

DETERMINANTS OF HOUSING DEMAND IN NAIROBI, KENYA

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DECLARATIONS

This research paper is my original work and has not been presented for a degree in any other University.

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DEDICATION

This paper is dedicated to my late mother Florence Nafula and my immediate family members particularly my dear wife Christabel Abwaku and my children; Dean Nambya and Eva Nafula. May God bless you.

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Irrespective of the aforementioned recognitions, I take full responsibility for any flaws in this paper. It is my conviction that it will contribute to the knowledge in the field of housing demand in Kenya.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey Fuller
ARCH	Autoregressive Conditional Heteroscedacity
ARDL	Autoregressive Distributed Lag
AMCHUD	African Ministerial Conference on Housing and Urban Development
CUSUM	Cumulative Sum
DF	Degrees of Freedom
DF	Dickey-Fuller
DW	Durbin Watson
ECM	Error Correction Model
ECT	Error Correction Term
FDI	Foreign Direct Investment
HD	Housing Demand
KHBS	Kenya National Bureau of Statistics
NGO	Non Governmental Organisation
NHC	National Housing Corporation
OLS	Ordinary Least Squares
KP	Kenya Pound
USA	United States of America
UN	United Nations
VOL	Volume

ABSTRACT

Housing is a key component of urban development. Improved housing is not only a desirable goal in its own right, but it also contributes to economic growth, social development, improved governance and enhanced security and stability. Failure to deal with housing issues will lead to the continued growth of slums and poorly serviced informal settlements on the urban periphery. This study therefore set out to investigate the factors that determine demand for housing in Nairobi City using annual time series data from 1979 to 2009. The Schwarz's-Bayesian Information Criterion (SBIC) was used in lag selection. The tests for stationarity and cointegration were done to avoid spurious results in the estimated model and to depict if there was a long run relationship between two or more non-stationary variables. The Error Correction Mechanism was estimated to capture the long run relationship. The results of the study show that for Nairobi city, the major determinants of demand for housing are income proxied by GDP, the number of households and housing prices. The prices of other goods and interest rates have no significant impact an indication that households are more concerned about housing prices and growth in their income. The study findings could be used to guide policy on urban infrastructure, slum upgrading projects, housing finance and affordable land for housing in both National and County governments.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Housing is a basic human need and with the advent of civilization and subsequent urbanization, housing needs have evolved from simple shelter to modern housing units. At the same time, urbanization and natural population increase are on the rise and hence the need for shelter by the households is also increasing. However, not many households are able to afford good housing as stipulated by the United Nations Habitat Charter. Although most developing countries expanded their residential construction industry during the first United Nations Development decade, all indications show that the housing gap widened during that period. Therefore, the housing facilities of most and probably all developing countries are grossly inadequate.

Developing countries are urbanizing at historically high rates exerting pressure on already inadequate services (Todaro, 1985; Habitat, 1986; Mitullah, 1993). Among the most pressing services is housing, provision of housing has been inadequate due to socio-economic and political factors together with inappropriate housing policies. Where housing policies exist, they are frequently unclear and poorly implemented. This has always resulted to an increased gap between demand and supply of housing (Todaro,1985).

Housing as both an economic good and a basic need, is one of the most challenging aspects of the rapid urbanization taking place in the developing countries. The need for urban housing is generally a consequence of a number of factors which include high urban population growth due to rural- urban migration, natural increase, lag in the development of infrastructure that supports housing development, low purchasing power of the majority of urban households, poor management and lack of appropriate policies especially those relating to building by-laws and standard of low income housing (Todaro, 1985). These factors have contributed to the excess demand for urban

housing. Although shortfall mostly hit the low income groups, it's experienced by the majority of the urban residents (Mitullah, 1993). This is reflected by middle income group's predominant occupancy of housing units planned for the low-income groups as the low income groups resort to unplanned informal settlements. This demand, can only be met if more budget allocations are devoted in housing areas and inflation is stabilized so that the cost of building materials is minimized.

Access to secure shelter and basic services has traditionally been considered one of the most vital components of urban social policy (Hall, 2004). Both have also been directly linked to the level of overall national development not only in the sense that higher income countries have better housing conditions and services, but in the sense that development effort must be committed to addressing urban needs. Basic services include water supply and sanitation, urban transport, health and education services. Basic services play a vital role in environmental sustainability by preventing the pollution of rivers and aquifers and the destruction of the ozone layer. Secondly, serviced housing is an economic asset. Its value may increase over time and it can be used to generate rental income or as a work place. Housing also forms an important part of a nation's or a city's fixed capital, with a buoyant housing market helping to fuel economic growth in other areas (Hall, 2004).

Housing is a basic human want and its attributes include shelter and privacy, location relative to employment area and resident in terms of transportation costs and environmental amenities. In addition to being consumption good, housing may be considered as an investment good (Smith, 1970). Smith pointed out that housing has a duality component which makes its economic analysis difficult but necessary. In Kenya, for any small developer, serviced land rather than money is the problem as demonstrated by residents of unauthorized dwellings in Nairobi and the dynamic nature of slum development. For the departments of public sector in charge of housing development, money seems to be their problem as there are limited funds channeled to housing production sector. This therefore requires the integration of public and private sectors economic and administrative efforts in housing development.

Urban housing draws particular attention to authorities more than rural housing for varied reasons. Urban areas are experiencing high population growth rates than rural areas hence there is a high potential of health and environmental conditions worsening as a result of overcrowding and inadequate facilities. Therefore there is need for public sector to participate more in urban than rural housing development. Moreover unlike rural areas, salient urban socio-economic problems such as sprawling shanty towns, slums or squatter areas, dilapidated shelter structures and appalling lack of basic services are seen in housing. Such housing conditions tend to lower the standards of living of the urban residents. Hence, housing is a major element in the living standards and the general welfare of any society and hence extent to which its need is realized in an economy is a significant measure of economic and social progress.

1.2 Housing Developers and Market Players

Despite some attempts at achieving decent housing for Kenyans, the country has, on the whole, failed to address the dire housing conditions of her population. The situation has been partially alleviated through the activities of the private sector housing developers, who have been a key supplier of housing, particularly in Nairobi (Hassanali, 2009). In the year 2007, the private sector commenced construction of housing units worth Kshs. 9.8 billion and registered growth of 6.9% over the previous year (Republic of Kenya, 2004). But despite intensive overall private-sector activity, these private developers have mainly concentrated in the middle and upper segments of the market with relatively little focus on the low-income market. The low income house units currently constitutes less than 30% of the private development portfolio (Republic of Kenya, 2007), yet this is the segment where the need is particularly acute.

In the past, the government took up the role of housing supplier by controlling planning, land allocation, and development and maintaining housing estates, through the National Housing Corporation (NHC). The NHC is charged with the responsibility of providing subsidized housing and implementing government housing policies and programmes through tenant purchase, mortgages, rental and rural housing loan

schemes. The National Housing Corporation was formed as part of Kenya's post-colonial housing policy, underscoring the importance of providing decent shelter for all urban workers in the country (Hassanali, 2009). While theoretically this should have been feasible, an acute problem has arisen as central government expenditure on housing has been on a consistent decline, stemming from activities of the parastatals such as corruption, price controls, inappropriate building regulations and codes as well as a lack of basic planning and provision of services (Otiso, 2003). In 2007, the National Housing Corporation completed construction of only 309 residential units at an estimated cost of Kshs.507.72 million, with a further 394 units under construction at a cost of Kshs.1,059.9 million. Approved Central Government expenditure for housing for the year 2007 – 2008 was only Kshs.2.2 billion, compared to private sector investments of approximately Kshs.10 billion (Republic of Kenya, 2008).

NGO's have come in to fill in the gap in the housing shortage especially for the low income households. Jamii Bora Bank, a deposit taking Micro Finance Institution, provides a wide range of services to the very poor, and is now engaged in a low cost housing development project for its members, providing housing microfinance loans to the families involved. They began a very ambitious Kshs. 300 million housing project in Kaputei, Kajiado District in 2006. The housing scheme that consist of 2000 homes built on 293 acres of prime land, is a model for low-income housing development in Kenya and has already generated a lot of interest and excitement not only among the members but also among the relevant authorities (Jamii Bora, 2006). Habitat for Humanity Kenya and K-Rep Development Agency have also provided limited project-based housing assistance for low income households with less than 500 housing units. Other NGO's involved in policy making and assisting developers in this sector include: National Urban Forum (Kenya), African Ministerial Conference on Housing and Urban Development (AMCHUD), UN Habitat and Shelter Afrique. These housing developers focusing on the low income market cannot adequately meet the needs of the market unless more players from the private sector join in.

1.3 Facts and Figures on Population

Table 1.1 indicates that Kenya's population increased by more than seven times between 1948 and 2009.

Table 1.1 Kenya Population Size and Trends:1948-2009

	1948	1962	1969	1979	1989	1999	2009
Kenya	5,410,281	8,636,263	10,942,705	15,327,061	21,443,636	28,686,607	38,610,097
Nairobi	-	-	509,286	827,775	1,324,570	2,143,254	3,138,369
Central	-	-	1,675,647	2,345,833	3,116,703	3,724,159	4,383,743
Coast	-	-	944,082	1,342,794	1,829,191	2,487,264	3,325,307
Eastern	-	-	1,907,301	2,719,851	3,768,677	4,631,779	5,668,123
N/Easter n	-	-	245,757	373,787	371,391	962,143	2,310,757
Nyanza	-	-	2,122,045	2,643,956	3,507,162	4,392,196	5,442,711
Riftvalley	-	-	2,210,289	3,240,402	4,981,613	6,987,036	10,006,805
Western	-	-	1,328,298	1,832,663	2,544,329	3,358,776	4,334,282

Source: KNBS, Census Reports Vol.1 1948-1999 and Vol. 1B, 2009

In 1948 when the first census was carried out in the country, Kenya's population was enumerated at 5,410,281 people compared with 38,610,097 people in 2009. The rapid population increase in Kenya has hampered the country's socio economic development by exerting pressure on the available resources.

Table 1.2 Household Numbers and Trends:1979-2009

Total Population and Household Numbers								
	1979		1989		1999		2009	
	Total population	Number of households	Total population	Number of households	Total population	Number of households	Total population	Number of households
Kenya	15,327,061	2,956,369	21,443,636	4,352,751	28,686,607	6,371,370	38,610,097	8,767,954
Nairobi	827,775	200,474	1,324,570	382,863	2,143,254	649,426	3,138,369	985,016
Central	2,345,833	466,687	3,116,703	664,241	3,724,159	924,545	4,383,743	1,224,742
Coast	1,342,794	269,199	1,829,191	360,882	2,487,264	527,427	3,325,307	731,199
Eastern	2,719,851	504,617	3,768,677	677,740	4,631,779	957,648	5,668,123	1,284,838
N/Eastern	373,787	71,972	371,391	70,076	962,143	148,006	2,310,757	312,661
Nyanza	2,643,956	463,321	3,507,162	700,916	4,392,196	968,014	5,442,711	1,188,287
Riftvalley	3,240,402	647,953	4,981,613	1,020,772	6,987,036	1,494,981	10,006,805	2,137,136
Western	1,832,663	332,146	2,544,329	475,261	3,358,776	701,323	4,334,282	904,075

Source: KNBS, Census Reports Vol.1 1979-1999; Munguti, (2008)

The households have been increasing over time since 1979 when Kenya carried out her second complete national census. As indicated in table 1.2, household numbers have more than doubled between 1979 and 1999. They have increased from 332,146 in 1979 to 701, 323 in 1999 and are projected to increase to 877,897 by 2010.

Table 1.3 Population and Household Growth Rates:1969-2009

Population and household Growth Rates							
	1969-1979 Population	1979-1989 Population	1979-1989 Household	1989-1999 Population	1989-1999 Household	1999-2009 Population	1999-2009 Household
Kenya	3.4	3.4	-	2.9	-	3.0	-
Nairobi	4.9	4.7	6.47	4.8	5.28	3.8	4.17
Central	3.4	2.8	-	1.8	-	1.6	-
Coast	3.5	3.1	-	3.1	-	2.9	-
Eastern	3.5	3.3	-	2.1	-	2.0	-
N/Eastern	4.2	-0.1	-	9.5	-	8.8	-
Nyanza	2.2	2.8	-	2.3	-	2.1	-
Riftvalley	3.8	4.2	-	3.5	-	3.6	-
Western	3.2	3.6	-	2.5	-	2.5	-

Source: KNBS, Census Reports Vol.1 1948-1999 and Vol. 1B, 2009.

Table 1.3 indicates that the population growth rate remained constant from 1969 -1989 at 3.4 per cent but started to decrease in 1989-1999 to 2.9 per cent. However, there was slight increase in 1999-2009 period. After registering a negative population growth rate in 1979-1989, North Eastern province recorded a highest growth rate of 9.5 per cent in 1989-1999. However, the 2009 Population and Housing Census indicate that this population growth rate declined slightly to 8.8 per cent per year. The table also shows a continuous decline in the rate of growth of the households for Nairobi from 6.47% in the 1979-1989 period to 4.17% for the inter-censal period 1999-2009.

1.4 Importance of housing

Housing is one of the most important basic needs in every society. The production and consumption of housing affects the socio-economic development process in different ways. It promotes economic growth through the expansion of the construction industry and contributes to reducing poverty by increasing the demand for low skilled workers. Hence, the development of housing solutions has proven to be one of the most cost-effective ways of expanding the asset base of low-income households and enhancing both equity and growth. Nevertheless, most developing countries have failed to provide adequate shelter to their people, and therefore unable to take advantage of the economic benefits of a well-functioning housing sector. Improvements in the housing sector's performance are broadly accepted as a critical public policy with vast social and economic impacts. For instance, increased housing activities could give impetus to the economy with enhanced capacity utilization of related industries such as steel, cement and transportation. This could in turn lead to an increase in government revenues by way of excise, stamp duty, and other taxes. Also demand for building materials, jobs and professions of builders and developers, architects, civil engineers, property valuers, contractors, plumbers and furnishers all thrive when housing activities are booming.

That housing is a major component of household wealth, especially for low-income household Kenyans is evidenced by the surge in demand for ownership. For many households it is the most important form of savings as homeownership is considered a source of protection for wealth against inflation in the long run. In relatively high

inflationary environments, investors move away from money markets to the goods market as a hedge against inflation. Housing equally serves as collateral for borrowing by homeowners, generating funds for other investment and wealth creation.

In most developed economies where housing equity is of much importance to households, it is found that homeownership has a significant impact on household wealth accumulation in the long run. The activities of businesses, especially banks, are also significantly affected by homeownership. There is evidence that banks are the main source of finance for start-up businesses and that they are unwilling to grant unsecured lending. Thus, family homes have become one of the most acceptable collateral for granting credits. Additionally, high returns on housing investment provide yet another basis for increasing bank credit to the sector (Di and Zhu Xiao, 2001).

Housing impacts positively on the social well being of the people. People who are satisfied with their homes and neighbourhoods are more productive at work (Rohe, Zandt, and McCarthy, 2001).

Children whose parents are homeowners tend to achieve higher levels of education and income, own homes sooner, and have larger housing and nonhousing wealth accumulation than those otherwise (Boem and Schlottmann, 2001). Furthermore they also noted housing to be the largest expenditure item in a family budget. These high housing costs can strain a family budget; constrain availability of resources for other household needs such as utilities, education, health care, transportation, saving for retirement and emergencies. High housing costs do also drain family budget of expendable income that might otherwise be spent in the local economy, reducing the expenditure linkages of the household.

1.5 Statement of the problem

The provision of housing and quality of houses are both socio-economic indicators to growth and development in an economy. The Kenya Government through the Ministry of Housing came up with a National Housing Policy for Kenya (Republic of Kenya,

2004) which projected the government to build 200,000 housing units per year to meet this demand. The policy estimated the then current housing needs at 150,000 units per year. According to the policy, this level of production was to be achieved if the existing resources were fully utilized by the private sector with the enabling hand of the government.

The lack of housing to meet demand may come about in two main ways. The first cause is either decay or depreciation of housing stock over time, or through natural disaster. The second cause of lack of housing within any particular region is a result of an increase in housing demand generated through a population increase, combined with positive changes in social and economic factors.

It is in this respect that this study sought to analyse the factors that influence demand for housing in Nairobi County. The factors addressed in this study include economic, demographic and social that are presumed to have an effect on a households demand for housing. Whilst previous studies on housing in Kenya have focused on housing need or housing demand with regard to a particular area using the survey method (Malombe; 1992 and Ngau; 1995), this study used time series data from the KNBS to study housing demand for Nairobi County.

1.6 Research questions

The study sought to answer the following research questions:

- (i) What are the factors that influence housing demand?
- (ii) What is the relative importance of each factor influencing housing demand in Nairobi?

1.7 Research Objectives

The overall objective of the study was to assess the factors that influence demand for housing in Nairobi County.

The specific objectives of the study were:

- (i) To investigate the factors that influence housing demand in Nairobi.
- (ii) To determine the relative importance of each factor to housing demand.
- (iii) Based on findings make policy recommendations for addressing housing demand.

1.8 Significance of the study

Due to the ever increasing population in the country and also in urban areas in particular as a result of immigration and natural growth, there is increased pressure on the provision of housing. To cope with demand for the limited housing available, policy makers require information about housing demand to facilitate formation of effective policies

Data on housing demand is necessary for many aspects of public and private sectors in terms of planning and management. In the private sector, housing demand data is a key element in decision-making about property investment. The success or failure of property businesses is related to the ability of entrepreneurs to understand and predict future demand for housing. In the public sector, housing demand is a key indicator for government in the development and implementation of housing policies and for urban planning facilities.

Compared with other cities around the world and within the country, Nairobi's housing sector is one that is quickly growing. The high property prices as a result of a rapidly growing middle class and the rapid rate of urbanization have turned the housing sector into one of those with critical developmental issues facing the policy makers. Of immediate concern to the policy makers would be the pricing and the source of funds needed to meet the ever increasing demand. Therefore policies that support a housing sector capable of supplying adequate shelter to the population are important to the government's development strategy. Due to these challenges and many others, the need for mainstream urban economics to study the interactions between the housing sector and the macro economy becomes very vital. Thus the study set out to look into the

economy of the city in its entirety rather than concentrate on a particular part of the city, a deviation from studies done earlier by other researchers mentioned previously.

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1.9 Scope of the Study

This study was confined to housing demand in Nairobi and the findings cannot be generalized to other cities and towns across the country even though they might experience similar housing challenges as Nairobi. The choice of Nairobi for this study was based on the fact that it's the capital city of Kenya and one of the oldest, fast growing city.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section provides a review of selected literature relevant to the study. The areas covered in this literature review include theoretical literature, empirical literature, and an overview of literature.

2.2 Theoretical literature

Traditionally, low income housing projects are sited in areas of low land cost and high density building. This allows reduction of the land cost component of each residential unit, facilitating sale at lower prices. In seeking areas with lower land costs, developers have had to undertake low income housing schemes in locations that are peripheral to urban centers where benefit is gained from the proximity to cities but land costs are significantly lower (Hassanali, 2009). Given the likely scale and location of any low income housing development, embedded infrastructure such as water, sewerage, roads, electricity, social services and security are a vital component of housing provision and are fundamental to the success of any housing scheme. These in turn, will greatly improve the people's economic capacities, health and quality of life in general (Nabutola, 2004).

While the debate on whether housing as a commodity or a social service continues, neither of the approaches can demonstrate their success (Graciela,1994). However (Matthew,1979) remarks that there is some evidence that real socialism in the developing world has been more successful in reaching to the poorest groups with some kind of housing solution and would deal better with the housing shortage at least in qualitative terms. Economists have no consensus on the issue of whether housing should totally be left to market forces (Aaron,1972) or whether there should be government intervention (Harms,1972). Free market proponents argue that housing is no different from other goods that require government intervention and the best approach is to leave it to market forces. This in turn allows a “filtering” process

whereby houses rented by households moving to better, newly built accommodation are released to lower income groups. Those of the socialist ideology define housing problem as a result of unjust distribution of the wealth in the capitalistic societies and its solutions as a social responsibility. They recognize the role of centrally planned economy with housing being categorized with other social needs such as health and education (Matthew,1979).

Rosen (1974) disintegrate housing demand into a bundle of housing characteristics. This set up a tradition of studying the housing demand in terms of multiple characteristics rather than only its location. A guiding principle in such studies is the hedonic price methodology (Griliches, 1971, Berndt, 1991).

The housing market is made up of sub-systems. There is a three tiered structure of housing markets. The first is the small, well-financed upper class market which is an exclusive domain of the private sector and draws its funds from institutional finance systems. The second type is the subsidized market catering primarily for middle class workers and civil servants who benefit from public housing. Finally, there is the large and private incremental housing sub-market with no access to formal financing services and which produces housing which does not generally conform to official building codes and regulations (Renaud, 1987).

The number and size of the households is one of the most critical variables affecting estimates of housing need (UN 1980). Stegman (1985) in a New York study brings the issue of household size very clearly. The study observes that despite absolute decline in population in New York the need for housing increased, an inconsistency brought about by shrinkage in household size but space occupancy increased or remained the same as before. It is a factor the study observes by saying that an increase in housing need could still be felt even when household size was at a remarkable level of under two persons in 1980. This works against the usual assumption that as household size increases the need for more housing would increase and vice-versa.

Myers and Vidaurri (1990) note the influence of demographics: “the effect of changing demographics is felt in markets for all types of real estate. In housing markets for instance, demographic factors shape the number of households formed and the type of housing selected”. The demographic factors considered in the study were fertility, mortality and migration.

Borrie (1995) note that demographic factors, such as population, age profile (structure) and household structure are the main factors that determine the extension of a household, the type of household and, consequentially, housing demand. In other words, a change in population size (either an increase or decrease in the number of people) directly affects the extension of family and also housing demand.

Liu, Wu et al. (1996) in a study of housing demand model in Hong Kong, found out that economic variables, such as GDP growth, property-price index and income growth affect housing demand. Housing loans or home loans for instance remain the main financial mechanism for buying housing, and housing loan availability has become an important tool for controlling housing demand.

Yates (2001) in a study of Australia's housing choices: retrospect and prospect asserted that demographic, lifestyle; economic factors and policy changes have all shaped and reshaped housing market. The study noted the factors which most influence housing demand to be the number of teenagers in a household, the number of working people and the number of elderly people.

2.3 Empirical Literature

The relationship between housing demand and factors that influence it has become more important. Many countries, including Kenya, have a capitalist economic system whereby supply and demand of any good are determined by market forces. In this circumstance, the influence of factors, such as household income and housing prices, required repayments on housing loans, and interest rates play a significant role in determining housing demand (Ellis, 2003).

Thomas (2003) analysed how labour income and house prices would influence home ownership. The study found out that among United States households, a one standard deviation in covariance between income and home prices is associated with a decrease of approximately \$7,500 in the value of home occupied housing. Also a positive correlation was found between income and home prices suggesting that households enter financial markets with a greater exposure to risk.

Carliner (1972) studied Income Elasticity of Housing Demand. The results showed that demand elasticities especially for durable goods as housing are greater for permanent income than for current income. The study found out that at given levels of income, young people were more responsive to income changes than older people. This was explained as occurring perhaps because old owners, other things equal tend to be wealthier than young owners.

Cocco (2005) in analyzing the life cycle optimization problem of home owners to explain the variation in composition of wealth showed that house price risk crowds out stock holdings. The study however, does not consider the effects of the rental-versus-owning decisions. The traditional view that investment in housing is risky due to unpredictability of house price functions and illiquidity in the investment is considered in the study.

Lawrence (1978) in an article in the Los Angeles Times found out that an increase in demand for housing resulted from net immigration, faster than average growth of population aged between 20-35 and decline in average household size. The study further noted that the cause of decline in household size was increased proportion of divorced and never married persons in the population who opted to stay alone.

Davidoff (2006) analysed a one period model in which households may hedge against their labour income risks by purchasing houses today and selling tomorrow. The only sources of income to the households are capital gains from investment and labour income. The study found out that the co-movement of house price growth and labour income growth have a negative impact on both the probability of home ownership and

the size of housing investment. The ownership of homes is not attractive to households who are likely to experience negative shocks to labour income and house prices at the same time. The study concludes that households enter financial markets with a greater exposure to risk than is typically modelled.

Serrano (2004) studied the effect of labour income uncertainty in the probability of home ownership in Germany and Spain. Using a simple theoretical formula that highlighted a pivotal role of risk attitudes in the housing tenure decision that would allow introduction of the phenomenon, the study carried out tests using an income uncertainty measure based on panel data labour equations. The findings of the study showed that households facing increasing income uncertainty display preference for renting while those located in a positively skewed income distribution show a greater propensity for home ownership. The study also concluded that income uncertainty analysis in housing decision has important implication for the design of private mortgage insurance products.

Lee (1986) defined housing demand as “housing need” coupled with willingness and ability to pay. From an estimated simple regression, relating net rent to total consumption on housing results revealed that consumption on housing has a negative value net rent. The economic interpretation given is that even when a household has no steady income (proxied by total consumption), they nonetheless still need shelter that may necessitate borrowing or drawing from past savings, thus negative rent.

Holder (1985) analysed the demand for housing in Barbados using a partial adjustment model that included prices, income and interest rates as the major determinants of demand. The study concluded that the level of income and the price of all goods except housing were the most powerful influences on the demand for housing in Barbados.

Arimah (1992) estimated demand functions for a set of housing attributes for the city of Ibadan in Nigeria using a two-step method. The empirical results showed that income, price, household size and the occupational status of the head of household were the

most important determinants of the demand for housing attributes. Besides income and wealth, sociological and demographic characteristics of the household influenced the difference in housing demands. The number of people in the household influences the consumption demand positively since they require more space. Moreover, the nature of professional activity such as being employed or self-employed and professional status (retired vs. in activity) also affected housing demand. The stock value of financial information proxied by age and education also explained housing demand.

Hunaiti (1995), in a study of the relative importance and elasticities of the determinants of housing market behaviour in the urban sector in Jordan, used a loglinear specification and a stepwise multiple regression model. The main finding of the study was that households strive to maintain their level of housing, even if prices increased, by minimising expenditure on other basic needs. Overall, household income and household size were found to be the most important determinants of housing demand.

Halicioglu (2005), in a study of the demand for housing in Turkey; found out that housing demand is determined by economic and demographic factors. The findings of the study showed that the most significant factor in determining the level of housing demand was real income which was positively related to demand for housing, followed by house prices that showed a negative relationship and level of urbanization. The estimated private housing demand function revealed a stable long-run relationship between independent and dependent variables and a relatively stable housing demand function.

Clara (2006) studied the relationship between population and housing. The findings of the study show that the relationship is two-sided. Population is shown to influence housing via housing demand. But also, housing influences the number of people and households via the attraction or deterrence of migrants, keeping in place or pushing away the resident population, and the intricate links with leaving the parental home, and having children.

Bynoe et al. (2008), in a study of the demand for housing in Barbados found out that income, the price of non-housing items and interest rates largely explained the pattern of demand for housing in Barbados, with interest rates apparently having a positive impact on the demand for housing through their effect on mortgage credit availability. This indicated the primacy of individuals' ability to service their mortgage in their housing decisions.

Taufiq (2010) studied the effects of real interest rate volatility on demand for total housing and new housing in USA. The study used monthly data from 1975-2006 and adopted the ARDL lag bounds testing approach to co-integrate and the Hendry "general-to-specific" causality test found out a long run equilibrium relationship between housing demand and its determinants including interest rate volatility. The causality tests showed that housing demand determinants (interest rate volatility) cause demand for both total and new housing in the long run.

2.4. Overview of Literature review

The demand for housing can be studied at two levels; macroeconomic and microeconomic. Macroeconomic studies use time series data to do analysis while Microeconomic studies rely on cross-sectional data to do analysis. From the literature reviewed, we find that most of empirical studies on estimation of housing demand take price, income and demographic parameters either in a log-linear regression or in a two-stage hedonic pricing regression method (Rosen, 1974; Epple, 1987; Bartik, 1987; Bajari and Kahn, 2003).

There is little doubt from the discussions in chapter that there have been studies and deliberations about the housing problem in Kenya (e.g Hassanali, 2009; Republic of Kenya, 2004). Furthermore, the studies that have been done on housing have been limited to understanding the housing problem of a specific area or a group of people in a particular area using survey method and descriptive analysis. Therefore there is need to have an empirical study of the behavior of housing demand at a bigger macro level such as City.

The study aimed at addressing this gap in the literature on housing in Kenya and specifically Nairobi City with regard to determinants of housing demand. In a devolved county, such studies will assist in forecasting housing demand and also designing policies that will address the housing market challenges. The results of this study therefore can be used to guide both the County and National Government policy in matters such as taxation and interest rates which can have an influence on housing demand.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter outlines how the research study was conducted. It includes the research design adopted, the target population, data collection and analysis of the data.

3.2 Research Design

The research design is the conceptual structure within which research is conducted. It consists of the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of the framework of study, availability of various data, and observations. It means the exact nature of the research work in a systematic manner (Kothari, 2004).

The application of Least Squares Estimation with time series data was used to provide information about the presence and strength of associations between variables, permitting the testing of hypothesis about such associations. Secondary data was collected through reviewing various issues of the Statistical Abstracts, Economic Survey and Census Reports from the Kenya National Bureau of Statistics and Ministry of Devolution and Planning.

3.3 Theoretical Framework

A household is assumed to derive utility from consumption of housing (X) and other non-housing goods (T). The objective of the household is to maximize utility subject to the budget constraint (Y). The household is also at the same time faced with the following utility function,

$$U = f(X, T), \dots\dots\dots(3.1)$$

Where:

U = Utility

X =Housing.

T = Other goods.

The household allocates its income on the consumption of the two goods and seeks to maximize utility so it will choose the combination of X and T that maximize its utility. It is assumed the price of housing is P_1 and for the other goods is P_2 and the income of the household, Y, which is fixed. In this case therefore, the household is faced with a constrained maximization problem, that is,

$$\begin{aligned} &\text{Maximize } U=f \\ &(X,T) \dots\dots\dots 3.2 \\ &\text{Subject to} \\ &Y=P_1X+P_2T \dots\dots\dots 3.3 \end{aligned}$$

The augmented function is given as

$$L=f(x,t)+ \lambda(y-p_1x-p_2t) \dots\dots\dots 3.4$$

Utility maximization requires that the first order condition be equated to zero.

3.5

$$\partial / \partial x = f'(x,t) - \lambda p_2 = 0 \dots\dots\dots 3.6$$

$$\partial / \partial \lambda = y - p_1x - p_2t = 0 \dots\dots\dots 3.7$$

The first order condition for x and t yield the demand function of housing and other goods. These are Marshallian demand curves i.e,

$$x = f(p_1, p_2, y) \dots\dots\dots 3.8$$

$$t = f(p_1, p_2, y) \dots\dots\dots 3.9$$

It is known that the demand for two goods will be inversely related to their respective prices. But they may be negatively or positively related to the price of related goods depending on whether they are complements or substitutes.

From equation (3.8) above, the general form of the demand function for housing can be specified as,

$$X=X(P_X,P_T,Y) \dots\dots\dots 3.10$$

3.4 Model Specification

A specific functional form of the housing demand function is the multiplicative form specified as;

$$X = AP_X^{\beta_1} P_T^{\beta_2} Y^{\beta_3} e^\varepsilon \dots\dots\dots 3.11$$

Where

A=Constant

$\beta_i(i=1,2,3)$ are the long run price elasticity(β_1), cross elasticities (β_2) and income elasticity (β_3) of demand for housing respectively.

ε is the error term

Following the above framework and previous literature (Bynoe *et al*, 2008), it is assumed that housing is a normal good, that is, it is positively related to income. Apart from price and income, there are other variables, which affect the demand for housing from the literature review. These include interest rates, population size, number of households and price of other goods.

Taking natural logs on both sides of equation 3.11 we get,

$$\text{Log } X=A+\beta_1\log P_X+\beta_2\log P_T+\beta_3\log Y+ \varepsilon \dots\dots\dots 3.12$$

From the literature, other factors that determine demand for housing are introduced into the model to obtain;

$$\ln X=\beta_0+\beta_1\ln P+\beta_2\ln Y +\beta_3\ln R+\beta_4\text{NHH}+\beta_5\text{Po}+ \varepsilon \dots\dots\dots 3.13$$

Where,

$\ln X$ = natural log of housing demand

$\ln P$ = natural log of price of housing

$\ln Y$ = natural log of income

$\ln R$ = natural log of interest rate

$\ln NHH$ = natural log of number of households

$\ln P_o$ = natural log of price of other goods

ε = error term

β_i are parameters to be estimated

3.5 Working Hypotheses

The study made the following hypotheses:

- (i) A negative relationship exists between the price of housing unit and housing demand. This was tested against the null hypothesis that there is no relationship between price of housing unit and housing demand. It was expected that when price of housing increases, the demand for housing by households will decrease.
- (ii) A positive relationship exists between household income and housing demand. This was tested against the null hypothesis that there was no relationship between household income and the demand for housing. It was expected that when the household income falls, the demand for housing will decrease.
- (iii) A positive relationship exists between population size and housing demand. This was tested against the null hypothesis that a negative relationship exists between the two.
- (iv) A negative relationship exists between interest rate and housing demand. This was tested against the null hypothesis that a positive relationship exists between the two.
- (v) A positive relationship exists between the number of households and the demand housing. This was tested against the null hypothesis that a negative relationship exists between the two.

(vi) A negative relationship exists between price of other goods and the demand for housing. This was tested against the null hypothesis that a positive relationship exists between the two.

3.6 Definition and Measurement of variables

The following table presents the definition and measurement of variables used in the study.

Table 3.1 Measurement and definition of variables

Variable	Definition and measurement	Expected sign and literature Source
Demand for housing (X)	Total number of residential houses completed by the private and public sectors. Unit of measurement was number.	Dependent variable
Price of housing (P)	Average real cost of a unit dwelling, measured in Kenya shillings.	-ve (Halicioglu 2005)
Income (Y)	GDP Nairobi (constant Kes millions). proxy for income	+ve (Bynoe 2008)
Interest rate (I)	Commercial bank lending rate(%)	-ve (Taufiq 2010, Bynoe 2008)
Number of households (NHH)	One or more persons occupying a housing unit and have the same eating arrangement. Measurement in number.	+ve(Hunaiti 1995, Clara 2006)
Price of other goods (Po)	Annual inflation rate(%)	+ve (Halicioglu 2005)

3.7 Study Area Profile

Nairobi lies at the southern end of Kenya's agricultural heartland, 1.19 degrees south of the Equator and 36.59 degrees east of meridian. Its altitude varies between 1,600 and 1,850 metres above sea level. The climate is generally a temperate tropical climate, with cool evenings and mornings becoming distinctly cold during the rainy seasons.

From its earliest times, emerging spatial patterns in Nairobi showed segregation between the Central Business District (CBD) and European, Asian and African

residential areas. By 1909 much of the internal structure especially the road network was developed. The boundary of Nairobi was extended in 1927 to cover 30 square miles (77 km²) as a result mainly of the rapid growth of the urban centre both in terms of population and infrastructure.

The main sources of population growth have been immigration especially from Central Province. The long distance sources have been mainly the Eastern, Nyanza and Western Provinces of Kenya (Obudho and Aduwo 1992:58). Other sources of population growth have been the boundary changes and natural growth factors.

By 1963, the Africans, who formed a major part of the population, lived in the eastern parts, while the Europeans and Asians lived in the western suburbs with access to better services. This position is reflected today not so much in terms of race, but rather in terms of incomes as well as population densities. Inevitably, there are wide variations in population density reflecting different land use patterns within what Obudho and Aduwo (1988) see as six distinct and different land use divisions, namely; the Central Business District (CBD); Industrial area; public and private open spaces; public land; residential areas; and undeveloped land. The spatially divided internal structure is based on land uses and income levels (Olima,2001).

In terms of governance, the City of Nairobi falls under the Nairobi City County (NCC), which is composed of elected members who form the council and the executive staff who run the day-to-day activities of the council. The Nairobi City County is governed in its operations by a variety of legal statutes and administrative decrees from the Office of the President (OP) and the Ministry of Devolution and National Planning. The Nairobi City Council (NCC) provides a wide range of services, through the various departments. In this role, the NCC's efforts are augmented by a number of government agencies and private sector organisations, which are active in the process of infrastructure delivery and management. These partnerships have been characterised by a lack of co-ordination, and at times outright hostility in their actions. The sufferer has

increasingly been the urban resident, and more so those who live in the informal settlements.

3.8 Data Type, Sources and Refinement

Secondary data used covered the period, 1979-2009 was obtained from the various issues of Statistical Abstracts, Economic surveys and Census reports from the Kenyan Ministry of devolution and planning and KNBS. Furthermore, the study used only secondary data and where data was incomplete or unavailable, statistical methods were employed to estimate missing data or data trends.

3.9 Econometric Tests

The estimation of equation 3.13 was done using ordinary least squares (OLS). A specification associated with error correction model (ECM) was applied. The study established the short run and long run equilibriums by using cointegration and error correction model. Tests for stationarity for all the variables used were performed to avoid spurious regression results. Where the variables were found to be unstationary, they were differenced to achieve their stationarity. Co-integration test for the series with higher order of integration was performed.

3.10 Co integration analysis and error Correction Mechanism

A variable that contains a unit root is non-stationary and unless it combines with other non stationary series to form a cointegration relationship, then the regression involving the series can falsely imply the existence of meaningful economic relationship. Variables are cointegrated if their linear combination assumes a lower order of integration. These variables must always be of the same order. The detection of cointegration imply that the relationship between the independent and dependent variables will be most efficiently represented by an error correlation model (Engle and Granger, 1987). The error correction specification facilitates the analysis of the short run effects on the dependent variable and also suggests the speed of adjustment to the long run equilibrium.

3.11 Diagnostic tests

In order to establish the inadequacy or failure of a model, diagnostic tests are used. For instance, in the case of linear regression model estimated by OLS, a series of the assumptions required for OLS to be the best linear unbiased estimator (BLUE) appears to be violated. These include serially un-correlated and homoskedastic error terms, absence of correlation between the error-term and regressors and correct specification of the model. Diagnostic testing plays an important role in the model evaluation stage of econometric studies (Otto, 1994). The diagnostic tests carried out included the ARCH test for heteroscedasticity, normality test for distribution of the residuals and RESET test for the regression specification. In addition CUSUM test for stability was carried out.

3.12 Estimation techniques

The estimation of a function using OLS may result in residuals that violate the assumption of normality of the error terms. Normality is a simplifying assumption of the classical normal linear regression model, and must be satisfied for the method of ordinary least squares to be the best linear unbiased estimator. To ensure the normality of the residuals, the estimation equation used in this study was expressed in logarithmic form. The transformation is justified because it ensures that the errors will be both homoskedastic and normally distributed.

Most macro-economic time series data are not stationary, that is, the variables may have a mean that changes with time and non-constant variance. This means that working with such variables in their levels will give a high likelihood for spurious results and furthermore no inference can be made since statistical tests like F-distribution or T-distribution are invalid. So the first step was to test whether the variables are stationary or to test the level of integration through the Augmented Dickey Fuller unit root test. It has been argued that Dickey-Fuller (DF) test fails to take in to account possible auto-correlation in error process. The ordinary least squares (OLS) estimates of the variants of the DF test will be inefficient if the error term is auto-

correlated. As a solution to this problem, this study employed the Augmented Dickey-Fuller (ADF) test specified below;

$$\Delta X_t = \beta_0 + \gamma T + \beta_1 X_{t-1} + \beta_i \sum_1^n \Delta X_{t-1} + \mu_i \dots\dots\dots 3.14$$

Where β_0 , β_1 , and β_i are the estimated parameters. T is the time trend variable and U_i is the error term which is independently and identically distributed. In each equation, the null hypothesis is that non stationarity exists. The acceptance of the null hypothesis confirms the presence of a unit root.

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION

4.1 Introduction

This chapter outlines the results of descriptive and regression analysis of the study. The first part provides the descriptive statistics while the second part presents regression analysis where an examination of the results based on the equation specified in chapter three is done.

4.2 Descriptive Statistics

Table 4.1 shows the descriptive statistics of the variables in the model.

Table 4.1 : Summary of descriptive statistics

Stats	Demand	Number of Households	Interest rate	Inflation	Price	GDP
Mean	1220.90	529816.60	20.54	12.38	59334.97	530727.50
Median	922.00	495191.00	15.00	11.20	28424.00	507757.50
Standard deviation	980.21	239081.80	11.98	8.79	106330.60	149376.70
Variance	960823.00	5.72e+10	143.46	77.19	1.13e+10	2.23e+10
Maximum	5440.00	985016.00	72.00	45.98	577187.00	836631.60
Minimum	296.00	200474.00	10.00	1.55	7039.00	311450.70

Source: Authors construction based on secondary data

The sample statistics indicate that the demand for housing measured as the total number of residential housing units completed per year stands at a mean of about 1221 housing units for the period 1979 to 2009. The highest number of housing units demanded was 5,440 with 296 housing units being the lowest demand recorded over this period.

The interest rate averaged 20.54% percent over the same period while the mean number of households stood at 529,817. There is however a big margin of the highest interest rate and the lowest interest rate over this period of 62 percent. The inflationary rate maintained a two digit figure of 12.38 percent whilst house prices averaged Kenya pounds 59,334. The GDP, a proxy for income for the study averaged khs 530,728 million. The median interest rate and inflation was 15% and 11.20% respectively.

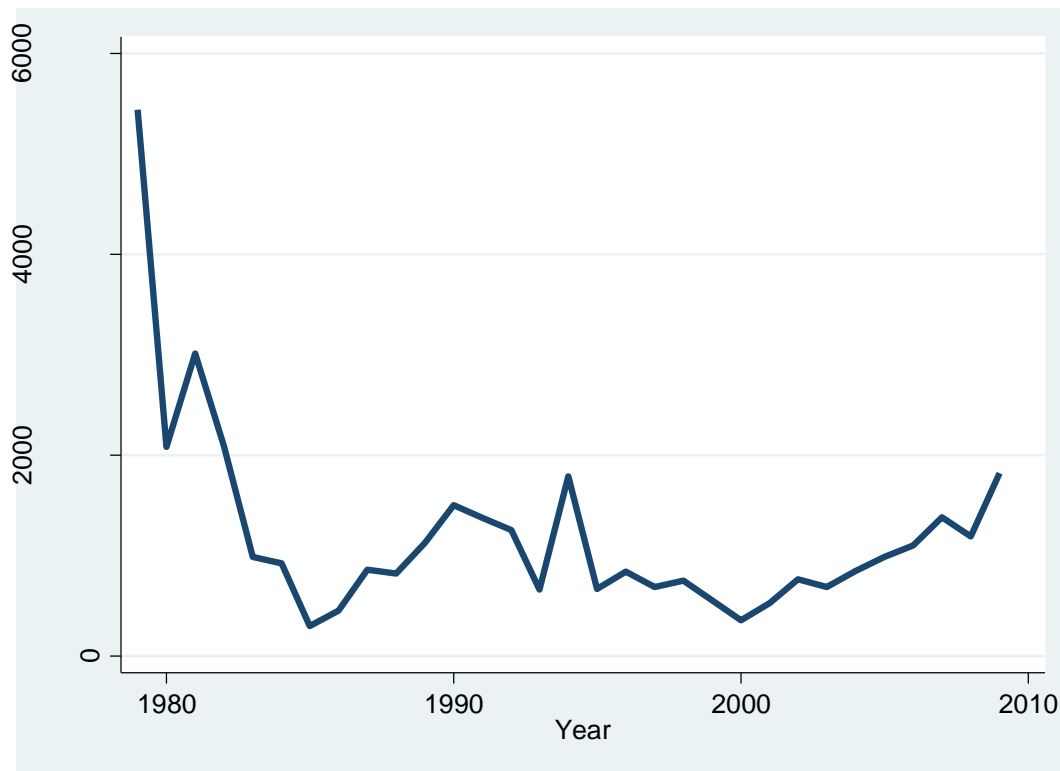


Figure 4.1: Trend in housing demand in Kenya, 1979-2009

From figure 4.1, the demand for housing was approximately 5,500 units in 1979 and has been on a downward trend to approximately 300 units in 1985. This slow growth is explained by the strong emphasis to upgrade the existing units at the expense of constructing new ones. Between 1986 to 1992 the demand maintained a steady growth but in 1993 there was a sharp decline in demand for housing units before a sharp increase in 1994. The fall in demand for housing in 1993 coincided with economic recession which occurred between 1990-1993 as a result of policy changes by the Central bank of Kenya in 1993 following a shortage of foreign exchange reserves that

year. The policy changes that saw the liberalisation of the exchange rate meant that it was now left to the market forces of demand and supply for the first time in the country's history. The weaker shilling had a negative effect on the demand for housing since the country's housing sector was import dependent and with the weaker shilling imports were expensive for the local importers.

There was a steady decline in demand for housing units between 1995 to 2000. This was a period of poor economic performance and therefore access to finance played a very critical role in influencing demand for housing. The trend indicates a steady rise in housing demand from the year 2000 to 2009. This was a period of strong growth in the construction sector mostly brought about by strong macroeconomic performance which led to an increase in demand for land and housing.

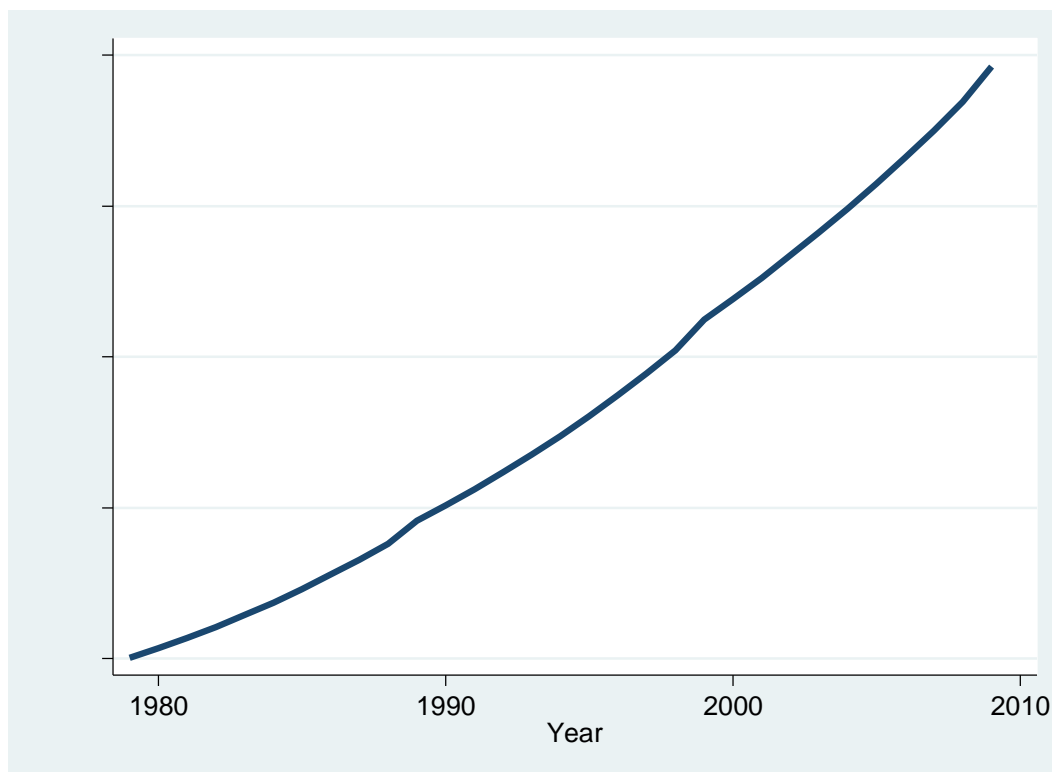


Figure 4.2: Trend in number of households in Kenya, 1979-2009

The number of households in Nairobi increased from 200,474 in 1979 to 985,016 in 2009 as shown in figure 2. This variable captures the impact of formation of new housing units. The data from the KNBS on household numbers captures the growth of these numbers in both the formal and informal settlements in Nairobi. While the growth of household numbers in formal settlements will generally be associated with a positive effect on demand for housing, the same cannot be said of the growth in household numbers in informal settlements. The informal settlements of Kibera and Mathare North for instance are mostly inhabited by the poor people who despite of their large numbers, play a very small role in the overall demand for housing in Nairobi.

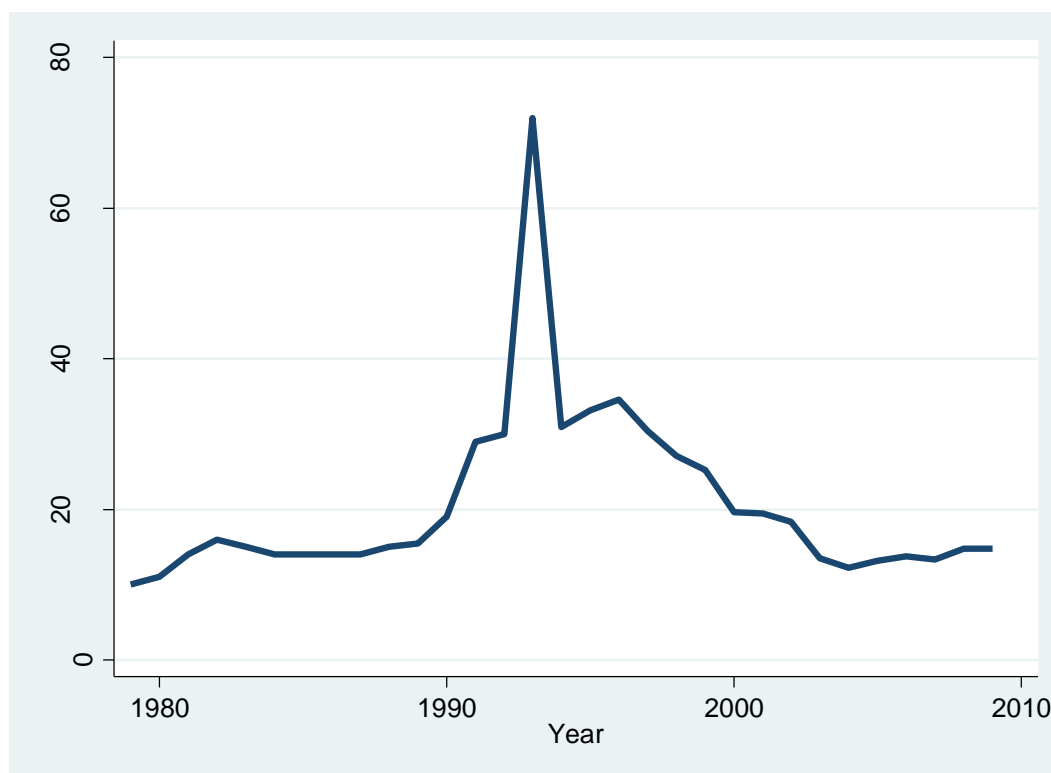


Figure 4.3: Trend in interest rates in Kenya, 1979-2009

The interest rate averaged 15% between 1979 to 1988 before rising to 30% in 1992. In the year 1993, the rate rose sharply to 72% before declining to about 31% in 1994. The sudden rise in interest rate is explained by the fact that between January 1988 and July 1991, the Kenya government as part of its financial sector reform liberalised interest rates. Subsequently, market interest rates sky rocketed to 72% in 1993. In 1994, there

were large capital inflows following liberalisation of the foreign exchange transactions and high interest rates, the shilling appreciated to 45 kenya shillings to the US dollar. This brought about stabilisation and in 1995, interest rates declined to 31%. The rates thereafter maintained an average of about 14% between 1996 to 2009.

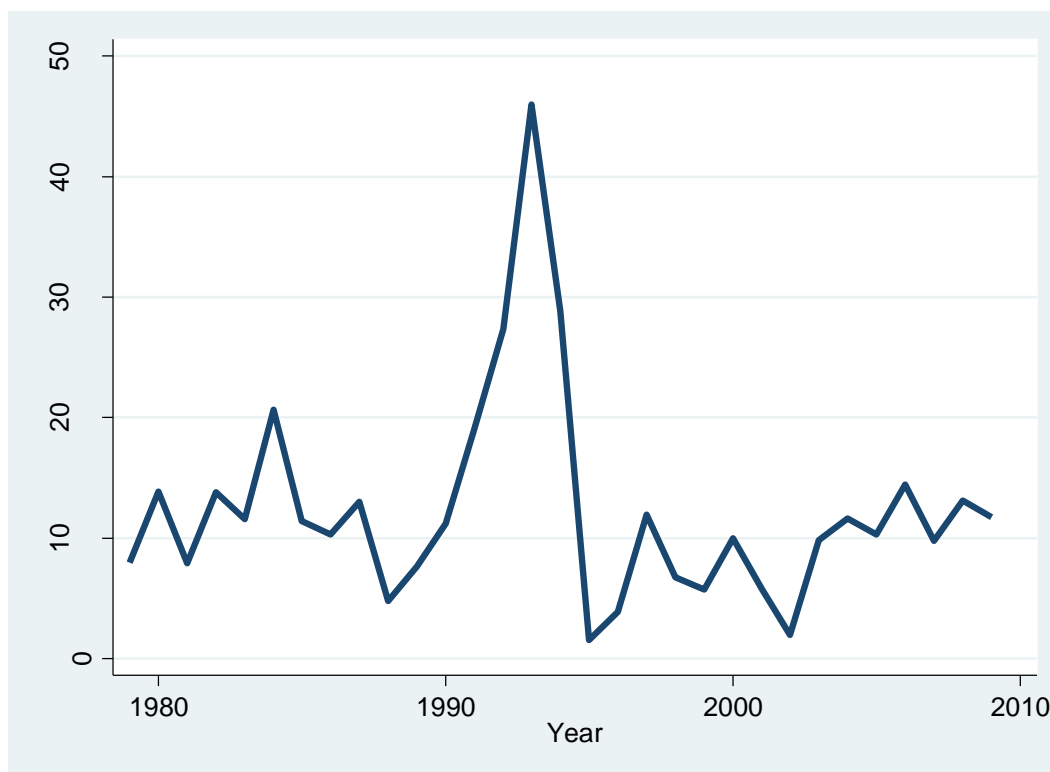


Figure 4.4: Trend in inflation in Kenya, 1979-2009

Inflation was approximately 10% between 1979 to 1987 before declining sharply in 1988 to 4.8% and thereafter rising sharply to about 46% in 1993. The rise in inflation in 1993 is explained by the financial sector reforms which the government implemented in 1988. The reforms not only led to the rise in interest rate but also a further increase in inflation. In the year 1995, it declined sharply to about 2%. Inflation continued to decline up to the year 2002 and thereafter there was a continuous rise to about 12% in 2009 (figure 4.4).

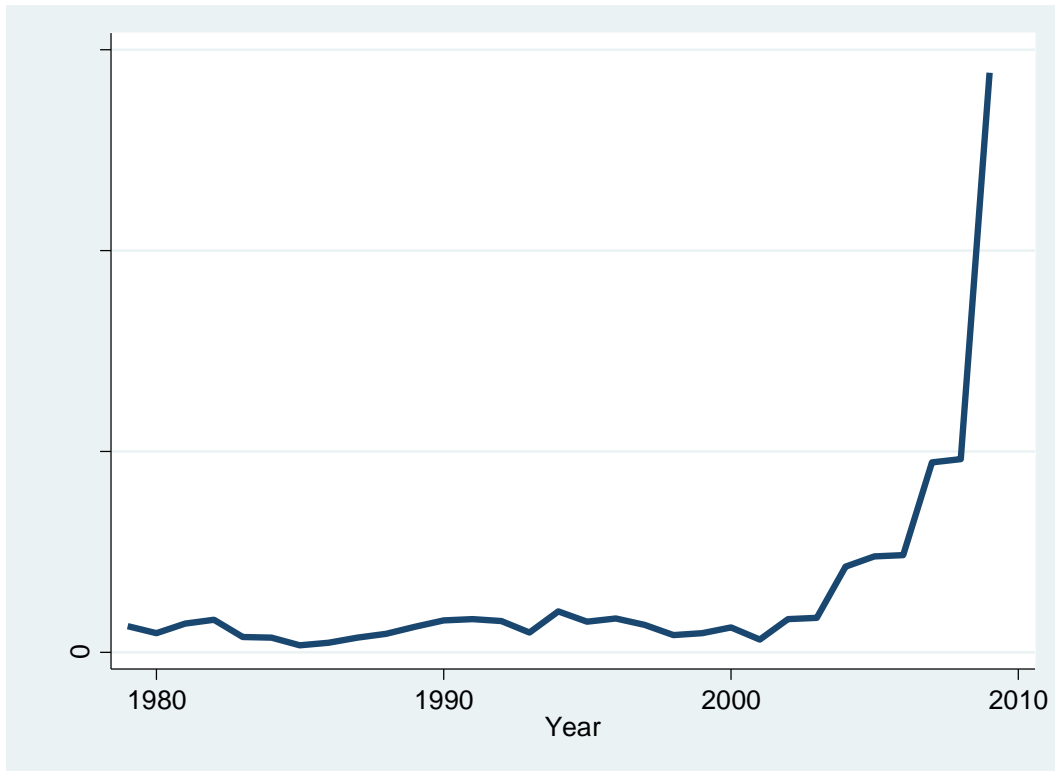


Figure 4.5: Trend in price in Kenya, 1979-2009

From figure 4.5, the general prices of housing units remained stable for the period between 1979 to 2002. Thereafter, there has been a sharp rise up to the year 2009. This trend in prices is explained by the demand for housing which despite being 5,500 units in 1979 maintained a downward trend to approximately 300 units in 1985 and a steady growth to the year 1993. This declining demand for housing therefore helped maintained stable prices for housing units. However following the stabilisation of the financial sector reforms in 1995, the economy has continued to grow and there has been an increase in Kenyas middle class who have contributed to the increase the price of housing.

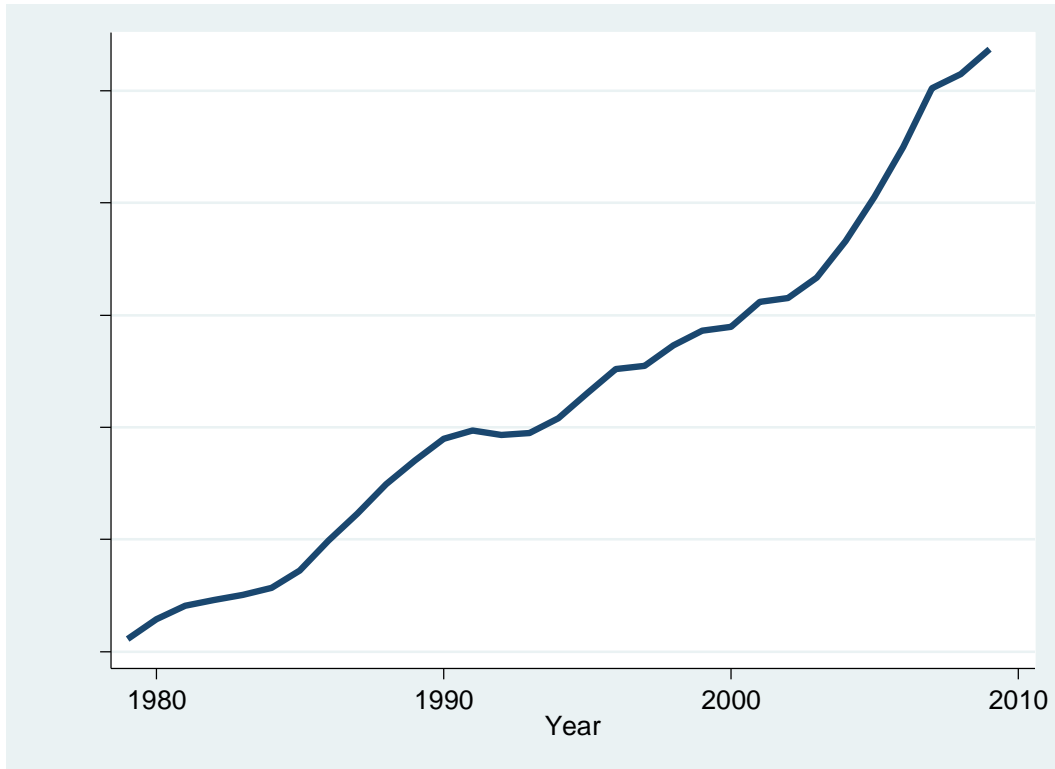


Figure 4.6: Trend in GDP, Nairobi 1979-2009

The GDP maintained positive upward growth from 1979 to 2009 (figure 6). The performance of the Kenyan economy during the first two decades of independence 1979-1983 was impressive. The growth of real GDP averaged 6.6% per year over this period and almost on equal comparison to some of the East Asia's newly industrialised countries (NICs). The performance was credited to consistent economic policy, high domestic demand, promotion of smallholder agricultural farming and expansion of domestic output within East African region. The third decade however marked an era of slow growth as a result of the emergence of powerful external shocks together with imprudent fiscal and monetary management. The expansionary fiscal policy over this period such as establishment of the highly protected but inefficient private sector industries and state corporations, began to cause serious strain to the economy's scarce resources. The budget deficits increased, exports and imports fell and the economic performance declined.

The slow but positive growth continued in the fourth decade of independence from the year 1993 to 2002. The factors responsible for this were poor fiscal and monetary policy regime, internal and external shocks as well as political events such as ethnic clashes which eroded investor confidence.

4.3 Correlation Test Results

Table 4.2: The correlation matrix of the variables

	Housing Demand	Number of Households	Interest rate	Inflation	Price	Gross Domestic Product
Housing Demand	1.000					
Number of Households	-0.328	1.000				
Interest rate	-0.246	-0.012	1.000			
Inflation	0.001	-0.133	0.613	1.000		
Price	0.119	0.596	-0.165	-0.020	1.000	
Gross Domestic Product	-0.311	0.988	-0.002	-0.113	0.641	1.000

Source: Authors construction based on secondary data

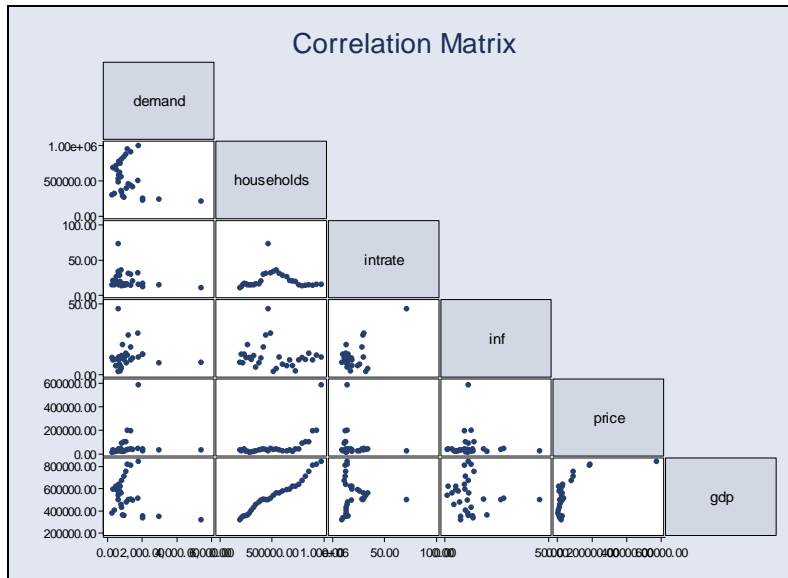


Figure 4.7: The correlation matrix of the variables

The study shows that there is a positive correlation between inflation, price and demand for housing. There is a low negative correlation between number of households, interest rates, GDP and demand for housing. This is an indication that multicollinearity level in the model is low and that each variable captures a distinctive feature of housing demand in Nairobi.

4.4 Stationarity Test Results

4.4.1 Lag Selection Results

Table 4.3: Lag Selection Order

lag	LL	LR	DF	p	FPE	AIC	HQIC	SBIC
0	-1404.51				9.6e+37	104.482	104.568	104.77
1	-1229.71	349.6	36	0.000	3.5e+33	94.201	94.800	96.217
2	-1180.11	99.193	36	0.000	2.0e+33	93.194	94.307	96.937
3	-1123.34	113.54	36	0.000	2.0e+33	91.655	93.282	97.127
4	983.542	4213.8*	36	0.000	2.8e+31*	61.744*	59.603*	-54.545*

Abbreviations:LL,Lag Length; LR,Likelihood Ratio;DF,Degrees of Freedom;p,p-value;FPE,Final Prediction Error;AIC,Akaike Information Criterion;HQIC,Hannan and Quinn Information Criterion,SBIC,Schwarz's-Bayesian Information Criterion

This study data was annual and thus Schwarz's-Bayesian Information Criterion (SBIC) was the best for the study in lag selection. The SBIC is a model selection tool among a finite set of models. In the process of fitting models the likelihood is increased by adding parameters, which in some cases might result to overfitting. The SBIC addresses this problem by introducing a penalty term for the number of parameters in the model. To use the SBIC for model selection, a model with the lowest SBIC over the whole set of others is selected. Thus for the study data, four lags are selected for each of the model equations as shown in table 4.3 above.

Table 4.4: Unit root test results at levels

Variable	ADF Statistic	5% Critical value	Decision
logDemand	-3.540	0.007	Stationary
logHouseholds	-6.670	0.000	Stationary
logInterestrates	-1.988	0.292	Non-stationary
logInflationrate	-3.803	0.003	Stationary
logPrice	0.479	0.984	Non-stationary
logGrossDomesticProduct	-0.221	0.936	Non-stationary

Source: Authors calculation based on secondary data

Table 4.5: Unit root test results at difference

Variable	ADF Statistic	5% Critical Value	Decision
D(Interestrates)	-6.809	0.000	Stationary
D(Price)	-6.079	0.000	Stationary
D(GrossDomesticProduct)	-3.119	0.025	Stationary

Source: Authors calculation based on secondary data

The non-stationarity of time series data is always a problem in empirical analysis. The regression results of non-stationary variables are always spurious and this makes any further inference meaningless. The first step was to test the data for presence of unit roots. In this regard, the study employed the use of Augmented Dickey Fuller (ADF) at levels and then at first difference, for interest rate, price and GDP variables to determine the level of integration. It was hypothesized that the model equation had unit roots; that is was not stationary.

From the results, housing demand, number of households and inflation rate are integrated of first order, I (0) while interest rate, price and GDP are integrated of order, I (1). This means that demand; number of households and inflation rate are stationary in levels (table 4.4) while interest rate, price and GDP are non-stationary at levels and stationary after first difference (table 4.5). After establishing the non-stationarity of the three variables, it is important to test whether the variables are cointegrated.

4.5 Cointegration Results

Table 4.6: Johansen test for cointegration

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	42	136.597	0.000	113.176	94.15
1	53	159.240	0.790	67.889**	68.52
2	62	173.758	0.633	38.853	47.21

Source: Authors calculation based on secondary data

It is hypothesized that the study variables move in a divergent manner in the short term and converge in the long-run through an Error Correction Mechanism. This means that the model variables are cointegrated and if so, then it can be said that a long-run relationship exists between them. The test for cointegration is sensitive to the number of lags. As determined in the section 4.4, four (4) lags were selected. Since the model as formulated is multivariate, then the test is performed using the Johansen Maximum Likelihood method since the Engel and Granger two-step method is best suited for model equations that are bivariate. In this case, a trace statistic of 67.889 with a critical value of 68.52 and a maximum rank of one (1) means that the model is cointegrated with at least one (1) cointegrating equation in the model (table 4.6).

4.6 Diagnostic Test Results

To establish the goodness of fit of the ECM model, diagnostic and stability tests were done. The diagnostic tests determine normality, serial correlation, functional form and heteroscedasticity in the model. The tests carried out include ARCH (Autoregressive

Conditional Heteroscedasticity), and the Jarque-Bera test for normality of the residuals(Appendices figure A2). The Jarque-Bera normality test is distributed as Chi-square, whilst the rest of diagnostic tests used the F distribution. To test for the stability of the coefficients, the cumulative sum of recursive residuals (CUSUM) was used, figure 8. The results revealed stability in the parameters and that at 5% level, the model could be used for forecasting.

Table 4.7: Granger Causality Tests

Null Hypothesis	F-statistic	P-value
log House Demand does not granger cause log Number of households	-0.011	0.467
log Interest rate does not granger cause log House Demand	-0.188	0.763
log House Demand does not granger cause log Inflation rate	0.108	0.923
log Price does not granger cause log House Demand	-0.549	0.508
log House Demand does not granger cause log Number of households	-0.018	0.587
log Inflation rate granger causes log Interest rate	-1.762	0.009
log Price granger causes log Interest rate	1.012	0.033

Granger causality tests whether lagged values of one variable predict changes in another, or whether one variable in the system explains the time path of the other variables. Hence, a variable x is said to Granger cause another variable y ($x \rightarrow y$) if past values of x can predict present values of y . Granger (1988) posits two cardinal principles namely the cause precedes the effect and; ‘*the causal series contains special information about the series being caused that is not available in the other available series*’ (Granger, 1988: 200). Similarly, there is an instantaneous causality from x to y ($x \Rightarrow y$) if present and past values of x predict present value of y . If causality is in one direction for instance from x to y , we have uni-directional causality while if x Granger causes y and y Granger causes x , we have bi-directional or feedback causality ($y \leftrightarrow x$).

The causality tests in table 4.7 show that it runs in one direction, that is, from inflation rate to interest rate or price to interest rate and not vice-versa making the relationship between the three variables unidirectional and significant at 5% level of significance.

4.7 Error Correction Model Results

Since cointegration is established, then causality exists at least in one direction. The presence of cointegration confirms the test for causality using the Error Correction Model (ECM) since unrestricted Vector Autoregression (VAR) after first difference will yield spurious results which lack the long-run properties. The ECM captures the long run relationship and reflects attempts to correct deviations from the long-run equilibrium. The coefficient is interpreted as the speed of adjustment or the amount of disequilibrium transmitted each period of housing demand. A high R^2 in the long-run regression equation is necessary to minimize the effect of small sample bias on the parameter of the co-integrating regression, which may otherwise be carried over to the estimates of the error-correction model. The results of the error correction model are represented in the long run model (table 4.8).

Table 4.8: Cointegrating regression results, the long-run relationship

Variable	Coefficient	z-statistic	z-value
loghousehold	-117.04***	-3.87	0.00
logirates	1.55	1.12	0.26
loginflation	-2.36	-1.19	0.24
logprice	-11.71***	-4.51	0.00
loggrossdomesticproduct	207.32***	3.91	0.00
Constant	-1046.20		
Adjusted R-squared	= 67.10		
F(5,25)	= 13.21		
P>F	= 0.00		

As can be observed from the results, the demand for housing has a trend at -1046.20 while an increase of one household decreases the housing demand by 117.04 units. An

increase in interest rate by a single percentage increases the demand by 1.54 units; an increase in inflation rate by one percentage unit causes a decrease in demand by 2.36 units. Whilst a price increase leads to a decrease in demand by 11.71 units, GDP is an important factor in the determination of housing demand. This is also the case in this study with an increase in demand by 207.32 units if GDP increases by a single unit. The number of households, price and GDP are significant determinants of housing demand.

The adjusted R^2 reveals that the variables in the model explains 67.10% of the variance in the demand for housing units demanded with the remaining 33.90% unexplained. The F-statistic with a p-value of less than 0.05 shows that in general the model is significant. The results of the study show that the number of households, price and GDP are significant determinants of housing demand ($F_{5,25}=13.21$, $p<.05$). In general, inflation rate, interest rate, number of households, price and GDP are significant determinants of housing demand. These variables explain 67.10 percent of the total variation in housing demand ($R^2 = 0.6710$). The F-statistic which determines if the model fits the data better than the mean is itself statistically significant at 5% level.

Table 4.9: Short-run results

Variable	Coefficient	t-statistic	p-value
loghousehold	-0.81	-0.70	0.49
logirates	0.11	0.66	0.52
loginflation	-0.04	-0.45	0.66
logprice	0.74**	5.50	0.00
loggrossdomesticproduct	-0.96	-0.44	0.67
Constant	22.20	1.73	0.10
ECT	0.03		
Adjusted R-squared	= 67.10		
F(5,25)	= 13.21		
P>F	= 0.00		

The results in table 4.9 show that in the short-run the speed of adjustment is 0.03 and not significant. This means that the model attains equilibrium after 3.0 percent adjustment. The results show that in the short run, price is a significant determinant of the demand for housing in Nairobi. There is as well a positive impact of price on demand for housing.

4.8 Determinants of Housing Demand

The overall objective of the study was to assess the factors that influence demand for housing in Nairobi County. The long-run test statistics (table 4.8) show that majority of the coefficients are statistically significant with the expected signs at the five percent level. The number of households, price and GDP of Nairobi are the key determinants of housing demand in Nairobi City.

Income

The coefficient of income in Nairobi is 207.32 (table 4.8), which suggests that in the long run an increase of one percent in income in Nairobi is associated with an increase in housing demand of 207.32 percentage points. Therefore higher income levels proxied by GDP, will increase the demand for housing. Higher incomes stimulate expenditure within the population on housing and thereby affecting aggregate demand upwards by inducing the behavior of a particular household.

Price

The price of housing in this study has a negative impact on demand for housing in Nairobi. A coefficient of -11.71 (table 4.8) would mean that a one percentage increase in price of housing would lead to 11.71 percentage decrease in demand for housing. As is the case with demand when the price of housing increases, the expectation of further increase in price builds into market sentiments, and this expectation lowers demand for housing in future.

However, as noted from the literature review, higher housing prices increase the wealth of the households who provide housing facilities. This increase in wealth stimulate consumer spending which is a component of aggregate demand. The impact of housing

prices on the economy call for the policy makers to find the correct policy response to price bubbles that might be harmful to the economy. The events of 2009 in the USA are enough evidence of the role played by the housing sector in the macroeconomic stability of the country.

Number of Households

The number of households has a negative influence on the demand for housing in Nairobi. As noted from the literature review (Clara 2006), the relationship between population and housing is two sided; population growth influences housing demand positively but housing influences the number of people and households via the attraction or deterrence of migrants. The findings of the study by Clara (2006) point out on the need to have a housing market with diverse and affordable housing stocks both rental and owner occupier for all the entrants. This study expected a positive effect of the number of households on the demand for housing in Nairobi, the conflict between the two can be explained by the fact that urban poverty in Kenya is real and on the rise. The effect is that income inequalities are also increasing significantly in the city. As a result there is a lot of congestion and overcrowding as household size increases. Presence of extreme poverty in some sections of the urban regions substantiate that the quality of life in some rural regions is actually better than that of the urban regions of the developing economies (UNCHS, 2001). The demographic changes would therefore only be a necessary condition for creating demand for housing. The sufficient condition is that the population must have financial resources to positively contribute to demand for housing in Nairobi city. In Nairobi for instance, Kibera slum has more than half a million people living in 225 hectares. Because of this rapid urbanization and poor economic conditions the households residing in such informal housing in the city do not contribute to the demand for housing but rather represent a housing need.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction

This chapter highlights the major findings and makes policy recommendations following issues that have emerged as a result of the analysis in chapter four.

5.2 Summary

This study set out to identify the factors that influence the demand for housing in Nairobi over the period 1979- 2009. The study specifically aimed at determining the relative importance of each factor on housing demand.

To achieve the study objective, annual time series data for the period 1979 to 2009 was used to estimate a demand function. The Schwarz's-Bayesian Information Criterion (SBIC) was used in lag selection. The tests for stationarity and cointegration were done to avoid spurious results in the estimated function and to depict if there was a long run relationship between two or more non-stationary variables. The Error Correction Mechanism was estimated to capture the long run relationship.

The results of the study show that for Nairobi city, the major determinants of demand for housing are income, the number of households and housing prices. The prices of other goods and interest rates have no measurable impact on demand for housing in Nairobi.

The price of housing in Nairobi has been on the increase from the year 1979-2009 due to rapid urbanization and ever increasing middle class. The price structure of housing in the city is composed of high cost of building, cost of land and land transactions and domestic interest rates as majority of housing projects are financed by bank loans

domestically. These factors have basically been driving the trend in prices in the housing sector over the period.

The income variable is one that measures economic growth. A growth in income is associated with good economic periods over which consumer expenditure on housing also increases *ceteris paribus*. The trend of the income variable has been one of upward and positive growth despite the many challenges the economy had to undergo and this has positively contributed to demand for housing.

The number of households is another variable that determines the demand for housing in Nairobi. The expectation was for the number of households to positively influence the demand for housing. The analysis has however revealed the relationship between housing demand and the number of households in Nairobi to be inversely related.

5.3 Conclusion

The results of the study have shown the number of households, price of housing and income to be the major factors explaining the pattern of demand for housing in Nairobi city. The price of housing just like those of other goods and services would influence the aggregate demand level and resource utilization in the economy. Interest rate and inflation rate do not influence demand for housing in Nairobi.

5.4 Policy Implications

The results of the study have shown the coefficients of income, number of households and price to be the most important determinants of housing in Nairobi.

It is recommended that the government should give price subsidies and tax exemptions or concessions on construction materials to companies engaged in housing construction. This in turn would guarantee lower market prices for housing. The high cost of housing as reflected on the final price to the consumer is itself a constraint to providing

affordable housing to the city dwellers majority of who are lower and middle income earners. Subsidy programmes that will allow government systems be more equitable in serving more households with affordable shelter are desirable.

The analysis has shown the price of housing to be a factor explaining the demand for housing in Nairobi city. Its therefore recommended that in order to curb the persistent increase in house prices, the government rationally plans for future urban expansion through provision of serviced sites, necessary infrastructure, easy access to urban land and implementation of realistic building codes and standards for low cost housing.

It is also recommended that the government's role in housing provision should be limited to that of a regulator and facilitator of housing markets. The government playing a role of a coordinator to all housing agencies and government parastatals engaged in the provision of housing to the city residents with the main target being provision of low cost housing.

The income coefficient has shown that income variable is a determinant of demand for housing in Nairobi. It is recommended that a sound macroeconomic environment complemented by the right fiscal and monetary policies are key to increasing growth in income. Growth in income does not only unleash private sector capital and know-how for urban and housing sector infrastructure but does also affect the level of aggregate demand in the economy.

Amongst the many challenges of rapid urbanisation is one that comes with increased populations that lead to rise in number of households which need to be sheltered by the available but limited housing facilities. From the analysis the number of households is a determinant of house demand in Nairobi. It is recommended that this rapid urbanisation in the city should be looked at as a resource rather than a source of chaos. The housing sector is an economic entity rather than a social necessity where increased investment into it by both levels of governments would act as a catalyst to spark and ignite development in other sectors of the economy. This policy has a multiplier effect where

those who depend on the informal sector would be accorded better living and employment opportunities, pulling them towards the formal sector and reducing the influence of the informal sector. Once the housing market becomes more formalised, then subjecting it to real taxes and utility charges will serve a source of revenue for the governments.

5.5 Limitations of the study and areas for further research

The analysis in this study was limited by available data. The study used only secondary data from KNBS. Where data sets were incomplete for instance on number of households, statistical methods were employed to extrapolate. There were also limitations on variables where some that affect demand for housing were omitted. They include housing loans, marriage rates, divorce rates, level of urbanization, age profile and household structure.

Nevertheless, the limitations are insignificant to affect the reliability of the results. I would however recommend that future studies on housing demand should include the factors not considered in this study, subject to availability of data.

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APPENDICES

Table A1: Data used in the Econometric Analysis

Year	House Demand	Number of Households	Interest rate %	Inflation %	Price '000' K£	Gross Domestic Product Nairobi (Kes. millions)
1979	5440	200474	10	7.98	25894	311450.69
1980	2081	213445	11	13.87	19324	328866.94
1981	3011	227255	14	7.9	28424	341276.88
1982	2087	241958	16	13.82	32713	346418.14
1983	988	257613	15	11.6	15552	350952.93
1984	922	274280	14	20.67	14524	357112.91
1985	296	292026	14	11.4	7039	372470.78
1986	451	310920	14	10.28	9663	399205.07
1987	858	331037	14	13.01	14708	422906.31
1988	820	352455	15	4.8	18165	449139.96
1989	1129	382863	15.5	7.62	25621	470206.19
1990	1501	403078	19	11.2	32074	489917.48
1991	1378	424361	29	19.1	32985	496964.19
1992	1255	446767	30	27.33	31420	492990.99
1993	662	470356	72	45.98	19881	494732.22
1994	1789	495191	30.9	28.81	40750	507757.45
1995	669	521337	33.1	1.55	30628	530130.35
1996	842	548864	34.6	3.86	33884	552114.00
1997	685	577844	30.4	11.92	27320	554736.00
1998	754	608354	27.1	6.72	17327	572988.00
1999	555	649426	25.19	5.75	19400	586197.60
2000	358	676507	19.6	9.96	25042	589713.00
2001	531	704717	19.49	5.76	12600	612003.60
2002	767	734104	18.34	1.96	33249	615350.40
2003	689	764716	13.47	9.82	34450	633395.40
2004	848	796605	12.25	11.62	85100	665725.80
2005	989	829823	13.16	10.31	95787	705048.00
2006	1102	864427	13.74	14.46	96763	749682.00
2007	1381	900474	13.32	9.76	189263	802109.40
2008	1191	938023	14.8	13.1	192647	814357.20
2009	1819	985016	14.8	11.75	577187	836631.60

Source: Kenya, Economic survey and statistical abstracts; various issues.

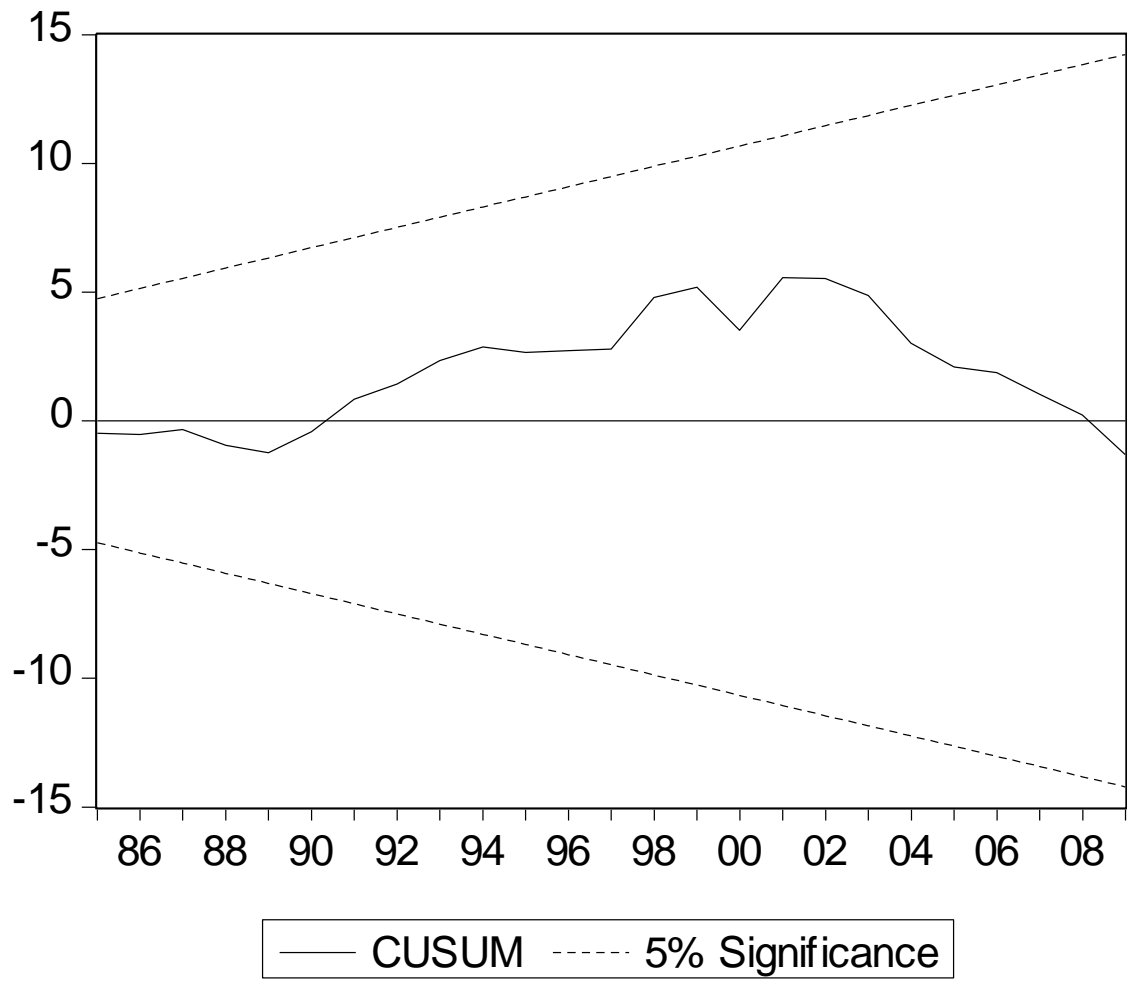
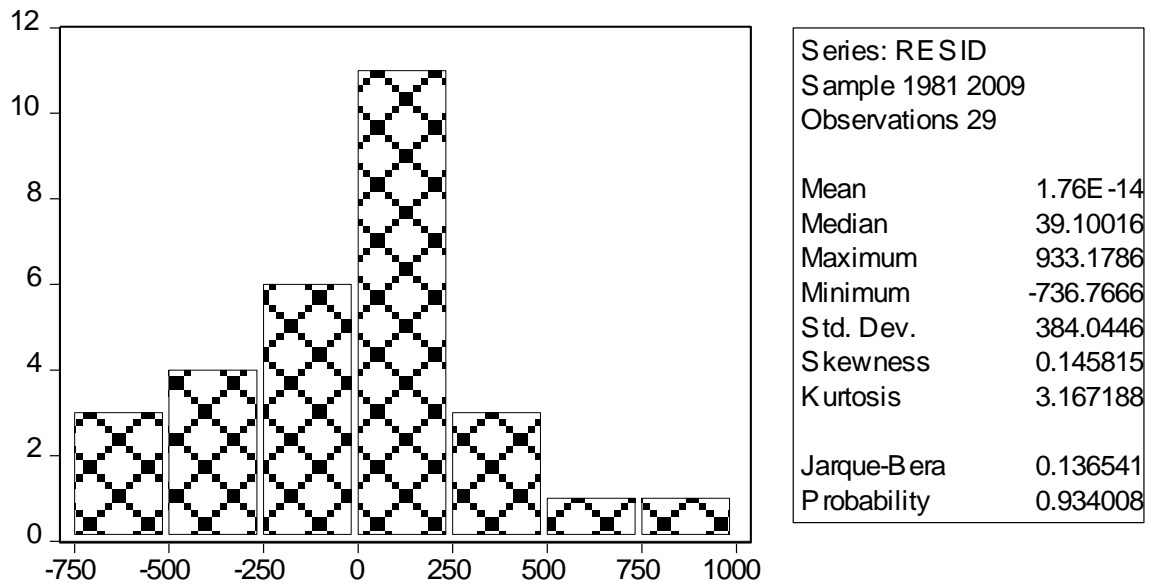


Figure A1 : Cumulative Sum (CUSUM) Test



Graph A1: Normality Test

Table A2: Causality results

	D_Indemand	D_Inhouseholds	D_Ininterestrate	D_Ininflationrate	D_Inprice	D_InGDP
L_ce1	0.025	0.001	0.116*	0.071	0.099	0.002
	(0.788)	(0.567)	(0.033)	(0.643)	(0.321)	(0.704)
LD.Indemand	-0.112	-0.012	-0.809	-1.022	-0.097	-0.023
	(0.890)	(0.500)	(0.082)	(0.436)	(0.910)	(0.560)
L2D.Indemand	-0.430	-0.009	-0.530	0.283	0.013	-0.005
	(0.488)	(0.540)	(0.137)	(0.779)	(0.984)	(0.867)
L3D.Indemand	0.380	-0.011	-0.617	0.108	0.034	-0.018
	(0.582)	(0.467)	(0.120)	(0.923)	(0.963)	(0.587)
LD.Inhouseholds	-1.028	0.248	-22.346	-3.910	-15.475	0.007
	(0.964)	(0.635)	(0.092)	(0.917)	(0.526)	(0.995)
L2D.Inhouseholds	-9.501	-0.086	-6.493	-4.980	-27.100	0.192
	(0.648)	(0.856)	(0.587)	(0.883)	(0.219)	(0.851)
L3D.Inhouseholds	-15.299	-0.183	-19.943	-20.334	-28.516	-1.192
	(0.539)	(0.746)	(0.164)	(0.615)	(0.280)	(0.330)
LD.Ininrate	1.188	-0.010	-1.762**	-0.006	-0.332	-0.035
	(0.315)	(0.722)	(0.009)	(0.998)	(0.791)	(0.544)
L2D.Ininrate	-0.142	0.004	-0.295	-1.303	-0.224	-0.000
	(0.819)	(0.801)	(0.408)	(0.194)	(0.732)	(0.992)
L3D.Ininrate	-0.188	-0.006	0.211	-1.075	0.264	0.006
	(0.763)	(0.683)	(0.557)	(0.288)	(0.689)	(0.845)
LD.Ininflationrate	-0.095	-0.001	0.461	0.018	0.439	0.017
	(0.833)	(0.925)	(0.075)	(0.980)	(0.356)	(0.444)
L2D.Ininflationrate	0.149	0.001	0.152	-0.146	0.118	0.007
	(0.421)	(0.784)	(0.154)	(0.627)	(0.548)	(0.453)
L3D.Ininflationrate	-0.212	0.001	0.287*	0.129	0.136	0.006
	(0.399)	(0.831)	(0.047)	(0.751)	(0.610)	(0.638)
LD.Inprice	0.166	0.013	1.025	0.981	0.067	0.014
	(0.866)	(0.552)	(0.070)	(0.538)	(0.948)	(0.773)
L2D.Inprice	0.420	0.008	1.012*	0.046	0.526	0.020
	(0.610)	(0.674)	(0.033)	(0.973)	(0.547)	(0.617)
L3D.Inprice	-0.549	0.009	0.970*	0.601	0.156	0.015
	(0.508)	(0.641)	(0.042)	(0.655)	(0.859)	(0.721)
LD.InGDP	0.812	-0.001	-10.311	-12.903	-0.094	0.529
	(0.936)	(0.995)	(0.074)	(0.428)	(0.993)	(0.283)
L2D.InGDP	4.060	-0.299	-3.281	-5.509	-0.224	0.048
	(0.762)	(0.326)	(0.671)	(0.800)	(0.987)	(0.942)
L3D.InGDP	-7.400	0.221	-8.074	3.484	-16.810	-0.613
	(0.591)	(0.480)	(0.308)	(0.876)	(0.249)	(0.364)
_cons	0.622	0.012	-0.831	-0.416	1.111	0.024
	(0.404)	(0.467)	(0.052)	(0.731)	(0.159)	(0.515)