Demand for mortgage in Kenya remains low with the major underpinning factor being high mortgage rates which stood at an average of 18 % and 16 % in 2012 and 2013 respectively (Central Bank, 2013). Furthermore, according to Central Bank survey, (2013) banks ranked mortgage interest rates as the main obstacle to growth of mortgage uptake. According to economic survey, (2013) the share of commercial credit to real estate in 2012 was 9.2 % compared to 9.4 % in 2011. This was attributed to increased Central Bank rate which was occasioned by high inflation levels.

Apart from hampering access to mortgage, high interest rate is one of the causes for mortgage default. In the case of variable interest rates the chances of default will increase as mortgage rates rises while for fixed interest rates, default rate increases with a decrease in rates (Cocco, 2011).

High mortgage rates have multiplier effects on the economy which cannot be overstated. High rates translates into high default rates among the borrowers hence leading to a rise

in the non performing loans on the side of lender and ultimately a negative impact on the lenders' balance sheet growth. In addition the high rates contributes to the low uptake of mortgage facilities prompting the public to invent other means of financing housing such as borrowing from Saccos and non bank financial institutions. However, these institutions have limited resources for long term lending thus locking the public out of home ownership. This has in turn led to the emergence of substandard houses such as slums as well as high rental charges. Moreover, high mortgage rates feed into high market interest rates through mortgage interest rates pass-through mechanism thus translating into high cost of living.

The global financial crisis of 2007-2008 was majorly contributed by the mortgage crisis whose spillover effect to Kenya was felt in 2010 due to volatility in exchange rate. Despite the government's effort to provide low cost houses the housing deficit remains high given that this effort only targets the civil servants. Therefore, availability of affordable mortgage loans by financial institutions is necessary so to compliment the government's effort. This therefore, presents the critical role of mortgage facilities in the Kenyan housing market.

Although studies on interest rates in Kenya have been carried out, they have adopted a more general approach thus lacking specificity on various financial sub sectors. For instance, Were and Wambua (2013) and Njuguna (2000) concentrated on determinants of banks interest rates spread with no particular attention to mortgage rates. It is against this background that this study seeks to provide answers to the following research question:
1. What are the main macroeconomic determinants of mortgage interest rates in Kenya?
This study therefore seeks to empirically analyze the impact of macro-economic variables, on interest rates in the period between 2003 and 2013.

1.2 Objectives of the Study
The main objective of this study was to identify the determinants of mortgage interest rates in Kenya. More specifically the study seeks to:

1. To evaluate the macroeconomic determinants of mortgage rates in Kenya.

2. To give policy implications on mortgage finance and home ownership in Kenya.

1.3 Significance of the study

The significance of the study is three-fold: to the existing literature, to policy makers and to the borrowers and financiers. To the existing literature the study seeks to add into the pool on what determines mortgage rates using the more recent data of up to 2013. This is because the study captures the period before and after global financial crisis hence addressing the more current phenomenon. In addition, the study will form basis for areas for further research.

To the policy makers the findings of the study can be beneficial to the government on the concerted effort towards providing low cost housing. To the central bank being the financial market regulator the findings could be of importance on the how the macroeconomic variables such as inflation rates and the Central Bank rate feed into the mortgage rate. This will inform the decision to anchor inflation rates within the 5 per cent (+/- 2.5 basis points) bound by the Central bank and how this could influence mortgage rates. The study could also benefit the construction of a property market index such as the house pricing index which is core in tracing the movements in the property market.

To the commercial banks and mortgage firms; understanding the determinants of mortgage rates could be beneficial in the determination of their market returns. In addition it will enable the lenders to appropriately price the mortgages based on their expectations on the prevailing macroeconomic environment. To the borrowers, the findings would be beneficial for appropriate timing on when to take a mortgage. The findings will go far in addressing the information asymmetry in the market as what constitutes the cost of mortgages among the lenders and borrowers hence promoting pricing transparency in the market.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

Over recent years, the Central bank of Kenya has carried out annual survey on the issues related to growth of resident mortgage. The findings have shown that mortgage rates are the main impediment to growth of this sector. Indeed the recent annual survey (Central Bank 2013) singled out mortgage rates as the main factor holding up uptake of mortgage in Kenya. This chapter presents both theoretical and empirical review of the literature on the determinants of mortgage rates.

2.1.1 Theoretical Literature

According to Mandura (2009), mortgage can be defined as a type of a debt fashioned to back investment in real estate. The debt is protected by property; it therefore follows that if the borrower fails to pay the property can be seized. Jacobus (2009) argues that mortgage is an instrument that makes property security for repayment of a debt. A mortgage therefore, is not conveyance of the property since it does not operate to transfer title from the borrower to the lender. It only pledges the property as security for the due payment of the debt, thus creating an encumbrance on the property.

2.1.2 Determinants and components of mortgage interest rates

Mortgage rates differ from time to time and with regions. This section will examine the reasons why mortgage rates vary by studying the factors that have been identified in the literature as the main determinants of mortgage rates.

2.1.2.1 Risk premium

This constitutes the risk premium lenders want in their expected return. Roberts (2008) observes that investors have the information on how much they will receive from the treasury notes. However, they are uncertain on how much they will earn from fixed

mortgage loan. Due to this, they will require an additional compensation, that is, the risk premium.

Risk can be considered from two sides of view; risk on realized ex-post returns and risk on ex-ante returns. The realized risk may either be more or less than expected; therefore, risk-averse investors will demand a premium on ex ante returns. Investors are more concerned with the ex-post return uncertainty since it cannot be diversified away (Geltner et.al, 2007). Risk premium vary with the business cycle and when the economy is declining, risk premium rises but declines when the economy is on the increase.

Forgang (2007) notes that the difference between high risk debt instrument and lower risk one is considered as the economic pointer, so that if the variation between the two is decreasing the investors will be expecting a strengthening economy. Lenders of fixed rate mortgages are exposed to interest rate risk because these mortgages are financed from short term deposits. This is because they rely on short term deposits to avail long term mortgages loans. Incase interest rates rise in due course; the financial institutions will incur an increased cost of obtaining funds, consequently, reducing their profits margin. On the other hand, borrowers will not benefit from reducing interest rates; however, they will not be affected by increasing rate.

Under variable rate mortgages, interest rate risk is shifted from the lenders to borrowers since the rate keep fluctuating depending on the state of the economy. Mandura (2009), argues that in fixed rate mortgage the required rate depends on the current risk free rate and risk premium rate. In case, the risk free rate increases, financial institutions will raise their required rate of return and consequently, mortgage rates increases.

2.1.2.2 Tax rate and lenders' required margin
Mukherjee (2005), postulates that it is the interaction of demand and supply factors that dictate interest rates. Events that affect income such as tax policy will cause a shift in the demand curve for loanable funds.

For instance if borrowers expect a decrease in future tax rates, they will increase their demand for loanable funds, thus the demand curve will shift outwards. According to a joint study (Regional Economic Outlook) by World Bank and IMF Kenyans interest rates spread are very close to those of the Sub-Saharan countries but considerably higher than those of OECD countries (IMF, 2005).The study identified operating costs and profit margins as the main determinants of interest rates spread.

The overhead costs include wages, security and inefficient payment system. In case a financial institution is not efficient enough it is likely to incur more operating costs that are passed on borrowers increasing the interest rates further. Lenders are likely to be more efficient in a competitive market than when there are just a few of them. This is because they strive to streamline their system and reduce operation cost with a view of lowering their interest rates.

2.1.2.3 Liquidity premium

Liquidity of a debt instrument refers to the easiness of converting them into cash without loss of value. Liquid money is preferable as opposed to other assets with a higher rate of return because it can be used for transactions Investors require compensation by way of premium for engaging their money in non liquid assets. Mandura (2009), argues that investors will be willing to avail funds for long term securities only if they are compensated by a premium for a lower degree of liquidity.

Investors add increasing liquidity premiums to existing rates to arrive at the actual rates. Ahokpossi (2013), argues that liquidity risk of a bank depends on its levels of liquidity hence banks with low liquidity tends to borrow emergency funds at high cost and thus charge liquidity premium which leads to higher interest spread.

2.1.2.4 Mortgage rates and inflation-the fisher hypothesis

This theory asserts that there is one-for-one relationship between inflation and interest rates (Thomas, 2005). According to (Romer, 2012) real interest rate changes as inflation

changes. Inflation erodes lenders purchasing power; since they are rational economic agents they will require reimbursement for the loss.

$$i = r + \beta\pi^e \tag{1}$$

Where i represents the nominal interest rate, r is the real interest rate and β is the extent to which nominal interest rate change as expected inflation change. In case the real interest rates are constant over time, $\beta=1$. Real interest rate is the disparity between the nominal interest rate and expected inflation (Domar, 2012 pp.402).

$$r = i - \pi^e \qquad \text{Fisher Identity} \tag{2}$$

(Pozdena, 1988), observes that when lenders advance a loan they form some expectations about the probable rate of inflation. If they expect an inflation rate of 8 per cent per annum, they will incorporate 8 percent to the yearly interest rates. On the other hand unanticipated inflation affects the lenders of fixed rate mortgage by eroding the value of their money while the bowers benefits since they make fixed nominal payments.

2.1.2.5 Central Bank rate

It is the role of the central bank to control inflation. One of the instruments it uses to achieve this is the bank rate. (Taylor, 2006) argues that when inflation rises the central bank response by raising the nominal rate and as a consequence the real interest rates rises. Consequently, exports, consumption and investment reduce. The converse is true. Asso (2010), observes that the Taylor rule can be used to set the Central Bank rate subject to some conditions and can be expressed by the following equation:

$$r = p + \frac{1}{2}y + \frac{1}{2}(p-2) + 2 \tag{1}$$

Where,

r = Central Bank

y= deviation of REAL GDP from the trend

p= inflation over previous four quarters with a target of 2%

The REAL GDP is growing on its trend at about 2% per annum so that y=0

The ex post interest rate will also equal 2

Kenya Banks' Reference Rate (KBRR) is the new reference rate set by the Central bank and replaces the base lending rate upon which banks were using to cost their loans. The rate is computed based on the base lending rate which now stands at 8.5 per cent and two months moving average of 91- day Treasury bill rate. The Monetary Policy Committee set the reference rate 9.13 per cent and is effective July 8th 2014. Following this move the total cost of credit will be KBRR plus premium 'K' that is,

$$9.13\% + K \qquad (2)$$

K represents the premium rate and will depend on: banks required margin, cost of funds, risk and other third party cost such as insurance and government levies.

2.1.2.6 Bond prices and mortgage interest rate

Drespins and Killin (2012), observes that there is an inverse correlation between mortgage rates and bond prices; that is, when the prices of the bond increases, the mortgage rates decreases. The opposite is true. The reason behind this argument is that bond prices are unchanging at maturity. If we suppose that the value of the bond at maturity is sh.1, 000 and the present price of the bond is sh. 900 and there are 5 years remaining, if the interest rates are escalating the prices of the bond will shift downwards.

2.1.2.7 Demand and Supply for Loans

Mankiw (2007), argues that interest rates adjust to balance demand and supply for money. The adjustments in the interest charge can be explained by the demand and supply perception (Rockwell, 2006). If there is high demand for mortgage loans, the interest rate will increase. On the other hand, low demand for mortgage rates is followed by low interest rates. Killin and Derespins (2012), argues that while mortgage rates move with other interest rates, real rates depends with the supply and demand for mortgage loans.

The supply of mortgage is determined by the willingness of the financial institutions to invest in the real estate. Moreover, lenders rely on supply of money which depends on customer deposit and prevailing interest rates in the market. The demand side depends on the income levels and the general economic conditions. Interest rates and money supply in view of short term liquidity effect are negatively correlated.

In particular, an increase in money supply given an existing price level and income creates a surplus supply of money Demand for money is a function of nominal interest rates since interest rate is the opportunity of holding cash.

Croushore (2007), argues that rise in the supply of money must make interest rates to decline so to sustain the money market in balance. In case the money supply is increasing (supply curve shift to the right) without a corresponding shift in money demand curve the equilibrium interest rates declines. Similarly, if a shift in money supply is followed by a shift in money supply in the short run, the interest will not change. This implies that a monetary policy is ineffective in lowering the mortgage interest rates. On the other hand, the short run equilibrium interest rates may increase than before if an increase in supply for money is followed by an increase in demand for loans. An expansionary monetary policy may not bring interest rates down hence ineffective. Secondly, interest rates and money supply are linked through real output and the price effect in the long run. Even in this case, expansionary policy may not be effective if the increase in money supply the resulting increase in real output and rising prices causes increase in demand since interest rates will also increase (Mishkin 2007).

2:2 Empirical literature review

Nampewo (2013), using time series data from Uganda between 1995 and 2010 and Engel and Granger two-step model tested for cointegration between bank rate, treasury rate, exchange rate volatilities and share of nonperforming loans to the entire credit sector. The findings showed that interest rate spread was positively related with bank rate, treasury rate and level of nonperforming loans.

Sirmans et.al (2011), did a study on the relationship between mortgage rates and Treasury bill rate. They concluded that there was a strong connection between mortgage rate and capital market rate and especially the 10-year treasury rate. The method of examination was regression and the 30-year mortgage rate, 10-year treasury rate data was obtained from the Federal Reserve. When 30-year mortgage rate was regressed against 10-year treasury rate, there was an r- squared of 0.969.

A 30-year mortgage rate was also regressed against Swap rate and corporate bond rate. Notably, the Swap rate was found to have a strong relationship (r-squared of 0.985) and with 30-year mortgage rate than 10-year treasury rate because there is a default risk premium not explained by treasury rate.

 Siddiqui (2012), observed that banks that are highly liquid have lower interest rate spread. This is because they do not incur the cost of sourcing funds externally. The results were confirmed by Millan (2008), where determinants of mortgage rates in the Euro area countries with emphasis on cost of funds, nature of guarantee and customer-banker relationship were investigated using cross sectional data. Harmonized monthly interest rates for fifteen countries running between 2003 and 2009 were used. A 10-year benchmark interest rate on government bonds expressed in a monthly average was used as a stand in for average cost funding in the financial market. In addition to that, the cost of interbank funding was represented by 3 month Euribor rate expressed in monthly average. From the study it was found that there was a strong positive relationship (0.43) between mortgage rates and cost of funds.

Mallik and Bhar (2010), using data from UK, Sweden and Finland and OLS as method of estimation concluded that the Central Bank increases interest rate when expected inflation increases. In related studies Ikhide (2009), Folowelwol and Tennant (2008) using a panel data model studied the determinants of interest rates spread in Sub Saharan

Africa using dynamic panel data model. They singled out inflation and money supply as the key factors.

On the contrary, Ben-Khedri (2005), did not find any significant relationship between inflation between inflation and interest margins. The findings were similar to a recent study by Were and Wambua (2013) who concluded that inflation and real REAL GDP statistically insignificant in explaining interest rates differences among banks. Using EGARCH M model, Wilson (2006), found that increased inflation uncertainity negatively affects interest rates and lowered economic growth in Japan. Mishkin (2005), using a monthly data between 1983 and 2003 found that inflation and interest rates are correlated in some periods and not in others.

The findings confirmed Fisher-effect in the long run but not in the short run. In the short run when there a change in the expected inflation, it is followed by a change in the short term interest rates. In the long run inflation and interest rates, trend together, that is, the long run Fisher effect (Ben-Khedri, (2005).

Similar studies on relationship between prices and interest rates confirmed that inflation uncertainty affects the economy by increasing long term interest rates. More specifically, interest rise when inflation rises and falls when there is a greater economic risk. However, recent studies have shown that the monetary authority can control inflation uncertainity and as a result control inflation by adopting credible inflation targeting strategy (Mallik and Bhar, 2010).

Bank particular factors have been argued to be some of the determinants of interest rates in the banking sector. Using Panel data, Were and Wambua (2013) found a positive relationship between interest rates charged by banks and credit risk, liquidity risk and net income as a ratio of total income and operating costs. The prevailing credit risk is reflected by risk premium charged by banks. Empirical evidence show that banks shift risks premium is associated with non performing loans to borrowers.

Ngugi (2001) and Beck et.al (2010) acknowledged risk premium is a key determinant of interest rates spread. Risk is a situation in which alternative outcome exist with known probability. These findings confirmed past studies by Croushore (2007) which found out that when mortgage interest rates are adjusted for a risk premium and statutory price ceilings, regional differentials disappeared.

Casey et.al, (2009)) observed that mortgage rates are linked to other interest rates. Moreover, maturity risks and default risks should capture those relationships. The more the chances of default, the higher the risk premiums which reflect the uncertainity of complete payment of mortgage principle and interest. The possible cost of default can be lowered by mortgage firms by taking an insurance cover. Jacobs (2007),) studied the proposition that prices are rigid downwards application to mortgage rates. In particular, the suggestion that mortgage rate follow an increase in capital market rate rather than decrease. A 10-year capital market rate running between 1978 and 2000 for Netherlands was used.

It was found that during the period of downward movement in interest rates, the gap between the mortgage and the capital market rate was widening. They concluded that switching cost and tacit price coordination are the likely causes of mortgage rate asymmetric response to capital market rate.

Shoofel (2006) using multiple regression analysis examined the effect of expansionary monetary policy on mortgage rates in the US. Contrary to expectations, the study concluded that expansionary monetary policy geared towards inducing investment in housing will not lead to reduced interest rates. The analysis utilized multiple linear regression model and data covering the duration between 1990 and 2004 of mortgage and money supply (both M1 and M2). Consumer expectation was used as one of the independent variable based on their sentiments capture the general state of the economy. Remarkably, the results showed that changes in the money supply have no impact on

mortgage. Nevertheless, in related studies by Casel (2005), it was found that supply of new houses influences mortgage rates.

2:3 Overview of literature review

The preceding section shows that most studies in Kenya have concentrated on the determinants of interest rates spread. For instance Ikhede (2009), Falawewol and Tenant (2008), Beck and Hesse (2006) and (Njuguna, 2000), basing their study on data from Sub Saharan Africa concluded that the interest rates spread are influenced by money supply, inflation and central bank reserve requirement. However, Khedri et al (2005), using Tunisian data did not find any link between interest rates and inflation based. On the contrary, Were and Wambua (2013), found a weak relationship.

In other studies Siddiqui (2012) and Sirmans et.al (2012), using data from Pakistan and Europe respectively found a strong relationship between interest rates and cost of funds. Furthermore, capital market rate and mortgage rate were found to be positively related These findings were consistent with those of Nampewo (2013), where treasury rate was found to explain interest rates spread in Uganda. Other factors that dominated the literature include money supply (Fazel, 2006), Liquidity risk premium (Were and Wambua 2013).

In all the cases except money supply, there was a positive link with interest rate. It is evident that most studies in Kenya concentrated on the determinants of interest rates spread generally and not mortgage rates. In the case of money supply and inflation, in some studies it failed to show the expected results as informed by theory. This is the research gap that this study intends to fill.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology adopted in the study which includes theoretical framework, specification of the empirical model, definition and measurement of variables and econometric procedures.

3.2 Theoretical framework

Mortgage interest rates are based on a ''derived demand'' that is, the demand for housing and other supply side factors. The mortgage market is part of a larger capital market. The supply of housing loans is in competition with other type of loans and investment in the capital market. The lenders have the option of investing in mortgage loans or other investment such as bonds and treasury bills. Similarly, the members of public can use mortgage loans for housing or other options to access housing such as bank loans, personal savings or rent houses. Use of mortgage loans will depend on the prevailing interest rates.

This study adopts the conceptual framework based on consumer behaviuor.Varian (1992), argues that the consumer being rational will chose the best bundle given a set of affordable alternatives. In a preference maximization problem, the consumer is faced by a budget constraint. The budget constraint and the set of bundles can be represented by:

$$B = (x \ in \ X : (px \leq y) \qquad (1)$$

In a preference maximization case:

Max $u(x)$ $\qquad\qquad$ (2)

Such that $\quad px \leq yx \ as \ in \ X$

X as in X

The consumer is assumed to maximize utility on consumption of housing. The cost of financing is interest paid.

$\qquad$ U=u (P_h, P_x) $\qquad\qquad$ (3)

Where,

P_h is the price for housing mortgage rate.

P_x is the price of other goods that is, opportunity cost.

The price or cost for housing is assumed to be determined through the market and all consumers choose interest rate that maximizes their utility subject to constraints. A consumer can either purchase a house using his income or invest in alternative products. The consumer's decision to pay a given cost for a mortgage will depend on other product (opportunity cost) disposable income and inflation. Inflation is considered by consumer because it reduces the purchasing power.

Hence,

U=u (P$_X$, P$_Y$, π)   (4)

Since utility can be measured indirectly through the costs (the amount the consumer is willing to pay)

$$X = U(P_X, P_y, Y)$$ (5)

$$R_m = f(rb, rt, y, \pi)$$ (6)

Where, rb, rt, is the opportunity cost. In this regard the economic agent that is, the lender or the borrower can either invest in bonds or buy or sell mortgage security.

The interaction of financial forces in the economy can be illustrated as:

$$U(x, y) = V(P_X, P_y, Y)$$ (7)

The equation on the right hand side indicates the indirect utility while the one on the right hand side is for direct utility. The consumer will maximize utility given the price of good x and other goods that is y, subject to his disposable income Y.

The supply for mortgage is dependent on the amount of credit in the economy. The credit available has competing uses that is, mortgage and other investments such as capital for firms. The more the money supply in the economy the more credit in the

economy and a tight monetary policy would lead to rationing of credit to competing uses and this would increase the mortgage interest rates. Equation (6) can be stated as:

$$R_m = f(rb, rt, y, ms, \pi) \tag{8}$$

Ms represents money supply which is (M3)

3.3 Empirical model

From the reviewed literature we develop our model based on the variables presented by studies as likely to influence mortgage interest rates. Consistent with Milan (Milan, 2010) and Sirmans, et al (2012) our empirical model is specified as;

$$LnR_m = \beta_0 + \beta_1 LnIBR + \beta_2 LnT_B + \beta_3 LnINFL + \beta_4 LnGDP + \beta_5 LnM_3 + \varepsilon_t \tag{9}$$

Where,

R_m = variable mortgage interest rate.

$\beta_1, \beta_2, \beta_3 \ and \ \beta_4$ = Parameter of the model

IBR= Interbank lending rate

T_B = Treasury bill rate

INFL= the inflation rate

Real GDP = Real Gross Domestic Product

M_3 = money supply

ε_t = error term

3.3.1 Dependent variable

The choice of the above variables is based on empirical and theoretical literature review. The dependent variable was variable mortgage rate. The choice of variable interest rate was informed by central bank residential mortgage survey which showed that 97.4% of mortgage loans in Kenya are on variable interest rate (Central Bank annual Supervision Report, 2013). This variable was measured using average of variable mortgage data from five mortgage institutions which according to Central Bank control at least 70 % of the

total mortgage market. The data was on monthly basis covering the period between 2000 and 2013.

3.3.2 Explanatory variables

For the purpose of this study, we considered a set of variables likely to influence the trend of mortgage interest rates which includes macroeconomic indicators and banking-financial indicators. Each of them is described in detail as follows:

Gross domestic product

The real GDP is the measure of income. It has been used in the literature as an indicator of a country's macroeconomic conditions and also a proxy of household income. In this study real GDP in market prices was divided by the respective CPI index. Increase in the economic activity in a country leads to increase in demand for credit and therefore real GDP and lending rates are positively correlated (Gambocarta, 2004). In this study real GDP was used in monthly basis.

Treasury bill rate

The treasury rate was the 182 days treasury bill rate. This represents the opportunity cost of funds incurred by lending institution. This is based on the premise that the economic agents can either invest in mortgage or long term securities such as government treasury bills. Incase the interest rates paid on treasury bills increases, the opportunity cost of investing in mortgages increases and therefore interest rates are expected to reduce as evidenced in the study by Sirmans, et al (2012). 182 days treasury bill rates was used in monthly basis from 2000 to 2013.

Inflation

Inflation is a measure of general increase in prices. This variable is important since lenders being rational, would require compensation for the loss in purchasing power. Rising inflation tend to erode the purchasing power of money and therefore when

inflation rises interest rates are expected to rise (Mishkin, 2005). In this study we used inflation rate in monthly basis.

Inter-bank lending rate

Interbank lending rates represent rates at which banks lend to each other. This variable has been used in the literature as a proxy for the cost of funds by the mortgage finance institutions. If the cost of obtaining funds by mortgage institutions increases the lending rate will increase in return.

Mortgage rates are expected to rise as the cost of credit increases hence there exist a positive relationship as evidenced in Milan (2010). In this study we used the commercial banks interbank rate on monthly basis.

Money supply

Money supply will be measured in terms of broad money (M3) which includes M1 and M2. This is used to capture the change in money supply as reported by the Central bank. M3 was used in monthly basis. Lending rate and deposit may change as the monetary policy changes because of its effect to short term interest rates. For instance, a tight monetary policy will increase lending rates because lenders pass the cost to borrowers (Gambarcorta, 2004). Therefore, mortgage rates and money supply are negatively correlated.

3:4 Data

The study utilised monthly data for the period 2000 to 2013. The dependent variable was variable interest rate only and was collected from five main institutions for mortgage finance that according to Central Bank Survey (2013) represent 70% of the mortgage market. These institutions are Kenya Commercial Bank, Housing Finance, Standard Chartered Bank, CFC Stanbic Ltd and the Cooperative Bank of Kenya. The income measure that is, real GDP, money supply (M3), interbank lending rate, 182 days Treasury bill rate and inflation rate were collected from the Central Bank of Kenya.

Table 3.1: Summary of variables and expected signs

Variable	Notation	Measure	Predicted effect	Source
Cost of credit	IBR	Interbank lending rate	Positive	CBK
Opportunity cost of funds	T_B	182 days T-bill rate	Positive	CBK
Inflation	INF	Inflation rate	Positive	CBK
Gross domestic product	REAL GDP	REAL GDP	Positive	KNBS
Money Supply	Ms	M3	Negative	CBK

3.5 Estimation and testing

In order to explain the determinants of mortgage rates, the study shall use the ordinary least squares model (OLS). OLS's main assumption is that the errors must be uncorrelated. For data estimation, multiple Ordinary Least Squares method was applied. The collected data was transformed into natural logarithms so that the parameters can be interpreted in terms of elasticities. Prior to carrying out data estimations, the following pre - tests were applied on the data.

3.5.1 Stationarity test

In order to establish the order of integration of the variables, unit root test was applied. We needed to know the order of integration of the variables so as to decide on whether we should run VAR in case our variables are cointegrated at the same time non stationary. In this case, Augmented Dickey- Fuller test was used. The reason behind application of the unit root test is to avoid econometric problems of spurious regression as well as the inconsistency problem. For the model estimates to be BLUE estimates it's required that all variable of the model are integrated of the same order failure to which spurious regressing and inconsistency problems will be inevitable. For this test our null will be "presence of a unit root" and alternative hypothesis "absence of a unit root". Non – stationary variables will therefore require to be differenced to make them stationary prior to carrying out the OLS regression.

3.5.2 Co-integration test

Granger, C.W (1983) showed that if two variables are cointegrated, then they have an error correction representation (ECM). Two time series variables are cointegrated if:

- They are integrated of the same order, I(d)

- There exists a linear combination of the two variables that is stationary (I(0)).

Co-integration test will be crucial to determine the presence of the absence of the long run relationship among the model variables. In this case we applied the Johansen cointegration test. Presence of co-integration test imply the presence of the long run relationship and thus the need for running the error correction model to correct for the adjustment of the short – run disequilibrium.

Post-estimation/diagnostic tests

We also carried various post-estimation tests in order to confirm the adequacy of our chosen model. The purpose of any diagnostic test is to control accurately the probability of wrongly rejecting the null hypothesis, while at the same time ensuring a high probability of correctly rejecting the null hypothesis.

3.5.3 Heteroscedasticity test

The homoscedasticity assumption means that the variance of the unobservable error term ε_t is constant. If this assumption fails the OLS will be ineffective and it means that the residual variance differs across time periods (Var (ε_t/ Xi) = $\sigma2$) (Gujarati, 2004). In this case there will be a problem of heteroscedasticity which will be corrected by heteroskedasticity-robust standard errors.

3.5.4 Autocorelation test

Given the nature of the data absence of autocorrelation cannot be assumed. Durbin-Watson test was used to test the presence of serial autocorrelation. Presence of autocorrelation will imply that regression errors are correlated across observations. If this is the case the problem will be corrected using autoregressive models.

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents data analysis of the study and the results. This includes summary statistics, correlation analysis, stationarity and co-integartion tests, regression analysis and post estimation tests.

4.2 Descriptive Statistics

Descriptive statistics such as Skewness, Kurtosis, Jarque-Bera Statistic, and Probability Value are calculated for all the variables. Results of the same are presented in Table 4.1. Table 4. 1shows that money supply has a mean value of Ksh. 1,137,361 while treasury rate has a mean of 8.46 per cent. In terms of the standard deviation from the mean, money supply is the most volatile followed by real GDP with mortgage rate displaying the lowest volatility. All variables are positively skewed hence right tailed implying that their distributions when plotted have the tail prolonged to the right from the mean value.

In terms of distribution of the variables, mortgage rate is normally distributed given that is has a kurtosis value of 3.103. For a normal distribution the kurtosis statistic is 3.0 this therefore implies that all the other variables are non – normally distributed. The Jarque-Bera statistic measures the distribution of the error term. A probability of the Jarque Bera statistic of less than 5 percent significance level implies that the error term is normally distributed hence acceptance of the null hypothesis otherwise not. From the descriptive statistics, all the variables are normally distributed except the mortgage rate which has non – normal distribution.

Table 4.1: Descriptive Statistics

	Mortgage Rate	Inflation	Treasury rate	Interbank Rate	Money Supply	REAL GDP
Mean	17.1660	8.7866	8.4617	7.2834	1137361	3495.930
Median	16.7500	6.6700	8.1200	6.8100	1045533	3445.427
Maximum	20.7000	19.7200	20.6900	28.9000	1957492	4268.136
Minimum	14.0200	1.9600	1.7200	0.9800	560061	2855.729
Std. Dev.	1.8118	5.2720	3.5822	4.9891	413263.9	424.4961
Skewness	0.3321	0.7778	0.9697	1.8248	0.3534	0.3244
Kurtosis	3.1034	2.2155	5.4416	7.4070	1.8274	2.0896
Jarque-Bera	1.7887	12.0165	38.4884	129.6074	7.4198	4.9468
Probability	0.4088	0.00245	0.0000	0.0000	0.024480	0.0843
Sum	1630.770	834.7300	803.8700	691.9200	1.08E+08	332113.3
Sum Sq. Dev.	308.5877	2612.703	1206.247	2339.774	1.61E+13	16938516
Observations	95	95	95	95	95	95

4.3 Correlation analysis

Correlation measures the strength of the relationship between two variables. If two variables move together, they are said to be correlated. Correlation matrix is based on the correlation coefficient ranging between -1 to +1. A correlation coefficient of -1implies a perfect negative linear relationship between variables, +1 shows a perfect positive linear relationship, and 0 means there is no linear relationship between variables. Multicollinearity among the variables is said to occur if the correlation coefficient between two variables is above 0.8 (Gujarati (2004) Table 4.2 reports the pair wise correlation coefficient of all variables of the model.

Table 4.2: Pair-wise Pearson coefficient of correlation

	MORTGAGE	INFL	GDP	T_B	IBR	MS
MORTGAGE	1	0.3189	-0.1121	0.3127	0.3447	0.0501
INFL	0.3189	1	0.0078	0.1270	0.1565	-0.0824
GDP	-0.1121	0.0078	1	-0.4589	-0.3998	-0.6132
T_B	0.3127	0.1270	-0.4589	1	0.9313	0.3563
IBR	0.3447	0.1565	-0.3998	0.9313	1	0.3274
MS	0.0501	-0.0824	-0.6133	0.3563	0.3274	1

From the results, none of the variables is correlated with another since the correlation coefficients lies between – 0.6132 and 0.3447 thus low correlations among the variables.

Trend analysis of the variables

Appendix 1 presents the graphical analysis of the variables. The analysis reveals that the series are time-varying. This may imply that each series may not be stationary in level terms. Money supply, inter-bank rate, treasury rate and inflation seem to display positive upwards trend with an intercept, the other variables displays intercept with no meaningful trend. Real GDP growth displays negative trend since 2003. Such information on each series is particularly important in determining whether a series is stationary or not. A close scrutiny of data shows structural break in 2010 for the mortgage rate, treasury bill rate and inflation.

4.4 Sationarity Test

This test is used to determine for stationarity (or non stationarity) of the time series data. It is conducted to prepare the time series variables for statistical analysis and to ensure that variables to be used in the analysis are integrated of the same order. A unit root test is a statistical test for the proposition that in the autoregressive statistical model of the time series data, the Null hypothesis of this test is that $\rho=0$, where $\rho=\alpha-1$ and $\alpha=1$ in the equation $\Delta y = \rho y_{t-1}+v_t$, where v_t is a random term the alternative hypothesis is that ρ is less than zero in the equation. If $\rho=0$ or $\alpha=1$, then there is a unit root and the variable under consideration is non stationary or integrated and if the null hypothesis is rejected then the time series variable is stationary. A stationary series depicts mean revision in that it fluctuates around a constant long run mean and has a finite variance that is time invariant. On the other hand non stationary time series when used in estimation it produces unreliable t-statistic of the estimated coefficients that have infinite variances, mean or variance that are time dependent that is no long run mean to which the series returns to.

A variable is non stationary if the estimated ADF test is smaller than the critical value in absolute terms and vice versa. Some non stationary variables have to be differenced to make them stationary. If a time series has a unit root, the first difference of such time series has to transform it to stationary. The ADF test is reported in Table 4.3

Table 4.3: ADF Unit root Test for the Sample period 2000-2013

	At Level with Intercept		At First Difference with Trend and Intercept		Order of Integration
Variables	t-statistic	Critical values	t-statistic	Critical values	
Mortgage Rate	-3.2062	-3.4808 at 1% -2.8836 at 5%	-12.6904	-4.0302 at 1% -3.4445 at 5%	I(1)
Inflation	-2.9568	-3.4812 at 1% -2.8837 at 5%	-7.3645	-4.0302 at 1% -3.4445 at 5%	I(1)
Treasury Rate	-2.5016	-3.4812 at 1% -2.8837 at 5%	-7.3121	-4.0302 at 1% -3.4445 at 5%	I(1)
Interbank Rate	-3.0290	-3.4825 at 1% -2.8843 at 5%	-4.1135	-4.0302 at 1% -3.4455 at 5%	I(1)
Money Supply	0.8790	-3.4808 at 1% -2.8836 at 5%	-12.5364	-4.0302 at 1% -3.4445 at 5%	I(1)
REAL GDP	-0.8817	-3.4861 at 1% -2.8859 at 5%	-2.9841	-4.0302 at 1% -3.4445 at 5%	I(0)

The results all variables are integrated of order 1 implying the presence of one unit root. Only inflation is stationary at level implying that it is integrated of order zero. We therefore differentiate all non–stationary variables to make them stationary.

4.5 Testing for Co-integration

At times two or more variables may be non stationary but a linear combination of these variables form a long term or equilibrium relationship between them. This condition is exhibited when a regression of these variables is run and residuals from these regression are subjected to unit root test and found to be stationary at levels I (0). Under these condition, although the individual variables are I (1) that is they have stochastic trends their linear combination is I (0) and the regression from these variables is not spurious but give a meaningful interpretation and these variables are said to be co integrated. Variables, found to be co integrated must be integrated of the same order. In our study we applied the Johansen co integration test to test as to whether the variables have a long run relationship. The test which yielded the results is presented in Table 4.4.

Table 4.4 Johansen Co-integration Test

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.370463	130.4531	95.75366	0.0000
At most 1 *	0.221670	71.68120	69.81889	0.0352
At most 2	0.124775	39.85444	47.85613	0.2278
At most 3	0.114596	22.92860	29.79707	0.2496
At most 4	0.056257	7.471337	15.49471	0.5235
At most 5	0.000927	0.117835	3.841466	0.7314
Trace test indicates 2 co integrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

Unrestricted Co-integration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.370463	58.77193	40.07757	0.0002
At most 1	0.221670	31.82675	33.87687	0.0461
At most 2	0.124775	16.92585	27.58434	0.5863
At most 3	0.114596	15.45726	21.13162	0.2581
At most 4	0.056257	7.353502	14.26460	0.4482
At most 5	0.000927	0.117835	3.841466	0.7314
Max-eigen value test indicates 2 co integrating eqn(s) at the 0.05 level				

The results reveal that according to the trace statistic test there are two co-integrating equation Similarly the Max-Eigen statistic reveal presence of two co-integrating equation. This therefore concludes that private investments has a long run relationship with all other independent variables implying that in the long run, they move in the same direction. As a result the OLS model yields into the long run relationship among the variables which is also the unrestricted model.

Table 4.5 Co-integrating equations for mortgage rate

Standard errors ( ) and t- statistics [ ]

Co-integrating Eq:	CointEq1	CointEq2
LN MORTGAGE_RATE(-1)	1.000000	0.000000
LN INFLATION(-1)	0.000000	1.000000
LN TREASURY RATE(-1)	0.539213	-8.177340
	(0.21176)	(2.05738)
	[2.54628]	[-3.97464]
LN GDP(-1)	4.420591	-27.61402
	(0.68472)	(6.65237)
	[6.45603]	[-4.15100]
LN INTBANK(-1)	-0.381092	4.473525
	(0.12941)	(1.25730)
	[-2.94477]	[3.55803]
LN M3(-1)	1.212998	-6.683278
	(0.19058)	(1.85152)
	[6.36492]	[-3.60962]
C	-56.11934	324.4427

4.6 Empirical results and discussion

The main aim of running the long run variable mortgage rate function was to obtain the
residuals of the model and subject them to the unit root test and see whether they are
integrated at levels. If the computed Engle Granger value has excessive negativity than
the critical value then our conclusion is that the residuals from the variable mortgage rate
function is I (0); that is, they are stationary. This means that the parameters of investment
function can be interpreted as long run parameters.

The long run unrestricted model estimates are presented by the Table 4.6 which shows that previous period mortgage rates, inflation and real GDP growth are significant determinants of mortgage interest rates. The findings imply that one per cent increase in the previous period mortgage rate will increase the current period mortgage rate by 0.84. This suggests that mortgage rates are sticky downwards. These results are similar to Jacobs et.al (2007) and in particular confirms the hypothesis that mortgage rates are rigid downwards.

Table 4.6: Determinants of mortgage rates (long-run estimation)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.002225	1.030555	0.972510	0.3327
MORTGAGE_RATE1	0.839393	0.052862	15.87896	0.0000
INFLATION	0.014636	0.008586	1.704553	0.0308
TREASURY RATE	-0.003666	0.023622	-0.155181	0.1469
GDP	-0.055098	0.084986	-0.648313	0.0180
INTBANK RATE	-0.002802	0.014955	-0.187351	0.8517
LNM3	-0.008340	0.024079	-0.346343	0.7297
R-squared	0.734374	Durbin-Watson stat		2.041633
Adjusted R-squared	0.721521			
F-statistic	57.13696			
Prob(F-statistic)	0.000000			

Inflation was found to be positively and significantly related with mortgage rates. It implies that that one per cent change in inflation will increase mortgage rates by 0.15% . The findings are also consistent with Mallilk and Bhar (2010), Ikhide (2009) and Folowelwol and Tenan t (2008) who singled out inflation as key determinant of interest rates.

Real GDP was also found to have significant but negative impact on mortgage lending rates. According to the results a one per cent increase in real GDP would reduce mortgage lending rates by 0.06 percent. These findings however, were contrary to Wambua (2013), who found real GDP to be insignificant in explaining movements in interest rates. Notably, the negative relationship between real GDP and mortgage rates is

surprising. Since we would expect that increase in income would increase demand for mortgage hence pushing lending rates upwards. This implies households may be preffering other methods of acquiring houses such buying in cash as a consequent of the income effect as they seek to attain higher levels of utility.

We found treasury bill rate statistically insignificant in explaining changes in mortgage rates. 182 Days T bill rate was taken to proxy for the opportunity cost of investing in mortgage. From the OLS results a one per cent increase in 182 Days T bill rate would cause mortgage lending rates to reduce by 0.004 percent. It is important to note that the resulting sign is contrary to theoretical assumption that increase in capital market rate would increase the opportunity cost and consequently increase in lending rates. These findings imply that the positive and significant impact of Treasury rates in short term interest rates as was the case in Nampewo (2013), cannot be generalized to mortgage interest rates.

Interbank lending rates were found to be statistically insignificant in explaining variation in mortgage rates. One per cent increase in interbank lending rates would cause mortgage to decrease by 0.003 per cent. This is not surprising given that mortgage loans are long term in nature and therefore, it is probable that lenders do not depend on short term lending as a source of funds.

Finally, money supply is not important in explaining changes in mortgage lending rates. From the OLS a per cent change in money supply would lead to 0.01 per cent reduction in mortgage rates. These results are consistent with those of Fazel (2006).

For the coefficient of determination, 73.43 per cent of changes in mortgage rates are determined by independent variables in the model. Only 26.57 per cent of total changes in mortgage interest rates are determined by factors outside the model. Considering the joint test statistic, the probability of F – statistic is less than 5 percent implying that all the independent variables jointly determine mortgage interest rate in Kenya.

Looking at the autocorrelation, the Durbin Watson statistic is close to 2.0 implying absence of autocorrelation among the model variables. On the heteroscedasticity problem was solved by generating the robust standard errors when analyzing the data.

4.7 The Error Correction Model

As noted above, the variables are co-integrated and there is a long run relationship between them. If there is short term disequilibrium, then the error term can be treated as the "equilibrating error" and the error term is used to tie the short run behaviour of the variable mortgage rates in Kenya. The estimation results are reported in Table 4.7

Table 4.7: Determinants of mortgage rates (ECM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002603	0.006771	0.384518	0.7013
D(MORTGAGE RATE (-1))	0.650445	0.266518	2.440530	0.0161
D(INFLATION)	0.049781	0.024930	1.996842	0.0481
D(TREASURY RATE)	-0.017190	0.032910	-0.522349	0.6024
D(GDP)	-0.054315	0.109460	-0.496209	0.6206
D(INTBANK)	-0.000880	0.017743	-0.049596	0.9605
D(M3)	-0.187381	0.413563	-0.453090	0.6513
U1	-0.840677	0.280423	-2.997891	0.0033

R-squared	0.115645	Durbin-Watson stat		1.976305
Adjusted R-squared	0.064904			
F-statistic	2.279103			
Prob(F-statistic)	0.032390			

Table 4.7 shows that the coefficient of the error correction term (U1) is –0.8407 implying that the short term disequilibrium are being corrected at the rate of 84.07 percent per month to arrive at the long run equilibrium. The coefficient is significant since the probability of the error correcting term is less than 5 percent. Therefore, our error correction model is valid.

4.8 Post estimation tests

Upon running the estimations, post estimation tests were carried out to confirm that the coefficients estimated were unbiased and reliable.

4.8.1 Test for Autocorrelation

Autocorrelation problem is an econometric problem in which the error terms are serially correlated. From the study, the Durbin Watson test to whether there was serial correlation among the variables. Durbin Watson statistic ranges from 0 to 4. A Durbin Watson statistic of 2 implies absence of autocorrelation among the variables. A statistic close to 2.0 implies absence of serious autocorrelation problem. From the results, the statistic is 1.97 which is close to 2.0 implying absence of serious autocorrelation problem.

4.8.2 Test for normality

Upon testing for the autocorrelation and heteroscedasticity, we tested for the distribution on the error terms of the estimated model. The study used residual test to tests for the normality of the error term. The results for normality test are presented in figure 1. From the test results the probability of the Jarque – Bera statistic is less than the conventional 5 percent significance level. This therefore warrants acceptance of the null hypothesis implying that the error terms of the model are normally distributed.

Fig 1: Normality test results
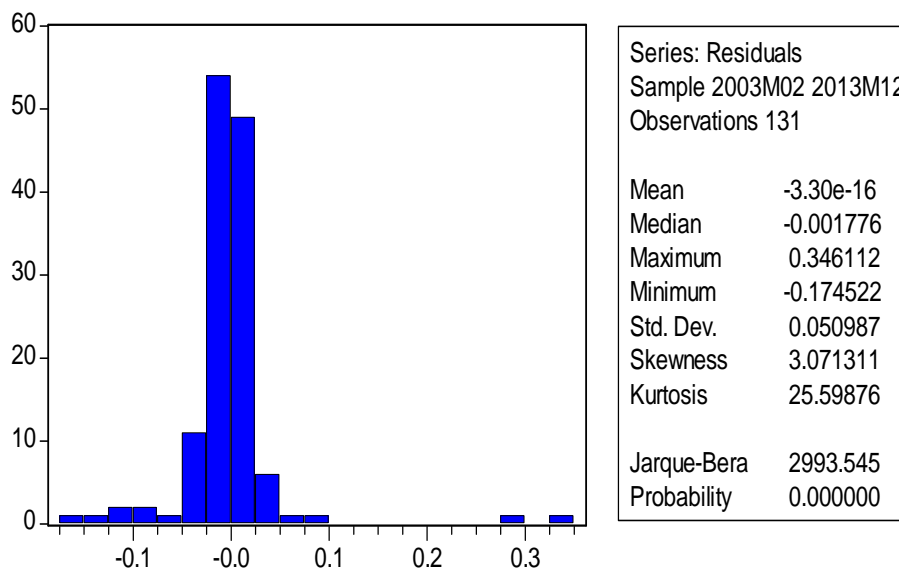
4.8.3 Test for Heteroscedasticity

Heteroscedasticity is an econometric problem in which the variance of the error terms is not constant across the observations of the variables. The key assumption with regression is that the variance of the error term is homoskedastic across all the observations. Presence of heteroscedasticity has a serious consequence on ordinary least squares estimators in that they become unbiased and consistent, but they are not efficient and the standard errors are inconsistent therefore invalidating statistical test.

The results given in Table 4.8 indicate that the   p value is 0.0677 hence non-significant at 5% level of significance. This is an indication that the errors are homoskedastic and independent of the regressors, therefore we accept the null hypothesis of constant variance

Table 4.8: White heteroscedasticity Test:

F-statistic	1.734798	Probability	0.067735
Obs*R-squared	19.64523	Probability	0.074102

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Several studies have tried to establish how macroeconomic factors and bank financial indicators are related with mortgage rates. Since high mortgage rates impede growth in mortgage loan uptake, it is important to understand how variables such as inflation, treasury bill rates, real GDP, inter-bank lending rate and money supply influence mortgage rates. In this study, the relationship between these variables and mortgage rates was investigated for the period between 2000 and 2013.

5.2 Summary of the findings

The variables were estimated using the multiple linear regression models. The objective of this study was to determine the effect of inflation, real GDP, treasury rate inter-bank lending rate and changes in money supply on the variable mortgage rates in Kenya. The results showed that previous period mortgage rates, inflation, and real GDP were significant determinants of mortgage rate in Kenya. Treasury rates, interbank lending rates and money and money supply were insignificant.

Finally it was found that money supply and mortgage rates are negatively related but not significant in explaining mortgage rates in Kenya. However, results were consistent with the economic theory which postulates that tight monetary policy will push lending rates upwards.

5.3 Conclusion

Based on the empirical findings we can conclude that mortgage rates in Kenya are solely determined by pervious mortgage rates, inflation and economic growth. Contrary to economic theory, treasury rates, interbank lending rates and money supply do not matter. The inter-bank lending rates are not significant in explaining movement in mortgage

lending rates. It is probable that the lending institutions do not rely on short term borrowing as a source of funds for mortgage loans.

Money supply in terms of broad money (M3) was found to have a negative impact on the mortgage lending rates although insignificant.Inflation was found to have a strong connection with mortgage rates. These findings confirm economic theory which postulates that interest rates have positive relationship with mortgage lending rates. real GDP was also found to be significant in explaining mortgage interest rates.

5.4 Policy implication and recommendation

From the findings of the study the Central Bank should endeavor to achieve desirable inflation rates in order to encourage mortgage loan uptake through lower lending rates. These results supports the decision to anchor inflation rates within the 5 per cent (+/- 2.5 basis points) bound by the Central Bank. This in turn will lead to lower lending rates and consequently increase mortgage loan uptake.

Secondly, the policy makers should create conducive environment so that the prevailing lending rates reflects the prevailing macroeconomic environment. This will reduce the stickiness of the mortgage rates as was showed by estimation results. This can be achieved by increased transparency through enhancing disclosure of information especially on the part of the lender, encouraging competition among the players and appropriate policies by the regulator that reduce uncertainties in the market.

Given that real GDP growth rates are accompanied by reduction in mortgage rates, it implies that when households income increases, individuals opt to finance their housing through other means such as short term bank loans, personal savings or buy in cash. This implies that mortgage rates are relatively high and therefore mortgage loans are considered comparatively expensive in the long run. Given the revelation, there is need to consider ways that would lower the prevailing mortgage rates in order to promote

mortgage uptake. This may be achieved by embracing Central Bank policy such as KBBR by all lenders.

From the conclusion of the study, investors do not consider government bills as the opportunity of mortgage as a bench mark for measuring interest rates. Finally, as the findings show mortgage interest rates do not move with short term interest rates. This implies there is need for Central Bank and the government to have different policies targeted to mortgage sector in their concerted effort towards lowering interest rates and provision of low cost housing.

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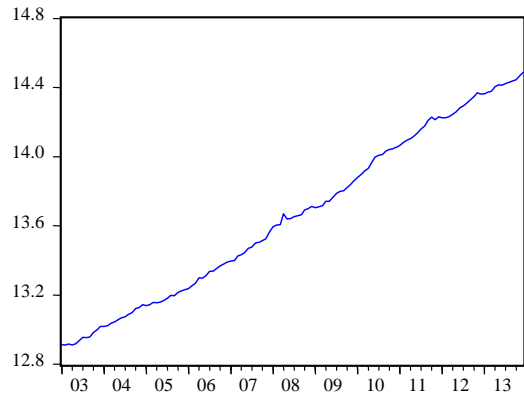
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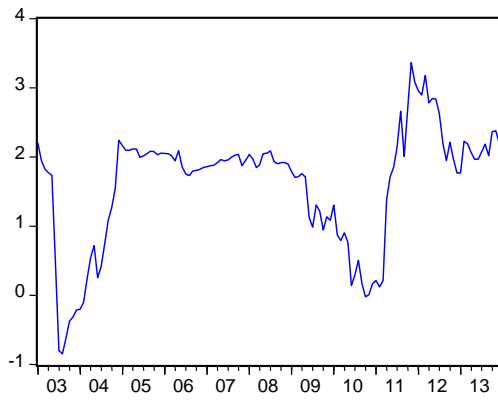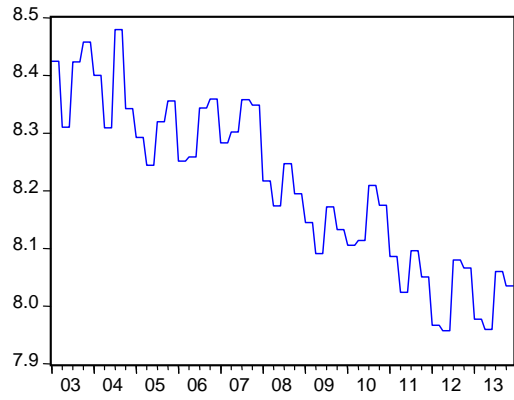
APPENDIX 1: STATIONARITY GRAPHS

MORTGAGE RATE
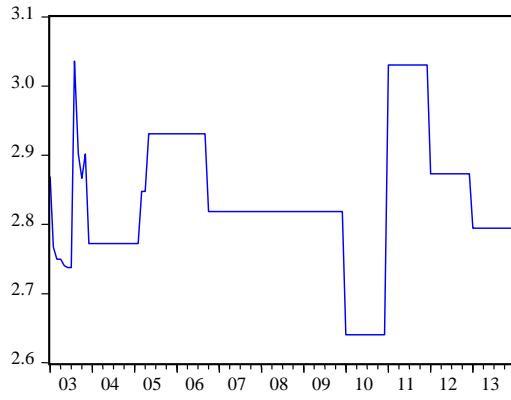
LNM3

INTBANK

GDP

BOND RATE

INFLATION