

**THE EFFECTS OF SUPPLY SIDE CHARACTERISTICS ON RETURNS OF
RESIDENTIAL REAL ESTATE INDUSTRY IN NAIROBI COUNTY, KENYA**

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DECLARATION

This research project is my original work and has not been submitted for award of a degree at University of Nairobi or any other University.

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This research project has been submitted for examination with my approval as the University Supervisor

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DEDICATION

I dedicate this project to my mother Grace Anyango Joshua and father Tobias Odhiambo Okech.

TABLE OF CONTENT

DECLARATION.....	ii
ACKNOWLEDGEMENTS	iii
DEDICATION.....	iv
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS	ix
CHAPTER ONE: INTRODUCTION.....	1
1.1 Background of the Study	1
1.1.1 Supply Side Characteristics	2
1.1.2 Returns of Residential Real Estate.....	4
1.1.3 Supply Side Characteristics and Returns of Residential Real Estate Industry6	
1.1.4 Residential Real Estate Industry	7
1.2 Research Problem	9
1.3 Objectives of the Study.....	11
1.4 Value of the Study	11
CHAPTER TWO: LITERATURE REVIEW.....	13
2.1 Introduction.....	13
2.2 Theoretical Review	13
2.2.1 Inelastic Housing Supply	13
2.2.2 User Cost Model	14
2.2.3 Prospect Theory	14
2.3 Determinants of Returns of Residential Real Estate.....	15
2.3.1 Location	15
2.3.2 Infrastructure.....	16
2.3.3 Interest Rates.....	16
2.3.4 Legislation.....	17
2.3.5 Cost of Construction and Sale.....	17
2.4 Empirical Review.....	18
2.5 Summary of Literature Review.....	21
2.6 Conceptual Framework.....	22

CHAPTER THREE: RESEARCH METHODOLOGY	23
3.1 Introduction.....	23
3.2 Study Design.....	23
3.3 Population of Study.....	23
3.4 Data Collection	24
3.5 Diagnostic Tests.....	24
3.6 Data Analysis	25
3.6.1 Analytical Model	25
3.6.2 Test of Significance	26
CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATIONS	27
4.0 Introduction.....	27
4.1 Descriptive Statistics.....	27
4.2 Diagnostic Test Results.....	28
4.2.1 Test for Autocorrelation.....	29
4.2.2 Test for Heteroscedasticity	29
4.2.3 Test for Multicollinearity	31
4.3 Correlations Analysis.....	31
4.4 Multiple Regression Model.....	33
4.4.1 Model Summary.....	33
4.4.2 Analysis of Variance (ANOVA).....	33
4.4.3 Table of Coefficient	34
4.5 Discussion of the Research Findings	36
CHAPTER FIVE: SUMMARY CONCLUSION AND RECOMMENDATION	38
5.0 Introduction.....	38
5.1 Summary of the Findings.....	38
5.2 Conclusion	39
5.3 Recommendations.....	39
5.5 Limitation of the Study	41
5.6 Suggestion for Further Research.....	41
REFERENCES.....	42

LIST OF TABLES

Table 4.1: Measures of Central Tendency	27
Table 4.2: Coefficient Correlations.....	29
Table 4.3: Collinearity Diagnostics	29
Table 4.4: Breusch-Pagan/Cook-Weisberg test Results	30
Table 4.5: Test for Multicollinearity.....	31
Table 4.6: Correlation Table	32
Table 4.7: Model summary	33
Table 4.8: Anova.....	34
Table 4.9: Table of Coefficients	35

LIST OF FIGURES

Figure 2.1: Conceptual Framework	22
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LIST OF ABBREVIATIONS

CBK – Central Bank of Kenya

GDP – Gross Domestic Product

KNBS – Kenya National Bureau of Statistics

KPDA – Kenya Property Developers Association

NAR - National Association of Realtors (America)

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The demand for housing in Kenya and in effect in Nairobi is high following the high growth in population and urbanization (World Bank, 2011). Growing prosperity has also increased demand for larger and better quality housing. Rising house prices on the other hand have become a key inhibitor in home ownership since most population cannot afford them (Mwololo, 2014). Developers are increasingly trying to initiate projects and payment schemes that focus on affordability in addition to their projects that are targeted to the upper middle-class and rich elite. This is in response to the high demand from different social classes.

House prices are an indicator of returns on investment in residential real estate. Glaeser, Gyourko and Saiz (2008) theorized that house price volatility was impacted on by elasticity of housing supply. According to this theory, when housing supply is elastic, irrational price bubbles resulting from demand shocks would lead to quick construction response and the bubble would only last the duration of construction. In inelastic supply however construction response would be slow to price appreciation, making house prices more volatile thereby affecting returns to developers. Kahneman and Tversky (1979) in their prospect theory concluded that people are more averse to loss than gain of a similar amount. According to this theory therefore house sellers with higher developmental costs and hence potential losses are likely to set higher house prices than sellers with potential gain. This impacts returns.

Supply side factors therefore influence investment in real estate. According to the Kenya National Housing 2012/2013 Survey report, the high cost of land and building materials had hindered development of housing countrywide. Infrastructure and related utilities including but not limited to roads, power, water supply, sewerage and drainage system among others impact on level of investment required for development of residential real estate by increasing financial outlay required. This huge financial requirement for investment in the real estate business requires developers to have financial partners like banks to enable them undertake projects.

On the other hand, interest rates stood at an average of seventeen percent, a prohibitive rate for mortgages and commercial loans for housing development (Kenya Economic Survey, 2016). The high cost of financing both development and home ownership, affects developers and in general Kenyans' ability to borrow money for development of residential projects. Real estate investors therefore must be ready for the high cost of capital that such developments require. This huge capital requirement raises the risk profile of the investment and hence therefore investors expect high returns commensurate to the risks. It is therefore of interest how these supply side factors impact on returns to investors of residential real estate projects.

1.1.1 Supply Side Characteristics

Supply side characteristics refer to the features affecting the development and supply of residential property in Kenya. These features impact on the performance of residential property market in the country. Follain et al. (1980) defines supply side, as the price and volume of savings available for investment in housing. He goes ahead to define demand side factors for housing as the characteristics, preferences and constraints of households towards housing on offer. The supply side characteristics

include but are not limited to; cost and level of financing, location of development, cost of construction, infrastructure and utilities. All these impact on investment decisions for real estate projects.

Location of development is a key feature in supply of residential property since it adds to the value of a property. Location determines the neighbourhood of a property therefore determines the proximity to social amenities such as shopping centers, hospitals, schools and many more. Proximity to such social amenities raises the value of a property since it increases the utility derived by homeowners of the property. Location of development determines the price of land hence the land price serves as a measure of value of a particular location. The difference in pricing of land based on location, affects supply of housing (Hass Consult, 2016).

Infrastructure refers to utilities such as road network leading to development locations, power lines for ease of power connection, water, drainage and sewerage systems. These are utilities that make development projects accessible and habitable. Presence of good infrastructure raises the value of an area, in effect raising the land prices, which in turn impacts on the supply of housing (Hass Consult, 2016).

According to the Kenya National Housing Report 2013/2014 released on March 15th 2015, it is estimated that building materials account for approximately 40 per cent of the construction costs. The reports states that between 2007 and 2009, costs of building materials had increased by as much as 40per cent resulting in increased cost of housing development. This increased cost of construction impacts on supply of real estate.

Most housing projects are financed primarily through borrowed funds from various sources. Considering the time needed for construction, potential delays during construction as well as high and fluctuating interest rates, the cost of capital can weigh negatively on the total financing structure of developments. In addition, access to equity for construction is a challenge due to the conditions imposed by the lenders who are mostly banks (Kenya National Housing Report, 2012/2013). This high cost of finance then affects supply of housing.

1.1.2 Returns of Residential Real Estate

Residential real estate refers to capital investments in the development of land and housing for purposes of occupancy by households. Real estate investments offer two forms of return; capital gain and rental income. Capital gain is realized from appreciation of the asset value, in this case, value of the land or housing units built on the land. Rental income is represented by cash inflows from the users of the real estate (Yang and Ye, 2010).

Measurement of capital gains is based on real estate indices. Real estate indices show house prices and can therefore be used to measure or track growth in property prices. There is no centralized exchange for the real estate sector. This has led to the estimation of risks and returns. House pricing mechanisms that have been developed include hedonic pricing model (Kain and Quigley, 1970) and repeat sales model (Bailey et al. 1963). These pricing methods produces estimates in value of real estate and factors in residual risk and non risk factors such as taxes, marketability costs and information costs. It is through these pricing models that the real estate indices of house prices result.

Hedonic pricing estimates price of attributes of a property. This may include such attributes as number of bedrooms, size of house, distance from central business district, neighbourhood. This hedonic model treats these attributes separately and estimates their prices in an additive model; hence the value of the whole unit or house becomes the sum of the prices of the attributes. This valuation indicates that the quality of the bundle of residential services has as much effect as price of an attribute of the house (Kain and Quigley, 1970). Repeat sales model on the other hand measures the movement of prices of a single housing unit. This model measures average price changes in repeat sales or refinancing of the same properties. This model therefore facilitates a construction of an index for properties that allows tracking of appreciation in property value.

Kenya's population has been growing rapidly over the years. For instance, the country's population in 1999 was 28.7 million with urban population being 5.4 million, and by 2009 this population had grown to 38.6 million and 12.5 million, respectively (KNBS). It is projected that by the year 2030, about 50 per cent of the Kenyan population will be urban residents. The rise in population of urban residents is indicative of the increased population in Nairobi County. The rapid rate of urbanization continues to put more pressure on services to meet the needs of the growing population. This includes the needs for housing which have a resultant effect of increased demand for housing (Kenya National Housing Report 2012/2013). The resultant increased demand for housing increases prices of houses available resulting in capital gain for the property.

1.1.3 Supply Side Characteristics and Returns of Residential Real Estate Industry

Supply side features have an impact on the returns of residential real estate projects. This impact could either be positive or negative. Location of development is a key project decision that can heavily impact the returns of a project. Location in a good neighbourhood with good infrastructure and close proximity to social amenities like schools, hospitals, shopping centers and many more increases the value of a project. Distance from such amenities and infrastructure lowers the valuation of the project hence minimal returns (Kain and Quigley, 1970).

According to Carey (1990), in markets where there is fixed supply (that is, land and in the short run also buildings) a few investors are willing to pay a price above the fundamental price and can determine the market price if their demand is sufficient to clear the market. Hilbers et al., (2001) argues that distortion of real estate prices is due to market imperfections such as little or no transaction information, infrequent trades, negotiated pricing process, large transaction costs and rigid supply. This market imperfection allows for significant increases in the cost of land as well as house prices. Some of these market imperfections can result into cycles and bubbles that affect the demand for residential real estate, in turn affecting return on the same.

The rise in prices will thence stimulate an increase of supply in-order to reap profits of the high prices. According to Herring and Wachter (1999) immediate increase in supply will not be possible due to construction lags and imperfect information. The rising prices will make investors start on new construction to increase supply. Construction will take time even several years and hence prices will continue to rise. Equilibrium adjustment will be slow as demand starts to decline. Due to the nature of

the market with little transactional information available, developers are likely to continue to initiate construction based on imperfect demand estimates. By the time new construction is ready for occupancy demand for residential real estate will have fallen. This coupled with competing projects will result in oversupply resulting in fall in real estate prices hence lower returns.

Interest rates are another key supply side factor affecting returns of residential projects. Investors required rates of return are determined from the interest rate plus a risk premium commensurate to the risk of the investment. Risk premium varies as a result of supply and demand and other risk factors in the market. Investors rate of return therefore fluctuate based on these interest rates that make them up. Property prices hence change to stay in line with real estate risks as interest rate fluctuate. Generally increase in interest rates increases investors required rate of return; interest rates therefore affects valuation of a property (Karoki, 2013).

1.1.4 Residential Real Estate Industry

Housing is recognized as a basic human right in the Kenyan Constitution. The housing sector in Kenya is faced with many challenges, which have resulted in a huge demand-supply gap of approximately 200,000 housing units annually (Kenya National Housing Report 2012/2013). Low investment by the Government of Kenya in housing has resulted into huge demand. Demand for housing in Nairobi County in particular has also been compounded by growth in population and rapid urbanization. The urban population increased from 19 percent in 1999 to 32 percent in 2009 and is expected to increase to 50 per cent by the year 2030 (KNBS). This huge supply deficit provides investors with potential for high returns as they price their units to the highest bidder.

Location is a key feature of the supply of real estate projects and determines attractiveness and value of a development. In Nairobi County, major city suburbs have become dominated by developers keen to build high-density residential and commercial property (Hass Consult, 2016). This domination is due to the high land prices associated with the major suburbs. According to the report, these developers are assured returns due to sustained demand by homeowners and investors alike.

Land price trends in Nairobi major suburbs have however shown a marginal fall while those of satellite towns in Nairobi periphery have continued to appreciate in the first quarter of 2016 (Hass Consult, 2016). The highest fall in land value was experienced in Eastleigh at 7.5 percent followed by Ridgeways, Kileleshwa and Nyari. This fall is attributed to shift in speculation to the satellite towns. Donholm however experienced a rise of 9.3 percent in land prices. This rise was attributed to infrastructure upgrades in the region and developers move to take advantage of the area's increased accessibility. The infrastructure upgrades have thereby caused price appreciation of completed units in Donholm. High demand for housing has also led developers to focus on the satellite towns. Athi River, Ruaka and Ruiru are some of the satellite towns that have witnessed large-scale residential projects with the relatively lower land prices providing opportunities for investors to reap high returns.

The trend in development projects in Nairobi County is also shifting to incorporating partial payment terms as construction of projects proceeds. The payments schedule is organized in form of installments that are paid during the construction period and are designed to sum up to the asking price of a housing unit by the time the project is complete. This is as a result excessive debt leveraging that has obliged developers to engage in high levels of pre-selling in order to secure cash-flows that allows loan

repayment during the construction period hence minimizing their cost of capital they borrow from banks for such projects. This can however compromise deposit finance from initial purchasers who invest in pre-sales and induces cash flow risks to developers as well as forgone income since they would tend to sell at a lower price than if they did at end of construction (African Economic Brief, 2013).

1.2 Research Problem

The real estate sector is one of the key sectors of the Kenyan Economy. This sector has been characterized by a huge mismatch of demand and supply for housing (Centre for Affordable Housing, 2012). The under supply of housing has attracted investors looking to earn high returns for the high risks incurred. Supply side factors however influences supply levels of residential units and in turn affects returns. The impact of supply side characteristics on returns is possibly significant and hence requirement of an investigation to establish the effects of supply side characteristics on returns.

The annual housing demand has been put at 200,000 units with a supply of only 40,000 units available annually. This leaves an unmet demand of 160,000 units annually (Kenya National Housing Report 2012/2013). This presents a huge supply gap with development projects aiming at maximizing returns as they strive to meet the demand. Potential returns from these projects are however influenced by supply side factors. These supply side factors include location, infrastructure, cost of construction as well as interest rates. Good location with good infrastructure and amenities coupled with low interest rates impact positively on returns of real estate projects.

In Nairobi County developers have dominated the county's main suburbs, putting up projects to meet demands of the rising population for housing. These projects are multi-million and some even multi-billion shilling endeavours that forecast huge

returns on investment. Achievement of these returns is however influenced by the supply side factors such as mentioned above. High land prices and the high cost of financing that are required to put up such projects increases the risk profile and exposure of such projects. This limits the development of housing projects delivered to market, resulting in higher priced housing stock and threatening the capital introduced by the developer in the first place (African Economic Brief, 2013).

Tsatsaronis and Zhu (2004) concluded that external financing is majorly used for acquisition of houses thus cost of mortgage loans play a critical role in determination of prices of houses. The implication thereof is the higher the cost of mortgage, the costlier the house and hence decreased demand. This decreased demand in turn implies lower returns for investors. Odame, Key and Stevenson (2006) conducted a study on measures of real estate from land registration and valuation systems in emerging economies between 1998 to 2005. They noted that size of plot, quality of landscaping, size of property and location are critical variables that affect prices of real estate properties in Ghana. The implication here is that a property's characteristics and location impacted on the level of return on investment.

Obaigwa (2013) in his study looked at the effect of lending rates on real estate prices. His study found that lending rates played a key role in house pricing in Nairobi in the period between 2004-2008 and therefore affected pricing of residential real estate. Marete (2011) concluded that location and real estate agents played a role in the determination of real estate prices in Kiambu. Prime locations such as proximity to the road enhanced valuation of property raising its price. Ndinda (2014) in her study found a positive relationship between mortgage financing and performance of the real

estate market in Kenya. Homeowners invested in real estate in anticipation of future price increases.

Research findings on supply side characteristics have resulted in varying conclusions. Odame, Key and Stevenson (2006) concluded property's characteristics and location impacted on the level of return on investment. Kigige and Messah (2011) on the other hand concluded that location and realtors have an insignificant impact on prices. Marete (2011) concluded that location and real estate agents played a role in the determination of real estate prices. Findings from different studies focusing on effects of supply side characteristics on real estate returns vary. What therefore is the effect of supply side characteristics on real estate returns?

1.3 Objectives of the Study

To establish the effects of supply side characteristics on returns of residential property in Nairobi County.

1.4 Value of the Study

Private and institutional housing developers have been the main suppliers for housing for rent and sale. Factors that influence their choice of areas to develop include: access to affordable land, surrounding infrastructure and utilities and prospective future returns on investment. This study will be of great importance to private and institutional developers, as it will provide insight on supply side characteristics that affect returns so as to effectively project the levels of return on their prospective future investment. This will be key to the investors as it aims to bring out the supply side factors that could affect their returns and how these can be used to their advantage.

This study is also of great importance to government as it provides knowledge on supply side characteristics and how this affects development projects. This gives government an insight on how to facilitate developers to reduce the demand deficit. It helps government to budget and institute incentives to enhance business in the real estate sector and encourage developers. Additionally, this helps government to initiate policy and regulations that ensure efficient functioning of the real estate sector.

The study will also be of great value to scholars as it adds on to knowledge on the subject. This study will also provide valuable reference material to those who would wish to further the study or conduct other studies with relation to this one.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of related literature on the subject of study as presented by other researchers, scholars, analysts and authors. The researcher derived materials from several sources related to the theme and objectives of the study.

2.2 Theoretical Review

This section discusses and articulates theories and concepts relating to supply of residential real estate and the subsequent expected returns.

2.2.1 Inelastic Housing Supply

Economists Glaeser, Gyourko and Saiz (2008) developed a model on housing prices volatility focusing on housing supply, a fundamental part of the housing market. The model suggests that rational bubbles can exist when supply of housing is fixed, but not with elastic supply and a finite number of potential homebuyers. They modeled irrational, exogenous bubbles as a temporary increase in optimism about future prices; Irrational hikes of real estate prices reflecting homebuyers' optimism about future house prices hence price volatility. This model hence predicts that bubbles or demand shocks have an impact on house prices where housing supply is inelastic. On the other hand, house bubbles have less of an impact the on house prices where the housing supply is elastic as new construction is initiated to respond to demand.

The model hypothesizes that housing supply elasticity is a key determinant on the duration of a bubble. According to the model, when housing supply is elastic, new construction quickly comes on line as price rises, which will result in the bubble lasting only the duration of the construction. This model hence does not suggest that

bubbles are impossible in elastic areas but it implies that they will be quite short. While the average boom in inelastic places lasted for more than four years, the average duration of the boom in more elastic areas was 1.7 years (Glaeser et al, 2008).

2.2.2 User Cost Model

The theoretical framework that underlies this analysis of shelter costs is based on the assumption that the appropriate theoretical construct for measuring consumer prices is the cost-of-living index. The user cost is defined as the opportunity cost of holding and using a house, less the increase in its value (Gillingham, 1981). The user cost includes the opportunity cost of equity capital used for purchase as well as mortgage payments.

This theory compares the cost of owning and using a home with the cost of living in a rental house. The user cost comprises of out of pocket payments for example mortgage payments, maintenance, taxes, capital variation, forgone investment opportunities among others. If rental cost is higher than the user cost, households would prefer to own (purchase) homes instead of paying rent.

2.2.3 Prospect Theory

The prospect theory proposed by Kahneman and Tversky (1979) describes how people frame and value a decision involving uncertainty. According to the prospect theory, people look at choices in terms of potential gains or losses in relation to a specific reference point, which is often the purchase price or cost price. According to the theory, people make decisions based on potential value of losses and gains rather than the final outcome. People feel more pain from a loss than the pleasure from a gain of a similar amount.

Investors in real estate incur huge developmental costs. The high cost of land and building materials raises the cost price of completed units. According to the theory sellers with potential losses (with reference to cost price) are likely to set higher prices than sellers with potential gains. This loss aversion behavior means that there will be a rise in properties prices in the market (Genesove and Mayer, 2001). Rise in property prices will then influence increase in supply of housing.

2.3 Determinants of Returns of Residential Real Estate

This section discuss the factors that influence and determines the returns of residential real estate.

2.3.1 Location

According to hedonic pricing, valuation of housing units is determined based on the mix of attributes of the house. Location is one of the attributes used in determination of value and therefore it is a key determinant of return of residential development. Location of a development refers to both physical location (postal code) as well as the neighbourhood location, which is determined by the social class of residents within the location, occupation and income levels and their educational attainment (Duffy, 2001).

Homebuyers' willingness to pay for housing is based on utility gains of living in a particular location and expected housing price appreciation (Glaeser et al, 2008). Utility is derived from the quality of the bundle of residential services. Pollakowski (1982) indicates that house prices are not determined only by accessibility but also by the environmental attributes of the location. This may include attributes such as proximity to shopping centers, schools, parks and other social recreational facilities such as restaurants, clubs as well as nature and type of residential developments

surrounding a particular location. These are the physical location characteristics. Additionally utility is derived from the neighbourhood quality of a location. Neighbourhood quality is determined by characteristics of neighbours such as their occupation and income levels.

2.3.2 Infrastructure

The infrastructure in the development locations impacts on returns. Infrastructure includes the road network, availability of power connection, access to water, and drainage and sewerage systems. Infrastructure opens up areas making them accessible and able to support settlement. Residential property values rise significantly with the development of good infrastructure. In Nairobi county, the county government determines zonal ordinates for different zones and sub-counties. The zonal ordinates determines the Ground coverage and Plot ratios of residential developments within these zones. This is based on the drainage and sewerage infrastructure as well as road reserves within these sub-counties available to support population. This therefore determines the number of housing units allowable in a development within an area hence affects the returns possible.

2.3.3 Interest Rates

Interest rates also have a major impact on the real estate markets. Changes in interest rates can greatly influence a person's ability to purchase a residential property. This is because mortgages impact on the prices of residential property; a change in interest rates therefore impacts property prices. Interest rates thereby influence demand for housing. Low interest rates will result in increased uptake of mortgages, thereby increasing demand for housing; increased demand results into higher returns.

Interest rates also affects capital flows. Increase in interest rates increases the cost of funds. Competing investments make capital availability tight as banks and investors consider their required rate of return on investment. This competition for capital reduces the flow of capital hence impacts on capital available to developers. This affects supply of housing and in turns affects returns.

2.3.4 Legislation

Legislation is a factor that can have a sizable impact on property demand and prices. Tax credits, deductions and subsidies are some of the ways the government can temporarily boost demand for real estate. For example, in 2008, the U.S. government introduced a first time homebuyers' tax credit to homeowners in an attempt to jump-start home sales in a sluggish economy. According to the National Association of Realtors (NAR), this tax incentive alone led to 900,000 homebuyers to buy homes. This was quite a sizable increase in demand for housing in the United States after the sub-prime global financial crisis (NAR, 2009).

Tax incentives and subsidies by Government towards real estate investors also impacts on their returns by reducing their business costs. Reduced tax burden and subsidized development cost lowers developers' overall cost and thereby impacts positively on project returns.

2.3.5 Cost of Construction and Sale

Cost of construction affects the levels of return possible out of real estate projects. The higher the cost of construction, the smaller the margins of profit available for the developers. Change in cost of building materials and other related production factors greatly impacts on the levels of returns made by real estate developers. According to the Kenya National Housing Report 2013/2014 released on March 15th 2015, it is

estimated that building materials account for approximately 40 per cent of the construction costs. The reports states that between 2007 and 2009, costs of building materials had increased by as much as 40per cent resulting in increased cost of housing development. This increased cost of construction impacts on return of real estate.

Developers engage selling agents to sell their developments to buyers. According to Marete (2011) real estate agents played a role in the determination of real estate prices. Selling agents' commissions are passed on to the potential buyers. This has the impact on increasing real estate prices which affect demand and in-turn impact returns. Additionally marketing costs such as advertising and other sale related expenses increases the total cost of development. This has the effect of increasing the sale price in order to meet investors required return. This ultimately impacts on demand for the same units affecting return.

2.4 Empirical Review

Residential real estate is a basic need and is required by all. It requires substantial initial outlay to develop. The rise in population coupled with urbanization has increased the demand for the same. According to Carey (1990), in markets where there is fixed supply (that is, land and in the short run also buildings), a few investors are willing to pay a price above the fundamental price and can determine the market price if their demand is sufficient to clear the market. Hilbers et al., (2001) argues that distortion of real estate prices is due to market imperfections such as little or no transaction information, infrequent trades, negotiated pricing process, large transaction costs and rigid supply. This market imperfection allows for significant

increases in the cost of land as well as house prices. These studies indicate that supply side issues influence house prices and hence returns to residential developments.

Grimes and Aitken (2006) concluded that supply of housing and house prices are inter-related with an increase in house prices raising new house supply. In the study they incorporated land prices as well as construction costs and found that both have statistically significant effect on new house construction. An increase in land costs increased development cost and in turn reduced house supply resulting in increased house prices. In this study they also found that house prices were more volatile in areas with low supply responsiveness to demand shocks than in areas with high supply responsiveness.

Harold and Leonard (1991) suggested that more distant locations may have more attractive features and amenities, despite the longer commute. According to their study many metropolitan areas included upper income households and they tended to live outside the center of the city, while lower income resided in the cities, close to employment centers. However in Melbourne a trend is occurring where lower income families live further away from the city center and the city is increasingly in demand with new expensive apartments being constructed (Romkaew, 2016).

According to Gallimore, Fletcher and Carter (1996) income levels, profitability of business, inflation and interest rates are important factors in determining general level of value. Households, which have the same tastes and income, tend to live in the same area, therefore factors such as size of households, income and education levels and availability and cost of mortgage financing affects types and location of housing and the values. High income residents seek out parts of the city that offer leisure facilities, parks, amenities and most convenient forms of transportation and infrastructure.

Tsatsaronis and Zhu (2004) concluded that yield curve, inflation, banks' credit and mortgage market difference significantly affect prices of houses. They concluded that external financing is majorly used for acquisition of houses thus cost of mortgage loans play a critical role in determination of prices of houses. Odame, Key and Stevenson (2006) conducted a study on measures of real estate from land registration and valuation systems in emerging economies between 1998 to 2005. They noted that size of plot, quality of landscaping, size of property and location of property are critical variables that affect prices of real estate properties in Ghana.

Gathuru (2014) studied the effect of macro-economic variables on real estate values and concluded GDP, inflation, cost of construction and percentage of debt financing had a positive relationship on real estate values. Kigige and Messah (2011) did a study on factors influencing real estate property prices in Meru, Kenya and noted that income, demand for housing units, realtors and location affected the prices of real estate properties. Income and demand contributed to 70 percent and 20 percent respectively in change of prices of housing units while location and realtors were found to insignificantly affect the prices.

Obaigwa (2013) in his study looked at the effect of lending rates on real estate prices. His study found that lending rates played a key role in house pricing in the period between 2004-2008 and therefore affected pricing of residential real estate. Marete (2011) concluded that location and real estate agents played a role in the determination of real estate prices. Prime locations such as proximity to the road enhanced valuation of property raising its price. Ndinda (2014) in her study found a positive relationship between mortgage financing and performance of the real estate market. Homeowners invested in real estate in anticipation of future price increases.

2.5 Summary of Literature Review

The empirical studies above majorly relate to the determinants of housing prices and thereby determinants of returns on real estate. Research findings on supply side characteristics however differ. Odame, Key and Stevenson (2006) concluded that location of property is a critical variable that affects price of real estate properties in Ghana. Kigige and Messah (2011) on the other hand concluded that location has an insignificant impact on prices. In most studies within Kenya, the impact of location has focused only on physical location, time-distance from other destinations, rather than incorporate neighbourhood quality. There hence exists a research gap on impact of neighbourhood quality of a location on house prices.

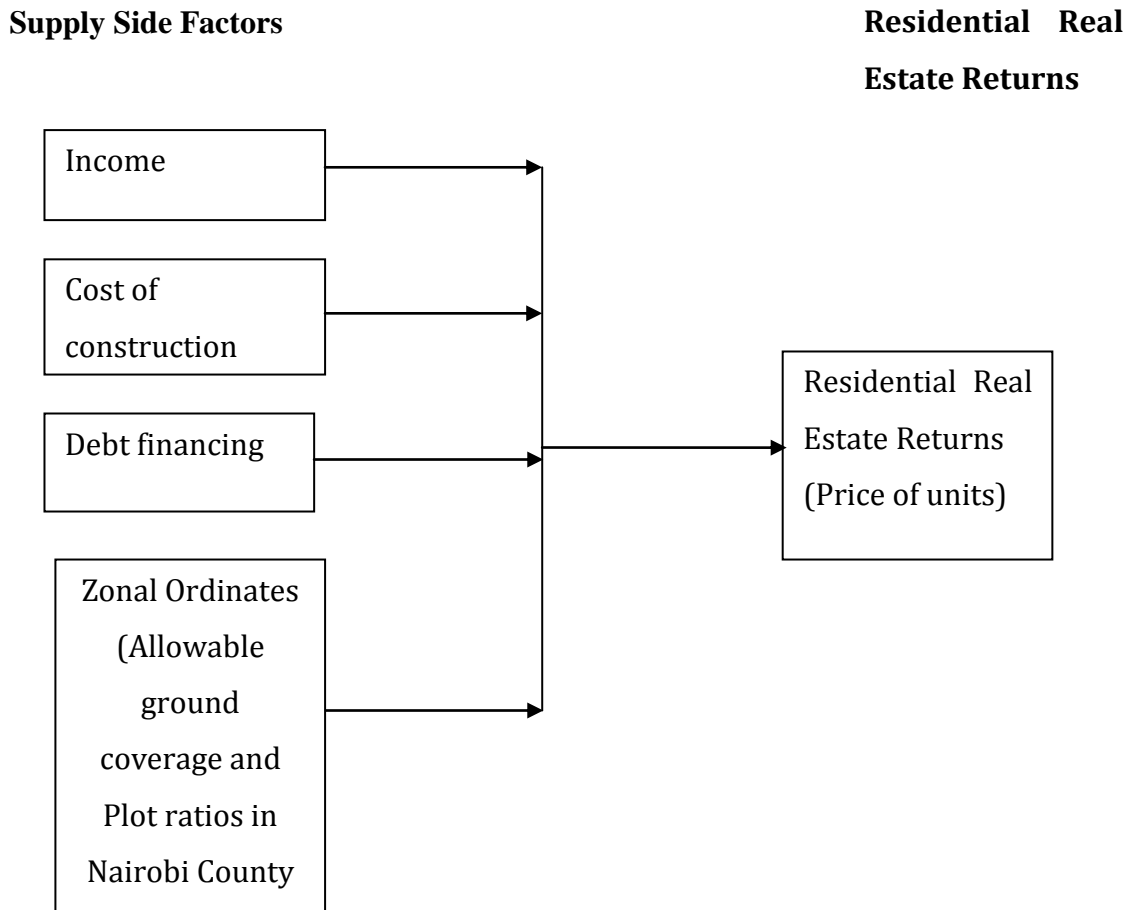
Findings on impacts of infrastructure have mostly been measured using a time-distance scale in most studies hence focusing on transport infrastructure from a central business district. This measurement of infrastructure is interchangeably used as a measure for location in some studies. Use of this scale has resulted in inconclusive findings that locations near to central business district of the main city are more valuable and vice versa. The use of the time-distance scale invariably gives the net impact of location of house values. There is hence a research gap on the effect of other forms of infrastructure apart from transport infrastructure on house values.

The findings from different studies focusing on effects of supply side characteristics on real estate returns vary. Most studies have measured location and infrastructure as the same variable hence providing a gap on what is the real impact of each of these variables separately. Additionally, variation in findings also exists in the context and region in which the research is done. This study therefore sought to contribute on to

the knowledge on the effect of supply side characteristics on real estate returns in Nairobi county?

2.6 Conceptual Framework

Figure 2.1: Conceptual Framework



In the conceptual framework depicted in Figure 1 above, supply side variables are envisaged to influence the returns of residential real estate units within Nairobi County. The returns of units are measured by their selling price. The available stock of new and existing residential units form the market supply which hence affects prices (returns) of units in the market.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The Chapter focuses on the research methodology to be employed in carrying out the research. It covers the research design, sampling techniques, instruments and procedures for data collection and methods to be utilized in data analysis.

3.2 Study Design

A study design is the framework, strategy or plan that the research followed. A research design is the arrangement of conditions for data collection and analysis of data in a manner that aim to combine relevance to research purpose with economy in research procedure (Kothari, 2004). This study adopted a correlational research design, which refers to the systematic investigation of relationships among two or more variables. In correlation research design the researcher determines whether or not and to what extent an association exists between two quantifiable variables. This design helped to investigate the possibility of relationship between the supply side characteristics and returns of residential real estate projects in Nairobi County.

3.3 Population of Study

Population refers to the entire group of individuals or items under consideration in any field of inquiry (Mugenda and Mugenda, 2003). The population of study consisted of the residential property developers with development projects in Nairobi County. This population refers to the fifty-nine, (59) developers registered with the Kenya Property Developers Association (KPDA).

3.4 Data Collection

The research made use of secondary data. This research required data on income levels, cost of construction and level of debt financing and house prices and zonal ordinates for Nairobi County. This data was quantitative and was sourced from Hass Consult property index, Kenya National Bureau of Statistics and Central Bank of Kenya (CBK) and the Nairobi County Website. The data used was in a span of 5 years from 2010 to 2015 with the data frequency being annual.

3.5 Diagnostic Tests

Diagnostic tests were carried out on the data to check for normality, collinearity and heteroscedasticity. Multiple linear regression analysis envisaged for use in analysis of the above secondary data assumes and requires all variables to be normal. Multiple linear regression analysis also assumes and requires little or no multi-collinearity in the data. Multi-collinearity occurs when two or more independent variables are correlated and provide redundant information about a response. This increases the variance of the coefficient estimates and makes the estimates very sensitive to minor changes in the model; this results in coefficient estimates becoming very unstable making analysis and interpretation difficult. Multi-collinearity was checked through variance inflation factor (VIF).

Heteroscedasticity occurs when the variance of the error term differs across observations. Errors may increase in value as the independent variable increases. They may also increase in value as values of an independent variable become more extreme in either direction. Heteroscedasticity affects the efficiency of predictions in a model. Heteroscedasticity was tested using the Breusch-Pagan test on Excel.

3.6 Data Analysis

Data analysis was carried out using simple mean, standard deviation and percentages. Correlation and Multiple Regression techniques was used to measure relationship between variables. Correlation analysis technique measures the existence of an association between the variables in question. Multiple Regression technique on the other hand measures if there is any cause and effect relationship between variables in question and to what degree and direction is the relationship.

In this analysis, income levels, zonal ordinates, cost of construction and percentage of debt financing were the independent variables while house prices for the residential units taken as the dependent variable. The Pearson correlation coefficient and Multiple regression models were used to investigate the relationship between the variables.

This study expects that increase in residential property returns in Nairobi County is determined by income levels, metropolitan zoning, cost of construction and level of debt financing. The following function is hence formulated for multiple regression analysis

3.6.1 Analytical Model

$$Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + e$$

Whereby Y = Returns on Residential Property (House Prices)

β_0 is the Y-intercept,

$\beta_1 - \beta_3$ = Regression Coefficients

X_1 = Income levels

X_2 = Cost of Construction

X_3 = Level of Debt Financing.

X_4 = Zonal Ordinates (Ground Coverage and Plot ratios)

e = Error Term

3.6.2 Test of Significance

The significance of the model was tested using F-test at 5% Level of Significance. Analysis of Covariance (ANOVA) was applied and correlation coefficient R and coefficient of determination R^2 was used to test the significance of the regression model in explaining the relationship between supply side characteristics and returns on residential real estate.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATIONS

4.0 Introduction

This chapter presents analysis and interpretations of the collated secondary data. It presents analysis and findings of the study in line with the research objective. The research objective is to establish the effects of supply side characteristics on returns of residential real estate industry in Nairobi County. These supply side characteristics include income levels, cost of construction, level of debt financing and zonal ordinates.

4.1 Descriptive Statistics

Descriptive statistical analysis is carried to establish statistical conclusions about the behavior of the data.

Table 4.1: Measures of Central Tendency

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Level of debt Financing	40	918154.00	.00	918154.00	151352.0556	34999.20297	209995.21782	44097991505.540
Income Levels	40	124044.00	.00	124044.00	14658.0978	6099.10734	36594.64404	1339167972.201
Cost of construction	40	7614.10	.00	7614.10	1625.0494	368.51700	2211.10201	4888972.099
Zonal ordinates	40	.00	9.00	9.00	9.0000	.00000	.00000	.000
House prices	40	50946.54	5.86	50952.40	6537.3958	2352.20096	14113.20575	199182576.664
Valid N (listwise)	40							

The study sought to establish the relationship between returns on residential property, Income level, cost of construction, level of debt financing and zonal ordinates. Their mean, maximum, minimum and standard deviations were taken in to account. From the findings, the study found that there was mean of 6537.40 for returns on residential property, 14659.00 for income level, 1625.05 for cost of construction, 151352.06 for level of debt financing and 9.00 for zonal ordinates. There was a deviation of 14113.21 from the mean of returns on residential property, 36594.64 from the mean of Income levels, 2211.10 from the mean of cost of construction, 209995.22 for level of debt financing and 0.0 from the mean of zonal ordinates.

4.2 Diagnostic Test Results

As indicated in Chapter three, the researcher conducted various diagnostic tests to ensure that the assumptions of classical linear regression model (CLRM) were not violated and to choose the appropriate models for analysis in the event that CLRM assumptions were compromised. This section presents the results of the following diagnostic tests: test of autocorrelation test, Heteroscedasticity test and Multicollinearity test.

4.2.1 Test for Autocorrelation

Table 4.2: Coefficient Correlations

Model	Cost of construction	Level of debt Financing	Income Levels
Correlations	cost of construction	1.000	-.886
	Level of debt Financing	-.886	1.000
	Income Levels	-.983	.872
Covariances	cost of construction	1.995	-.007
	Level of debt Financing	-.007	3.125E-005
	Income Levels	-.112	.000

a. Dependent Variable: house prices

Table 4.3: Collinearity Diagnostics

Model Dimension	Eigenvalue	Condition Index	Variance Proportions			
			(Constant)	Level of debt Financing	Income Levels	cost construction
1	2.656	1.000	.04	.01	.00	.00
2	.931	1.689	.08	.06	.01	.00
3	.402	2.571	.68	.13	.00	.00
4	.011	15.546	.20	.80	.99	.99

a. Dependent Variable: house prices

Two eigenvalues are close to 0, indicating that the predictors are highly intercorrelated and that small changes in the data values may lead to large changes in the estimates of the coefficients. From the findings, the eigenvalues are not a problem.

4.2.2 Test for Heteroscedasticity

Table 4.4: Breusch-Pagan/Cook-Weisberg test Results

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity	
	Ho: Constant variance
	Variables: fitted values of Returns on Residential Property
	Chi2 (1) = 0.22
	Prob > chi2 = 0.6363

The study used Breusch-Pagan/Cook-Weisberg test for heteroscedasticity. Heteroscedasticity (the violation of homoscedasticity) is present when the size of the error term differs across values of an independent variable. The impact of violating the assumption of homoscedasticity is a matter of degree, increasing as heteroscedasticity increases. From the findings, the chi-square value was small, indicating heteroscedasticity was not a problem (or at least that if it was a problem, it wasn't a multiplicative function of the predicted values). Also it was revealed that the p value of 0.6363 was greater than 0.05 significant levels implying that there was no violation of homoscedasticity.

4.2.3 Test for Multicollinearity

Table 4.5: Test for Multicollinearity

Multicollinearity		
estatvif		
Variable	VIF	1/VIF
Income Levels	1.12	0.896379
Cost of Construction	1.07	0.931549
Level of Debt Financing	1.07	0.936727
Zonal Ordinates	1.04	0.965104
M	1.15	0.869565
Mean VIF	1.09	

Multicollinearity was tested for the data used in the research. This was done using the variance inflation factor (VIF) which quantifies how much the variance is inflated. The findings indicate that the VIF values were close to 1 indicating that the variance of the variables were inflated at a very low level. The analysis exhibits signs of multicollinearity though low levels.

4.3 Correlations Analysis

A correlation is a single number that describes the degree of relationship between two variables. In this study correlation was used to assess a possible two-way linear association between two continuous variables of the study. Correlation is measured by a statistic called the correlation coefficient, which represents the strength of the putative linear association between the variables in question.

Table 4.6: Correlation Table

		House prices	Level of debt Financing	Income Levels	Cost of construction
Pearson Correlation	House prices	1.000			
	Level of debt Financing	-.051	1.000		
	Income Levels	.971	-.012	1.000	
	cost of construction	.871	.322	.927	1.000
Sig. (1-tailed)	House prices	.	.384	.000	.000
	Level of debt Financing	.384	.	.473	.028
	Income Levels	.000	.473	.	.000
	cost of construction	.000	.028	.000	.
N	house prices	40	40	40	40
	Level of debt Financing	40	40	40	40
	Income Levels	40	40	40	40
	cost of construction	40	40	40	40

On the correlation of the study variables, the researcher conducted a Pearson Product Moment correlation. From the findings on the correlation analysis between returns on residential property and various supply side characteristics, the study found that there was strong positive correlation coefficient between returns on residential property and Income levels as shown by correlation factor of 0.971. The study further revealed a positive correlation between returns on residential property and cost of construction as shown by correlation coefficient of 0.871, association between returns on residential property and level of debt financing was found to have negative relationship as shown by correlation coefficient of -0.051. There was no association found however between returns on residential property and zonal ordinates as the ordinates were all constants

and thereby were omitted from the regression henceforth. All the study variables were significant since the p-values were less than 5%.

4.4 Multiple Regression Model

4.4.1 Model Summary

This model summary shows the R squared, the adjusted R squared and the standard error of estimate. R-squared is a statistical measure of how close the data are to the fitted regression line. It is also known as the coefficient of determination, or the coefficient of multiple determinations for multiple regressions.

Table 4.7: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.976 ^a	.952	.948	3220.54166	.952	213.381	3	40	.000

a. Predictors: (Constant), cost of construction, Level of debt Financing, Income Levels

Adjusted R squared is coefficient of determination which tells us the variation in the dependent variable due to changes in the independent variable, from the findings in the above table the value of adjusted R squared was 0.952 an indication that there was variation of 95.2% on the returns on residential properties due to changes in income levels, cost of construction and level of debt financing at 95% confidence level.

4.4.2 Analysis of Variance (ANOVA)

In this ANOVA analysis, the dependent variable is returns on residential properties. There are significant relationships between the dependent variable (return on residential properties) and independent variables such as income levels, cost of construction and level of debt financing.

Table 4.8: Anova

Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	6639489747.94	3	2213163249.31	213.381	.000 ^b
	Residual	331900435.294	37	10371888.603		
	Total	6971390183.27	40			

a. Dependent Variable: house prices

b. Predictors: (Constant), cost of construction, Level of debt Financing, Income Levels

Table 4.8 summarizes the observed means for each dependent variable across experimental condition and the associated F ratios and *p* values obtained from the one-way ANOVAs conducted for the primary analyses. From the ANOVA statics in table above, the processed data, which is the population parameters, had a significance level of 213.381 which shows that the data is ideal for making a conclusion on the population's parameter as the value of significance (p-value) is less than 5%.

4.4.3 Table of Coefficient

The following tables gives the coefficients which helps in establishing the regression line. The table gives the coefficients of each variable and the extent to which it influences the dependent variable and which in this case is returns on residential properties. The table also includes the significance level of each variable in the study.

Table 4.9: Table of Coefficients

Model	Unstandardized Coefficients		Standardized Coefficient	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	2341.734	798.315		2.933	.006	715.619	3967.849		
Level of debt Financing	-.009	.006	-.132	-1.592	.121	-.002	.020	.215	4.650
Income Levels	.559	.081	1.451	6.923	.000	.395	.724	.034	29.51
cost of construction	-3.293	1.413	-.516	-2.33	.026	-6.171	-.416	.030	32.98

a. Dependent Variable: house prices

The established regression equation was; Returns on Residential Property = -5154 + 0.559 Income Levels (X_1) + -3.293 Cost of Construction (X_2) - 0.009 Level of Debt Financing (X_3). The beta shows the magnitude or the strength of each dependent variable. This shows the extent to which the dependent variable will change when the independent variable is increased by one unit in each case.

From the above regression model, holding income levels, cost of construction and level of debt financing to a constant zero, returns on residential property would be -5.154. Its further established that a unit increase in income level would cause an increase in returns on residential property by a factor of 0.559, a unit increase in cost of construction would cause an decrease in returns on residential property by a factor

of -3.293, also a unit increase in level of debt financing would cause decrease in returns on residential property by a factor of - 0.009.

The study further revealed that the P-value were less than 5% in all the variables, which shows that all the independent variables were statistically significant and thus in position to make conclusion for the study.

4.5 Discussion of the Research Findings

The Multiple regression provided results that were in line with the expectations of the study and the literature. The results from correlation analysis depicted a strong association between the dependent variable and the independent variables except for the zonal ordinates which was a constant value and was henceforth omitted from the regression. The adjusted coefficient of multiple determinations depicted high joint explanatory ability of the independent variables.

The study reveals that real estate financing options become more affordable with lower interest rates. The low interest rates generate a shift in the demand for owning homes, impacting positively on the returns of real estate. High interest rate on the other-hand lowers demand impacting negatively on returns. Additionally the study also revealed that cost of construction decreases returns on residential property by a factor of -3.293. This therefore means for a unit increase in cost of construction there is corresponding decrease in return of 3.293 units.

Increase in income levels would cause increase in returns on residential property by a factor of 0.559. This therefore means for any unit increase in level of income, the residential returns would increase by 0.559 units. Increased level of income increases

money flowing in the economy, which in turn increases the demand level of real estate thus leading to sudden rise in prices.

The findings are in line with those of Iman (2006) who stated that with higher economic growth and increasing income level, people are able to spend more on housing which leads to increased demand and increased prices of buildings. Similarly, in a collapse of the economy, falling incomes means that consumers cannot afford to buy houses and consumers who lose their jobs may be unable to payback mortgages and end up with their house being repossessed.

CHAPTER FIVE

SUMMARY CONCLUSION AND RECOMMENDATION

5.0 Introduction

This study wanted to establish the effects of supply side characteristics on returns of residential property in Nairobi County. The study was guided by four independent variables which included income levels, cost of construction , level of debt financing and zonal ordinates.

5.1 Summary of the Findings

This study revealed three significant factors affecting returns on residential real estate. These were level of income, cost of construction and level of debt financing. Out of the three factors the most significant factor affecting residential returns was cost of construction. This variable had the largest co-efficient of 3.293 and negatively impacted on returns for every unit increase. The second most significant factor was level of income, which had a co-efficient of 0.559 and a positive impact on returns for each unit increase. Level of the debt financing also had a negative impact on returns with a co-efficient of -0.009, causing a decrease of 0.009 units for every unit increase in level of debt financing. Zonal ordinates was non significant in the study in relation to residential returns.

The regression equation established was as follows; Returns on Residential Property = $-5154 + 0.559 \text{ Income Levels } (X_1) + -3.293 \text{ Cost of Construction } (X_2) - 0.009 \text{ Level of Debt Financing } (X_3)$.. A unit increase in income level would cause an increase in returns on residential property by a factor of 0.559, a unit increase in cost of construction would cause a decrease in returns on residential property by a factor of -

3.293, also a unit increase in level of debt financing would cause decrease in returns on residential property by a factor of - 0.009.

5.2 Conclusion

From the results it was concluded that income levels, cost of construction and level of debt financing were the major determinants of returns on residential property at the 0.05 level as per the SPSS fitted model. Cost of construction and income levels impacted the most to the returns on residential property in Nairobi.

The regression results suggest that up to 95% of the returns on residential property can be explained by the independent variables considered. This study concluded that there are at least three critical determinants of returns on residential property in Nairobi County that must be addressed to make housing accessible and affordable to the majority of the population. These are cost of construction, income levels, and level of debt financing. Failure to address these challenges will result in increased gap between supply and demand for housing that will further fuel growth of slums and escalating prices of houses which middle and low income population cannot afford. The end implications are that availability and affordability of houses in Nairobi will remain a major challenge as population and urban migration continues to grow.

5.3 Recommendations

This study therefore makes the following recommendations;

The national government in collaboration with the county government should come up with an efficient plan of offering subsidies to private real estate investors in order to promote investment in real estate sector. Subsidies should be easily available and adequate for the low income housing, middle and high income housing projects.

These subsidies can be in form of construction materials, financial subsidies, tax subsidies as well as supply of land for development of residential property. Further, the County and the National Governments should offer loans to private developers at lower rate than the rates charged by mortgage lending institutions.

The county government should amend the current zonal ordinates in order to allow and accommodate construction of more buildings in the study area. This amendment should go inline with development of relevant infrastructure to support high density settlement. This will allow for construction of high-rise residential buildings in order to meet the overwhelming demand of residential property over limited supply of land.

Regulations should be formulated by the government that will guide real estate market. These regulations should be able to ensure that people do not buy residential houses for speculation purposes but for consumption purposes only. These regulations should be able to ensure that residential property developers do not overprice their properties which in most cases is higher price than the market price. In addition, the mentioned regulations should be able to control the residential property prices.

The National Government should start an intensive research and establish an institute to spearhead the establishment of an affordable local construction material industry. These building materials should be able to meet the conventional standards of building codes and by-laws. The established research institutions should also be able to advice investors on best ways to finance real estate investments in order to avoid incurring high construction cost.

5.5 Limitation of the Study

One of major limitation of this study was that the format of the secondary data available was not on a project by project basis but was rather formatted collectively as all residential projects completed within each specific year of the study by all the residential developers in the county. However, effort was made to get reliable economic data from economic surveys and Statistical Abstract for the key variables, hence increasing the variability, validity and testability of the data.

5.6 Suggestion for Further Research

This study investigated the effects of supply side characteristics on returns of residential property in Nairobi County. Three critical variable were found to explain up to 95% of factors affecting residential real estate return. A further area for research would be investigation of other critical factors that that would impact significantly on residential return and explain the remaining 5%.

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