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Factors Affecting the Growth of Real Estate in Kenya

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Abstract: **The aim of this study is to assess factors affecting the growth of real estate in Kenya. The objective of this study was to examine the effect of interest rate, inflation rate, and interest rate and GDP fluctuations on real estate growth. Higher market risk because of concentration in a specific industry, interest rate volatility and long term investment that can lead to decline in the value of real estate, risks related to general and economic conditions, changes in the value of the underlying property and default on loans. The study will be of great significance to the real estate firms and other researchers. The study adopted correlation research design. Secondary data was collected from central bank, Hass consultant quarterly property index. Time series analysis was applied; ADF revealed that real estate growth rate and exchange rate were stationary at the first difference while interest rate, inflation rate and GDP all were stationary at first difference. Johansen Cointergration was used to examine the long run relationship which revealed nonexistent of Cointergration among the study variables therefore it was not appropriate to fit error correction modeling to examine short run relationship. VAR was used to examine both impulse response and variance decomposition. An increase in exchange rate had a positive impact on real estate growth. Interest rate had a negative impact on real estate growth. This implies that the more the government borrows on short run locally it discourages real estate growth rate since there are increased borrowing charges thus the government should devise measures of borrowing externally as such to promote real estate growth. Thirdly, the results revealed that GDP had a positive influence on real estate growth rate. This implies that in order for the country to ensure that positive strides are made in relation to real estate then GDP acceleration strategies should be pursued which will ensure that the real estate grows at faster rates. Finally, inflation rate influence real estate growth rate positively. This implies that there an increase in inflation rate increases growth rate, there are various factors which influences an increase in inflation. An increased amount of money borrowed increases inflation though in most cases real estate is financed using debt financing. There is need to control inflation levels as such to eliminate the chances of increased cost as real estate grows.**

Keywords: **Growth, Real Estate, interest rate, inflation rate.**

1. INTRODUCTION

The real estate industry, much like any other industry, is continuously evolving. The key drivers for the real estate sector ranges from prospect for profitability to the changing face of space complimented by the uncertainty surrounding the sector. However, as major towns in Kenya continue experiencing rural-urban migration which is driving growth in demand for both residential and commercial property, property developers are not able to satisfy this demand (Sill & Keith, 2004). This has been to some extend as a result of absence of a proper finance mechanism, non-availability of loan capital, high interest rates, general low income levels, bottleneck in the supply of building materials, increasing cost of building material and land acquisition problems. Although the demand for affordable modern housing in Kenya is insatiable, real estate developers are faced with a low sale-to-rental ratio on the properties they build. Because of high interest rates, low mortgage uptake, and high perceived risks of default. For real estate developers, this means that they cannot sell off properties to raise capital and build new developments (Gilda et al, 2003).

1.1 Global Perspective of Real Estate:

The Indian real estate sector is one of the most globally recognized sectors. It is slated to grow at 30 per cent over the next decade. It comprises four sub sectors - housing, retail, hospitality, and commercial. The growth of this sector is well complemented by the growth of the corporate environment and the demand for office space as well as urban and semi-urban accommodations. The construction industry ranks third among the 14 major sectors in terms of direct, indirect and induced effects in all sectors of the economy (Kapila, 2014).

The South African real estate market size is expected to increase to US$ 180 billion by 2020. The housing sector alone contributes 5-6 per cent to the country's gross domestic product (GDP). Also, in this period, the market size of this sector is expected to increase at a compound annual growth rate of 11.2 per cent. Retail, hospitality and commercial real estate are also growing significantly, providing the much-needed infrastructure for South Africa's growing needs. Real estate has emerged as the second most active sector, raising US$ 1.2 billion from private equity investors in the last 10 months (Norbert, 2014).

In Seychelles foreign investors have bought real estate valued property space worth over US$ 2 billion. Responding to an increasingly well-informed consumer and keeping in mind the globalization of the business outlook, real estate developers have also shifted gears and accepted fresh challenges especially that of land scarcity. Real estate developers are struggling to meet the growing demand for housing and the need for managing multiple projects across cities in the country (Raman, 2013).

1.1.1 Kenyan Case:

In Kenya the real estate market is increasingly dominated by institutional investors. This presents a challenge to private real estate investments because individual properties are not bought and sold on a regular basis like stocks and bonds (Dawson et al, 2007). Unlike the developed countries that use stocks and bonds, financing of real estate, in Kenya it is predominantly through mortgage financing. Interest rate targets are a vital tool of monetary policy and are taken into account when dealing with variables like investment, inflation, and unemployment. The Central Bank of Kenya generally tends to reduce interest rates when they wish to increase investment and consumption in the country's economy. However, a low interest rate as a macro-economic policy can be risky and may lead to the creation of an economic bubble, in which large amounts of investments are poured into the real-estate market and stock market.

The Kenyan property market has increased by 25 per cent, including increases in commercial and residential real estate East Africa's biggest economy is growing at a rate of 2.7 per cent annually. During the country's rebasing – replacing of the old base year used for compiling the constant price estimates to a new and more recent base year – that saw the country attaining a lower middle income status, the real estate sector contributed 5.9 per cent accounting for most of the change in the level of the country's GDP. Meanwhile, a survey by the country's central bank revealed there were less than 20,000 mortgage loans in the country in 2013, a fraction to that of the population of the capital city, Nairobi at over four million. Nonetheless, the real estate sector in the country grew by 2.6 per cent in the second quarter of 2014 according to the county's statistics bureau. The Kenyan real estate market is focused on renting properties, with 70 per cent of house hunters looking to rent. Although there is an imbalance between the supply of housing and the current demand, this gap provides investors and developers with a great opportunity to make capital gains and fuel the economy. Especially with lower interest rates, the real estate market has great potential for growth. A housing price index is set to be launched to help policymakers take a broader view of changes in the economy and to assist investors in managing risk as the country currently has no independent tool for tracking real estate prices (ROK, 2014).

Kenya's GDP increased to 55.2 billion US dollars in 2013 from 44.1 billion US dollars, a 25.3 per cent jump. The real estate sector contributed 5.9 per cent accounting for some change in the level of the country's GDP. The country's booming property market is said to be responding to demand that has been created by the expanding middle class. Currently, the total number of mortgage accounts in Kenya stands at 20,000 which is significantly below the demand for housing units of more than 200,000 per year and growing. There is therefore an urgent need to increase the supply of new and affordable housing units. Financial institutions are similarly focusing their effort towards easing access to affordable credit by lowering the mortgage rates, lengthening the mortgage repayment periods by embracing multi-generational mortgages and restructuring mortgage repayment mode in order to accommodate the informal sector (GOK 2014).

Lower interest rates allow more people to be able qualify to purchase a home, thus more people can afford to purchase and at the same time, because more people are able to purchase homes it reduces the amount of homes on the market

(reduces the supply) which in turn pushes up the cost. Conversely, when interest rates are high fewer buyers are able to qualify for a loan which increases supply. Over supply tends to push prices lower.

The real estate sector being one of the major sectors of the economy in Kenya has been largely affected by fluctuating interest rates. The study seeks to show case this effect by showing how real estate growth is affected by the cost of borrowing. Real estate is a large investment which requires huge capital that most ordinary Kenyans cannot raise, therefore they turn to banks to finance this cost of construction or purchase (Kith, 2008). The cost of borrowing in all banks is driven by the real interest rate which is fuelled or largely accommodates inflation. Inflation is the key driver of interest rates. The banks are highly supervised and are under the obligatory role of the Central bank of Kenya which determines the base lending rate accommodating all factors in the economy, based on this the bank can then come up with their own mortgage rates or borrowing rates a few basis points from the Central Bank lending rate.

1.2 Statement of the Problem:

The real estate investment has been on the growth path for over a decade now. The industry has seen massive investment and there are concerns that the trend may slow down (Salmin, 2008). The change is partly attributed to the glut in supply and variability of interest rates. Although variability of interest rates is a prominent feature of the economy, interest rates change in response to a variety of economic events, such as changes in government policy, crises in domestic and international financial markets, and changes in the prospects for long-term economic growth and inflation. There is a more regular variability of interest rates associated with the business cycle, the expansions and contractions that the economy experiences over time (Mohan & Lewin, 2007).

Anderson & Filbert, (2007) assert that real estate investment can improve returns, especially if interest rates increase funding costs of new construction and the higher costs limit the amount of new supply, which, in turn, supports increased pricing of existing buildings and improves the overall performance of real estate. Makay, (2006) posit that that interest rates and real estate prices are generally inversely correlated and that, rising interest rates can cause capitalization rates—the ratio between the net operating.

Young & Cramer, (2007) posit that there are numerous real estate investment challenges that may be as a result of higher market risk because of concentration in a specific industry, sector or geographical sector. Interest rate volatility and long term investment can lead to decline in the value of real estate, risks related to general and economic conditions, changes in the value of the underlying property and default on loans. When the interest rate is low, real estate investors do not discount their future investment but are more concerned about what the value of their investment will be (Makinsey, 2008). These concerns have led to increased volatility, in the form of unusually large upward or downward movements in asset prices. The aforementioned concerns are critical and hence the need to find out factors affecting the growth of real estate with a view to addressing the gaps

1.3 Objectives of the Study:

1.3.1 General Objective:

The main objective of the study was to assess factors affecting the growth of real estate in Kenya.

1.3.2 Specific Objectives:

The specific objectives of the study were:

i. To establish the effect of exchange rate on the growth of real estate in Kenya.
ii. To determine the effect of interest rate on the growth of real estate in Kenya.
iii. To assess the effect of GDP fluctuations on the growth of real estate in Kenya.
iv. To examine the effect of inflation rate on the growth of real estate in Kenya.

1.4 Research Questions:

The following research questions guided the study:

1. What is the effect of exchange rate on real estate growth rate in Kenya?
2. How does interest rate affect real estate growth rate in Kenya?
3. How does GDP affect real estate growth rate in Kenya?
4. What is the effect of inflation on real estate growth rate in Kenya?

2. LITERATURE REVIEW

2.1 Literature Review:

This chapter reviews the existing literature that underpins the study. The study is reviewed thematically with special emphasis on the theories, empirical studies, and summary of research gaps.

2.2 Theoretical Review:

According to (Graham, 2002) a theory is a set of statements or principles devised to explain a group of facts or phenomena especially one that has been repeatedly tested or is widely accepted and can be used to make predictions about natural phenomena. Theories are formulated to explain, predict, and understand phenomena and, in many cases, to challenge and extend existing knowledge, within the limits of the critical bounding assumptions.

2.2.1 Classical Theory:

The classical theory of interest rates applies the classical theory of economics to determining interest rates. Classical theory of interest rates compares the supply of savings with the demand for borrowing. Using supply and demand curves the equilibrium rate is calculated by determining the curves intersection point (Landau & Lifshitz, 2005).

Thus if savings are greater than investments the interest rate drops until they reach equilibrium and vice versa, if savings are less than investment the interest rate increases until the reward for savings encourages increased savings rates causing the market to again reach equilibrium.

2.2.2 Liquidity Preference Theory:

Liquidity preference theory asserts that economic units have a preference for liquidity over investing. Applying this theory explains the premium offered in forward rates in comparison to expected future spot rates. This premium is used as payment for the use of scarce liquid resources. The preference for liquidity can be accounted for by the fact that economic units need to hold certain levels of liquid assets for purchase of goods and services and the fact that these near term future expenditures can be difficult to predict. Liquidity theory is limited by its short-term nature, the assumptions that income remains stable, and, like classical theory, only supply and demand for money are considered (Garret, 2005).

2.2.3 Loanable Funds Theory:

Loanable funds theory assumes that interest rates are determined by supply of loanable funds and demand for credit. In loanable funds theory the demand of loanable funds originates from domestic business, consumers, governments and foreign borrowers. While the supply is generated by domestic savings, dispersion of money balances, money creation in the banking system and foreign lending. With these factors determining long-term interest rates, short term interest rates are decided by financial and monetary conditions in the economy. The many factors considered in loanable funds theory mean that equilibrium will be reached only when each of the factors is in equilibrium. Previous researchers conducted many studies that were useful for households, policy makers, home buyers and sellers. Mortgage rate is one of the key components of housing affordability index, and the rise in mortgage rate decreases the index and vice versa (Mc Gibany & Nourzad, 2007).

2.3 Empirical Review of the Variables:

2.3.1 Exchange Rate and Real Estate Growth:

Juma (2014) carried out a study which sought to determine the effect of macroeconomic variables on real estate investment growth in Kenya. Growth in real exchange investment was measured using percentage of change of annual Hass Composite Annual Average Stock Index with the independent variables being inflation rate, money supply growth, real output growth, growth in diaspora remittances and growth in exchange rate measured as a percentage change in average annual Kenyan currency exchange to USD. The research adopted a descriptive research design with secondary data being obtained from the Central Bank of Kenya(CBK) and Hass Consultant Report for the period between 2000-2013.The research findings established that a strong positive relationship existed between exchange rate fluctuations, growth in diaspora remittances, growth in money supply, inflations and GDP growth since they had positive coefficients with the R^2 being 0.761.The study further suggests that growth in each individual macroeconomic variable does not influence real estate investment growth in the country, but only the combination effect of the macroeconomic variables influences growth in real estate. One or more of the selected macroeconomic variables and real estate growth were found

to be declining during 2002-2005, 2007-2010 and 2011-2013 which were election periods. The study recommends that policy makers and planners ought to manage exchange rates and inflation rates. Moreover, political stability ought to be maintained in order to cushion its adverse effect on the economy.

2.3.2 Interest Rate and Real Estate Growth:

Despite the significant impact that real estate have on communities and on the environment, the real estate sector has until recently been largely overlooked as a vehicle for Investment (Pivo, 2005). This has proliferated globally as a model for evaluating the impacts of investments not only economic returns on investments, but also the social and environmental impacts of those investments. The real estate investment has received widespread attention and significant acceptance in many countries around the world, and is just beginning to make inroads into the other sectors (Odell, 2006). As such, there is presently no standard for evaluating real estate investments for adherence to Socially Responsible practices. These two facts present another significant challenge to financing real estate. Integrating real estate investments into financial models aimed at quantifying the value of development, is critical to potential investors (Boyd, 2004).

The world, real estate investment has increasingly affected the overall economy developing countries. The development of global real estate investment benefits from the liberalization and internationalization of financial market. The evaluation of market fundamentals and institutions of recipient localities are the key factors that drive the real estate market (Zhou, 2006). Global investment cost of international real estate diversification account for 68% of the market with china setting the pace with its emerging middle class. Investment in real estate has its challenges and the property market firms ought to mitigate the risks inherent in their local and domestic market. In China, real estate investment is the concern for government monopoly, while common citizens. Have no role in real estate business. Stability and affordability is more important in the real estate market than profitability (Chen, 2006)

Rahman (2008) examined the causes and effects of rising prices in Australia housing market. The research findings established that for any given price level lower interest rates implied lower mortgage repayment which allowed borrowers to borrow more for a given repayment to income ratio which causes an increase in housing demand and prices other factors held constant as was the case in the 1980s.Once interest rates increases housing demand eased and prices remained steady, increased moderately or in some cases decreased steadily as was the case between 1995-2003.

Goodhart and Hofmann (2008) incorporated the panel VAR to investigate the relationship between house prices, macroeconomic variables and other financial indicators in 17 industrialized countries. The variables in the study model were real GDP growth, CPI inflation, short-term nominal interest rate, house price growth, broad money growth and nominal private credit growth. The results depicted Granger-causal relationship between a majority of the variables and in particular causal relationship from interest rate to house prices and credit growth. The researchers found that a 25 point orthoganalized expansionary interest rate innovation led to a statistically significant 0.8% increase in house price.

2.3.3 GDP Growth and Real Estate Growth:

Huang and Ma (2015) conducted a research on the influence of real estate investment and economic growth in China. A preliminary analysis on the status of real estate investment, economic growth and fixed investment was carried out to establish the relationship between real estate investment and economic growth based on input-output method and National economic accounting theory. The research findings established that the influence of real estate investment on economic growth exceeded that of economic growth on real estate investment. Moreover, money supply played an important role to increase in real estate investment.

Muli (2015) carried out a study whose main objective was to examine the impact of GDP on growth of real estate investment in Kenya. The sample for the study comprised of real estate and renting business where data for annual time series on interest rate, inflation rate, population growth and GDP was obtained for the years between 1998 and 2012.The target population of the study consisted of private and public property developers. Primary data was collected from property developers both from the government and private sector, and financial institutions dealing in real estate property. Secondary data was obtained from Government of Kenya publications such as the Annual Budget and Financial Estimates, Central Bank of Kenya Annual report, Kenya Economic Survey and statistical abstracts by the Ministry of Planning National Development and Vision 2030.From the results the contribution of factors affecting real estate growth as measured by Pearson correlation coefficient suggest that GDP had the highest contribution with a value of 83%,inflation growth at 78%,interest rate at 75% and population growth at 29%.GDP growth, interest rate variation and growth in inflation were found to be statistically significant to real estate growth. The researcher recommends that policy

measures geared towards improving economic growth and curbing rising inflation and interest rates should be undertaken so as to increase the level of investment.

Peng *et al*., (2008) examined the relationship between the macro economy and property market development in China using data of 6 major cities and 25 provinces. The study sought to identify how price changes in property affected macroeconomic variables such as GDP growth, investment, consumption and bank credit expansion. The research findings established that property price growth was positive and significantly related to real GDP growth. They further assert that bank credit expansion did not play a critical role in property price inflation.

Chau and Chui (2005) examined the relationship between real estate prices, real estate investment and economic growth in Hong Kong. Data was obtained from the RVD and the Census and Statistics Department of Hong Kong. The real estate investments were obtained from expenditure GDP series which was classified into private and public sectors which consisted of residential and non-residential buildings. The data series was tested for seasonality and stationarity with Granger casualty test being performed to test for lead-lag relationship. The results suggested that during the period between 1973 quarter 1 and 2003 quarter 2 there was no relationship between GDP and real estate investment which was attributed to the significant variation of project duration in Hong Kong

2.3.4 Inflation and Real Estate Growth:

Inflation deprives investors of their expected profits. Inflation erodes the value of corporate earnings. Inflation favors borrowers as debt repayments are made in lower value and inflation pummels consumers especially those on fixed incomes by depressing the purchasing power of their incomes. In an effort to quiet their uneasiness, investors are re-examining the capacity of various asset types to offer inflation protection, should inflation become problematic. Conventional wisdom and some solid historical research show that real estate does indeed offer inflation protection.

Arnason and Persson (2012) conducted a study whose main objective was to analyse Swedish real estate's and other Swedish financial assets capability to hedge inflation. The researchers conducted a linear regression analysis and correlation analysis with inflation being measured from three perspectives: actual inflation, unexpected inflation and expected inflation. Data on inflation was collected for the period between 1993 and 2011. The research findings establish that none of the exposures of real estate are a hedge against expected, unexpected and actual inflation. Moreover, stocks and bonds had a negative relation to inflation while gold depicted a partial hedge against inflation. The researchers further assert that real estate in Sweden does not offer a hedge against inflation and instead they suggest that real estate is instead driven by business cycles, accessibility to financing and interest rates as opposed to inflation.

Burdekin and Tao (2012) conducted a study on the relationship between house prices, share prices and the macroeconomic variables which was examined using vector autoregressive (VAR) framework. The paper used data collected between 1999-2011 to examine the possible linkages between lending activity, real estate prices, stock prices and inflation. The research findings established that house prices respond to liquidity and lending rates along with evidence of codetermination of stock prices and housing prices. House price inflation was found to consistently impact the overall inflation rate in China based on casualty testing and VAR estimation

Nguyen et al., (2008) conducted a study which sought to establish whether real estate investment hedges expected and unexpected return in Taiwan. Data was collected between 1991 and 2006.The research findings revealed that a negative relationship between housing returns and both expected and unexpected returns proving the ineffective inflation hedge in Taiwan.

Khil and Lee (2013) conducted a study on stock returns, housing returns and inflation in US, UK and Korea. The study used a bivariate model identification of positive and negative shocks to inflation. The research findings established that housing returns cause inflation and its dynamic net effect was found to be significantly positive in all three countries.

3. RESEARCH METHODOLOGY

A correlation research design was employed for the study. According to Bryman *et al*, (2007) correlation research design was selected since the study sought to examine the factors which influencing the growth of real estate in Kenya. The design was appropriate since the study sough to examine the effect of macroeconomic factors which were observed over past periods.

3.1 Data analysis:

Econometric techniques were applied to explain the factors determining real estate growth in Kenya. Since the data was time series Augmented Dickey Fuller Test (ADF), was used as stationarity test. The long run influence between the variables was tested using Cointergration. Through this test the both short run and long run between variables was examined. To determine the impulse response and variance decomposition Vector Auto Regression (VAR) was applied. The variance decomposition was used to explain the proportion of the variance in the real estate growth as a result of its own shock and shocks of the other variables.

Statistical software (EViews 9.0) was used in the determination of the factors influencing the growth of real estate in Kenya.

3.2 Time Series Properties:

3.2.1 Stationary Tests:

The basic equation used in the ADF is expressed in the form of:

$\Delta X_t = \mu + rX_{t-1} + \partial T + \Sigma^{k}_{i=L} r_i \Delta X_{t-i} + \varepsilon_t$ …….. (3.1)

The number of lags (K) for ΔX_{t-1} should be relatively small to save the degrees of freedom, but large enough to allow the existence of autocorrelation in the error term. The hypotheses are:

H_0: r = 0

H_1: r < 0

Whereby, the rejection of H_0 for the alternative hypotheses indicates stationarity of the variables. There is also danger of over differencing in the ADF and care needs to be exercised.

3.2.2 Co-Integration and error correction mechanism:

Trends whether stochastic or deterministic result into spurious regression results, un-interpretable student t-values and other statistics have too high goodness of fit which make results difficult to evaluate. This can be resolved by differencing in order to stationaries' the data. Although, differencing stationaries' the data it leads to the loss of long run properties though this can be resolved through the use of error correction model (ECM) or measuring of the shorn effect by maintaining the stationarity.

Non-stationary variables are said to be cointergrated if they have a long run relationship amongst themselves in which deviations from their long run path are stationary that is two or more variables could be non-stationary but have their differences (or their linear combination) stationary. By definition, therefore variables are said to be cointergrated if a linear combination of these variables assumed lower order of Cointergration. The variables are themselves non-stationary but must be of the same order of integration individually. It is their linear combination which is integrated of a lower order. Where Cointergration is rejected, then there will be no long run relationship between the non-stationary series and thus there will be no information in α coefficient in equation 3.2 below. Imposition of ECM, will be rejected by the data and the solution will be to specify the model in another form in which no long run relationship appears.

If $Y_t \sim I(a)$ and $X_t \sim I(b)$ and their linear combination is

$\varepsilon_t = Y_t - \alpha X_t I(a-b)$ then Y_t and X_t are cointergrated. This can be specified as;

$Y_t = \alpha X_t + \varepsilon_t$..... (3.2)

Where

Y_t is the regress and X_t is the regressor, α is the parameter to be estimated and ε is the mean-zero error term.

If Y_t and X_t are non –stationary but their differences (ΔY *and* ΔXt) are stationary, then only the short run effect will be captured by running a regression on the following equation.

$\Delta Y_t = \alpha \Delta X_t + \varepsilon_t$…… (3.3)

But if in (3.2), $Y_t - \alpha X_t$ is stationary, then their lag ($Y_{t-1} - \alpha X_{t-1}$) can be augmented into (3.3) as an explanatory variable such that we have an ECM_t represented by

$\Delta Y = \alpha \Delta X_t + \text{ø}\ (Y_{t-1} - \alpha\ X_{t-1}) + \varepsilon_t$ …… (3.4)

Equation (3.4) simultaneously incorporates both the short run and the long run solution and has an error correlation mechanism when ø is negative.

3.2.3 Granger-Causality:

A general specification of the Granger causality test in a bivariate (X, Y) context can be expressed as:

$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \ldots\ldots + \alpha_i Y_{t-i} + \beta_1 X_{t-1} + \ldots\ldots.. \beta_i X_{t-i} + \mu$ …… (3.5)

$X_t = \alpha_0 + \alpha_1 X_{t-1} + \ldots\ldots + \alpha_i X_{t-i} + \beta_1 Y_{t-1} + \ldots\ldots.. \beta_i Y_{t-i} + \mu$ …….. (3.6)

In the model, the subscripts denote time periods and μ is a white noise error. The constant parameter α represents the constant growth rate of Y in the equation (3.5) and X in the equation (3.6) and thus the trend in these variables can be interpreted as general movements of Cointergration between X and Y that follows the unit root process. We can obtain two tests from this analysis: the first examines the null hypothesis that the X does not Granger-cause Y and the second test examines the null hypothesis that the Y does not Granger-cause X. If we fail to reject the former null hypothesis and reject the latter, then we conclude that X changes are Granger-caused by a change in Y (Gul and Ekina, 2006). Unidirectional causality will occur between two variables if either null hypothesis of equation (3.5) or (3.6) is rejected. Bidirectional causality exists if both null hypotheses are rejected and no causality exists if neither null hypothesis of equation (3.5) nor (3.6) is rejected Duasa (2007).

3.3 Estimation Techniques"

3.3.1 Vector Auto-Regression (VAR) analysis:

Based on Fu, Taylor & Yucel (2003) the study adopted a VAR model to estimate simultaneous shocks to more than one variable and used that to investigate unexpected and equivalent structural shocks. VAR was used to achieve the four objectives of the study. Use of VAR in the study was on the justification that it is a theory free method used for the estimation of economic relationships (Sims, 1980). The current study considered macroeconomic variables effect on the growth of real estate in Kenya. Three different types of VAR exist: The reduced form VAR, the recursive VAR and the structural VAR. The recursive and structural VAR have the same form at the level of matrix equations. The reduced VAR sidestepped the need for structural modeling by modeling every endogenous variable in the system as a function of the lagged values of itself and of all the endogenous variables in the system (Engle & Granger, 1987). The reduced form and the recursive VAR models are statistical models that utilize no economic structure beyond the choice of variables. The reduced form of a VAR model is represented as:

$$X_t = A_0 + A_1 X_{t-1} + A_2 X_{t-2} + \ldots\ldots\ldots + A_p X_{t-p} + e_t \ldots\ldots\ldots\ldots\ldots\ldots (3.7)$$

Where A_0 is a n×1 vector of constant terms, $A_1, A_2 \ldots\ldots A_p$ are n×n matrices of coefficients, X_t is a n×1 vector of endogenous variables and e_t is a vector of serially uncorrelated error terms that are assumed to have a mean of zero and a covariance of matrix ϕ .

3.3.2 Impulse Response Analysis:

Stock (2001) argued that impulse responses are geared towards estimating the link between the current and past error term of the variable under investigation. Impulse response analysis relates the current value of the error-term to the future values of X_t or similarly, the current and past values of the error-term to the current values of X_t. The analysis enables one to investigate the effect of one time shock to one of the innovations on the current and future values of the endogenous variable.

3.3.3 Variance Decomposition:

Having investigated the effect of one time shock to one of the innovations on the current and future values of the endogenous variable, the variance decomposition separates the variation in an endogenous variable into the VAR components. Odour (2008) posited that forecast error variance decomposition technique is appropriate if the study seeks to determine proportion of variance which was due to its own unique as well as other identified shock since it allocates weights to every shock identified in the system.

In the short run, the shocks due to own are high but the variance due to other variables increase with time horizon.

4. RESULTS AND DISCUSSIONS OF THE STUDY

The current presents the results for the study. Initially, descriptive analysis and correlation analysis was carried out, followed by regression analysis, then time series analysis. In time series analysis section, stationarity test were carried out, followed by Cointergration, then granger causality and finally vector auto regression since there was no Cointergration, hence error correction modeling would not have been appropriate. Both impulse response and variance decomposition were used to test the study hypothesis. The study considered secondary data quarterly data on real estate growth index as indicate by the quarterly index calculated by Hass real estate consultant. The real estate growth rate was assumed to be influenced by inflation rate, exchange rate, and interest rate and GDP fluctuations.

4.1 Descriptive Statistics:

Results in Table 4.1 showed both the measures of central tendency and dispersion. Jarque Berra test was used to show the normality of the study variables where real estate growth, exchange rate, GDP and inflation rate were normally distributed while the interest rate was not normally distributed because its p value <0.05 while the other variables had p value >0.05. The average real estate growth rate was 111.7% which implied that there was an 11.7% increased growth on real estate while considering the first quarter of 2007 as the base year. During the period under consideration the average growth rate was kshs 80.18 against one US dollar, the currency did not strengthen a lot since the minimum exchange rate recorded was 72.25, though there was currency volatility as indicated by standard deviation of 8.89. The average 91 day Treasury bill rate was 8.18%, with a maximum of 19.35%. The average GDP growth rate was 1.86% while the inflation averaged at 6.64% with a maximum of 12.02.

Table 4.1 Descriptive Statistics

	Real estate growth	Exchange rate	Interest Rate	GDP	Inflation rate
Mean	111.70	80.18	8.18	1.86	6.64
Median	112.00	82.24	7.91	1.60	5.81
Maximum	132.00	93.87	19.35	3.70	12.02
Minimum	95.00	72.65	1.82	0.10	4.18
Std. Dev.	13.77	8.89	3.38	0.81	2.12
Skewness	0.17	-0.58	1.08	0.51	0.80
Kurtosis	1.40	2.30	6.09	3.21	2.92
Jarque-Bera	3.69	2.50	19.47	1.47	3.53
Probability	0.16	0.29	0.00	0.48	0.17
Sum	3686.00	2646.03	270.00	61.30	219.05
Sum Sq. Dev.	6064.97	2527.36	366.16	20.80	144.36

4.1.1 Multicollinearity Analysis:

The study sought to examine multicollinearity of the study variables as well as the strength of the relationship between independent variables and real estate growth rate in Kenya. Results in Table 4.2 shows that there was a positive and significant relationship between exchange rate and real estate growth rate, this implies that an increase in exchange rate increases the growth rate. This can be explained by the fact that there are high chances of attracting more foreign investment when the local currency is weaker against the US dollar. There was a negative and insignificant relationship between 91 day Treasury bill rate and real estate growth. Thirdly, there was a positive though non-significant relationship between GDP growth rate and real estate growth. Fourthly, there was a negative and insignificant relationship between inflation rate and real estate growth rate in Kenya.

Table 4.2 Correlation Matrix

	Real estate growth	Exchange rate	Interest rate	GDP	Inflation rate
Real estate Growth	1				
Exchange Rate	0.6566	1			
	0.0000	-----			
Interest rate	-0.0442	0.3396	1		
	0.8070	0.0531	-----		
GDP	0.1306	0.0631	-0.1992	1	
	0.4689	0.7271	0.2664	-----	
Inflation rate	-0.1354	0.3569	-0.1784	0.3421	1
	0.4525	0.0415	0.3207	0.0513	-----

4.2 Regression Analysis:

The study hypothesized that real estate growth rate in Kenya is a function of exchange rate, interest rate, GDP fluctuations and inflation rate all these combined were modeled with regression analysis as follows.

$Y_t = \beta_0 + \beta_1 x_{1,t} + \beta_2 x_{2,t} + \beta_3 x_{3,t} + \beta_4 x_{4,t} + \acute{\varepsilon}_{,t}$ .....(4.1)

Where:

Y= Real estate growth rate, x_1= Exchange rate, x_2= 91 day Treasury bill rate,

x_3= GDP, x_4= Inflation rate $\acute{\varepsilon}_{i,t}$= error term

Since the data was time series in nature the use of regression analysis to examine the nature of the relationship between independent variables and real estate growth rate. Moreover, regression diagnostic test for normality, serial correlation and heteroskedasticity were carried out. Exchange rate, interest rate, GDP and inflation rate all had a combined joint effect on real estate growth since the F statistics was 7.307 with a p value <0.05. All the four independent variables jointly explained 51.1% of the change in real estate growth rate in Kenya the remaining percentage was explained by other factors which were excluded from the model. There was a positive and significant relationship between exchange rate and real estate growth in Kenya (β =1.275, P value =0.000). This implies that a unit change in exchange rate increased real estate growth by 127.5%. Secondly, there was an inverse but not significant relationship between interest rate and real estate growth rate. Thirdly, there was a positive and insignificant relationship between GDP and real estate growth rate. Finally, there was an inverse and insignificant relationship between inflation rate and real estate growth.

Table 4.3 Regression Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Exchange rate	1.275	0.244	5.227	0.000
Interest rate	-1.044	0.614	-1.700	0.100
GDP	1.883	2.429	0.775	0.445
Inflation rate	-1.567	1.019	-1.539	0.135
C	24.912	16.897	1.474	0.152
R-squared	0.511	Mean dependent var		111.70
Adjusted R-squared	0.441	S.D. dependent var		13.77
S.E. of regression	10.295	Akaike info criterion		7.64
Sum squared resid	2967.362	Schwarz criterion		7.87
Log likelihood	-121.057	Hannan-Quinn criter.		7.72
F-statistic	7.307	Durbin-Watson stat		0.87
Prob(F-statistic)	0.000			

Results in Figure 4.1 shows that the residuals were normally distributed since the p value for Jarque Berra test was > 0.05.

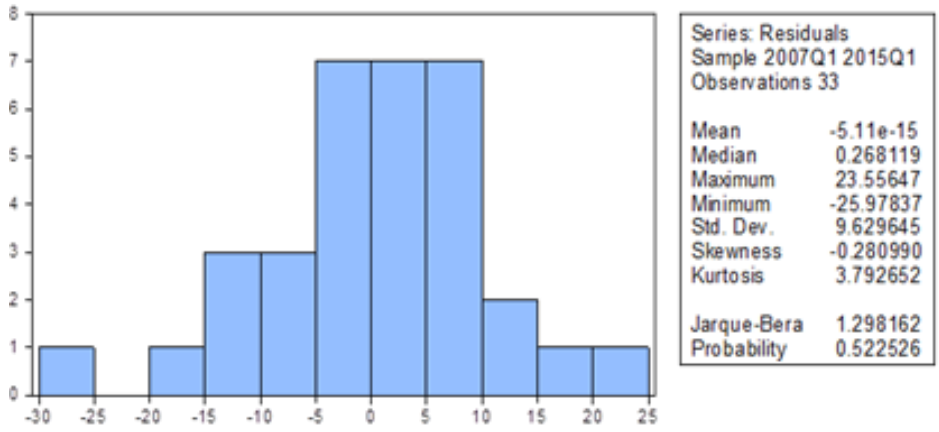

Figure 4.1 Normality Test

To test for serial correlation of the residuals, Breusch-Godfrey Serial Correlation LM Test is performed. As shown in Table 4.4, at 5% level of significance, the null hypothesis that there is no serial correlation is rejected ($p<0.05$). We therefore accept the alternative hypothesis that there is autocorrelation.

Table 4.4 Breusch-Godfrey Serial Correlation LM Test

F-statistic	25.74275	Prob. F(1,27)	0.000
Obs*R-squared	16.10668	Prob. Chi-Square(1)	0.000

Lastly, we tested for uniform variance among the error terms using White test. Results in Table 4.4, at 5% level of significance, showed that there was no enough evidence to reject the null hypothesis of uniform variance and therefore there was uniform variance among the error terms.

Table 4.5 Heteroskedasticity White Test

F-statistic	1.57215	Prob. F(14,18)	0.18152
Obs*R-squared	18.1537	Prob. Chi-Square(14)	0.19987
Scaled explained SS	18.2491	Prob. Chi-Square(14)	0.19567

4.3 Time Series Analysis:

Since the data violated the regression assumption of autocorrelation it was not appropriate to use regression analysis to examine the determinants of real estate growth in Kenya. Therefore, time series analysis was applied, ADF was used as unit root test, and Johansen Cointergration was used to test for long run and short run relationship between variables.

4.3.1 Stationarity Test:

Results in Table 4.6 shows that interest rate, inflation rate and GDP all were stationary at levels while real estate growth rate and exchange were not stationary at levels hence it was appropriate to difference them at first orders. Therefore, interest rate, GDP and inflation rate all are integrated at order 0.

Table 4.6 Augmented Dickey Fuller Test at Levels

Variable	**Test at levels**	**ADF Test**		
		T statistic	**Critical Value at 5%**	**P value**
	Constant	-2.215523	-2.960411	0.2051
Real estate growth	Constant and Trend	-2.335307	-3.56288	0.4039
Exchange rate	Constant	-1.826739	-2.957110	0.3613
	Constant and Trend	-2.9187	-3.55759	0.1702
Interest rate	Constant	-3.94401	-2.95711	0.0048
	Constant and Trend	-4.2623	-3.5577	0.0103
GDP	Constant	-6.3412	-2.95711	0.0000
	Constant and Trend	-6.3055	-3.5577	0.0000
Inflation rate	Constant	-4.2569	-2.95711	0.0022
	Constant and Trend	-4.261548	-3.5577	0.0103

Results in Table 4.7 showed that both real estate growth and exchange rate were stationary at first difference. Hence both real estate growth rate and exchange were integrated at order 1.

Table 4.7 Augmented Dickey Fuller Test at First Difference

Variable	Test at levels	ADF Test		
		T statistic	Critical Value at 5%	P value
	Constant	-4.038925	-2.960411	0.0039
Real estate growth	Constant and Trend	-3.965426	-3.562882	0.0209
Exchange rate	Constant	-4.674766	-2.9677	0.0008
	Constant and Trend	-4.714801	-3.574244	0.0039

4. 3.2 Cointergration:

From the foregoing section the variables were integrated in order 0 or 1, and then it was necessary to carry out Cointergration analysis to examine whether the variables were cointergrated. Two set of time series variables are assumed to be stationary if they tend not to drift far away from each other. Cointergration analysis was used to examine both short run and long run relationship between study variables. Trace statistics was used to test the significance of estimates of Eigen values. Since the Trace statistics indicated that there was no Cointergration between real estate growth rate and exchange rate, interest rate, GDP and inflation rate. This implies that there was no long run relationship between real estate growth and exchange rate, inflation rate, GDP and interest rate.

An error correction term is therefore not needed in the Granger causality test equations.

Table 4.8 Johansen Cointergration Test

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.5948	63.9114	60.0614	0.0229
At most 1	0.4238	35.9074	40.1749	0.1260
At most 2	0.3085	18.8183	24.2760	0.2090
At most 3	0.1883	7.3835	12.3209	0.2886
At most 4	0.0291	0.9144	4.1299	0.3923

4.3.3 Granger Causality Test:

Granger causality was performed to examine whether there was causal linkages between the study variables. Results in Table 4.9 revealed that there was no causality between exchange rate and real estate growth.

Table 4.9 Granger Causality Test

Null Hypothesis:	F-Statistic	Prob.	Conclusion
Exchange rate does not Granger Cause REG	0.156	0.857	
REG does not Granger Cause Exchange rate	0.960	0.396	No Causality
Interest rate does not Granger Cause REG	3.714	0.038	Unidirectional causality running from interest rate to real estate growth.
REG does not Granger Cause Interest rate	0.500	0.612	
GDP does not Granger Cause REG	0.410	0.668	No causality
REG does not Granger Cause GDP	2.146	0.137	
Inflation rate does not Granger Cause REG	1.983	0.158	No causality
REG does not Granger Cause Inflation rate	0.439	0.650	
Interest rate does not Granger Cause Exchange rate	0.408	0.669	
Exchange rate does not Granger Cause Interest rate	0.400	0.674	No causality
GDP does not Granger Cause Exchange rate	4.025	0.030	Unidirectional causality running from GDP to exchange rate
Exchange rate does not Granger Cause GDP	0.774	0.471	
Inflation rate does not Granger Cause exchange rate	1.666	0.209	Unidirectional causality running from exchange rate to inflation rate.
Exchange rate does not Granger Cause Inflation rate	8.115	0.002	
GDP does not Granger Cause Interest rate	1.671	0.208	No causality
Interest rate does not Granger Cause GDP	0.305	0.740	
Inflation rate does not Granger Cause Interest rate	2.782	0.080	
Interest rate does not Granger Cause Inflation rate	1.272	0.297	No Causality
Inflation rate does not Granger Cause GDP	0.071	0.931	
GDP does not Granger Cause Inflation rate	3.143	0.060	No causality

4.4 Vector Auto Regressive Modelling (VAR):

Gitahi et al (2013) argued that when variables are cointergrated then there is a long run relationship. To examine short run relationship then an error correction model is used and if there is no Cointergration then vector auto regression is the most appropriate model to fit on the study variables. VAR results cannot be used as regression analysis results but they are useful for generation of both one standard deviation shocks to current and future values of all variables in the system.

The test for the lag selection criteria revealed that the most appropriate number of lags was 1 as indicated by the entire lag order selection criterion test.

Table 4.10 Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-324.901	NA	21143.79*	24.13109*	25.30979*	24.50025*
2	-303.488	28.05758	30836.89	24.37851	26.73592	25.11683
3	-281.695	21.04233	57727.66	24.59963	28.13574	25.70709
4	-239.946	25.91305	50593.65	23.44454	28.15935	24.92116
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

4.4.1 Results for VAR Model:

Since the real estate growth rate, exchange rate, interest rate, GDP and inflation rate were not cointergrated, VAR (1) was estimated and the results tabulated as shown in Table 4.11 in the appendix. Although the fitness statistics such as AIC revealed a good model none of the variables had a significant relationship with insurance return. The resultant equation for the model was. Results of the study revealed that the past real estate growth rate had a negative significant influence on subsequent growth rate.

$$\Delta REG_t = 20.52 - .9\Delta REG_{t-1} - .13\Delta ER_{t-1} - .46\Delta IR_{t-1} - 1.72\Delta GDP_{t-1} + 1.30\Delta IR_{t-1}$$

Standard error = 11.75 .12 .24 .43 1.62 .74

T value = 1.75 7. -.52 -1.1 -1.1 1.70

4.4.2 Impulse Response:

Since VAR coefficients have no statistical meaning due to lack of theoretical underpinning. The study applied VAR results to estimate both impulse responses and variance decomposition. The primary purpose of fitting impulse responses is to examine the relationship between the current and past error term on the variable under investigation. It amount to statistical misinterpretation if the VAR results are estimated like ordinary least squares regression results. Stock (2001) posited that through the use of impulse responses the study can trace the effect of one standard deviation shock to changes on current or future values of all endogenous variables in the equation.

Figure 4.2 shows plots and impulse responses of the real estate growth index over a 10 period horizon, to one standard /deviation shock of each of the lagging macroeconomic variable in the VAR model. From the plot, we note that the response of the real estate growth rate to one standard deviation shock of exchange rate was a positive increase which lasted for the whole ten month period. This implies that increases in exchange rate will cause a positive shock to the real estate growth rate.

Secondly, we note that one standard deviation shock of interest rate resulted in a negative movement which lasted for the whole ten month period. This implies that interest rate have a negative shock to the real estate growth rate.

Thirdly, we observe a positive response of real estate growth rate from GDP shock. This positive shock lasted for the whole ten month period. This implies that a change in GDP fluctuation will have a positive shock to the real estate growth rate. Among the study variables GDP growth rate had the highest shock on real estate growth rate in Kenya.

Finally, there was a positive response of real estate growth from inflation shock. This positive shock increased in the initial period though it remained stagnant after the two and half periods. This implies that inflation rate impacted positive on the real estate growth.

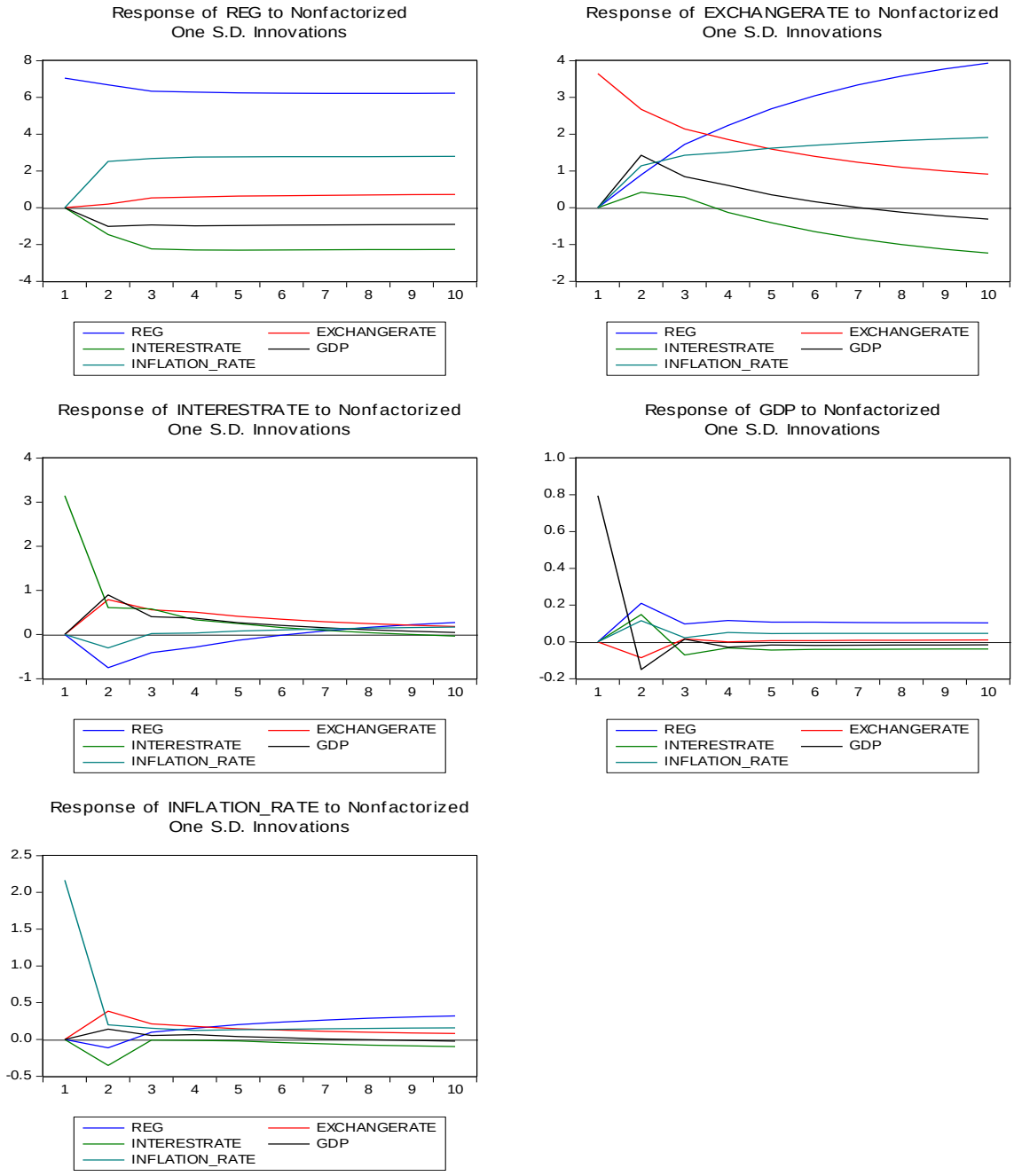

Figure 4.2 Impulse Response

4.4.3 Variance Decomposition:

Impulse response functions aimed at tracing the shocks effects on endogenous variables in VAR while variance decomposition aimed at examining the separated variation effects of endogenous variables in VAR components. Consequently, variance decomposition was carried to determine real estate shocks proportions which can be attributed to exchange rate, interest rate, GDP and interest rate from which there relative importance in the determination of real estate growth rate in Kenya was established.

Figure 4.2 shows variance decomposition results for the first ten quarters among the variables under investigation.

Results in Figure 4.3 shows that the highest variation in Real estate growth was in the first quarter which was attributed to REG own shock. The REG shock showed a declining trend in the first four periods which remained stagnant after the fourth period. The variation of real estate growth rate in the initial period was zero though it maintained an increasing trend as time increased. Exchange had the slowest increasing trend while interest had the highest increasing shock trend calling for the need to monitor 91 day Treasury bill rates as such to minimize its effect on real estate growth.

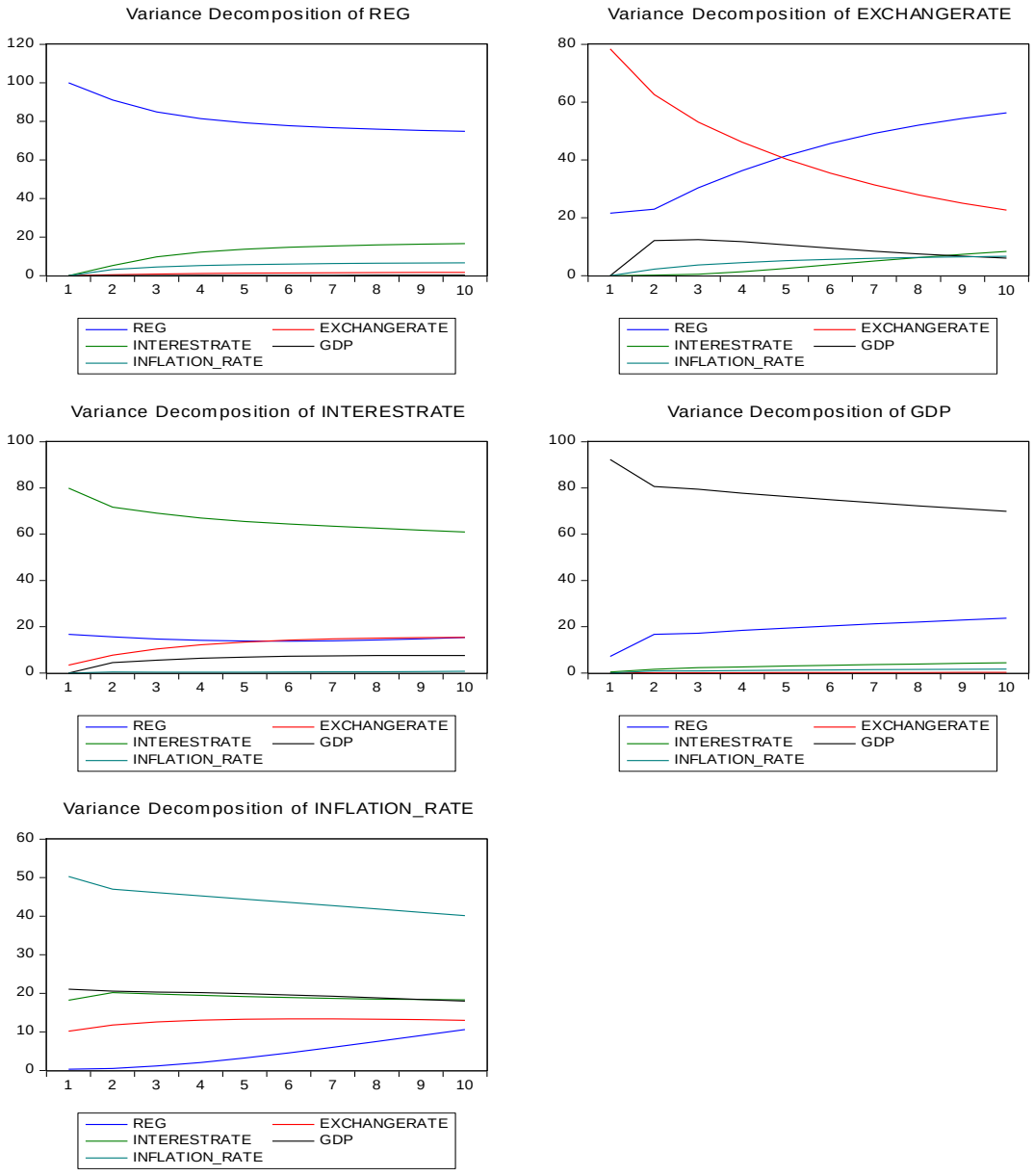

Figure 4.3 Variance Decomposition

4.5 Discussion:

In to achieve the first objective of the study which was sought to examine the effect of exchange rate on real estate growth rate in Kenya. We applied used impulse response analysis and variance decomposition. Results of the study showed that there was a positive impulse response of real estate growth from exchange rate. The current study was in disagreement with Geetha et al (2011) who reported a positive long run relationship between exchange rate and real estate growth in China. Moreover, these results were in support of Omotor (2010) who reported a positive relationship of exchange rate in a Nigerian case

The second objective sought to find out the effect of interest rate and real exchange growth rate in Kenya. Results of the both impulse response and variance decomposition revealed a negative effect of interest rate on real growth rate. These

results were in contrast with (Alma, 2009; Alman and Udin, 2009) who found a positive effect of interest rate on growth rate. In addition, there were a negative influence of growth rate and interest rate (Hsing, 2004). These results were in agreement with the past studies because the current study evaluated the effect of 91 day Treasury bill rate, which ought to have an inverse relationship since when the Treasury bill rate increases then investors may tend to switch from real estate to government short term borrowing.

The third objective of the study sought to examine effect of GDP on real growth rate. Results of both regression analysis and correlation showed a positive and significant relationship between real estate growth rate and GDP. Both impulse response and variance decomposition revealed a positive relationship between GDP and real estate growth rate. These findings were in agreement (Tursoy, Gunsel and Rjoub, 2008; Osamuonyi and Evbayiro, 2012) who found positive relationship between GDP and growth rate.

The fourth objective of the study sought to examine the effect of inflation rate on real estate growth rate. Results of the study revealed that there was a positive impulse response and variance decomposition effect of real estate growth from inflation rate. These findings were in agreement with (Choundhry, 2001; Maswere and Kaberuka, 2013), both found that inflation rate had positive effect on real estate growth.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary:

In the current chapter discussion, conclusion and recommendations are presented. The chapter is organized in coherent with the research objectives. The current study sought to examine the determinants of real estate growth rate in Kenya. The study conceptualized that real estate growth rate is jointly influenced by exchange rate, 91 day Treasury bill rate, GDP and inflation rate. To achieve the study operationalized that real estate growth rate to be measured by Hass Consultant real estate property index which is given on quarterly basis. The index was an appropriate measure of real estate index since it determined as a weighted index of household ownership, land revaluation rate as well as the prevailing mortgage charges by financial institutions. The first quarter for 2007 was taken as the base period. Secondary data was collected from the quarterly publication of Hass Consultant real estate property index as well as Central bank of Kenya website from which quarterly data for interest rate, inflation rate, exchange rate and GDP were collected commencing the first quarter of 2007 to the first quarter of 2015. Descriptive statistics, correlation analysis, regression analysis were used to answer the research questions. Although, regression analysis showed model fitness it was not appropriate since there was correlation among the residuals. Consequently, time series analysis was applied; ADF revealed that real estate growth rate and exchange rate were stationary at the first difference while interest rate, inflation rate and GDP all were stationary at first difference. Johansen Cointergration was used to examine the long run relationship which revealed nonexistent of Cointergration among the study variables therefore it was not appropriate to fit error correction modeling to examine short run relationship. VAR was used to examine both impulse response and variance decomposition.

Conclusion:

From the foregoing results we can conclude that an increase in exchange rate increases the prospects of investment in real estate in Kenya. This implies that when the currency is weak against US dollars there are high chances of attracting more investors on real estate since there are increased opportunities of arbitrage gain.

Secondly there was a negative effect of interest rate on real estate growth. This implies that the more the government borrows on short run locally it discourages real estate growth rate since there are increased borrowing charges thus the government should devise measures of borrowing externally as such to promote real estate growth.

Thirdly, the results revealed that GDP had a positive influence on real estate growth rate. This implies that in order for the country to ensure that positive strides are made in relation to real estate then GDP acceleration strategies should be pursued which will ensure that the real estate grows at faster rates.

Finally, inflation rate influence real estate growth rate positively. This implies that there an increase in inflation rate increases growth rate, there are various factors which influences an increase in inflation. An increased amount of money borrowed increases inflation though in most cases real estate is financed using debt financing. There is need to control inflation levels as such to eliminate the chances of increased cost as real estate grows.

Recommendation:

From the foregoing results the study recommends that; the foreign exchange policy ought to be determined by the forces of demand and supply, thus the status quo remains as such to attract investment in the real estate segment. Secondly, the both national and county government ought to be discouraged from borrowing locally as such to increase the prospect of real estate growth. Thirdly, there is need to devise measures and mechanisms of improving the GDP so as to ensure there is a positive trend in the real estate sector. Finally, measures ought to be taken as such to control the level of inflation even if it increases the prospect of real estate growth.

Areas of Future Research:

Future research should adopt the use of primary data to examine the determinants of real estate growth in Kenya. From this study it would be appropriate to retrieve first-hand information from those who are actively involved real estate development and also gather information from those who benefits from real estate investment in Kenya.

In addition, the government has a role in promoting real estate growth more so it ought to ensure that all are housed in good housing conditions. Through government planning, future studies ought to examine the role of government on real estate development and what it can do as such to trigger faster growth and development in the real estate sector.

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APPENDIX - RESULTS

Table 4.11 VAR Estimation Results

	REG	EXCHANGE-RATE	INTEREST-RATE	GDP	INFLATION_RATE
REG(-1)	0.899963	0.106832	-0.11018	0.029193	-0.02286
	0.128471	0.067846	0.060537	0.015312	0.041252
	[7.00520]	[1.57463]	[-1.81998]	[1.90657]	[-0.55415]
EXCHANGERATE(-1)	-0.12864	0.657359	0.203609	-0.02614	0.079769
	0.246056	0.129944	0.115944	0.029326	0.079008
	[-0.52281]	[5.05880]	[1.75610]	[-0.89140]	[1.00963]
INTERESTRATE(-1)	-0.45803	0.135391	0.194679	0.047414	-0.11115
	0.435482	0.22998	0.205203	0.051903	0.139833
	[-1.05177]	[0.58871]	[0.94871]	[0.91350]	[-0.79486]
GDP(-1)	-1.72375	1.606661	1.095928	-0.19477	0.113111
	1.627785	0.859643	0.767027	0.19401	0.522681
	[-1.05896]	[1.86899]	[1.42880]	[-1.00394]	[0.21641]
INFLATION_RATE(-1)	1.249347	0.562199	-0.13362	0.05422	0.103816
	0.739198	0.390375	0.348317	0.088102	0.237356
	[1.69014]	[1.44015]	[-0.38361]	[0.61543]	[0.43739]
C	20.52339	8.4914	1.505182	0.282454	2.896655
	11.75447	6.207603	5.538812	1.40097	3.774354
	[1.74601]	[1.36790]	[0.27175]	[0.20161]	[0.76746]
R-squared	0.797391	0.848549	0.271513	0.168193	0.109235
Adj. R-squared	0.758428	0.819424	0.131419	0.00823	-0.06207
Sum sq. residue	1200.23	334.7392	266.4968	17.0497	123.7496
S.E. equation	6.794314	3.588117	3.201543	0.809789	2.181651
F-statistic	20.4652	29.13453	1.93808	1.051452	0.63768
Log likelihood	-103.399	-82.9679	-79.3201	-35.3324	-67.0464
Akaike AIC	6.83741	5.560493	5.332503	2.583274	4.565402
Schwarz SC	7.112235	5.835318	5.607329	2.858099	4.840227
Mean dependent	112.0625	80.73078	8.199583	1.840625	6.709778
S.D. dependent	13.82363	8.443769	3.435217	0.813142	2.116945
Determinant residue covariance (dof adj.)		5795.323			
Determinant residue covariance		2052.081			
Log likelihood		-349.056			
Akaike information criterion		23.69099			
Schwarz criterion		25.06512			