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**ASSESSMENT OF FACTORS AFFECTING RESIDENTIAL REAL
ESTATE PRICES IN NAIROBI COUNTY**



**A Research Thesis Submitted to the School of Management and Commerce in
Partial Fulfillment for the award of a Master of Commerce Degree of
Strathmore University**

MAY 2019

DECLARATION

I hereby affirm that this thesis has not been previously submitted for the award of a degree by this or any other university.

.....

.....

Approval

The thesis for Hellen Ungayi was reviewed and approved

Dr. Freshia

Lecturer Financial Management, Strathmore University Business School

Strathmore University

.....

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First and foremost, I would like to express my profound gratitude to the Almighty God for the gift of life and giving me the strength and good health to pursue this demanding but rewarding program. Special and sincere thanks to my supervisor Dr. Freshia for patiently guiding me through all aspects of this study.



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ABBREVIATIONS AND ACRONYMS

CBD	Central Business District
CBK	Central Bank of Kenya
GDP	Gross Domestic Product
KBA	Kenya Bankers Association
KNBS	Kenya National Bureau of Statistics
NCA	National Construction Authority
NSE	Nairobi Securities Exchange
OLS	Ordinary Least Squares
SIP	Structured Insulated Panels
SPSS	Statistical Package for Social Sciences
VECM	Vector Error Correction Model

ABSTRACT

The study analyzes the effect of selected economic factors on real estate market in Kenya. House prices in Kenya have continued to rise over the past years. The study employed both cross sectional and time series data analysis to establish the relationship between growth in house prices in real estate and selected economic variables. Physical attributes of the property, locational factors and proximity to social amenities are fundamental in the determination of house prices. A factor analysis on cross sectional data showed that number of rooms, number of bathrooms, backup generator, swimming pool, balcony, parking garage and lift (micro variables) had significant effect on house prices at 5% level of significance. This is important for real estate developers when designing and building houses to capture home owners' preferences that can add value and catalyze the residential real estate sector. Macro analysis of time series data using Vector Error Correction Model (VECM) revealed that on one hand inflation rate, Hass price index, investments in real estate and GDP while forex and diaspora remittances on the hand have asymmetric long run effects on growth in house prices on average, *ceteris paribus*. This implies that economic growth and conducive investment environment in the country stimulates developments in real estate which in turns leads to a steady supply of housing units at affordable prices for potential home owners. Lack of centralized housing data posed a challenge in collecting and collating time series data was one of the limitations faced by the researcher where it necessitated the researchers own calculation. This research will be of value as it gives insights on what matters most to different income groups as opposed to generalized findings.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The real estate sector plays an important role in an economy. Real estate investment and prices are good measures for reflecting expected real estate demand and serve as good predictors of economic growth (Cytonn, 2015). According to Brueggeman and Fisher (2005), real estate refers to property consisting of land, minerals, buildings, water and natural resources that may be contained on the estate. However, the capital requirements in the development of real estate investment is huge and not always available or easy to come by particularly by most investors in developing countries. The primary focus goal of every investor in property development is profit maximization in the shortest time possible (Muthama, 2012). Accordingly, investors will put their funds in instruments that will give the greatest return from the available comparable alternatives.

Adequate supply of affordable and quality shelter lowers the rate at which slums or informal settlement is developed preventing crime and social unrest resulting from frustrations and depravation of slum dwellers (Muli, 2013). Residential properties constitute the largest land use in the urban areas. The residential real estate contributes highly to employment, development of capital and financial market. According to Svets (2010) residential real estate sector is a stable retail market because of its good returns for the risk taken making it an attractive investment vehicle for large long-term institutional investors such as pension funds and insurance companies. These types of properties provide high long-term return relative to their low volatility. He also found that over a period of 20 years' different types of property performed differently and house prices adjusted in response to various factors influencing investors' returns. To efficiently manage a property portfolio, an investment manager needs a good understanding of house price drivers, rental rates, capital values and property returns. Therefore, investors understanding of factors influencing property values and their effects on asset returns is equally imperative.

According to Sprague (2016), factors influencing return on investment from real estate's include macroeconomic factors, location, building characteristics and infrastructure. Valentine (2009) found that in Sidney factors such as the building structure, economic and demographic factors, macroeconomic factors and location of the properties were affecting real estate market. In Australia, Romkaew (2014) found that house prices were dependent on many characteristics such as location and physical characteristics of the building, presence of recreation facilities and neighborhood characteristics, presence and proximity of social facilities such as health clinics, schools, community services and parks. Sprague (2016) found that macro factors, property location factors, physical attribute of the property were significantly affecting the property prices.

Location of a house influences the accessibility to commercial centers, work stations, recreational facilities; neighbors and neighborhood characteristics; distance to social amenities; the level and quality of public services. Location is a foremost factor of domestic residential gratification and the subsequent patterns of household mobility and neighborhood change (Omboi, 2011). The location decision leads to segmentation of the housing units along various dimensions depending on building characteristics such as ownership, quality, type and price. In addition, household characteristics such as income, ethnicity, race and lifestyles. Real estate experts know that "location" is a key determinant on the premium households are willing to pay for comparable properties. Appraisers consider location as major factors and previous sales in measuring the market value of properties. Bankers and insurance companies know that the location of the property that secures a loan is a key factor of their credit risk exposure (Romkaew, 2014).

Residential buildings in Kenya can be classified into five categories. High Income residential buildings serve people in income levels of Kshs 300,000 and above. Upper Middle Income serves tenants with income levels ranging between Kshs 150,000 and Kshs 300,000. Lower Middle-Income residential buildings serve tenants with income levels between Kshs 50,000 and Kshs 150,000- and lower-income residential buildings serve tenants between Kshs 25,000 and Kshs 50,000. In addition, people living in informal settlements each below Ksh. 25,000 (Cytton Investments, 2016). Residential real estate prices have been on the rise from the year 2001 and 2015 in Kenya. During this period, a one to three bedroom house increased by more than 5

percent from a price of two million to around ten million while a four bedroom to a six bedroom house from ten million to thirty million by the year 2015 (Hassconsult, 2015). However, given above scenarios on income levels, most city dwellers live in lower-income residential estates putting pressure on limited social amenities. This has led to mushrooming of slums and rise in crime.

1.2 Problem statement

Kenya is a prime location for real estate investors, in part due to its fast-growing GDP, booming property market and secure financial returns. The country's investment climate is the strongest in the region with flowing in from markets in line with its economic blueprint (Gatauwa & Murungi, 2015). The government of Kenya aspires to provide affordable housing for its people as envisioned in its development blue print Vision 2030. To achieve this, the government has employed several strategies including lowering interest rates to ease credit uptake to spur private sector investments in the housing sector, review of mortgage rates for its staff and encouraging of pension schemes to invest in the sector. To illustrate the importance of this sector, the jubilee regime has listed housing among its big four agenda for the next five years.

The number of expatriates in Kenya has grown in the last 10 years, because of international companies settling down in the country. This has led to increased demand for residential real estate, with employees looking for accommodation near work (Knight Frank, 2015). This signals an environment for quick investments in large real estate developments. The population has also been on the increase from 43 million in 2013 to 49.7.2 million in 2017 which increase the demand in housing (World Bank, 2017).

Growth in real estate sector in Kenya is driven by a huge housing deficit being experienced in housing in Kenya. Between the year 2014 and 2017, the Kenya urban population grew at an average rate of 4.2% annually resulting in a demand of about 250,000 new housing units every year. Nairobi County faces a shortage of 200,000 housing units annually, with only 50,000 new units being constructed every year (Mutai, 2016). Provision of decent and affordable housing for city dwellers has been an eyesore to the county government. Due to the population of Nairobi County growing exponentially against the planned carrying capacity, mushrooming of slums within main estates or makeshift structures on public land for schools and hospitals or play

grounds has recently been on the rise. Most of the estates are either crowded or unaffordable to most of the Nairobi residents. In these crowded estates, access to social facilities including access roads during emergencies is limited. Despite the increasing demand for public housing and increasing opportunities for investors to invest in residential real estates, house prices have been rising from the year 2007 (Hass consult, 2016). Most estates in Nairobi experience high demand for housing, while available units are unaffordable to most of its residents especially middle class seeking to own homes due to rising prices. It's on this background that the current study sought to critique the effects of both micro and macro factors on house prices in Nairobi County.

1.3 Objectives of the study

1.3.1 General objective

The general objective of this study was to analyze factors affecting residential real estate prices in Nairobi County.

1.3.2 Specific objectives

The study sought to address the following specific objectives:

1. To examine the influence of micro factors on residential housing prices in selected segments in Nairobi County.
2. To determine the influence of macro factors on growth of residential real estate prices.
3. To obtain real estate developers' perspectives on challenges facing residential real estate companies in Nairobi county.

1.4 Research questions

The study was guided by the following research questions;

1. What is the influence of micro factors on residential housing prices in selected segments in Nairobi County?
2. What is the influence of macro factors on changes in houses prices in residential real estate price?

3. What do real estate developers perceive on the challenges facing residential real estate in Nairobi county?

1.5 Scope of the study

The study was conducted in Nairobi County covering a period of 14 years (2004 to 2018). The period was adequate to understand the dynamics of macro factors variables used in the study. Cross-sectional analysis was conducted in Nairobi County in the different segments. That is because Nairobi, being a city, provided a heterogeneous sample with many local and multinational companies having their headquartered here. As such, demand for residential real estate is high as there are a lot of people formally and informally employed who need housing. The target population for this analysis was be 384 respondents from real estate agents, home owners, property managers and sales representatives in Nairobi County. The study also sought responses from the 75 listed real estate developers.

1.6 Significance of the study

The findings of this study will be beneficial to various groups of people and institutions such as real estate investors, the government of Kenya and policymakers as well as researchers and academicians.

1.6.1 To investors

To real estate investors, the study will provide key information on the factors influencing residential real estate prices that can be used in making decisions. Equipped with findings from this research, investment advisors and financiers will be able to offer more informed quality advice to investors. Moreover, findings will help investors in comprehending trends in house prices both in short run and long run.

1.6.2 To researchers

The study will add more information to the body of knowledge on the determinants of residential real estate growth. To other researchers and academicians conducting studies on real estate return on investment in residential buildings, the study will provide information that they can be used as literature review.

1.6.3 To policy makers and regulators

The government and regulatory bodies will benefit in knowing how macro factors like lending rate, forex, GDP and inflation rates affect the sector and hence formulate appropriate regulatory framework for enhancing the growth of the sector. The study will also provide insights on what causes the high cost of construction hence focus will be given on lowering this cost .



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature on factors influencing residential real estate prices in Kenya. The chapter begins with a theoretical review, followed by empirical review, research gaps and conceptual framework. Theoretical review presents the theories related to the determinants of residential real estate house prices. The empirical review presents a review of studies done on the determinants of real estate return on investment. The research gap outlines various gaps in the empirical literature and the conceptual framework presents the hypothesized relations between various independent variables and the dependent variable.

2.2 House prices, rent and rental yield

The demand of a house mirrors the utility derived for it by the resident. The motivation to select a house relies on whether there are means to benefit from ease of access and compatibility within the urban set up. Access plays an important role to residential location because it influences traveling costs to work and social amenities. The neighborhood must benefit the user in terms of what they seek in a certain location. According to Blair (1991), the choice of a location involves a balance between cost and access to amenities and other neighborhoods. Location which is influenced by accessibility to the positive attributes in the environment dictates the amount of rent charged and the asking price of a houses. Some literature of rental yield can be found from past studies like Garner and Verbrugge (2009) who found out that rents rise at a decreasing rate comparative to value.

Several studies have been conducted with either selling or rental rates as the dependent variable. Some researchers have documented the relationship between rent and residential property prices and their combined effect on the rental yield. A combination of rent and price rates is the common approach, but the result will be biased because of the different attributes in both series. Hattapogli (2009) studied two micro data sets of Houston city on rent listings and house prices of 11 years beginning the year 1996 to the year 2007 from Houston Association of realtors. In his methodology, Hattapoglis matches house prices and rents by defining distinct hedonic rent and

price functions for each neighbor in area. He relates the anticipated rents to actual prices and vice versa, though he does not include cost as a forecaster for the rent to price ratio. Findings from Hattapogli reveal that the existing rental yield is reliant on past price appreciation. However, he found out that the yield is not on past rent appreciation. Thus, Hattapoglis settles that that expectations are founded on past price appreciation and not fluctuations in rent. The coefficient of rent appreciation is significant in all his model.

2.3 Theoretical literature review

The factors of housing prices are thought to be the interaction between the demand and supply of housing. The most idiosyncratic characteristics of recent metropolitan which differentiate it from the rural areas is the level of concentrated activities and people. Accessibility to industrial and commercial areas therefore becomes very important in analyzing residential locations which takes into consideration time and space. It's from this background that the study adapts location theories to discuss characteristics used when assessing attractiveness of a residential location. These features include physical features of the neighborhood such as building characteristics, and types of finishes, Public services such as quality and type of schools, roads and social amenities and accessibility of the neighborhood. We therefore highlight theories of filtering down, trade off model, maximum housing theory and perfect competitive theory of housing to discuss the micro and macroeconomic determinants of housing prices.

2.3.1 Tobin's q theory

As per Tobin's q theory, a rise in expected future income results in an increase in the current consumption. In the case of real estate, the comparable analysis is that growth in demand of housing leads to potential home buyers' willingness to pay for the higher prices to rise thereby increasing the marginal return in real estate investment making it more attractive for investors. This implies that as residential real estate prices go up, investment in the sector will rise leading to an increased supply of units in the market. The ability and willingness of potential home owners to pay prices that are high will be higher when future expected income is more or if there is a rise in the number of potential home owners demanding for housing which ultimately increase house prices. Consequently, expected future increase in income leads to a bigger demand for housing. An increase in residential real estate prices will push up investment in housing sector. This theory highlights the user cost concept which is important in analyzing

factors influencing house prices. It gives another cause of swings in the demand curve for real estate prices. Following this theory, a decline in the interest rates on mortgages causes the cost of purchasing a house to decrease increasing the ability of potential home owners to buy bigger spaces or new houses. This implies that, a reduction in mortgage rates increases the demand for dwelling units, also increases the demand for a comparative higher price, and an increased investment in real estate market. Thus, a more anticipated future income leads to a higher Tobins' q hence increases in house prices and increased residential investment. This theory captures the significance of lending rates, investment in real estate, GDP and other macro factors in the housing market.

On the other hand, micro factors are analyzed using a theory by Stahl, (1985) which is closely related to Tobin q . It explicates on the element of user cost by taking the expected rate of change in the real price of the capital assets. In housing context, the expected rate of change in the prices of a house can be influential in the shifts in demand for housing. If home owners anticipate a price increase in the housing market, the user cost goes down, leading to an increased demand. The price of residential dwelling will go up while investment in the housing sector will also increase. Rather, if there are expectations that the residential real estate investment will be good, there will be an increase in the demand for building materials including land increasing the demand for new dwellings. Consequently, expected increase in housing prices increases the demand for residential dwellings higher price in housing, and increased investment in residential real estate market. From to this theory, the demand for housing can be influenced by financial constraints. If lenders ease credit availability and credit uptake, potential home owners who would have been constrained by finances can afford to own homes. The implication of this is that accommodative or considerate financial capacity of a country increases the demand for houses, a higher price in housing and increased investment in residential real estate. According to this theory, growth in the residential estate prices is brought about by changes in the user cost caused by expectations and elimination of constraints in the financial market. Prior studies have shown that the real estate sector functions as Tobin q theorized. Supply of housing stock appears to be a response to the demand of houses in the market. Githae (2017) while utilising Tobin q theory found that growth in housing prices cab be attributed to increase in expected future income and increase in construction cost Similarly, Kaijser (2014) found a positive reallionship between housing investment and Tobin q in the long run but not explained in the short run.

2.3.2 The trade-off model

This model assumes that as growth in incomes happen, the rate of willingness among families to substitute for less expensive land also changes from time to time. According to Muth (1959) the model explains the predominance of quality housing in the environs of the city as a trade-off between the household's demand for space and the access to central locations. The model has two aspects namely including Space versus travel cost theory and trade-offs in the Multiple Nucleus City.

According to the Space versus travel cost theory, households will be prepared to pay the maximum costs in terms of rent or price if the travel costs to their places of work are low or even zero (Balchin, Bull & Kieve, 1995). The theory suggests that the rich will usually live closer to the central business district while the poor live in the cheaper outer regions of the city. The opposite is however true, with lower income houses living close to the places of work as they seek to minimize their transport expenses. These areas will thus be more densely populated. As incomes rise, the rich will seek to move away from the congestion. They will relocate to more expensive affluent housing in the outer regions of the city. According to Balchin and Kieve (1982), this theory is valid to some extent. As individuals moves distant from the central business district, the value of residential properties tend to decrease since land further away has lower business use.

Blair (1995) alludes to there being an optimum location. This arises due to the opportunity cost of commuting. As incomes rise, household will move from point A to point B as they seek more spacious and cheaper land. The theory is however not enough in explaining residential location preferences in areas with multiple central business districts or areas where income distribution is not localized. For this reason, Blair sought to refine the model further to provide for the Multiple Nuclear City. Development in infrastructure in the multiple Nuclear cities in Nairobi has led th CBD has ceasing being the key access point in most cities. Thus, the assumption of lower transport costs to the CBD may cease to hold for many households with these new job distributions. As such, there may even be instances where cost of residential real estate near the CBD may come down. There have been developments in the recent past and locations other than the central business district have become very prevalent for commercial uses. In Kenya for

example, locations such as Westlands, Upperhill, Mombasa Road and Ngong Road have seen an increase in their commercial importance.

Evans (1985) suggested with increase in income levels, higher income households can outbid lower income households whether the location is near or far away from the CBD due to their higher purchasing power. The higher income households are also indifferent about location as they can readily pay the higher transport as well as higher housing costs. Highways have also decreased transport costs by making locations far away from the CBD more accessible than some areas closer to the CBD (Balchin, Bull & Kieve, 1995)

Another theory closely related to trade off model theory is the filtering down theory was developed by Wilbur Thompson in the year 1968 (Thompson, 1968). This theory seeks to explain how social economic groups end up occupying a certain neighborhood. It was first put forward by Burgess while he was doing a study in Chicago. He observed that when higher-income households left homes near the city centre for housing units further away, the vacated housing units were usually occupied by lower income households. Since a housing unit has a relatively long useful life, it is possible that it will be used by several households over this time. Over the years, the house will be passed down to households with lower income levels (Mills & Hamilton, 1994).

This can be explained by the fact that when incomes rise, the demand for housing also rises. People will satisfy this demand by buying newly constructed houses. This new house will usually be located further away from the commercial Centre since that is where land will be available. In Kenya, there are several estates or neighborhoods that moved from higher-income to lower-income households over the years. In the nineteen seventies houses in the Buruburu area of Nairobi used to accommodate high income households who could afford mortgage to pay the high asking price then. Over the years, with development of new estates in other areas such as South C, South B and Langata, the original owners of Buruburu moved to the newer housing estates. They either sold or rented their houses out, leaving people who were relatively lower-income earners compared to them opportunity to occupy the houses. There were also considered for the rich such as Lavington. But as the years have moved, these areas are being occupied by the upper- middle class as new affluent neighborhoods such as Kitusuru and Nyari come up. Thus, as per the theory the returns of a house will change over time both in terms of rent and capital gains.

2.4 Empirical review

This section will discuss prior literature on the key variables of this study that is, House prices, macro-economic and micro economic factors and challenges in the housing market. Prior studies have identified drivers of housing prices as GDP, inflation, lending rates ,diaspora remittances, foreign exchange rates, lending rates and cost of construction as the macro economic factors. The micro environment includes factors such as location, infrastructure and building characteristics.

2.4.1 Sources of growth in housing prices

Studies on housing market began more than 40 years ago and some of the earliest studies were done by Alonso (1964), Charles,(1970) , Dipasquale and Wheaton (1994) in U.S, Apergis and Rezitis (2003) in Greece. In a study examining the factors leading to differences in property prices, Żelazowski (2011) studied economic indicators including household incomes, cost of construction, demographic factors including population, migration balance, age structure and GDP. Kasparowa and White (2001) analyzed the receptiveness of house prices to macroeconomic forces and revealed that real estate prices are determined by interest rates and income growth. Iacovello and Minetti (2003) disputed that liberal lending procedures and mortgage loans availability impact the demand of houses and prices. A study by Quigley (1999) on an examination of the relationship between economic cycles and real estate prices, while Sornette and Woodard (2010) reported that the situation of the financial market was the basis of rapid changes in real estate prices. In another study of housing market in U.S, Foryś (2011) analyzed economic performance of construction markets, availability of loans, number of new apartments, unemployment rate, social drivers of growth and state spending on housing

2.4.2 Infrastructural facilities and social amenities

Infrastructure consists of basic facilities and services that allow for effective functioning of the society such as roads, schools, communication systems, water, sewage treatment power lines and post offices among others. Ajibola, Awodiran and Salu-Kosoko (2013) conducted a study on the impact of infrastructure on house prices in unity estate in Lagos. The study revealed that social amenities such as roads, electricity water are ranked as the most important infrastructural facilities facilitating the effective functioning of an estate. Gatauwa and Murungi (2015) conducted a study on the infrastructure development and real estate values in Meru County. The study found that basic facilities that may lead to higher residential property values include good

road network, improved social amenities, presence of commercial centers, improved educational systems and industries. The provision of these infrastructural facilities are considered to be the drivers of demand and changes in house prices.

Adebayo (2012) reveals infrastructural facilities to be one of determinants of the returns on real estate investment, the consideration of which leads to high of property values and its absence affects neighborhood prices and causes dissatisfaction among residents. Capital investment on infrastructure development is a key driver that may reduce the production and labor costs, leading to high profitability, increased output level, employment which in turn effects on the economic growth across the African continent hence leading to improved living standards reducing poverty index.

A well-established transport network is among the infrastructural facilities that attracts higher property values ensuring a positive net of return on investment in residential buildings (Heise, 2009). Due to development projects in today's mobile society like the development of the bypasses and the primary linkages are highways. In selecting a house, most individual's important factors that influence the selection of a house initially included the neighborhood environment, ease of access to shopping malls and recreational canter, job accessibility and proximity to other social amenities basis (Olujimi & Bello, 2014). In this study, Olujimi and Bello (2014) found that infrastructural facilities played a very crucial role in the determination of rental values by contribution of 30.50% of the decision-making process in choosing a house in Akure. Security measures such installation of a burglary proof in all windows and provision of wall-fence round the building were to be very important when selecting a house. Other factors that were affecting rental values include, water supply, watch day-security and watchnight-security services, drainage channel and refuse disposal services. The variables for electricity, kitchen and access road had no significant relationship with the determination of rental values.

The degree of provision of infrastructural facilities may vary from one location to the other and from building to building. The expansion of the highway system has had a great effect on regional, national, and local economies in ensuring lesser travelling time and travelling costs. Past studies done suggest that transport networks and quality of the environment, characteristics of the surrounding neighborhood are crucial determinants of residential property prices and rental values. A study done by Boucq and Stratec (2011) on the influence of rail transport

infrastructure on property prices in France established that development of infrastructure leads to property gains in the long run. However, the improvement of transport network can also lead to a decrease in the values of properties and rent if the accessibility of the properties adjacent to the roads network is made easier. In the United Kingdom (UK), John (2006) investigated the impact of new transport infrastructure on property values in the South Yorkshire. Findings from the study reveal that anticipation of the construction of a super tram led to an increase in residential buildings leading to an increase in return on investment.

Social amenities also influence return in investment in residential buildings. Gallimore, Fletcher and Carter (2011) proposes considerations that a residential property user may be prepared to pay for a high value comparative to another. Facilities such as accessibility to job, shopping malls, water and electricity supply. Nubi (2003) found that social amenities affect occupancy and returns on investment in residential buildings. These social amenities consist of housing, basic facilities such as pipe-borne water and electricity, drainage systems, waste disposal, roads networks, sewer lines, health facilities, educational facilities, communications systems, and institutional structures like police posts, fire brigades, post office and banking halls. The value of real estate is derived from its utility by the users, and it has therefore no value if it is not effectively demanded or scarce. It therefore has significance only if it fulfills its intended purpose of satisfying the user's needs and desires. Kuye (2002) says that it is a man's collective desire and determination to own property that gives rise to value. The capacity of a property to fulfill a man's needs and desires together with its degree of scarcity and utility compared with others makes man to ascribe value to it.

Another factor influencing return in investment and occupancy in residential buildings is education infrastructure (Omboi, 2011). Though the relationship between public schools and property values may not be directly ascertained, several studies argue that quality of school has a positive and a direct relationship with house prices. Barrow and Rouse (2012) found that, holding other factors constant, houses in locations with good quality schools have higher prices compared to the ones located near average or poor performing schools. Gatauwa and Murungi (2015) study similarly like the above studies found that the factors that lead to higher property prices in the real estate sector include developed social amenities, enhanced transport networks, industries, commercial center, and expanded educational institutions

2.4.3 Building characteristics

Ajilowo, Olujimi and Bello (2009) conducted a study on the effects of infrastructural facilities on the rental values of residential property in Nigeria. Findings from the study showed that rental values of residential buildings were significantly influenced by infrastructural facilities. The study found that the installation of boundary walls, a burglary proof windows and the provision of wall-fence round the building played a significant role in pricing of a house. The fundamental infrastructural facilities available in the residential property include water supply, electricity, road access, refuse disposable facility, drainage channel, security factors such as burglary proofing windows and doors, alarms internal fittings such as spacious windows, sanitary and electrical fittings, joinery works, floor and wall finishes and kitchen fittings. Availability of these facilities differ from one location to another depending on various factors such as availability of funds.

In Malaysia, Isa *et al.* (2014) conducted a study on green attributes affecting investment returns for green buildings. Findings from study show that green real estate investment strategy provides a new investment option to property investors with more leverage compared to traditional approaches. The cheap and ecofriendly materials used in green buildings are progressively replacing the conventional buildings. This can be attributed to the fact that green building provides high appraisal values, high occupancy rate, higher rents, cost savings lower utility costs. The effect of energy and water efficiency have the potential to generate a positive economic impact and sustainable site planning management., In India, Barry and Rodriguez (2004) carried out a study on the effect of building characteristics on return in investment in Residential Real Estates in India. The study used a cross-sectional study design and the target population was real estate developers. The results revealed that that building characteristic's such as layout, cleanliness, security, interior and exterior design had a significant influence on occupancy rate and hence return in investment.

2.4.4 Locational factors

Real estate is property that is uniquely different made up of land and buildings occupying a geographically distinct location on the earth's surface. However, because of its fixed location, properties have the same common external influences. According to Barry and Rodriguez (2004), traditionally in the real estate industry there are three important value determinants. These are "location, location, and location." Visibly, this is so redundant and not illustrating its

direct effect or its importance on the market price or rather the effect of location in the real estate industry. Basically identical houses located in different neighborhoods can have vastly different prices (Adebayo, 2006).

Barrett and Blair (2001) explain the location aspects as the indirect economic factors that influence the demand and supply of real estate buildings. These factors include geographical factors such as topography, zoning and ground conditions, accessibility, neighborhood, utilities, traffic, transportation linkage and traffic, parking, proximity to social amenities, impact on government services, socio economic level and environmental impact. These location factors are majorly influence residential property prices and are constraints to be overcome in the real estate market. These indirect economic factors are therefore the essential factors in the development market and the most critical factors in the real estate investment markets

In the United Kingdom, Svets (2010) found that apart from the demand for the attributes of the dwelling units themselves determining the price of houses, the area in which the properties are located plays a very critical role selecting a type of a house. Accessibility of a location is a relationship between the time and distance taken to access linkages to transportation networks, other neighborhoods and social amenities Harold and Leonard (2005) propose that locations further away may have more attractive features and amenities, despite their higher commuting cost and time. Frequently, most properties in a neighborhood have the same or highly similar locational relationships with common origins and destination.

The neighborhood is influenced by the neighboring community. Different areas respond to its own local demands for urban space (John, 2006). In his study most urban areas include high end and upper income households who tend to live further away from the CBD, while lower income families continue prefer to live closer to the CBD's nearer to employment centers. Those who use public transportation or those who prefer not to use their cars during working days are very keen on distance to CBD compared to those who own cars (Gallimore, Fletcher & Carter, 2011). Accessibility to shopping malls, schools, sports facilities, distance from public transportation are considerations taken by those who are to be served by their availability. Notably, urban apartment inhabitants prefer to be within convenient walking distance to public transportation to minimize on travelling cost and time

On the other hand, inflation, interest rate and profitability, are also important factors in determining general level of value at any given point in time. Households categorize themselves in terms of their tastes and preferences, income levels, social and economic activities and beliefs (Boucq & Stratec, 2011). Consequently, the factors such as their age, education and income levels, size of household availability and cost of borrowing must be assimilated in affecting the types of housing and the values. The above average income earners will hunt for a part of the city that offers leisure facilities, social amenities, parks and convenient form of public transportation and infrastructure (Green, 2005). This shows that the proximate and relevant influences on the property are related to the same influences operating on other properties in the neighborhood.

2.3.5 Cost of building

Building cost includes statutory fees approval of building plans, site overheads, materials, labour, equipment or plants, land, finance cost, head office cost, professional fees, and profit. These costs and construction cost overrun are well documented in Mbachu and Nkado (2004). Cost overrun has an effect project budget and final price of the building. The developer will realize less return on investment while the end user will have to pay more on rent or purchase price. According to Akanni et al. (2014) on implication of rising in the cost of building materials, the study shows that the high cost of building materials affects the final price of the building including rental income. Rising cost of building materials are majorly affected by exchange rate, cost of power and fuel supply, variation in legislation and government policies. Variation in development cost also influences the building cost since it can result in scheme abandonment and reduction in volume of building production.

2.4.6 Housing prices and macroeconomic factors

A direct association between real estate industry, the economic situation and the general economic activity of the nation (Romkaew, 2014). The significant economic indicators include unemployment rate, real wage levels and per capita income GDP, building and construction activities, personal savings and investments. Barrett and Blair (2001) split the economic factors depending on their origin or impact into the demand and supply sides of the economy. The demand side of the economy consist of total community income and distribution, population, and

sources of occupation. The supply side consist of the current and intended amount of supply in properties and competitive environment.

Yang *et al.* (2014) analyzed returns in global property markets and revealed that returns profoundly correlated with the fundamental economic variables such as GDP, economic growth and inflation while Ling and Naranjo (2003) found out that real interest rate, unexpected inflation, term structure of interest rate and growth in consumption as regular determinants of real estate returns. In addition, studies by Hekman (2001) emphasized GDP to have significant impact on prices and returns of housing market while unemployment rate had no significant effect on returns. Similarly, unemployment rate was found not to have any significant effect on returns in real estate.

Kofoed-Pihl (2003) conducted a study on the macroeconomic determinants of United States Commercial Real Estate returns. Data on total returns in real estate on quarterly basis was collected from 1984 – 2008 Findings of the study indicate that long term interest rate and unemployment had a negative influence on returns in US real estate market while the GDP influences returns positively over time. From the results, inflation had a weak relationship with returns on investment. Barrett and Blair (2001) describe the real estate industry to have a strong relationship with inflation. Unlike other assets where depreciation rate is very high, property tends to rise in price due to a firm re-sale market. The rate at which property prices have increased greater than general increase in price level (inflation). The expectation of future inflation is just as important as inflation, with majority of the investors ready to purchase properties of low rates of return with future expectation of inflation in order to gain from capital appreciation and rental growth. Changes in interest rates tend to affect growth in a country's economy with the housing market being greatly affected by changes in the interest rate term structure. Raising interest rates will intensify the cost of borrowing which will in turn discourage investment because of less disposable income. High interest rates can slow down the economy reducing demand for new homes uptake and the supply of new housing units in the market. In consort with material and labor costs, high interest rates cause the costs of construction to rise because most developers get funding from banks to build. Subsequently, interest rates affect both the demand and supply of property markets.

Wofford (2002) illuminates how property taxes tremendously impact on individual's decisions to property ownership, and on the types and timing of development. Changes in taxation influences

property values. The values of properties will decline following an increase in property taxes. This change will occur since investors will incur increased carrying costs associated with owning properties reducing future revenues expected from capital appreciation, which investors could expect from selling them in the future. Investors can take the changes in property taxes into account by changing the assessment value of a house to establish a higher value of the same property. This will help in deciding how much to pay so as to capitalize those taxes into the values of properties. Therefore, the economic factors affect generally the performance of property markets.

In Kenya, Nzalu (2013) evaluated factors affecting real estate investment. In his study, population included real estate investors while the target group was private and public property investors. Findings from the study showed that, interest rate variation, GDP growth, and growth in inflation to be statistically significant determinants of real estate returns. In a study to assess the determinants of real estate prices in Kenya, Karoki (2013) found to exist a negative significant relationship between residential real estate prices and level of money supply, positive relationships with GDP, and interest rates. In this study, Interest rates was found to greatly influence house prices followed by GDP and level of money supply. Consequently, the growth in house prices is vastly explained by macroeconomic variables. Even though the study found a direct positive relationship between residential real estate prices and inflation rates, the relationship was found to be weak. The movement in house prices indicate a general rise in property prices over time hence the trend is expected to continue. Even without significant changes in the variables, the result of time is that house prices go up. This also indicates that the real estate market is significantly stable.

Karoki (2013) analyzed the determinants of residential real estate prices in Kenya. Data collected from publications in government and financial institutions included monthly secondary data for a period of eight years spanning from 2005 to 2012. The study found out that there are positive relationships with GDP, significant negative relationship between residential real estate prices and interest rates, , and level of money supply. From the findings, Interest rates have the most significant effect on house prices followed by GDP and level of money supply. However, the study was limited to macroeconomic determinants and hence it did not show the influence of location. This contradicts the study carried out by Ochuodho (2011) who deliberately dropped the GDP and Rate of Inflation Variable from his model as an indication that they are among the

significant economic fundamentals that support residential house prices. From his findings, a positive relationship existed between house prices and inflation implying an increase in rate of inflation will have a positive impact on house prices.

Kibunyi (2015) conducted a study on the determinants of the prices of houses in Nairobi. The results show that positive relationships exist between house prices with lending rates, diaspora remittances, GDP, cost of construction and loans to real estate sector. Inflation had a negative relationship with house prices. The cointegration tests results indicated unstable relationships for diaspora remittances and building costs while GDP and NSE index had a stable long-run relationship with house prices. The results show higher orders of integration using fractional integration, for the house price series compared with the other variables, though the study is indifferent about the existence of a house price bubble. No causal relationships between house prices and diaspora remittances from granger causality tests. However, two-way causalities between house prices and GDPNSE Index and building cost. In his study, Kibunyi findings shows that lending rates has direct relationship with house prices. Increase in lending rates causes a rise in house prices. This is consistent with study done by Mahalik & Mallick (2011) who observed that credit has more supply force than its demand force thus giving rise to increased supply of houses as credit gets utilized in the construction than in acquisition of houses. However, the study carried out by Himmerlberg *et al* (2005) contradicts the two as he observed that the easy availability of credit for the housing sector at cheaper rate the higher the prices of the houses.

Amatete (2016) conducted an evaluation of critical factors affecting pricing of real estate among low income people in Nairobi. The study applied an exploratory research design and a causal approach. The results indicated that construction cost, macroeconomic determinants, financial markets dynamics, and structural characteristics were the major determinants of acquisition and ownership of real estate among the low-income earners. The study conducted by Githae (2017) similarly concurs with Amatete who found construction coefficient to be significant in-house prices. A positive shift in the cost of construction leads to an increase in the housing prices in the current period which negatively affects the demand for housing. From this study, it implied construction cost in Kenya housing market causes an overreaction to the housing prices in the long run. Kibunyi (2015) did also find a positive relationship between construction cost and house price.

2.4.7 Government regulations

The National and county governments have set by-laws which effect delivery of housing in Kenya. The choice of materials to be used in the building are inclined by building codes and regulations. Building codes always specify materials quality, type, size of spaces, class of services and tolerance levels. This is well elaborated by Gichunge (2001) which shows that building codes do not provide specifications for the local materials but covers only the conventional materials. Stringent bylaws in the use of building materials specified in the building codes causes the cost of building to be unaffordable without considering whether the building would be safely occupied or not by the users.

Most development in urban areas are controlled by the County Government Physical Planning Act (Development and Control). According to (Keivani & Werna, 2011) most County governments have developed a guide of development Ordinance and Zones to be used by Physical Planning Department before granting any approval and construction of buildings. The guide shows the zone, areas covered, ground coverage, plot ratio, type of development and minimum area in hectares allowed. Building regulations are also continuously reviewed to allow for more development.

Also, the regulation of building materials influences the cost of building and types of buildings put up in specific areas. With the new regulation approved by National Construction Authority, materials such as Expanded Polystyrene (EPS) technology and interlocking blocks are being used in the construction industry. Government Act which work in tandem County Governments by Laws in regulating the land use and zoning are the Land Act, Land Registration Act, the National Land Commission Act, (Ambreena, 2014).

2.4.8 Challenges facing real estate investments sector

There was a significant decline in residential sector activity in the year 2017 as evidenced in reports by KNBS and other organizations. Various segments have had a drop-in volumes transacted. From KNBS annual leading economic indicators reports, the values for residential building approvals went down by 16.3% the year 2017. Hass consult reported a 3.1% decrease in sales prices while KBA released their housing price index in 2017 showing a slower growth in property prices at 1%. Cytonn release indicated a price increase of 3.8% during the same period. The mortgages front went down by 1.5% that is 24,453 mortgages in 2015 to 24,085 in 2016. The

study undertook to select some of the key happenings of the period ending 2016 basing on the 2017 report.

Investors are faced with several challenges such as inadequate and the high cost of funds, increased supply and competition, as well as a lack of affordable land in the past years. Cytonn Investments in an annual market report for 2018 shows that mortgages had reduced due to the interest-rate capping, with the number of active accounts dropping at the end of December. Despite the capping of interest rates, availability of funds has been on the decline as financial institutions become more risk averse. ‘

According to the available house price index published by the Kenya Bankers Association (KBA), Kenya was faced by a number of challenges in year 2017. The market slowed down, developers and private investors still struggle to sell properties at the initially projected prices. Inadequate development land supply at fair prices that increased the costs of development and consequently end-user prices. On average, land prices have grown by a six-year compound annual growth rate of 17.4 per cent (Cytonn, 2016). Several studies have studied the challenges facing real estate developments. Danny (2012) found out that unemployment was a major challenge in real estate development as one cannot afford to own a property without a source of income. According to Vontello and Williamson (2001) real estate requires huge amount of capital investment and this worsens in time of economic crisis where the level of employment stagnates, cost of borrowing increases and purchasing power declines.

Government policies related that influenced the cost of building and return in investment are digitization of the lands ministry, fifty percent off on corporate taxes for any developer producing over one hundred affordable residential properties annually, Innovative financing solutions such as Mortgage Liquidity Facility (MLF) i.e. The Kenyan Mortgage Refinancing Company (KMRC), the National Housing Development Fund (NHDF). Other Government policies related to taxation influence the cost of building and return in investment is Withholding tax of 10% of the rental income which is also payable to Kenya Revenue Authority

In Kenya’s household disposable income has been on an increase according to KNBS statistics. This is an implication that households can spend more on basic needs such as shelter. Since the capping of the interest rates, emerging evidence indicate that commercial banks have shifted their interest to government and large corporate borrowers avoiding the small risky borrowers. Though the GDP has been on the increase, the impact on growth has also begun to suffice. From

the findings, high interest rates were perceived to be one of the major challenges in real estate development. This is an indication that the cost of borrowing is a barrier to most potential buyers. High interest rates lower the market liquidity of real estate by enhancing the attractiveness of other alternative investments (Comptrollers' 1998).

Like any other market in the world, Kenya's real estate market operates in cycles just Kenya cycles starts after a general election and end with the following general elections. Due to 2017 elections, there was slowdown in uptake of houses leading to high vacancies and drop in prices Gichunge (2015). This implies that the market was influenced by the political uncertainty that was there. Harsh operating environment has caused the Kenya industrial base to Kenya's industrial base to dwindle. Factor that have contributed heavily to this include underdeveloped transport infrastructure, power unreliability, corruption and land crisis. Consequently, in 2016 Kenya was faced a crisis in the manufacturing sectors with several factories closing and transferred. On a brighter note, the government has come up with strategies to recover the business climate. These include enormous investment in road transport, rail transport and sea port creation and or development and power generation such clean energy for instance the geothermal, solar and wind energy. Bureaucracy in companies has since been reduced especially during registration, legal and Institutional Constraints, Costly plan approvals, strict planning regulations and government restrictions were other challenges perceived to be facing real estate developments. This process has become very tedious for developers who must pay exorbitant amount just to obtain approvals. It has been violated where poor designs and are approved leading collapse of buildings, damage and loss of property and even life.

2.5 Research gaps

A review of literature established that majority of factors influencing house prices studies have concentrated on developed economies with less focus in developing economies such as Kenya. Moreover, findings from literature show that housing prices studies at different timings produced contradictory results. As a result, the current study aimed at assessing the influence of macro and micro factors on housing prices. A review of literature has established that most studies on housing prices have focused on the influence of macro factors on house prices. The current study extended the analysis of both the micro and macro factors. The micro and macro factors were from previous studies. Additionally, methodologies in data analysis differed as most studies

employed VAR model to establish relationship between independent and dependent variables. The current study used the VEC model to establish both long and short run effects of macro variables on growth in house prices. Previous studies that analyzed micro factors mostly did a primary data collection while the current study used secondary data and did a stepwise regression. The current study also captures shocks experienced in the economy during and after regime change at the ballot as captured in time series data beyond 2014 contrary to most studies done. Lastly, the current study sought to desegregate the different segment in residential real estate market by income levels while previous study generalized findings across the housing market.

2.6 Conceptual framework of the determinants of residential real estate returns

The study sought to analyze factors that influence residential real estate prices in Nairobi County. The independent variables were GDP, lending rates, inflation, foreign exchange rates, has house price index, total remittance, real estate investment and construction cost as the macro variables. The micro variable included location, and cost of building, government policies and residential building's characteristics. The dependent variable was housing prices. The study sought to assess how the independent variables related with the dependent variable.

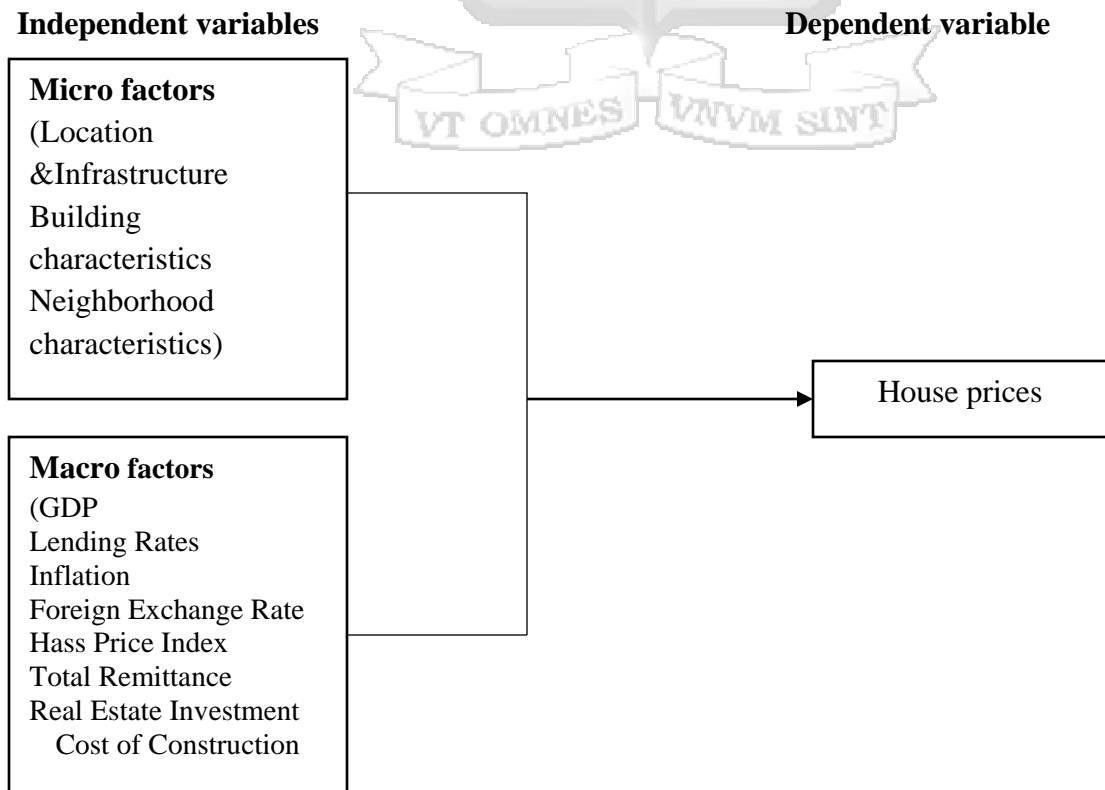


Figure 1: Conceptual framework

Researcher's own conceptualization

2.7 Operationalization of variables

This section describes how the researcher measured the independent variables that is; GDP, lending rates, inflation, foreign exchange rates, total remittance, real estate values and cost of construction. The micro variables included location factors, infrastructural factors and building characteristics. The dependent variables were house prices and growth in house prices.

2.7.1 Micro factors

When buying a house, location is vital. It refers to an area or particular position a property is situated. It sometimes used interchangeably with proximity and accessibility (Fanning and Stephen, 1994). Pioneers of land economies viewed distance as the heart of locational analysis. Five main attributes are identified by Segal (1997) when assessing the desirability of a residential location, such are the virtual features of a neighborhood such as residential buildings, infrastructures, socio economic activities of the people living in the neighborhood, public services such the quality of schools, roads and recreational facilities. It also includes the quality of the environment and ease of access to the neighborhood. Pollakowski (2016) indicates that house prices are influenced by accessibility properties and neighborhood attributes of the location. The environmental factors, such as locality, amenities, parks, and levels of neighborhood security were considered. Amatete (2016) measured location in terms of accessibility from the main roads (distance and type of roads), availability of social amenities (water, electricity, police station of police post, churches and schools), physical neighborhood environment (surrounding buildings and infrastructure) and income level of people living in the area. Primary data was obtained by administering questionnaires to real estate agents, managers, and developers in Nairobi County in the various segments.

Building characteristics involves general building characteristics such as the age of a building, the floor space and total occupants found in a building. It can also refer to occupancy level which is the rate at which a building is occupied in a given period. Other scholars look at level of distribution of floors whether they are below or above grade and the usage of floor spaces.

Characteristics of the site also constitute to building characteristics such the topology where it is situated. The external attributes such exterior walls and other facilities such generators, solar heaters, bore holes are part of the building characteristics. It also constitutes suitable architectural designs, quality of finishes Neighborhood refers to the physical area surrounding a building. It could also refer to the style of architecture of houses that stand out like the roof types, sizes of the houses and many more.

2.7.2 Macro factors

The macroeconomic factors according to previous studies refer to interest rate, GDP and Inflation rate (Ouma, 2011), (Karoki, 2013), (Kibunyi, 2015). Interest rate is the cost of borrowed funds. It refers to payment for the expense of the current spending power and for the risks involved in lending (Mudida, 2009). GDP measures the total value of domestic production for the entire domestic economy. The data for GDP is collected on quarterly basis from Kenya Bureau of Statistics from 2004-2018. Mikhed and Zemcik (2009) in USA used GDP and Inflation to determine the influence of macro-economic factors on housing prices. Many studies (Davis and Heathcote, 2003; Goodhart and Hofmann, 2008; Madsen, 2012) agree that relationship exist between housing market and GDP.

Inflation rate refers to increase in the prevailing market prices that is eroding the cost of purchasing of a typical consumer over time. Therefore, inflation refers to the level of increase in general prices. Gross domestic product and inflation rate is the obstinate rise in general price levels of goods and services as a result of high costs of production costs (cost-push), and the demand-pull which takes place when the aggregate supply is persistently exceeded by the aggregate demand at the current prices (Mudida, 2009) employment rate for the last five years. Data for inflation and interest are obtained from Central Bank of Kenya on quarterly basis.

Diaspora remittance are funds by nationals of a country generated in other countries. Recently, diaspora remittance has been on the leading to their recognition as an important contributor to the country's growth and development. Rising (Apergis and Rezitis, 2003; Igan *et al*, 2011). Andrews (2010) observed there is a relationship between house prices and interest rate.

Kibunyi (2015) observed a positive relationship between house prices and diaspora remittances. The data for diaspora remittances was obtained from Central Bank of Kenya (CBK) on quarterly basis. There are no significant studies done on house prices and rental yield and diaspora

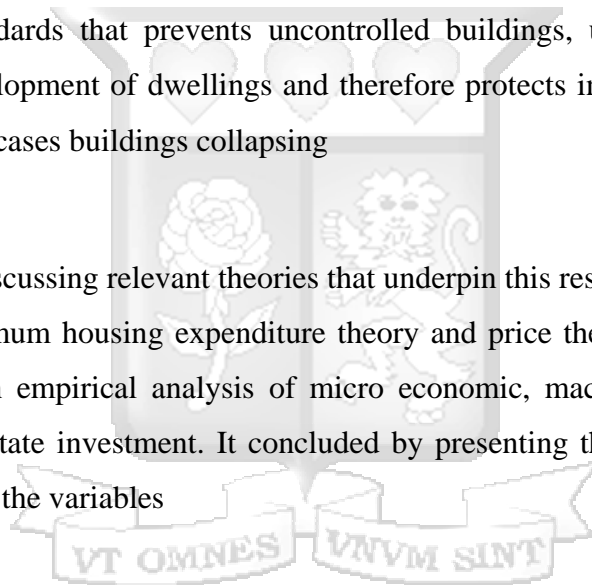
remittances. This study therefore sought to find out if there is any relationship between house prices and diaspora remittances.

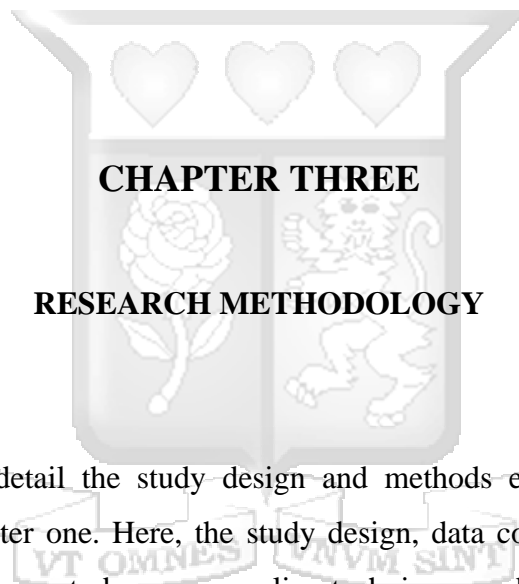
Cost of building is measured in terms of cost of materials used in building and cost of buying the land. Data for construction cost is limited and therefore the study used the Building cost Index data obtained from KNBS as a proxy for cost of construction.

Legal frameworks related to residential buildings include taxation, zoning, building codes and standards, land use controls and county government by-laws. Land use controls on housing have a significant effect which type of dwellings construction of houses in Nairobi. Their enactment and enforcement by the local government dictates on rules and regulations that govern urban planning. They set standards that prevents uncontrolled buildings, unfinished houses which prevents haphazard development of dwellings and therefore protects investors from unexpected demolitions and in other cases buildings collapsing

2.8 Chapter summary

This chapter began by discussing relevant theories that underpin this research. The filtering down theory, trade -off, Maximum housing expenditure theory and price theory were discussed. The chapter also included an empirical analysis of micro economic, macro-economic factors and challenges facing real estate investment. It concluded by presenting the conceptual framework and operationalization of the variables





CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses in detail the study design and methods employed in answering our objectives as stated in chapter one. Here, the study design, data collections methods, types of data collected and their sources, study area, sampling techniques and population and sample size computation, data collection instruments used, their validity, data analysis methods, results presentations and ethical considerations are highlighted.

3.2 Research design

The study adapted both exploratory and causal effect approach in examining the effect of microeconomic environment on rental yield and how macroeconomics factors affected growth in house prices in the last 14 years in in Nairobi, Kenya. Both primary and secondary data was collected on specific variables as captured in the conceptual framework. Macroeconomic data was captured on quarterly basis from first quarter of 2004 and fourth quarter of 2018 making the study longitudinal in nature.

The structured exploratory approach allowed for gathering quantitative data that was subjected to empirical analysis. Both descriptive and econometric analysis were done, and findings discussed in subsequent chapters.

3.3 Population and sampling

The study objectives required both cross-sectional data for micro-economic analysis while time series data was gathered for macroeconomic analysis. Cross sectional data was collected from home owners, real estate agents, property managers and sales representatives in Nairobi County. Sample size has to be large enough to be a true representative of the universe population according to Kothari (2004). It should be able to give relevant and enough information on the population to be analyzed with ease Creswell (2006). This sample size was calculated using the proportion sample size determination formula as given by Cochran, W. G. (1977).

$$n = \frac{z^2 pq}{e^2} = \frac{1.96^2 (0.5)(0.5)}{(0.05)^2} = 384$$

where n is the desired sample size of the respondents who included real estate investors, home owners and managers among others in Nairobi County, z is the standard normal deviate at the required confidence level and is found in the Z-table, p is the proportion in the target population estimated to have characteristics of interest, q is $1 - p$, and e is the desired level of precision (i.e. the marginal error). Since the estimated proportion of the respondents was unknown, the proportion adopted for p was 0.5.

Third objective was mainly addressed to the development companies in Kenya which from the Kenya Property Development Association, there are 75 registered development companies. Therefore, all the registered development companies were the target population to address challenges faced in the real estate investment companies.

3.4 Data collection methods and procedure

To address the first objective on the micro factors, structured questionnaires were administered to residential home owners, investors, caretakers, sales representatives and agents with aim of capturing micro factors effect of real estate in Nairobi county. The questionnaires were

administered by research assistants/ enumerators while some were dropped and picked at later dates during the data collection period. Secondary data was collected on macro factors (GDP at market prices, lending rates, inflation rate, foreign exchange rate, diaspora remittances, residential real estate building cost index, investments in residential real estate, and growth in residential house prices) from existing published literature, financial statements, KNBS, CBK and World Bank journals and Real Estate annual reports to address the second objective. The third objective was mainly addressed to development companies through questionnaires.

3.5 Data analysis procedures and presentation

Both primary and secondary data was analyzed using excel, statistical package for social sciences (SPSS) and Stata. Descriptive statistics and inferential analysis were done on Quantitative data gathered and findings presented in the results section. Descriptive statistics recorded include percentages, frequencies, mean and standard deviation. Cross sectional data was subjected to both normality and collinearity tests and a factor analysis techniques was used to determine the relationship between micro factor and house prices.

Time series data was subjected to several statistical tests including Pearson correlation tests, Philip Perron test, Johansen and Juselius test and granger causality tests. These tests are imperative in determining the relationship that exist amongst the variables in the dataset before specifying our regression models. In a nutshell; Pearson Correlation test was used to establish the strength and direction of the relationship between the dependent variable and its covariates in the regression. Philip Perron test was used to check for stationarity (unit root test) in the data while Johansen and Juselius test was necessary as a co-integration test. Granger Causality were appropriately applied on data to establish the effect-causality relationship on selected time series variables.

When executing the above-mentioned tests, the study hypothesizes that there is a unit (data is non-stationary) thus we reject our null hypothesis if the test statistic is greater than the critical value from a Philip perron test. Using Johansen and Juselius test for cointegration, we hypothesize that there is no cointegration among the variables, thus reject null if trace statistic is greater than the critical value. In granger causality test, we select our level of significance (e.g. 5%) and test macro -economic variables against our dependent variable. We set a null hypothesis

that an independent variable does not granger cause changes in our dependent variable. We will therefore reject the test statistic (p-value) is greater than the assumed significance level (5%).

3.6 Model specifications

To address objective one: to examine the relationship of the micro factors and residential housing prices. Factor analysis was carried out on the overall model but the number of observations were not enough for the segment analysis and therefore the study used stepwise regression as expressed in the following equation.

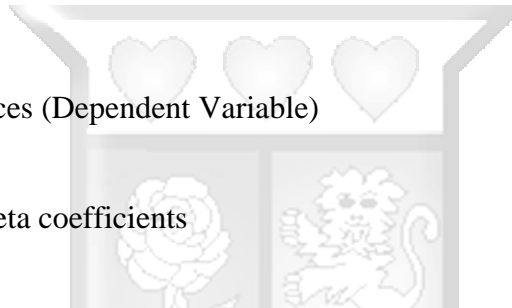
$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \beta_{12}X_{12} + \epsilon \dots (i)$$

Where:

Y = house selling prices (Dependent Variable)

β_0 = Constant Term

$\beta_1, \beta_2, \beta_3 \dots \beta_n$, = Beta coefficients



Y = house selling prices
(Dependent Variable)

β_0 = Constant Term

$\beta_1, \beta_2, \beta_3 \dots \beta_n$, = Beta coefficients

X_1 = number of rooms

X_2 = plinth area

X_3 = Back-up generator

X_4 = Solar water heater

X_5 = Borehole water

X_6 = Gated

X_7 = Exterior finishes

X_8 = Number of bathrooms

X_9 = swimming pool

X_{10} = Balcony

X_{11} = Parking garage

X_{12} =Master ensuite

X_7 = Exterior finishes

X_8 = Number of bathrooms

X_9 = swimming pool

X_{12} = Interior finishes

X_{13} = Quality roads

X_{14} =Source of water

ϵ = Error term

As theory dictates, the study selects between the SVAR and VECM models to analyses objective two. Decision criterion is usually in order of integration of the series with the presence of long-run equilibria, which are supposed to be stationary. Stationarity properties of the data are first examined using Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF).

Irrespectively of model type estimated, the order of variables assumed throughout the research is as follows: lnHPGROWTHA, lnLENDRATE, lnINFLATION, lnHPINDEX, lnFOREX, lnREMITTANCE, lnRBCINDEX, lnRINVETMENT and lnGDP. OLS estimation method is used to both SVAR and VECM. Post estimations tests of lagrange-multiplier (LM) test for autocorrelation in the residuals, Jarque-Bera test for normally distributed residuals are performed to check for model adequacy. Eigenvalues stability test is performed to check if the predicted values of the cointegrated equations are stationary.



Table 3. 1 Variable definitions and measurements

Variable label	Variable name	Measurement	Type
<i>Micro variables</i>			
<i>Dependent variable</i>			
lnSelprice	Selling price	Log of selling price of the the house/ apartment	
<i>Explanatory variables</i>			
<i>building characteristics</i>			
lnplinth	Plinth area	Log of area of the floor measured in square meters	Continuous
Bathrooms	Bathroom	Number of bathrooms in the house	Count
rooms	Number of Rooms	Number of rooms in the house	Count
generator	Generator	Dummy: 1 indicates presence of generator and 2 indicates absence of generator	Dummy
Lift	Lift	Dummy: 1 indicates presence of lift and 2 indicates absence of lift	Dummy
borehole	Borehole	Dummy: 1 indicates presence of borehole and 2 indicates absence of borehole	Dummy
balcony	Balcony	Dummy: 1 indicates presence of balcony and 2 indicates absence of balcony	Dummy
Park	Parking/garage	Dummy: 1 indicates presence of parking and 2 indicates absence of parking	Dummy
Solarheater	Water Solar heater	Dummy: 1 indicates presence of water solar heater and 2 indicates absence of water solar heater	Dummy
Separate dining area	Separate dining area	Dummy: 1 indicates presence of separate dining areaand 2 indicates absence of separate dining area	Dummy
Master ensuite	Master ensuite	Dummy: 1 indicates presence of master ensuite and 2 indicates absence of master ensuite area	Dummy
Swimming pool	Swimming pool	Dummy: 1 indicates presence ofswimming pool and 2 indicates absence of swimming pool area	
Exterior finishes	Exterior finishes	Dummy: 1 indicates low quality of exterior finishes 2 indicates medium quality of exterior finishes 3 indicates high quality of exterior finishes	Dummy
Interior finishes	Interior finishes	Dummy: 1 indicates low quality of interior finishes 2 indicates medium quality of interior finishes 3 indicates high quality of interior finishes	Dummy
Condition of the building	Condition of the building	Dummy: 1 indicates new building 2 indicates otherwise	Dummy

Infrastructure			
Within gated community	Within gated community	Dummy: 1 indicates that gated community exists 2 indicates that gated community do not exist	Dummy
Quality School	Quality School	Dummy: 1 indicates that quality school exists 2 indicates that quality school do not exist	Dummy
Proximity to CBD	Proximity to CBD	Dummy: 1 indicates that proximity to CBD exists 2 indicates that proximity to CBD do not exist	Dummy
Proximity to Quality Shopping mall and Recreational facilities	Proximity to Quality Shopping mall and Recreational facilities	Dummy: 1 indicates that proximity o quality shopping mall and recreational facilities exists 2 indicates thatproximity o quality shopping mall and recreational	Dummy
Neighbourhood characteristics			
Quality of the roads	Quality of the roads	Dummy: 1 indicates very good quality of the roads 2 indicates good quality of the roads 3 indicates deficient quality of the roads 4 indicates very deficient quality of the roads	Dummy
Quality of light network	Quality of light network	Dummy: 1 indicates very good quality of light network 2 indicates good quality of light network 3 indicates deficient quality of light network 4 indicates very deficient quality of light network	
Source of water	Source of water supply(Nairobi)	Dummy: 1 indicates very good source of water supply from Nairobi Water 2 indicates good source of water supply from Nairobi Water 3 indicates deficient source of water supply from Nairobi Water 4 indicates very deficient source of water supply from Nairobi Water	
Location	Location	Dummy: 1 indicates Runda; 2 indicates Muthaiga; 3 indicates Karen; 4 indicates Kitisuru; 5 Indicates Kileleshwa; 6 Indicates Kilimani; 7 Indicates Westlands; 8 Indicates Upper Hill; 9 Indicates Langata; 10 indicates South C; 11 indicates South B; 12 indicates Kariobangi;	
swmpool	Swimming pool	Dummy: 1 indicates presence of swimming pool in the compound and 0	Dummy
masterb	Master bedroom	Dummy: 1 indicates presence of an ensuite master bedroom and 0 indicates	Dummy
Macroeconomic variables (quarterly from 2004 -2018)			
Dependent variable			
lnHPGRWTHA	Growth in house prices	Log of growth in house prices based on 2004 growth	Continuous
Explanatory variables			
lnLENDRATE	Lending rate	Log of growth in house prices (measured as a percentage, CBK published data)	Continuous
lnINFLATION	Inflation rate	Log of growth in house prices (measured as a percentage, KNBS published)	Continuous
lnHPIDEX	Hass House Price Index	Log of growth in house prices (Hass house price index)	Continuous
lnFOREX	Foreign Exchange	Log of growth in house prices ((Exchange rate between KES and USD, CBK	Continuous
lnREMITTANCE	Diaspora Remittances	Log of growth in house prices (Amount of money send from Kenyans living and	Continuous
lnRBCINDEX	Building and Construction Index	Log of Real estate building cost index; (Composed of real cost of labor, real	Continuous
lnRINVESTMENT	Real Estate Investment	Log of investments in residential real estate (measured as the value of approved	Continuous
lnGDP	Gross Domestic Product	Log of GDP (per capita GDP, KNBS published data)	Continuous

3.7 Research quality

3.7.1 Internal validity

Internal validity is the extent to which a study establishes cause and effect relationship between a treatment and an outcome in which certain conditions are perceived to lead to other as opposed to a spurious relationship. Internal validity relies heavily on the procedure of a study and how thoroughly they are performed. To ensure this, a pilot study on the questionnaire was done that informed the choice of questions used.

3.7.2 External validity

External validity is the ability to generalize the research findings. External validity denotes to how the outcome of a study can be expected to apply to other settings very well. The study was generalized to residential real estate investments.

3.8 Ethical considerations

During the entire research process, the team maintained high levels of ethics. The data collection was carried out in a professional and ethical manner. All the respondents were informed of the intended use of the information. The filled in questionnaires were handled with confidentiality and the data coded to help safeguard the identity of the respondent. The respondents were informed of their rights to participate and that the exercise was voluntary meaning they could stop the interviews at any point without prejudice.

CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

This chapter presents the findings of analysis done on data derived from annual reports, print media and questionnaires. This section is organized into three sections as per objectives. Section 4.2 presents findings from primary data on cross sectional analysis addressing objective one on micro. Section 4.3 presents findings from time series data on macro factors. Section 4.4 presents findings from primary data on practitioners' perspectives on the challenges facing real estate sector. In first two sections, the study presents the descriptive and summary statistic, correlation matrices, diagnostic tests and model results.

4.2. Results of the questionnaire

4.2.1 Response rate

Data collected for the analysis of the micro factors was from both primary and secondary data sources. The study first analyzed the primary data from questionnaires collected. Out of a sample size of 384, 307 responses were collected and analyzed indicating a response rate of 80%. The demographic information of the participants included their positions in their companies and the duration of time they had been in the real estate business. The goal of the first objective was to analyze the micro factors that influence changes in real estate prices in Nairobi metropolitan area. Table 1 indicates the position of the respondents and the response rate obtained from each category.

Table 4.1 General Information

Real estate stakeholders	No. of responses	Proportions
Agents	115	37%
Caretakers	30	10%
Property managers	56	18%
Owners	39	13%
Sales Representatives	67	22%

In the submarket analysis, the study adopted Cytonns classification of the various suburbs in Nairobi namely Upper/high end segment, Upper middle-income segment, Lower middle-income segment and lower end. Upper end segment consisted of prime suburbs in Nairobi which consisted of palatial villas and bungalows with very few apartments. The Upper middle consisted of apartments in zones characterization by middle class earners with averagely high incomes in comparison to the average characterization of middle class. These are zones of both high rise and low-density houses. The lower middle-Income segment consists of suburbs habited by middle class and lower end are zones that are habited by the poor with both formal and informal set up.

4.3 Microeconomic factors

To analyze objective one, the study first sought to understand home buyer’s affinity for certain characteristics in homes. Primary data was collected from the four segments with the aim of understanding how variation across sub-markets affects house prices. Factors in consideration were location factors, infrastructural and social facilities, building and neighborhood characteristics.

4.3.1 Communal factors in relation to housing prices in different segments

Figure 4 below presents statistics on how different segments as disaggregated by high end, upper middle, lower middle and low-end markets in Nairobi.

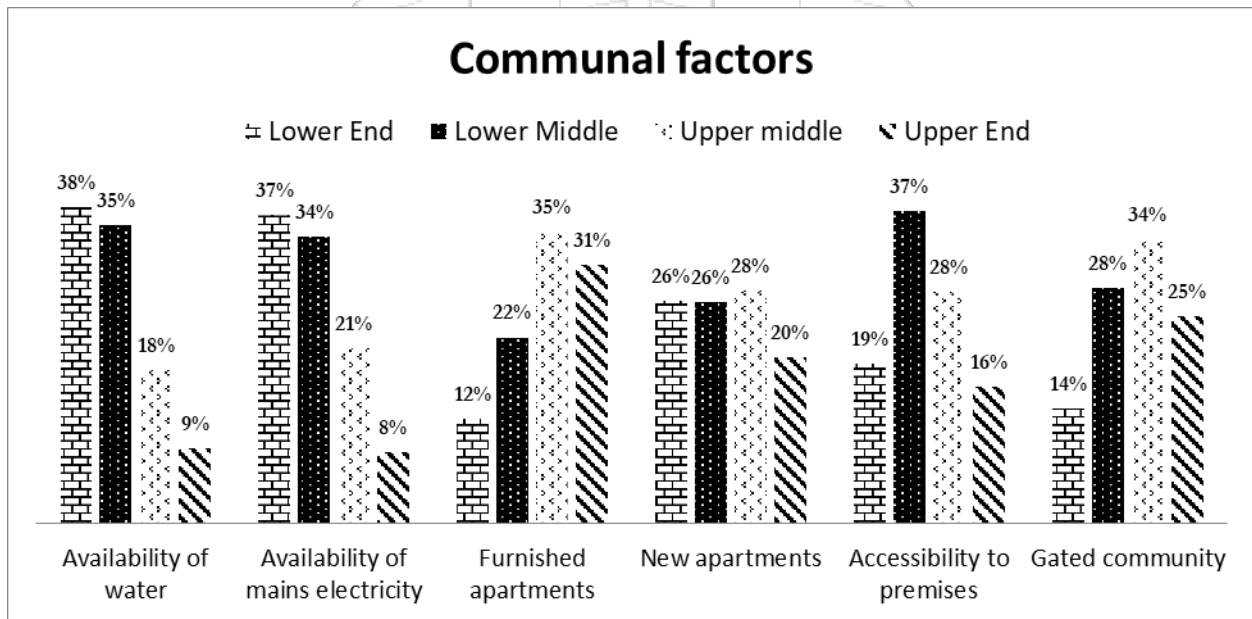


Figure 2: Communal factors that influence demand of housing in various estates

From the findings upper end segment indicated high preference for furnished apartments by 31%, gated communities at 25% while a moderate number of 25% indicated preference for new apartments. Ease of access to CBD and other social facilities was also considered to be of importance with 16% agreeing to this. Availability of water and electricity was the least of the factors residents were seeking in high end houses with a response rate of 9% and 8 % respectively. In the upper middle-income market, furnished apartments were highly desired with 35% agreeing to this, while 31% indicated that gated community mattered most in the upper middle-income segment. Accessibility to the premises had significant influence of the preference of most of this group with a 38% agreeing with this. Availability of water and electricity at a moderate extent was perceived to have an influence on houses in this income group with a response rate of 18% and 21% respectively.

In the lower middle segment, accessibility was purported to be of very high significance to this group of earners with a response rate of 37% while availability of water at 35%. New apartment and furnished apartment were of not so much importance as indicated by the response rate of 26 % and 22% respectively. In the lower segment, availability of water and electricity played a very critical role on income earners in this category with 38% and 37% agreeing with this, while the least consideration given to gated community and furnished apartment at 14% and 12% respectively.

4.3.2 Distance to social amenities in relation to house prices

Proximity consideration in price of a dwelling determination include distance to schools, distance to worship places, distance to public transportation, distance to hospitals, recreation centers and police posts (Takeuchi, Cropper ,& Bento ,2006).The closer it is to infrastructure such as railway, roads improves accessibility on one hand but increases risk of being evicted due to expansion or death caused by accidents (Wu, Gyourko, & Deng, 2012).The spatial dimension of house prices and rent is often captured through distance to the CBD (Herath & Maier,2010) .

Upper end income earners and upper middle income earners were least influenced by distance to public to social amenities. The reason could be that residents wish to live in a serene area, self-

contained neighborhoods and prefer a silent lifestyle with majority of them having their own private means to travel. Majority of respondent perceived residents in this segment do not consider distance to public transportation as a major determinant of housing but rather security had the major role to play. From the findings, 42 % in the upper end while 31% from upper middle said distance to police stations improved the security of a resident therefore making it more desirable for this income earners. Secondly, the upper segment and middle upper segment consists of an established shopping precinct at the junctions and other smaller strip shopping areas servicing the residents very well and conveniently.

Findings show that lower middle income earners and lower end put more emphasis on the distance to social amenities especially distance to public transportation than security with 32% respondents interviewed in the lower middle segment and 25 % in the lower end segment agreeing with this. Majority of these income earners are keen on proximity to work and distance to schools. This comprises of a resource constrained group of earners with so much savings and investment to focus on. The findings reveal that residents in these two segments will prefer living near schools for convenience purposes.

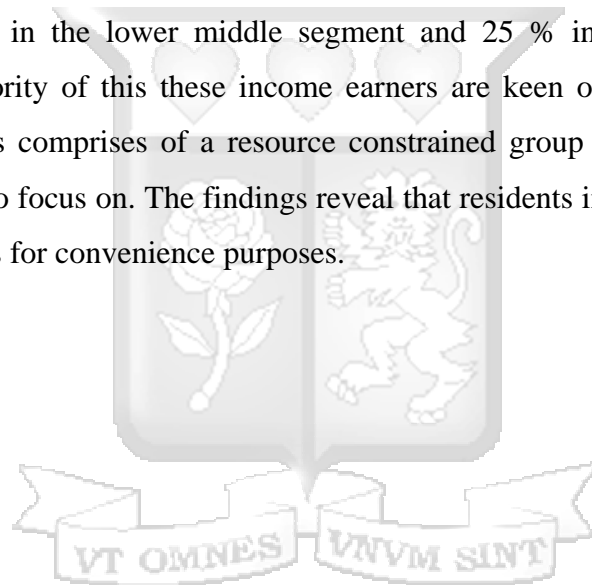
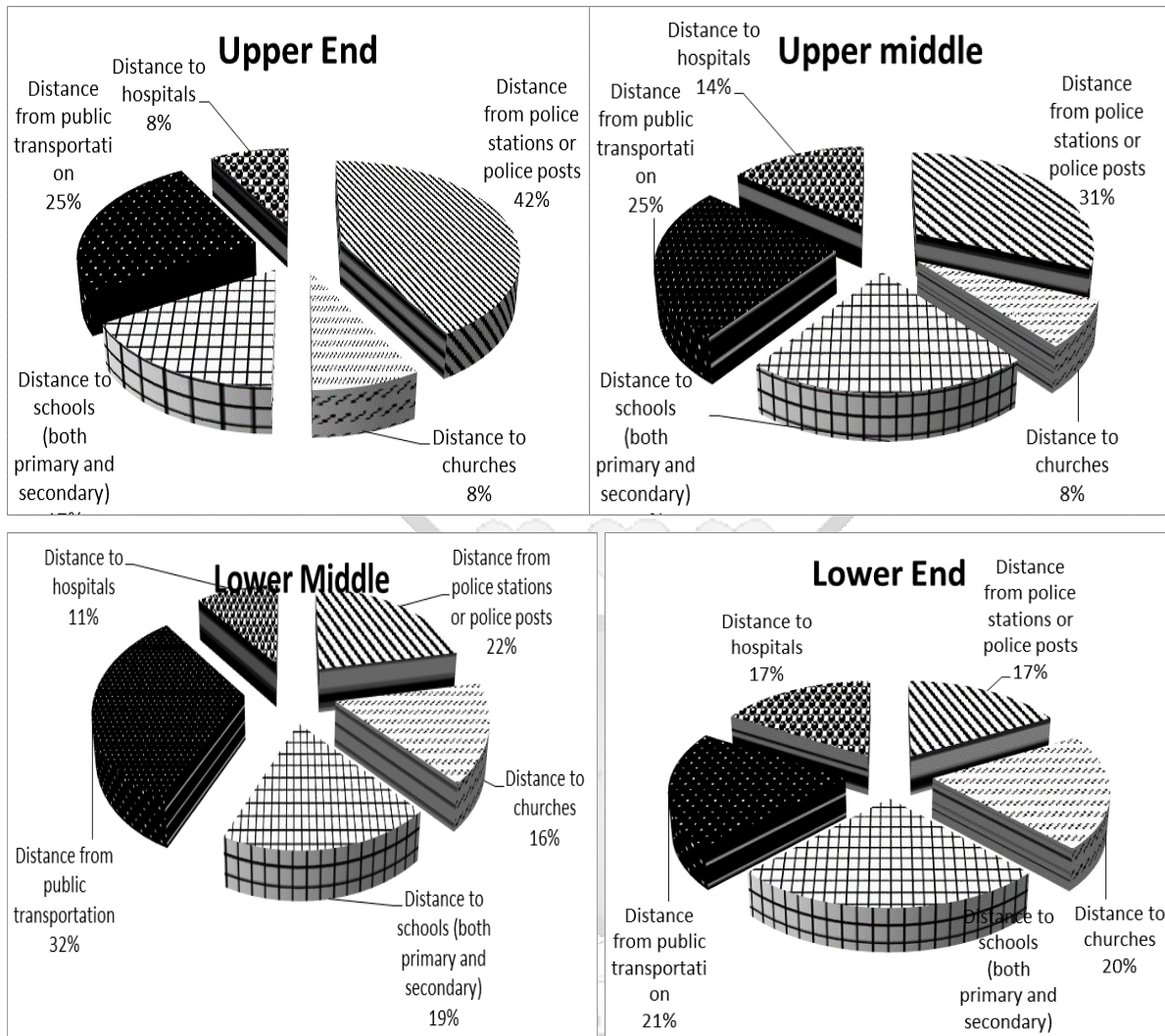


Figure 3: Distance to social amenities



4.3.3 Building characteristics in relation to housing in the various segments

An examination of building characteristics on type of houses, quality of finishes, level of security provided and facilities available was carried out. Table 5 below indicate results oh how different sub markets perceive the provision of certain building characteristics across the segments.

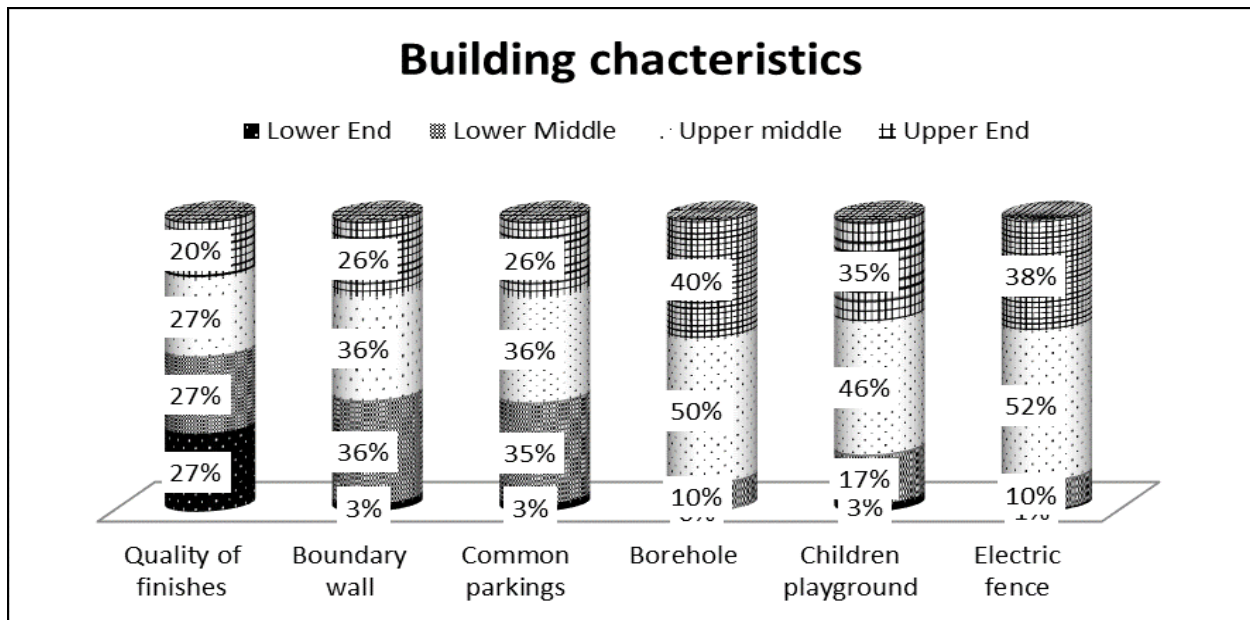


Figure 4: Building characteristics

Figure 4 indicate that security and safety of the building was what upper end income earners and upper middle income earners looked for in a home. From the findings, provision of an electric fence round the building and a boundary wall was deemed to be important to these group of residents with 52% of the respondents in the upper middle segment and 38% in the upper segment agreeing with this. Only 10% in the lower middle thought an electric fence was a determinant on income earners in this group while none thought that low end residents were concerned with availability of an electric fence. From the results, 36% thought a boundary wall around the building was preferred by the upper middle income earners and the lower middle income earners and availability of it would increase the value of the house. In general, security of a building in the upper end, upper middle and lower middle segments increased the desirability of the houses which influences the prices of the house.

The results above indicate the importance of quality of finishes and it can be concluded that everyone is seeking to derive value from their money. Quality is interpreted differently by the occupiers of the dwelling depending on their affordability index. The Quality of finishes desirable by the upper end income earners is different with the quality of finishes desirable with

lower middle income earners. Averagely 27% of those interviewed thought that quality of finishes is one thing that most city dwellers look at when purchasing a house, the segments.

Other than security and quality of finishes, the availability of parking space was the other determinant different income groups consider when purchasing a house. Results indicate 36 % respondents in the middle income ,35% in the upper middle and 26% in upper end supported this while only 3% of respondents in the lower end thought that parking had any significance in this segment.

4.4. Results from secondary data analysis

This second part of the micro analysis section entails an analysis of data that was collected from past property magazines, local newspaper advertisement and real estate agents. The data contains attributes and prices of 270 houses of sales between January and April the year 2016. The 3 months' period selected was for the purpose of eliminating as much variation as possible in regard to changing economic environment. It also gave the researcher an ample time to gather the data from the different secondary sources available from the archives. Data included houses in the different segment with preference given to more detailed advertisements during that period. The main goal of this section was to examine the influence of location, building characteristics, infrastructural and social amenities on residential housing prices and determine which housing characteristics were influencing house prices, factor analysis and step wise regression model was used.

4.4.1 Descriptive statistics

Table 4.2 indicates statistics of the dependent variable housing prices in the various segments and distance to CBD of the houses used in the study. findings show that the average selling price for a house in the high-end segment was Ksh.77M with a standard deviation of Ksh.42M and a minimum and maximum value of Kshs.17M and Ksh.210M respectively. Houses from this segment were on average distance of 9 km from the CBD with a plinth area of 360 square meters. In the upper middle, selling price fluctuated between Kshs.10M and Kshs.45M with a mean of Ksh.21M and a standard deviation of Kshs.7.5M. with an average floor space with 186 square meters. The descriptive statistics above indicate that the lower middle segment prices averaged at Kshs.10 million ranging from Kshs.7.5M and Ksh.18.5M with an average floor

space of 126 square meters. The lower end includes houses both formal set up especially under National Housing Corporation (NHC). The prices in this category averaged at Ksh.1.1 M with a highest price of Ksh.1.95M.

Table 4.2 Descriptive Statistics

Variable	N	Mean	Median	Std dev	Min	Max
Upper End						
Selling Price	72	77,213,889.00	76,500,000.00	42,750,069.78	17,000,000.00	210,000,000.00
Selling rate per sq meter	72	231,690.00	183,333.33	132,428.32	107,758.62	796,000.00
Plinth area	72	360.50	365.00	164.87	100.00	700.00
Proximity to CBD	72	9.53	8.65	3.40	4.00	14.89
Upper Middle						
Selling Price	72	21,745,673.20	20,500,000.00	7,595,685.64	10,937,500.00	45,000,000.00
Selling rate per sq metre	72	117,888.32	111,111.11	22,439.55	86,206.90	177,710.84
Plinth area	72	186.48	175.00	61.56	100.00	344.00
Proximity to CBD	72	10.53	9.93	2.51	3.20	13.00
Lower middle						
Selling Price	53	10,779,649.60	10,285,714.00	2,305,579.62	7,500,000.00	18,500,000.00
Selling rate per sq metre	53	85,838.05	85,714.00	11,699.26	62,500.00	107,142.86
Plinth area	53	126.02	123.00	22.06	88.00	186.00

Proximity to CBD	53	4.45	4.25	0.86	3.50	5.50
Lower end						
Selling Price	72	1,633,750.00	1,650,000.00	206,373.00	1,050,000.00	2,130,000.00
Selling rate per sq metre	72	30,000.00	30,000.00	–	30,000.00	30,000.00
Plinth area	72	54.46	55.00	6.88	35.00	71.00
Proximity to CBD	72	10.38	10.39	4.53	5.80	15.00

4.4.2 Factor Analysis for the overall model

The study used factor analysis to analyze building characteristics, location and infrastructure, neighborhood characteristic factors on house prices in general across the sector. Factor analysis is a variable reduction method that tries to put together inter-correlated variables which is conducted using a correlation matrix of variables of interest. A set of variables are joint to a new smaller set of variables called factors. This factor characterizes a weighted mean of the original data which are latent variables that is variables that cannot be observed. Factor analysis which uses principal component analysis and varimax rotation was used to extract factors subject to KMO, Barlett tests and an eigen value cut off of 1.0.

4.4.2.1 Sampling adequacy test (KMO and Bartlett's Test)

Kaiser-Meyer-Olkin (KMO) measures how a sample's adequate was employed to find out if factor analysis should be suitable to yield distinct and reliable factors or determine important variables. A value closer to one designates that there is a strong correlation among studies variables thus they can be used to generate factors or constructs variable. A KMO measure ought to be more than 0.70 and is insufficient if less than 0.50. This test shows if items are predicted by each factor sufficiently or not. From table 4.3, building characteristics has 0.921 which is great.

Location and neighborhood at least a KMO that is greater than 0.5 representing sufficient items for each factor.

Table 4.3 KMO Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	
Building Characteristics	0.921
Location & infrastructure	0.531
Neighborhood characteristics	0.562

The Bartlett's Test of Sphericity tested null hypothesis showing whether the correlation matrix contains an identity matrix or not. The study is interested in determining some relationship between variables thus should reject the null hypothesis that the correlation matrix is not identity matrix. The bartletts test is significant if the value is does not exceed 0.5 meaning the variables are highly correlated for the basis of factor analysis.

Table 4.4 Bartlett's Test

Bartlett's Test of Sphericity	Approx. Chi-Square	df	Sig.
Building characteristics	3331.867	105	0.000
Location & infrastructure	373.937	10	0.000
Neighborhood characteristics	220.974	3	0.000

From the 4.4 , the p values ($0.000 < 0.05$) hence we reject null hypothesis saying that Bartlett's test of sphericity is highly significant therefore factor analysis will be appropriate to be carried out.

4.4.3 Factors extraction

Table 4.5 shows the variance explained by from the initial solution and the extracted factors. The total column presents the quantity of variance in the initial variance in each component. The percentage of variance column presents the ratio of the variance accounted for by each component to the total variance expressed as a percentage. The cumulative percentage column presents that percentage of variance accounted for by the first n components (Costello & Osborne, 2005; Field, 2009). Findings from the initial solution indicate that there are as many components as variables.

According to the findings from table 4.5, factor 1 & 2 explained approximately 66.52% variability in building characteristics of the original fifteen variables respectively. From the table the variables employed in the factor's analysis are in the column 1. The initial eigen values are the variances of the factors to be extracted. Factor number 1 accounted for the majority of the variance and thus the topmost Eigen values. The following factor accounted for as a considerable amount of the left-over variance. Variance percentage signifies total variance percentage by each factor while cumulative percentage shows the cumulative percentage of variance accounted by the present.

Table 4.5 Extraction Method: Principal Component Analysis (Building characteristics)

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.340	55.603	55.603	8.340	55.603	55.603	7.712	51.411	51.411
2	1.638	10.918	66.522	1.638	10.918	66.522	2.267	15.111	66.522
3	0.970	6.469	72.991						
4	0.717	4.778	77.769						
5	0.627	4.179	81.947						

6	0.530	3.531	85.479						
7	0.481	3.208	88.686						
8	0.361	2.409	91.095						
9	0.286	1.905	93.000						
10	0.272	1.814	94.814						
11	0.218	1.453	96.267						
12	0.198	1.319	97.586						
13	0.148	0.986	98.572						
14	0.126	0.838	99.410						
15	0.088	0.590	100.000						
Extraction Method: Principal Component Analysis.									

Table 4.5 indicates the way the variance is divided among the 15 variables. It shows the real factors extracted and from the eigenvalues only two factors were greater than one. A glance at the “Rotation Sums of Squared Loadings,” displays factors that met cut-off standard (extraction method). Therefore, there were two factors with eigenvalues greater than 1. Factor 1 accounting for 51.411 % of the variability in all 15 variables, Factor 2 accounts for 15.111% of the variability. These 2 factors explain 66.522% of the total variability. Since factor 1 accounts for most variability it means that it constitutes the main variables influencing housing prices

Table 4.6 Extraction Method: Principal Component Analysis. (Location and Infrastructure)

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.429	48.575	48.575	2.429	48.575	48.575	1.782	35.644	35.644

2	1.036	20.713	69.288	1.036	20.713	69.288	1.682	33.644	69.288
3	0.862	17.236	86.524						
4	0.480	9.601	96.125						
5	0.194	3.875	100.000						
Extraction Method: Principal Component Analysis.									

Table 4.6 above shows factor 1 accounts for 35.6444 % of the variability in all 15 variables, Factor 2 accounts for 33.644% of the variability both explaining 69.288% of the total variability.

Table 4.7 Neighborhood characteristics

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.937	64.568	64.568	1.937	64.568	64.568
2	0.771	25.702	90.270			
3	0.292	9.730	100.000			

Extraction Method: Principal Component Analysis.

Table 4.7 indicates the neighborhood factors and only one component was extracted. The solution cannot be rotated

4.4.4 Factor rotation matrix

Using factor rotation, the variables in each factor are shown in the table below.

Table 4.8 Factor rotation matrix

Rotated Component Matrix^a		
	Component	
	1	2
No.of bathrooms	0.891	

Number of Rooms	0.889	
Children playing area	0.888	-0.124
Exterior finishes	0.840	-0.245
Plinth area	0.821	
interior finishes	0.811	-0.338
Master ensuite	-0.801	0.397
Separate dining area	-0.774	
Balcony	-0.764	0.315
Borehole water	-0.712	0.348
Backup generator	-0.620	0.571
Solar water heaters	-0.617	0.174
Lift		0.862
Swimming pool	-0.309	0.649
Parking/garage	0.318	0.408
<i>Location & infrastructure</i>		
police posts	0.906	
Quality School	0.836	-0.378
Within gated community	0.139	-0.801
Proximity to CBD		0.675
Proximity to Quality Shopping mall and Recreational facilities	-0.493	0.662
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser		

Normalization.

a. Rotation converged in 3 iterations.

From the rotated matrix component, the 15 variables have been sorted into 4 overlapping group of items. Rotation of factors is done for easy of interpretation. Rotation makes different items are predicted or explained by different underlying factors as much as possible. with each factor explaining more than one item is a condition called simple structure. Despite being the goal to rotation, it's not always achieved. We therefore look for the extent to which simple structure is achieved in the Rotated Matrix from the above table, we can conclude that key affects factors are number bathrooms, number of rooms, exterior finishes, interior finishes, plinth area, lift and proximity to quality shopping malls and recreational facilities.

4.4.5 Overall model

Table 4.9 has multiple regression results for the overall fit for the model. From the findings, the adjusted R square of the below model is 0.936. This implies that linear regression can explain 93.6% of the variation in house prices. The durbin-watson statistic is 1.591 falling between the expected two critical values of between 1.5 and 2.5 implying that there is no auto correlation in the data.

Table 4.9 Overall model summary

Model Summary^b											
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson	
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.968 ^a	0.937	0.936	0.15149	0.937	688.103	5	231	0.000	1.591	
a. Predictors: (Constant), neighborhood xtics, building characteristics_2, infrastructure_2, infrastructure_1, building characteristics_1											
b. Dependent Variable: Ln_sp											

Table 4.10 represents the F-test output. The null is that there is zero variance in the dependent variable. From the findings, the F-test is highly significant with a statistic of 688.103 and significance level of less than 0.05 and we can therefore conclude that the model explains a significant amount of the variance in house prices.

Table 4.10 Anova table

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	78.962	5	15.792	688.103	.000 ^b
	Residual	5.302	231	0.023		
	Total	84.264	236			
a. Dependent Variable: Ln_sp						
b. Predictors: (Constant), neighborhood xtics, building characteristics_2, infrastructure_2, infrastructure_1, building characteristics_1						

Table 4.11 presents multiple linear estimates with the intercepts and significance levels.

Table 4.11 Significant variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	7.120	0.010		709.613	0.000		
Number of bathroom	0.473	0.028	0.768	16.801	0.000	0.130	7.676
Number of rooms	-0.093	0.013	-0.157	-7.056	0.000	0.550	1.817
Police post	0.046	0.013	0.077	3.494	0.001	0.563	1.776
Quality schools	-0.033	0.013	-0.056	-2.528	0.012	0.564	1.775
Quality roads	-0.086	0.025	-0.139	-3.428	0.001	0.165	6.057

The variables are statistically significant in the model at 96.8% significance level. The final model shows variables that were significant in the overall model that is, number of bathrooms (t=16.801 p-value=0.000 <0.05), number of rooms (t=-7.056, p-value=0.000 <0.05), police posts (t=3.494, p-value=0.001 <0.05), Quality schools (t=-2.528, p-value=0.012 <0.05), quality roads (t=-3.428 p-value=0.001 <0.05). The results of the regression models indicate that prices of houses in the different segments are highly influenced by building characteristics. The strongest contributor in housing prices from the finding above is the size of the dwelling where in it was positive. Number of bathrooms also influenced housing prices. Proximity to police posts

improves security which in turn causes housing prices to go. The quality of schools near also has a significant role in the amount home owners are willing to pay so does the quality of roads. The results from the table above also shows the check for multicollinearity in the model. Tolerance should be greater than 0.1 or VIF of less than 10. In this case there is presence of multicollinearity as all the variables have a tolerance level of more than 0.1 and less than 10.

4.4.6 Diagnostic tests

4.4.6.1 Heteroscedasticity

Heteroscedasticity refers to situations where the variance is not constant which violates the assumptions of the error term. Lagrange Multiplier is used to test for the heteroscedasticity. It is calculated using R^2 from the auxiliary regression and multiplying it by the number of observations, that is, $TR2 \sim \chi^2(n)$ where n is the number of regressors in the auxiliary regression. The null hypothesis was ($H_0 = 0$), there was no heteroscedasticity. The table below shows how the Lagrange Multiplier (LM) was arrived at. From the results was calculated LM for model one was 48.09 and the 5% critical value from the χ^2 was 2.10 which lead to the conclusion that there was heteroscedasticity therefore researcher rejected the null hypothesis. Similarly, the calculated LM for model two was 59.44 and the 5% critical value from the χ^2 was 2.08 which lead to the conclusion that there was heteroscedasticity hence the researcher failed to reject the null hypothesis. The calculated LM for model three was 48.77 and the 5% critical value from the χ^2 was 2.12 which lead to the conclusion that there was heteroscedasticity since the researcher r the null hypothesis. Finally, the calculated LM for the overall was 224.96 and the 5% critical value from the χ^2 was 2.07 which led to the conclusion that there was heteroscedasticity since the researcher failed to accept the null hypothesis. One solution to heteroscedasticity is converting variables into logs (Brooks, 2012; Wooldridge, 2015). Therefore, house prices were converted into logs. The results are presented in table 4.2.2 as Appendix 1

4.4.6.2 Multi-collinearity

Multi-collinearity refers to situations where there is high correlation between independent variables in the model, which results in high coefficient of determination. Variance inflation factor (VIF) was used to test whether presence of multi-collinearity is statistically significant.

The table 4.3 below provides the results of the multi-collinearity check using Tolerance and VIFs.

Table 4.12 Results of the Multi-collinearity Check Using Tolerance and VIFs

	<i>Collinearity Statistics</i>	
	Tolerance	VIF
<i>Number of bathrooms</i>	0.274	3.647
<i>Backup generator</i>	0.343	2.914
<i>Solar water heaters</i>	0.413	2.419
<i>Lift</i>	0.499	2.006
<i>Separate dining area</i>	0.255	3.919
<i>Borehole water</i>	0.359	2.788
<i>Parking/garage</i>	0.913	1.096
<i>Swimming pool</i>	0.643	1.554
<i>Green areas</i>	0.160	6.255
<i>Children playing area</i>	0.200	4.995
<i>Quality School</i>	0.139	7.203
<i>Proximity to CBD</i>	0.543	1.843
<i>Proximity to Quality Shopping mall and Recreational facilities</i>	0.267	3.742
<i>police posts</i>	0.453	2.207
<i>Quality of the roads</i>	0.215	4.648
<i>Source of water supply (Nairobi water)</i>	0.389	2.572

Table 4.12 shows the degree of collinearity among variables. Tolerance should be greater than 0.1 or VIF of less than 10. From the results all the variables have a tolerance of more than 0.1 and VIF not greater than 10 and hence we can conclude that the presence of multi-collinearity is not statistically significant.

4.4.7 Segment Analysis

The test assumptions from KMO under segment analysis indicated that there were not sufficient items for factor analysis because of a less observations from each segment and therefore the study used stepwise regression to establish the effect of each of the independent variable on dependent variables in each segment. Stepwise regression enables the researcher to select the best grouping

of predictor variables that account for the most variance in the outcome (R-squared). The model significance improved as more variables were introduced in the model. The table represents the model summary results and the change statistic in each model. Table 4.13 shows a summary of the regression statistics for models 1 for upper end and upper middle was significant and 4 for each segment. According to the findings the change in R squared were significant in the model for the overall model and the lower middle segment since the F-statistic was significant ($p < 0.05$) apart from model 2 & 3 in both upper end & upper middle segment. The results also present coefficient of correlation (R), Coefficient of determination (R Square), Adjusted R square and standard error of the estimate. The R value explains what percentage of the model can be described by the data. Table 4.13 reveals that Model 1 had an R-squared of 63.9% indicating that the model was highly significant in explaining the variability of the dependent variable (house prices). Lower middle model 4 was highly significant of 91.5 %. The lower end Model 1 had an R-squared of 99.7% implying that it was highly significant.

The significance of each model in each segment was determined and the overall significance of the model was also established using analysis of variance (ANOVA). In this regression model, house price was the dependent variable and micro factors as independent variable. Appendix iii. presents the overall significance of the model. Analysis of variance (ANOVA) tables tells us the overall significance of the models. From appendix attached, the model is statistically significant at 5% significance).

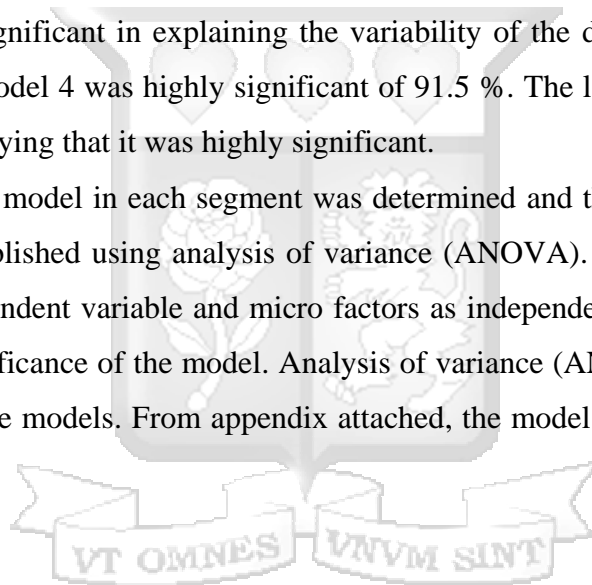


Table 4.13 Model Summary

Model Summary^d									
				Std.		Change Statistics			
	R	R Square	Adjusted R Square	Error of the	R Square Change	F Change	df1	df2	Sig. F Change
Upper end									
1	.799 ^a	0.639	0.567	0.16252	0.639	8.853	12	60	0.000
2	.810 ^b	0.655	0.565	0.16291	0.016	0.906	3	57	0.444
3	.817 ^c	0.668	0.557	0.16431	0.012	0.677	3	54	0.570
Upper middle									
1	.926 ^a	0.858	0.823	0.06415	0.858	24.654	14	57	0.000
2	.940 ^b	0.883	0.840	0.06110	0.024	2.167	5	52	0.072
3	.945 ^c	0.893	0.849	0.05938	0.011	2.530	2	50	0.090
Lower middle									
1	.850 ^a	0.723	0.634	0.05035	0.723	8.105	10	31	0.000
2	.915 ^b	0.836	0.769	0.04002	0.113	10.027	2	29	0.000
3	.915 ^c	0.837	0.762	0.04064	0.001	0.131	1	28	0.720
Lower end									
1	.997 ^a	0.995	0.994	0.00403	0.995	1423.230	6	43	0.000
2	.998 ^b	0.995	0.994	0.00398	0.000	1.338	3	40	0.276

4.4.8 Model results with the significant variables for each segment

Table 4.14 presents coefficient results for all each segment that is upper segment, upper middle, lower middle and lower end were significant model was significant since the F-statistic was significant ($p < 0.05$). According to the findings the significant variables in the upper segment was number rooms ($t=3.622$, $p\text{-value}=0.0001 < 0.05$) and interior finishes ($t=4.742$, $p\text{-value}=0.000 < 0.05$). They had a positive relationship with house prices indicating that the upper end income earners put emphasize on the size of the room and the interior finishes. A unit increase of a room had triple effect on the price of a house. In the upper middle segment, the significant variables were number of rooms ($t=3.022$, $p\text{-value}=0.0004 < 0.05$) and plinth area ($t=7.610$, $p\text{-value}=0.000 < 0.05$) which were positively influencing the price of a house while back generator was significant but negative effect on house prices ($t=4.745$, $p\text{-value}=0.000 < 0.01$) and swimming pool ($t=2.020$, $p\text{-value}=0.050 < 0.01$) also had a negative effect of house prices. This implies the bigger the size the house is, the higher the prices in which an increase unit in the

number of rooms increases the price of a house by thrice the price in the upper middle segment. While facilities such as swimming pool have a negative influence on price as they are costly to maintain and be serviced. Home owners have options such as inverters so generators a significant but a slightly negative influence of on house prices.

In the lower middle the significant variables included number of rooms ($t=5.394$, $p\text{-value}=0.000 < 0.05$) and proximity to CBD ($t=-2.930$, $p\text{-value}=0.000 < 0.05$). This indicates that the further a house is on lower middle-income earners; it has a negative effect on the price therefore prices get lower as you move further away from the CBD. The coefficient for lift ($t=-2.908$, $p\text{-value}=0.007 < 0.05$) was significant but negatively influenced the price of house. This could be due to its costly installation and maintenance fees. House prices the lower end segment was mainly influenced by the number of room and size of the house with a coefficient of ($t=2.006$, $p\text{-value}=0.051 < 0.05$), ($t=82.813$, $p\text{-value}=0.000 < 0.05$) respectively.

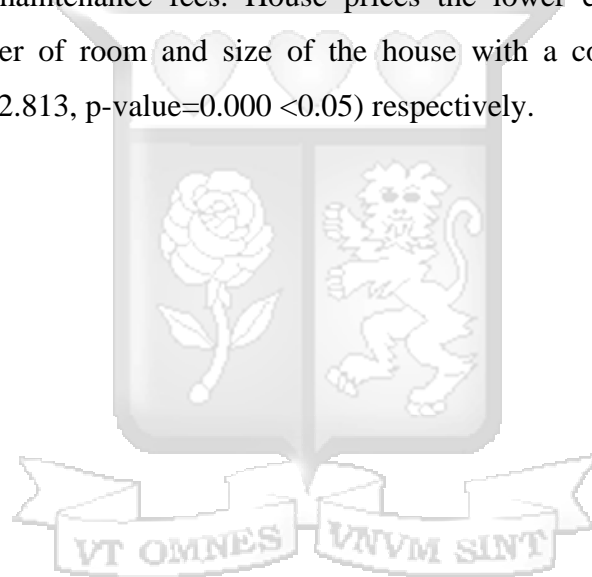


Table 4.14 Final model with the significant variables for each segment

	Upper End				Upper Middle				Lower middle				Lower end			
	Coefficients				Coefficients				Coefficients Std.				Coefficients			
	B	Std. Error	t	Sig.	B	Std. Error	t	Sig.	B	Error	t	Sig.	B	Std. Error	t	Sig.
Number of Rooms	0.060	0.072	0.830	0.410	0.122	0.040	3.022	0.004					0.003	0.002	2.006	0.051
Plinth area	0.001	0.000	3.656	0.001	0.001	0.000	7.610	0.000	0.002	0.000	5.394	0.000	0.008	0.000	82.813	0.000
Back up generator	0.015	0.057	0.271	0.787	-0.135	0.055	-2.468	0.017	0.037	0.018	2.013	0.054				
Solar water heaters	-0.030	0.058	-0.525	0.601	0.016	0.033	0.491	0.625	0.004	0.026	0.170	0.866				
Lift	0.090	0.060	1.505	0.138	-0.033	0.027	-1.239	0.220	-0.065	0.022	-2.908	0.007				
Separate dining area	0.106	0.137	0.777	0.440	0.013	0.027	0.494	0.623	0.007	0.018	0.392	0.698				
Borehole water	-0.032	0.083	-0.382	0.704	-0.006	0.024	-0.262	0.794	0.006	0.017	0.349	0.730				
Parking/garage	0.085	0.070	1.215	0.229	-0.016	0.069	-0.227	0.821								
Swimming pool	0.020	0.043	0.459	0.648	-0.046	0.017	-2.746	0.008	0.055	0.045	1.234	0.227				
Children playing area	-0.022	0.045	-0.502	0.618	0.117	0.048	2.445	0.018	0.021	0.019	1.112	0.275	0.002	0.004	0.457	0.650
Exterior finishes					-0.003	0.019	-0.164	0.870					0.002	0.002	1.343	0.186
interior finishes	0.362	0.076	4.742	0.000	0.008	0.022	0.369	0.713	0.019	0.022	0.881	0.385	0.000	0.002	0.230	0.819
Balcony					0.004	0.024	0.155	0.877	0.017	0.015	1.145	0.262	0.000	0.002	-0.102	0.919
No.of bathrooms	-0.031	0.069	-0.442	0.660	0.003	0.024	0.141	0.889								
Proximity to CBD									-0.009	0.003	-2.930	0.007				
Proximity to Quality Shoping mall and Recreational facilities									-0.011	0.021	-0.551	0.586				

4.5 Relationship of the macro factors and change in house prices

The data was collected from both government and non-government published documents on quarterly basis. Data captured on monthly or daily basis was converted to quarterly data by using arithmetic means. Data collected on monthly basis included Hass house prices, Diaspora remittances, lending rates and inflation while the GDP, Forex, real estate investments, building and construction index were captured at quarterly basis. The summaries are based on data collected from various sources as indicated in chapter three for the period 2004 to 2018. The current study measures growth as change in house prices overtime on the base year of 2004.

4.5.1 Descriptive statistics of macroeconomic variables

Table 4.15 shows descriptive statistics of the macroeconomic variables. The statistics include mean, standard deviation and the range of values of the observations as presented in Table 4.15.

Table 4.15 Descriptive statistics of macroeconomic variables

Variable	Observations	Mean	Std. Dev.	Min	Max
HPGROWTH	60	0.51	0.37	0.00	1.14
GDP	60	885,017.80	721,207.10	260,381.00	2,340,345.00
LENDRATE	60	14.93	2.05	12.20	20.21
INFLATION	60	8.25	4.52	2.63	19.19
HPINDEX	60	141.38	34.33	94.77	198.54
FOREX	60	84.82	11.96	62.95	106.89
REMITTANCE	60	90,490.50	55,954.33	27,591.33	245,674.00
RBCINDEX	60	6,414.98	1,537.53	4,123.06	8,865.44
RINVETMENT	60	108.48	64.48	12.60	270.80
HHPRICES	60	22,200,000	5,378,121	14,900,000	30,900,000

The findings in table 4.15 reveal an average growth in house prices by 51% to a maximum of 114% between 2004 and 2018. During same period, the lending rate averaged at 14.93% oscillating from a minimum of 12.2% to a maximum of 20.21% while inflation rate hit the highest of 19.19 % in the same period under study.

On average the value of new residential houses approved for construction in the country was 108.48 million on average in Kenya was KS 5.3 million between the year 2004 and 2018 with a

minimum price of 12.6 million and a maximum price of 270.8 million. Average remittances to the country between 2004 and 2018 was 55.954 Billion while exchange rate for US dollar hit the 106.9 mark according to CBK published data for similar period.

4.5.2 Pearson correlation analysis

Pearson's correlation coefficient is a parametric rank statistic that measures the strength of a relationship between two variables (Piovani, 2008). We also use correlation analysis to examine the relationship between dependent and independent variables to improve the viability of results.

Table 4. 16 Pearson Pairwise correlation analysis of macroeconomic variables

	HPGRO WTHA	LENDRAT E	INFLATIO N	HPINDE X	FOREX	REMITTA NCE	RBCINDE X	RINVETME NT	GDP
HPGROWTHA	1.0000								
LENDRATE	0.4286*	1.0000							
INFLATION	-0.228	-0.0165	1.0000						
HPINDEX	0.6940*	0.4202*	-0.2537	1.0000					
FOREX	0.8941*	0.2878*	-0.1542	0.8945*	1.0000				
REMITTANCE	-0.8936*	-0.5507*	0.2456	-0.8916*	-0.7307*	1.0000			
RBCINDEX	0.6871*	0.3656*	-0.2872*	0.6857*	0.8924*	-0.7045*	1.0000		
RINVETMENT	0.7531*	0.5061*	-0.0372	0.7385*	0.7556*	-0.7694*	0.7533*	1.0000	
GDP	0.6089*	0.1362	-0.3311*	0.6145*	0.8662*	-0.7400*	0.6320*	0.6031*	1.0000

*Denotes significance level at 5%

The findings show that the correlation coefficients between lending rates and house price growth was positive and moderately significant (coefficient = 0.4286). This implies that a growth in house prices are evidenced when lending rates rise. Similarly, house price index, forex, building and construction index, investments in residential real estate and GDP had a strong positive relationship with growth in house prices since 2004 to 2018. However, total diaspora remittance had a strong negative relationship as shown in table 4.9 with a correlation coefficient of -0.8936 significant a 5%. Moreover, inflation rate had a negative but weak relationship with growth in house prices (-0.228).

We also use pairwise correlation matrix presented above to check for multicollinearity among the independent variables (lending rate, inflation rate, HP index, forex, diaspora remittances, RBCI index and GDP). Correlation coefficients between 0.9 and 1 in absolute values shows a strong relationship between the explanatory variables and is an indicator for multicollinearity between the two variables being tested. In the current study, there was no presence of multicollinearity as can be deduced from table 4.16 from column 2 onwards.

4.5.3 Stationarity tests

A series should be stationary where its statistical properties such as variances and mean do not vary with time. It's a key phenomenon in time series because it influences the results of the regression and key to note is that a stationary data will give better results while a non-stationary series yields a spurious regression. Presence of a unit root or random walk in the data series indicates a stochastic trend. A time series data set will show a systematic unpredictable pattern if it has the unit root. Presence of the unit root causes the series to be non-stationary which leads to unreasonable and spurious regression results with large R-squared value even if the data is uncorrelated and erratic behavior in which t-ratios will not follow t-distributions. Unit root is associated with non-constant variance and biased OLS estimates. It's therefore important to test and correct unit root if present. Augmented Dickey-Fuller test and Philip Perron tests are recommended to establish the stationarity properties of a time series data set.

4.5.4 Lag selection criteria for unit root test

The lags order selection for each variable as presented in Appendix vi determined by Likelihood Ratio tests, Final Prediction Error (FPE), Akaike Information Criterion, Hannan-Quinn Information Criteria and Schwarz Bayesian Information Criterion. They all suggested selection of 3 lags for LnHPGROWTHA and 4 lags for LnREMITTANCE. The 3 lags for LnLENDRATE were selected based on FPE, AIC and HQIC as shown on Appendix vi.

4.5.5 Philip Perron unit root test

From table 4.17 we fail to reject the null hypothesis of no unit root at first difference for the variables apart from lnHPGROWTHA and lnREMITTANCE .PP test at variable level presented reveals that we reject the null hypothesis for unit root in lnHPGROWTHA and lnREMITTANCE series at all critical values. However, we fail to reject Null Hypothesis for other explanatory variables at variable level since they have a unit root. Since most of the variables at variable level have a unit root, we take their first difference and test for their stationarity. Similarly, the null hypothesis of no unit root, thus testing at first difference yields the following results in table 4.17. As a guide, we reject the null hypothesis if the test statistic is less than the critical value or the p-value is less than common significance levels.

Table 4. 17 Philip Perron unit root test.

Variable	Model	Variable level			First difference		
		Test Statistic	5% Critical value	p-value (Z(t))	Test Statistic	5% Critical value	p-value (Z(t))
lnHPGROWTH A	intercept and trend	-7.717	-3.491	0.000	-17.136	-3.492	0.000
lnLENDRATE	intercept and trend	-1.841	-3.491	0.685	-4.593	-3.492	0.001
lnINFLATION	intercept and trend	-3.212	-3.491	0.082	-6.585	-3.492	0.000
lnHPINDEX	intercept and trend	-2.814	-3.491	0.192	-5.723	-3.492	0.000
lnFOREX	intercept and trend	-2.500	-3.491	0.328	-6.367	-3.492	0.000
lnREMITTANCE	intercept and trend	-5.399	-3.491	0.000	-12.789	-3.492	0.000
lnRBCINDEX	intercept and trend	-1.461	-3.491	0.842	-6.398	-3.492	0.000
lnRINVETMENT	intercept and trend	-3.718	-3.491	0.021	-9.897	-3.492	0.000
lnGDP,	intercept and trend	-2.250	-3.491	0.462	-8.037	-3.492	0.000

4.5.6 Cointegration analysis

Findings in the previous section revealed that all the variables were integrated of the order (1), which means that cointegration test by Johansen and Juselius is inevitable.

4.5.6.1 Lag selection criteria for VEC model

The number of lags for cointegration test was determined by Likelihood ratio test, Final Prediction Error (FPE), Akaike Information Criterion and Hannan-Quinn Information Criterion. They all suggested 4 lags as shown in the table below.

Table 4. 18 Lag selection for VEC models

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
1	608.79	0.000	81	0.000	5.40E-20	-18.850	-17.714	-15.920*
2	681.871	146.16	81	0.000	8.60E-20	-18.567	-16.295	-12.708
3	802.713	241.68	81	0.000	3.70E-20	-19.990	-16.582	-11.201
4	979.573	353.72*	81	0.000	4.8e-21*	-23.413*	-18.870*	-11.695

4.5.6.1 Johansen and Juselius test for cointegration

Estimation of cointegration rank is done using Johansen and Juselius test. It derives two likelihood estimators for the trace test and maximum Eigen value test. From the results obtained, the null hypothesis is therefore rejected that there no cointegration and also the null hypothesis that there was one cointegrating vector in favor of two cointegrating vectors at both 1% and 5% level of significance. The test however could not reject the null hypothesis of at most two cointegrating vectors against the alternative hypothesis of three cointegrating vectors, for both the Trace and Eigen value test statistics. Consequently, the study concludes that there were two cointegrating equations in this model. When the variables are cointegrated we can proceed to estimate Vector Error Correction (VEC) model and when the variables are not cointegrated we estimate Vector Autoregressive (VAR) model. This implies that we will estimate the VEC Model.

4.5.7 Vector error correction model

4.5.7.1 VEC model estimation

The presence of cointegration between variables suggests a long-term relationship among the variables under consideration. The long run relationship between growth in house prices and Lending rate, inflation rate, Hass house price index, forex, diaspora remittance, Residential building cost index, residential investments and GDP.

All the variables in the model are significant at 5% except forex and GDP. CE1 means Error Correction term or speed of adjustment towards equilibrium. As a guide, there is Long run Causality between the dependent variable and independent variable if CE1 is negative in sign and significant while there exists no long run causality if CE1 is positive in sign and insignificant.

Table 4. 19 Error correction term

alpha	Coef	Std err	p> z
D_ lnHPGROWTHA _ce1 L1.	-0.213	0.137	0.121
_ce2 L1.	0.445	0.210	0.034

From our findings below, the error correction term in first cointegration equation is negative and insignificant implying that there is no joint long run causality running from all the independent variables (lnLENDRATE lnINFLATION lnHPINDEX lnFOREX lnREMITTANCE lnRBCINDEX lnRINVETMENT lnGDP) to lnHPGROWTH.. Equally, in the second equation the error correction term is positive and significant, thus we reject presence of long run causality.

The study therefore considers the long relationship between growth in house prices and the explanatory variables. When interpreting the VECM, the signs of the coefficients are reversed in the long run. Following the output from Equation one, it's evident that inflation, Hass House price index and investments in real estate had a positive impact while forex and diaspora remittances had a negative impact on growth in house prices in the long run. The coefficients are statistically significant at 5 % level.

Table 4. 20 VEC model results

Variable	coef.	std. Err	p> z
_ce1			
lnHPGROWTHA	1.000		
lnLENDRATE	0.000		
lnINFLATION	-0.796	0.143	0.000
lnHPINDEX	-8.462	1.700	0.000
lnFOREX	10.735	0.938	0.000
lnREMITTANCE	1.104	0.521	0.034
lnRBCINDEX	0.002	2.408	0.999
lnRINVETMENT	-0.486	0.204	0.017
lnGDP,	0.156	0.215	0.468
_cons	-15.671		
_ce2			
lnHPGROWTHA	0.000		
lnLENDRATE	1.000		
lnINFLATION	-0.729	0.104	0.000
lnHPINDEX	-0.619	1.236	0.616
lnFOREX	3.793	0.682	0
lnREMITTANCE	0.1	0.379	0.793
lnRBCINDEX	-0.059	1.751	0.973
lnRINVETMENT	-0.259	0.148	0.08
lnGDP,	-0.484	0.156	0.002
_cons	-8.025		

In the second equation, inflation rate, investments in real estate and GDP had a positive impact while forex had a negative impact on house prices in the long run. We can conclude that, on one hand inflation rate, Hass price index, investments in real estate and GDP while forex and diaspora remittances on the hand have asymmetric effects on growth in house prices on average, *ceteris paribus*.

4.5.7.2 Short run causality

The study sought to establish whether a single independent variable can cause the dependent variable alone or jointly with its lags. The null hypothesis is that there is no short run causality while its alternative is that there is a short run causality running from the independent to the dependent variable. Appendix viii shows the short run causality test results of the short run tests

for each variable against the growth in house prices. The null Hypothesis: there is no short run causality running from lnLENDRATE (LD, L2d, L3d) to lnHPGROWTH in our case, the probability is 79.44% more than 5%, thus we fail reject null hypothesis rather we accept null hypothesis meaning that there is no short run causality running from lnLENDRATE (LD, L2d, L3d) to lnHPGROWTH. This holds true for all the other variables as evidenced by large probabilities higher than 5% significance levels.

4.5.7.3 Post estimation results

From test results presented in Appendix ix, study failed to reject the null hypothesis of no autocorrelation and instead accept that there was no serial autocorrelation as seen from Probability of 53.08%, 81.94% and 36.71% of order 1, 2 and 3 respectively. A model that has serial autocorrelation in its residuals should be accepted. Study also tested for Normally distributed disturbances using a Jargue-Bera test Appendix x. Null Hypothesis is that the Residuals are normally distributed which is desirable so reject the null hypothesis of normality in distribution of residuals given that the probability statistics are greater than our 5% significance level attached on Appendix iii.

4.6 Challenges facing real estate investment

4.6.1. Demographic characteristics

A survey was carried out to establish the relationship between challenges facing real estate investment and changes in housing prices. The main targeted respondents were the real estate developments companies registered with the Kenya property Developer Association (KPDA). According to KPDA directory of members, there are 75 registered developer's companies. The researcher was only able to collect responses from 45 companies. From the results 67% (32) of respondents were male and 33% (16) of them were female. It was established that men were more available and accessible at various real estate property development companies contacted compared to women. Findings further reveal that most of respondents had attained 45 years old and above. The results of the respondent's main occupation show that majority were project managers 50% (24), Marketing executives 21%(10), marketing directors 17%(8) and managing directors 13%(6). Moreover, 38% of respondents had first degrees, 36% Diplomas and 26% post graduate degrees. Descriptive analysis and statistical inferences were applied to generate result.

4.6.2 Descriptive analysis

Using a Likert scale, respondents were asked to rank the challenges in order of severity i.e. highly, moderately and less likely to influence real estate development as ranked by the respondents. The most likely challenges included are; high interest rate with a 52% of the respondents agreeing to this. Among the respondents, 48% cited costly plan approvals and delays which makes the whole process to be costly therefore unattractive to investors. Another category of 43% of the respondents perceived poor infrastructure to be a key challenge in real estate. This refers to the state of roads and communication systems, water and power availability which influences cost of construction. 42 % of the respondents indicated that legal and institutional constraints was a major concern in residential developments

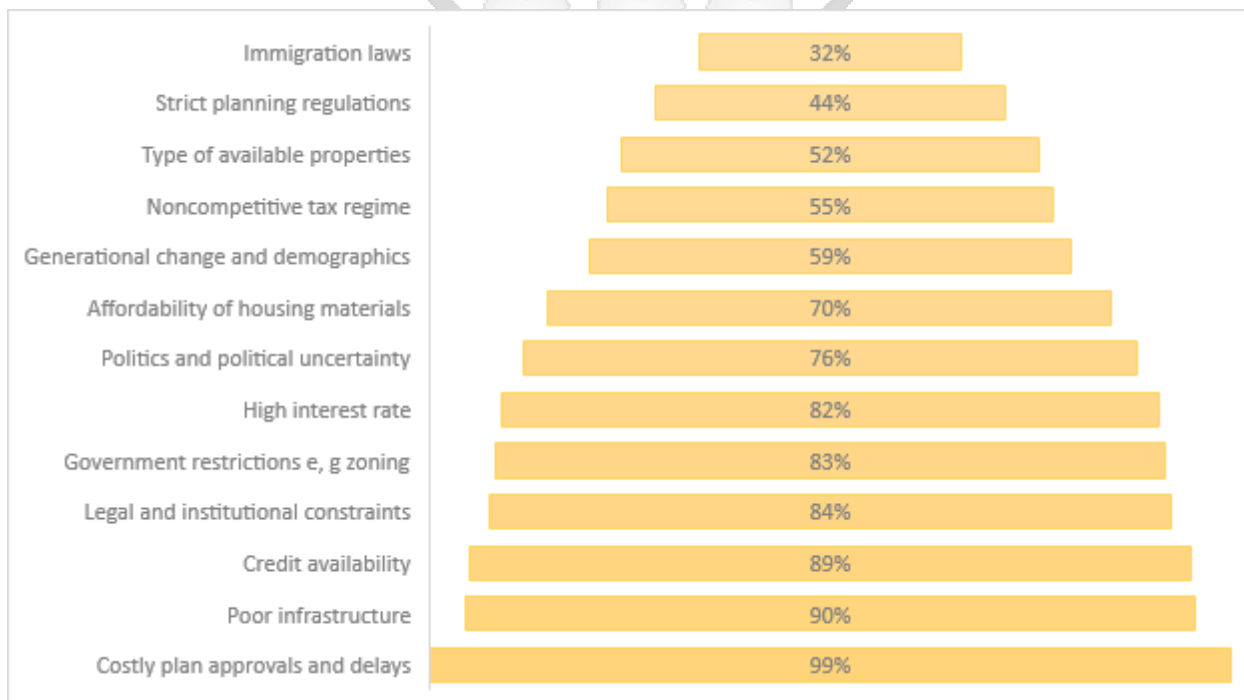


Figure 5: Challenges facing real estate development in Nairobi

Those that moderately affected real estate development are; Credit availability which from the responses obtained moderately influenced real estate development with 46% agreeing to this. Other challenges included; affordability of houses with a response rate of 69%. Politics and political uncertainty dictate the business environment of the country where 60% of the respondents felt it affects the real estate sector. Government restrictions at 65% and tax regime

53%. On the other hand, some challenges seem have a very low effect on real estate development. In other words, their effect seems to be less significant. These included immigration laws and strict planning regulations.

4.6.3 Relationship between real estate challenges and house growth

The study sought to establish the relationship between challenges facing real estate investment and house prices in Nairobi County. A composite index based on likert scale responses was computed to establish their joint relationship with growth in house prices. We adapt Pearson correlation matrix analysis. The results are presented in table 4.21

Table 4. 21 Relationship between real estate challenges and housing prices

		Challenges	changes in housing prices
Challenges	Pearson	1.000	0.279*
	Correlation		
	Sig.(2-tailed)	.	0.001
Changes in housing prices	Pearson	0.279*	1.000
	Correlation		
	Sig. (2-tailed)	0.001	.

* Correlation is significant at the 0.01 level (2-tailed)

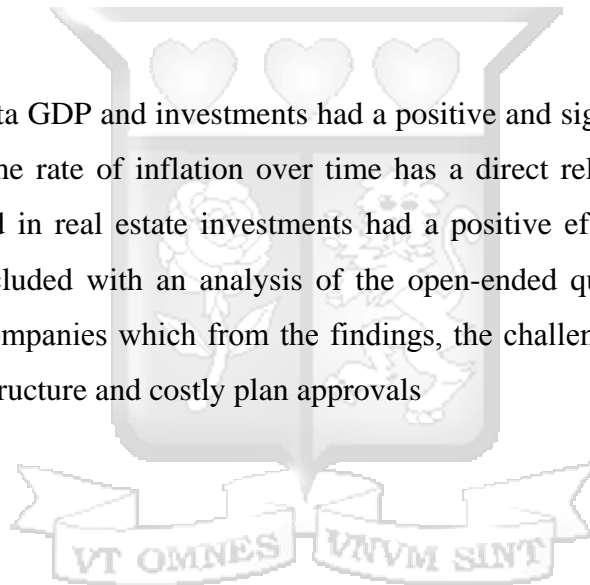
The pearson correlation matrix table with challenges facing real estate investment as independent variables and house prices as the dependent variable shows a positive significant $r = 0.279$ and $p = 0.001$. This implies a positive relationship between challenges and growth in house prices.

4.7 Chapter summary

The chapter began with an analysis of primary data then secondary data. Diagnostics tests were carried out to test for violation of OLS assumptions. Factor analysis was conducted on the results from the questionnaire on the factors that influence house prices generally. The observations from specific segment were not able to give a good basis for factor analysis and stepwise regression was used. Generally, the findings showed that building characteristics had a major influence on prices compared to all other factors. The size of the building, number of rooms and quality of finishes had a significant influence on prices. This implies that investors should invest in quality finishes and analyses the target market to understand the size of a dwelling they most

likely prefer. The secondary data yielded almost similar results with the survey analysis. The segment analysis indicated that upper end income earners showed high affinity for furnished houses, gated community and secured residence .From the regression done on secondary data, Interior finishes was significant conforming that the interior of house in terms of furnishes played a major role in this income category. In the lower middle income earners, accessibility was key to deciding the type of house to live. Similarly the regression result showed that proximity to CBD had a significant role to play among these income earners. Though the survey data indicated the importance of proximity to amenities such as schools, public transportation and churches in the lower end segment, the secondary data dropped these variable for the category in the stepwise regression.The size of the house was what seemed to matter most to these income earners.

In the long run, Per capita GDP and investments had a positive and significant relationship with growth in house while the rate of inflation over time has a direct relationship with growth in houses. Challenges faced in real estate investments had a positive effect on changes in house prices. The chapter concluded with an analysis of the open-ended questionnaires targeted for registered developers' companies which from the findings, the challenges faced mostly include credit availability, infrastructure and costly plan approvals



CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of findings, conclusions and recommendations based on the research objectives. This chapter is structured as follows: Discussion of findings, Conclusion of the study, Recommendations, Areas for further studies and Limitations of the study

5.2 Discussion of findings

The purpose of the study was to assess the influence of micro and macro factors on housing prices.

5.2.1 Influence of micro factors on housing prices

Building characteristics in this study included attributes of a building such as designs, interior and exterior finishing that may influence the asking price of a house. Findings indicate that houses mostly valued by end users are those easily perceived visually implying that the exterior finishing fittings play a major role in influencing the decision to buy a house. Security of a building in the upper end and upper middle segment increased the value of a house indicated by positive relationship of the provision of a boundary wall and electric fence with house prices. The coefficient of number of rooms and bathrooms was significant in all the segments. Facilities such as swimming pool and furnished apartments increased the value of a house because of the extra costs incurred in their installation. The condition of a house whether it was new or old also influenced the asking price. The findings are consistent with Olujimi (2010) who examined the relationship of infrastructural facilities in the determination of house prices. The research revealed that wall-fence and burglary proof are significant determinants of housing prices. The results are similar with the current research where types of finishes and presence of a burglary wall increased the attractiveness and price of the house.

Results obtained from the survey data provide evidence that location of a dwelling contributes to variations and changes in house prices. Each location exhibits different attributes such as

proximity to work place, schools, worship places, public transportation, hospitals, recreation centers and police posts. Results indicated the lower middle-income earners focused more on proximity to work and schools while this was not the case for upper end income earners. This may be attributed to the fact that high end income earners can easily drop off and pick up their kids to school or afford the transportation cost of school buses while low income earners want to be a walking distance to schools and avoid costs associated with travelling. These findings are consistent with Hwang (2009) who found that accessibility to place of work is a significant determinant of housing price. Results from the regression analysis indicate that location plays a very significant role in determination of house prices. The study analyzed houses in the different fourteen estates with their distance to CBD. Location of estates in specific segments had nothing to do with distance to CBD as the development of numerous commercial centers within estates has reduced the need live near the central business centre. This is because the services that were initially available only in the CBD have since been decentralized closer to users. Findings from the study show that home owners in the upper end and upper middle value a gated community unlike the lower and middle class because of the exclusivity it offers. A gated community in this case referred to a resident with controlled access using one or two gates with a contracted security company to offer security. Both the survey results and the regression results concur on its significance on house prices. The findings of this study are consistent with those of Romkaew (2011) on the importance of location but contradicts on the distance to school factor. In his findings, the variable distance to educational facilities did not appear significant

Proximity to social facilities was a significant determinant of house prices. The high-end areas characterized with destination malls considered to be big and classy with a huge number of anchor tenants compared to the middle and lower end shopping centers which are crowded and noisy with heavy traffics. The implication of this is that neighborhood centers defined by their smaller size and small number of anchor tenants in the middle and lower end segments have negative effect to house prices while the later have a positive influence on house prices. This findings are consistent with what previous researchers found such as (Gallimore, Fletcher & Carter,2011) .Survey findings indicate that distance to public transportation was most likely to influence the prices of a house on the lower middle and lower end income earners unlike the high-end income earners who from the regression results the coefficient of police posts was

significant implying their preference to live near a police station though it did not have any incremental value on the price of a house.

The neighborhood environment and its accessibility attributes plays a significant role in pricing of a dwelling. These comprises of a combination of quality attributes ranging from the extent of the developed land to the quality of facilities. As mentioned earlier, quality shopping malls attracts higher prices compared to small substandard centers. The quality of schools in the surrounding areas also had an impact on the prices of the houses. Findings indicate high end and upper middle income earners are attracted to a neighborhood with quality schools like international and private schools while the low end income earners are more attracted to public schools. This finding are true in Nairobi where most international schools are located in the suburbs characterized by the high end income earners. Worship centres to some extent was found to influence the price of some houses especially in areas characterized by Muslims. From the results, the quality of roads also determines the price a dwelling. Investors understands this too well to include accessibility of a premise in the development plan. A house located in an inaccessible neighborhood will sell low and will take time before it clears the market. The current findings are similar with those of Najihah (2013) who found neighborhood facilities such as shopping complexes, schools, sport accommodation and highways accessibility to influence the prices of residential properties in Malaysia. House prices in the lower segments was highly influenced by basic needs such as availability of water, electricity, transport network and access to social amenities while the high-end segment was mostly influenced by quality roads and well lighting network.

5.2.2 Macro factors

In the long run, Per capita GDP has a positive and significant relationship with growth in house prices as shown in the previous section. One percent rise in per capita GDP leads to 0.48 percent growth in house prices *ceteris paribus*. This is consistent with theory that both growth in house prices and GDP have a direct relationship. This result implies that as the economy grows, the purchasing power of individuals improve thus leading to need for home ownership. The need for own residential house pushes the demand for housing which in turn leads to increase in house prices as shown from the study. This is consistent with empirical findings of Ting Zhu, (2017)

who found out that real estate growth and GDP growth have inseparable relationship. Use of granger causality test verified a positive relationship between GDP and house prices. In his study, GDP growth influences building values and bank credit to stimulate investment needs, thus it influences house prices positively.

Investments in real estate as measured by value of approved residential properties has a positive and significant effect on growth in house prices. It was established that 1 percent rise in residential investments would lead to a corresponding growth in house prices by 0.25 to 0.48 percent. This could be attributed the value and nature of investments being done in the real estate. Comparatively, better and spacious houses are being constructed unlike in past years. Consequently, improved features in modern houses in the market raises the prices of houses which is consistent with our prior assumption that modern houses are more expensive than old town houses.

The rate of inflation over time has a direct relationship with growth in houses. The research finding reported that a percentage rise in inflation rate would lead to 0.72 to 0.79 Percentage growth in house prices. This is expected since inflation pushes up the cost of goods and services so did acquisition of residential house. In the long run, stabilizing inflation rate would be a reprieve to potential homeowners, and this explains the efforts by government of Kenya in stabilizing inflation. This confirms studies done by Tsatsaronis and Zhu (2004) and (Ochudho ,2011), who found a strong positive relationship between inflation and house prices. Whereas external factors mostly affect the capacity to pay for a house, fiscal policies such as interest rate term structure and credit conditions influence mortgage uptake. Long-term interest rates is a reflection of the expected future short term rates and instinctively, investors will shun from investing in long term bonds if short term bonds are higher. As expected, an increase in the return of other fixed-income assets such as bonds decreases the appetite of investing in real estate (Adams, 2010).

Diaspora remittances play a critical role in the economy. Mostly, these remittances are used as safety nets to beneficiaries' while a big chunk is invested in the real estate. The more remittances received is invested in real estate, the more units become available for occupation. Increased supply of these units over time would push house prices lower thus making them affordable. This is consistent with our finding of 1.104 percentage decline in growth of house prices due to a

percentage growth in diaspora remittances in the long run. This is consistent with findings of Egert & Milhajek (2007) which showed that significant portion of diaspora remittance goes to the supply of the residential real estate thus boosting supply which in effect slows down prices. Moreover, Kibunyi (2015) found a positive relationship between diaspora remittances and house prices as rise in diaspora remittances increases the demand of houses thus pushing up the prices.

The rate at which a Kenyan shilling exchanges for US dollar was considered in the analysis of growth in house prices. Forex plays a critical role in importation and exportation of goods and services in a country. Importation of building materials and technology comes at a cost, which puts more pressure on forex reserves. In our study we found a negative and significant effect of forex on growth in house prices. In the long run, 1 percent rise in forex would lead to 10.73 percentage decline in house prices. That is, when a few shillings would exchange for considerably a good amount of US dollars to help the investors import building materials, machinery and technology more cheaply, this would later translate to low house prices.

5.2.3 Challenges in real estate investments in Nairobi County

Findings from survey conducted are consistent with other researchers such as Chepsiror (2013) who sought to investigate the challenges of housing development and concluded that majority of the respondents are faced with challenges such as credit unavailability, a rising cost of land hindering them from accessing cheap housing, complex land acquisition process, high interest on capital finance, low return on investment and outdated planning regulations. The current study indicates that costly plan approvals, poor infrastructure, credit availability, legal and institutional and political stability are among the most highly ranked challenges affecting investment in real estate. Among the lowest ranked challenges included immigration laws, strict planning regulations and noncompetitive tax regimes. These results however confirm factors highlighted earlier in chapter three that were selected from the most notable events in the year 2017 where the sector experienced a decline in growth as reported by dropped values in building approvals by 16.3%, KNBS (2007), drop in house prices Index by 3.1% Hass (2017), slower growth by 1% KBA (2017) mortgages decreased by 1.5% (CBK, 2017)

5.3 Conclusion

The study was guided by the location theories, perfect competitive theory of housing market, price theory reviewed literature on the micro economic factors that influenced changes in house prices and macro-economic factors that influenced growth on house prices. The study also analyzed the challenges affecting real estate development in Nairobi County. The study found relationship between the independent variable's location, infrastructure and social amenities, building characteristics, and the dependent house prices.

Growth in house prices is influenced by macro-economic variables. A positive correlation relationship was observed between Real Estate Investment, cost of building, forex, GDP and lending rates while a negative relationship was observed in remittances and inflation with house prices. Cointegration test show there is 1 long run relationship between growth in house prices and Lending rate, inflation rate, Hass house price index, forex, diaspora remittance, Residential building cost index, residential investments and GDP. The error correction shows that there is no joint long run causality running from all the independent variables

5.4 Recommendations

5.4.1 Policy makers

The government of Kenya aspires to provide affordable housing for its people as envisioned in its development blue print Vision 2030. To achieve this, the government has employed several strategies including lowering interest rates to ease credit uptake to spur private sector investments in the housing sector, review of mortgage rates for its staff and encouraging of pension schemes to invest in the sector. The findings of this study provide insights to policy makers and regulators in this case the government and other institutions charged with maintaining financial stability. House prices are affected by inflation, lending rates and other factors which should be controlled to reduce the cost of borrowing. Controlling high cost of construction brought about by high acquisition cost of both land and building materials .

5.4.2 Investors

Investors can partner up with the government or private individuals to reduce the cost of a project. The jubilee regime has listed housing among its big four agenda for the next five years. This would enable the government to deliberately invest in housing as well as encourage public private partnerships across the country under both the National government and County government. This would see counties set aside residential zones and estates to attract investors. Encouraging Joint ventures projects where expertise and finances are distributed equally depending with the joint venture agreement. Developers in the residential market should consider shifting focus from three- and four-bedroom apartments to smaller units such as studio, bedsitters, one- and two-bedroom apartments due to oversupply in the former, taller buildings with more floors should also be considered.

5.5 Contribution to knowledge

The study contributes to literature by incorporating both macro and micro factors that influence house price in short and long run period. Residential real estate investment is one of the most unpredictable contributors of national product and having a clear understanding on its sources of variability exposes the causes of volatility in the national product. This has been attained by identifying the sources of residential real estate prices growth in Kenya. The current study findings have critique factors both at micro and macro level revealing how the residential real estate market relates with the selected factors. Analyzing and a clear understanding of their relationships means knowing what risks the housing prices have.

5.6 Areas of further studies

The study focused on the demand and supply factors that influenced house prices. Further the study examined the challenges facing residential development in real estate. To achieve this, Johansen method was applied, using only the series integrated of order one, to test for cointegration and a VEC model was used. To enhance the findings of the study, future studies on housing should consider: Effects of Preferences and culture on house prices.

5.7 Limitations of the study

Lack of centralized housing data at the KNBS posed a challenge in collecting and collating time series data. Panel data was used for a period of 14 years on quarterly basis which allows for robust estimation of long-term macro-economic impact. Real estate trans-actors are heterogeneous in their price behavior which is driven by different motivations causing them to set prices depending on their motivations. This led to the researcher calculating the price of some house independently in instance where transactions were to low or too high.



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APPENDICES

Appendix I: Questionnaire

My name is Hellen Ungayi, pursuing Masters of commerce (MCOM) in Strathmore University. I am conducting a research on “**Assessment of factors affecting residential real estate prices in Nairobi County**”. This research project will be used purely for academic purposes and for the partial fulfillment of a postgraduate degree course. Please note responses given will be treated with confidentiality and strictly for the purposes of this study.

Please tick your options where applicable.

SECTION A: Demographic information

1. What is your position in the company?
2. For how long have your organization been in real estate business?
3. Which Estate in Nairobi County do you reside?.....

determinants of residential real estate house prices in Nairobi County

1. To what extent do the following location factors influence house price in Nairobi County?
(1=No extent at all, 2=Low extent, 3=moderate extent, 4=great extent, 5=very great)

	1	2	3	4	5
Availability of water					
Availability, of mains electricity					
Furnished apartments					
New apartments					
Accessibility to premises					
Gated community					

2.To what extent do the following Proximity factors influence residential house prices in Nairobi County? (1=No extent at all, 2=Low extent, 3=moderate extent, 4=great extent, 5=very great extent)

	1	2	3	4	5
Distance from police stations					
Distances to churches					
Distance to schools					
Distance from public transportation					
Distance to Hospitals					

3.To what extent do the following building characteristics factors influence residential house prices in Nairobi? (1=No extent at all, 2=Low extent, 3=moderate extent, 4=great extent, 5=very great extent)

	1	2	3	4	5
Quality of finishes					
Type of floor					
Kitchen Furniture and fittings					
Burglary wall					
Razor fire Electric fence					
CCTV					

4.To what extent do the following policy provisions influence residential return in investment in Nairobi County? (1=No extent at all, 2=Low extent, 3=moderate extent, 4=great extent, 5=very great extent)

	1	2	3	4	5
County Policies and legislations					
National Housing policy					
Building codes and standards					
Land use controls					

PART II

QUESTIONNAIRE TO KENYA PRIVATE DEVELOPERS ASSOCIATION

(i) Please indicate your position in the Company

(ii) What is your level of education?

Diploma Degree Postgraduate

Other (specify).....

(iii)Please indicate your gender

Male Female

(iv)Please indicate your age group

18-35years 36-45years 46-55years Above 56years

Challenges facing real estate investment

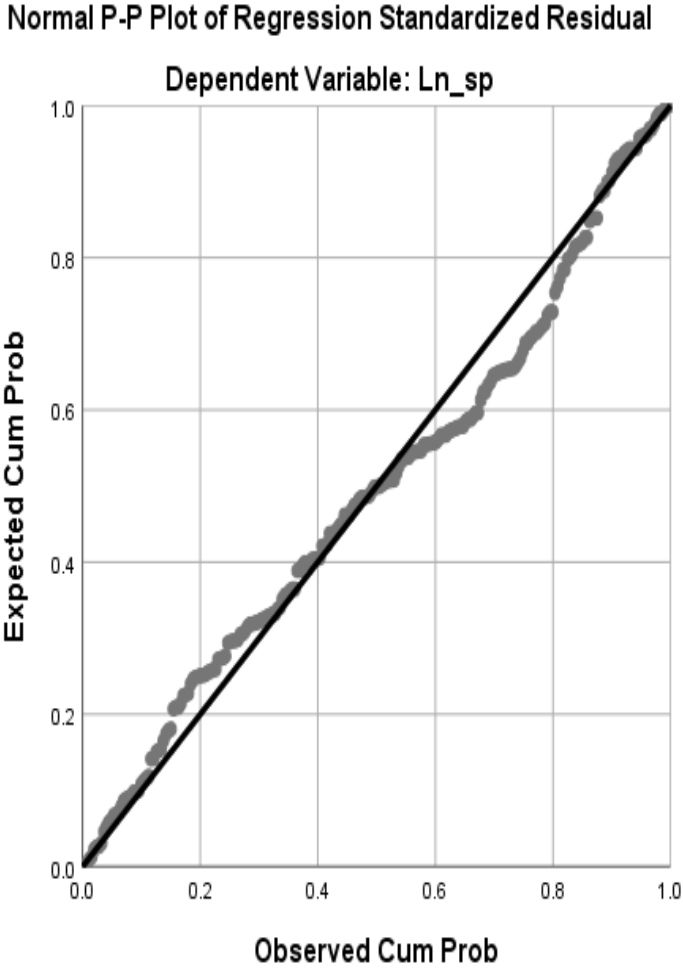
4.To what extent do the following challenges affect investment in residential buildings in Nairobi County? (1=Never, 2=Sometimes, 3=Frequently, 4=Most likely, 5=Always)

	1	2	3	4	5
Credit availability					
Politics and political uncertainty					
Generational change and demographics					
Immigration laws					
Legal and institutional constraints					
Costly plan approvals and delays					
Strict planning regulations					
Government restrictions e,g zoning					
Noncompetitive tax regime					

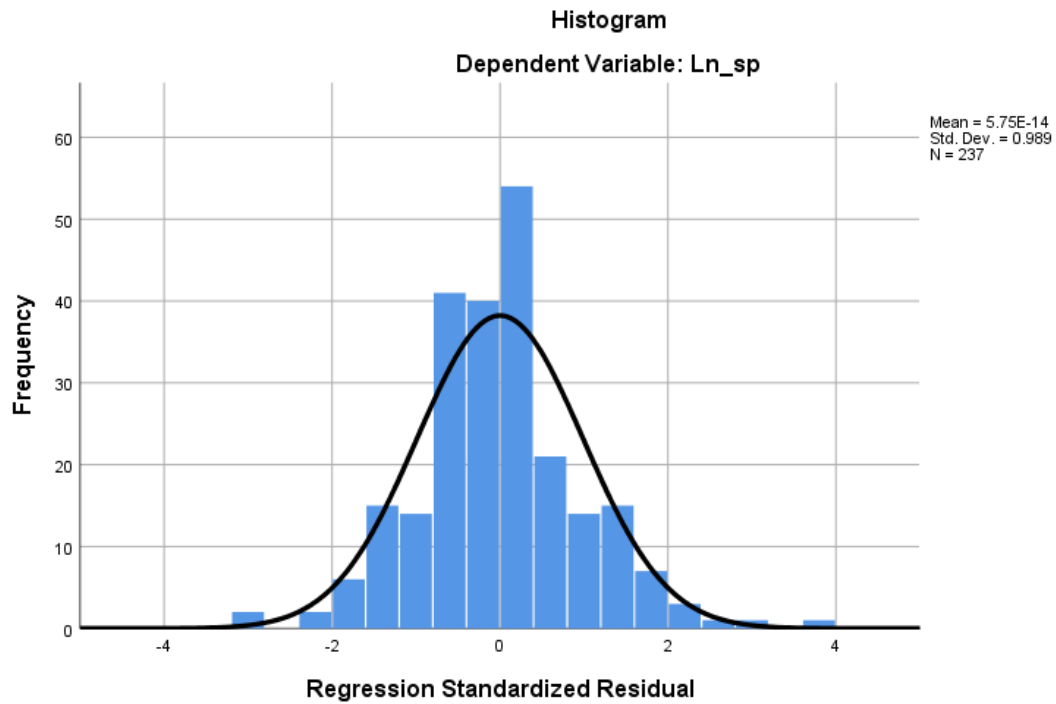
Appendix ii .Table 4.2.1: Lagrange Multiplier

	R^2	<i>No. of observations</i>	<i>LM</i>	<i>Tabulated value (X^2) at 5%</i>
<i>Model 1</i>	0.668	72	48.094	2.10
<i>Model 1</i>	0.837	71	59.441	2.08
<i>model 1</i>	0.995	49	48.777	2.12
<i>Model 2</i>	0.837	41	34.325	2.16
Overall model 4	0.953	236	224.96	2.07

Appendix iii :Test for auto correlation



Appendix iv: Normality test



Appendix v: Anova table

Segment	ANOVA ^a				
	Sum of Squares	df	Mean Square	F	Sig.
Upper middle					
1	1.421	14	0.101	24.654	.000 ^b
2	1.461	19	0.077	20.596	.000 ^c
3	1.479	21	0.070	19.971	.000 ^d
Upper end					
1	2.806	12	0.234	8.853	.000 ^b
2	2.878	15	0.192	7.230	.000 ^c
3	2.933	18	0.163	6.035	.000 ^d
Lower middle					
1	0.205	10	0.021	8.105	.000 ^b
2	0.238	12	0.020	12.358	.000 ^c
3	0.238	13	0.018	11.076	.000 ^d
Lower end					
1	0.138	6	0.023	1423.230	.000 ^b
2	0.138	9	0.015	971.610	.000 ^c
Overall model					
1	79.567	14	5.683	268.628	.000 ^b
2	79.773	19	4.199	202.867	.000 ^c
3	80.321	22	3.651	198.167	.000 ^d

VT OMNES VNVM SINT

Appendix vi: Lag selection criteria for unit test

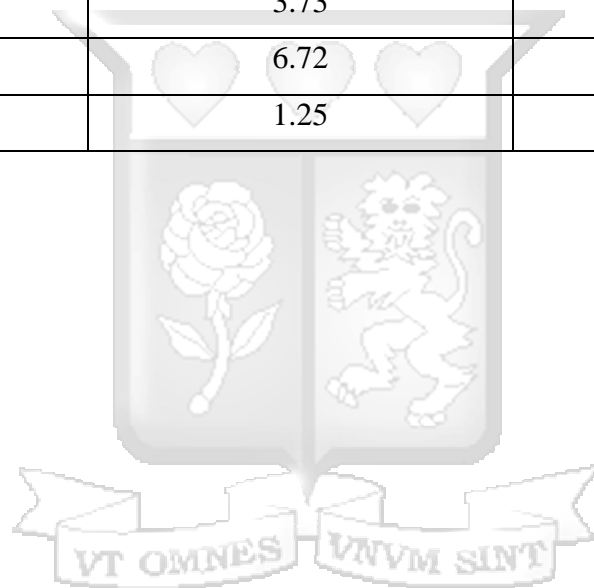
	lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
ln HPGROWTHA	3	10.36	10.639*	1	0.001	.045*	-0.263*	-0.221*	-0.154*
lnLENDRATE	3	94.60	3.774	1	0.052	.002*	-3.272*	-3.229*	-3.163
lnINFLATION	1	-19.76	0.000	1	0.000	.123*	0.741*	0.755*	0.778*
lnHPINDEX	3	123.08	3.182	1	0.074	.0001*	-4.288*	-4.246*	-4.179
lnFOREX	1	106.20	0.000	1	0.000	.001*	-3.757*	-3.743*	-3.721*
lnREMITTANCE	4	36.84	17.18*	1	0.000	.018*	-1.173*	-1.117*	-1.028*
lnRBCINDEX	3	170.54	3.747	1	0.053	.0001*	-5.984*	-5.941	-5.875
lnRINVTMENT	3	-21.77	4.021*	1	0.045	.142*	0.885*	0.927*	0.993
lnGDP	1	20.95	0.000	1	0.000	.029*	-0.713*	-0.698*	-0.676*

Unrestricted Cointegration Rank Test (Trace)

Maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value	1% critical value
0	171	662.314		280.000	192.89	204.95
1	188	706.807	0.790	191.013	156	168.36
2	203	740.251	0.691	124.127*	124.24	133.57
3	216	760.616	0.511	83.395	94.15	103.18
Maximum rank	parms	LL	eigenvalue	max statistic	5% critical value	1% critical value
0	171	662.314		88.987	57.12	62.8
1	188	706.807	0.790	66.887	51.42	57.69
2	203	740.251	0.691	40.731*	45.28	51.57
3	216	760.616	0.511	23.250	39.37	45.1

Appendix vii: Short run causality test

D_ lnHPGROWTHA	chi2	P>value
D_ lnLENDRATE	1.03	0.7944
D_ lnINFLATION	3.26	0.3526
D_ lnHPINDEX	1.52	0.6767
D_ lnFOREX	1.99	0.5747
D_ lnREMITTANCE	5.74	0.1252
D_ lnRBCINDEX	3.73	0.2916
D_ lnRINVETMENT	6.72	0.0813
D_ lnGDP	1.25	0.7407



Appendix viii: LM Test for residual autocorrelation

lag	chi2	df	Prob > chi2
1	79.3607	81	0.53076
2	69.3183	81	0.81937
3	84.7094	81	0.36719

Jarque Bera test for normality of the disturbances (Post estimation test)

Equation	chi2	df	Prob>chi2
D_lnHPGROWTHA	2.77	2	0.25035
D_lnLENDRATE	15.066	2	0.20054
D_lnINFLATION	0.079	2	0.96115
D_lnHPINDEX	0.848	2	0.65449
D_lnFOREX	1.737	2	0.41949
D_lnREMITTANCE	0.35	2	0.83944
D_lnRBCINDEX	3.709	2	0.15651
D_lnRINVETMENT	1.506	2	0.47088
D_lnGDP	0.141	2	0.93186
ALL	26.207	18	0.09513

Appendix xi. Turnitin results

<https://elearning.strathmore.edu/mod/turnitintooltwo/view.php?id=1373..>



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