Journal of Popular Education in Africa
January – April, 2017, Volume 1, Number 2
ISSN 2523-2800 (online)
Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

Residential Housing Demand in Kenya

By

Mwania Paul Mutwiwa

Abstract
This study provides estimates of the demand of housing in Kenya based on annual time series data for the period 1980-2009. As in other studies of housing demand, the log-linear demand equation was estimated to model the effect of house prices, income per capita, average lending interest rate, prices of other related goods and inflation on number of housing units purchased. Time series techniques were applied to test for unit roots, cointegration and Granger causality. Tests of unit roots are critical to avoid spurious results in the estimation of the model. An error-correction model (ECM) was also estimated to capture short-run dynamics toward the long-run equilibrium. The results show that income per capita is the most significant variable in explaining the demand for housing in Kenya both in the long-run and in the short-run. While the long-run income elasticity is greater than unity, the short-run income elasticity is less than unity. The results also show that the adjustment parameter is about 0.43 indicating significant but gradual adjustment toward the long-run equilibrium. The average lending interest rate which was used as a proxy for prices of housing does not have significant impact on demand for housing. Granger causality test indicate unidirectional causality from income per capita to number of housing units purchased. This implies that increase in income per capita directly affects housing demand. Consequently, to increase the uptake of modern housing units, the Government of Kenya should endeavor to overcome constraints on increasing income per capita.

Citation Format

Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

Journal of Popular Education in Africa
January – April, 2017, Volume 1, Number 2
ISSN 2523-2800 (online)
Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

Residential Housing Demand in Kenya

By Mwania Paul Mutwiwa

Introduction

This chapter provides background information on housing sector in Kenya. This includes, developments over time, the challenges facing the housing sector, and the regulatory and institutional framework. The chapter also provides a statement of the research problem, research objectives and significance of the study.

Background on Housing in Kenya

Access to adequate and affordable housing by a country's population is a primary goal of economic development. But according to the 2005 UN-Habitat report, by the year 2030, an additional 3 billion people, by then about 40% of the world's population, will need access to housing. This translates into a demand for 96,150 new affordable units every day and 4000 every hour (UN-Habitat, 2005). Across the world, an average of one in every three urban residents lives in housing with none or few basic services. In many sub-Saharan African cities, the slum population accounts for over 70% of the urban population (UN-Habitat, 2006). It is further estimated that every week in developing world more than one million people are born in or move to cities. As a result, it is estimated that the urban population of developing countries will double from 2 to 4 billion in the next 30 years. (Kissick et al, 2006).

In Kenya, the housing shortage is associated with land shortage, red tape bureaucracy, inadequate housing finance and very high prices of building materials (Republic of Kenya, 2004). Kenya needs to strategize on how to improve access to affordable housing to meet its demand. If this is not done, then expansion of informal settlements and slums will be inevitable to accommodate a fast growing population.

The Government of Kenya – present and past- has placed the housing sector in Kenya at the centre of government efforts to ensure that the population has access to decent and affordable housing. The sector contributes to the economy in at least two ways: First, the sector plays a vital role in meeting the demand for shelter. Second, the sector creates massive direct employment because it is labor intensive. For example, in the early seventies it was estimated that on average each K£ 1 million spent on modern housing construction in Kenya created one year's full time employment for 500 skilled and 1500 unskilled laborers(Republic of Kenya, 1970). Housing construction also creates indirect employment in associated industries like timber, cement and transport industries.

The housing sector in Kenya has evolved considerably since independence in 1963. The 1966/67 National Housing Policy (Republic of Kenya, 1966) promoted a greater budgetary vote for the government to provide affordable housing. At that time the population of Kenya was just over 9 million people. But it was growing at a rate of 3 percent per annum nationally and 5 to 6 percent per annum in the urban areas (Republic of Kenya, 1966). The annual housing requirements then were 7,600 and 38,000 new units in urban and rural areas respectively (Republic of Kenya, 1966).

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

According to current estimates, the urban housing needs are 150,000 units per year (Republic of Kenya, 2004). This level of production can be achieved if available resources are fully utilized by the private sector with support from the government. It is estimated that the current production of new housing in urban areas is only 20,000-30,000 units annually, giving a short fall of over 120,000 units per annum(Republic of Kenya, 2004). Inadequacy of affordable and decent housing has been accompanied by low level of urban home-ownership, extensive and inappropriate dwelling units, including slums and squatter settlements.

In recent years, the Government of Kenya has shown renewed interest in the housing sector. As Table 2 shows, actual government expenditure on housing increased by 44.9 per cent from Ksh.1, 969.9 million in 2006/07 to Ksh.2853.5 million in 2007/08. But the actual expenditure as a percentage of approved expenditure has been uneven. For example, in 2005-06 it was 65 percent while in the next financial year it rose to 98.9 percent, and then decreased to 91.2 percent in 2007-08. This might suggest that the absorptive capacity varies from year to year or reallocations of approved expenditure are done away from housing to other uses. In 2009, new housing projects were commenced in Nairobi at a cost Ksh. 696.79 million by the Ministry of Housing for sale to civil servants through the civil servant housing scheme fund (Republic of Kenya, 2009). These include, Ngara Phase 1, Jogoo road, Upper hill, Kileleshwa and Kilimani.

The Research Problem

Adequate shelter is a basic need and the housing sector is the sector that plays a critical role in provision of shelter to a country's population. Since independence in 1963, the Kenya government has addressed housing sector issues through various initiatives. The key ones include Sessional paper No. 5 on housing policy of 1966/67 (Republic of Kenya, 1966), the National Strategy for Shelter to the Year 2000 (Republic of Kenya, 2000), the Sessional paper No. 3 on National Housing Policy for Kenya (Republic of Kenya, 2004) and other measures contained in successive National Development plans.

The government of Kenya aims to improve housing conditions countrywide particularly in urban areas (Republic of Kenya, 2004). To attain this goal more recent and better knowledge of the housing market is required. In particular, although housing can be treated as a consumption good, the short-run and long-run behaviour of housing demand in Sub-Sahara African countries and Kenya in particular is still not well understood. Most studies of housing demand have been restricted to developed countries and developing countries outside Africa.

The purpose of this study is to fill this knowledge gap by providing empirical evidence on aggregate demand for residential housing in Kenya using recent advances in econometric methods. It addresses the following research questions. First, to what extent do interest rates, inflation and national income affect the aggregate demand for residential housing in Kenya? Second, what is the direction of causality between housing demand and macroeconomic variables?

Research Objectives

The main objective of this study is to analyze factors that determine the demand for residential housing in Kenya over the period 1980 and 2009. The specific objectives are;

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

a) Estimate a housing demand model that incorporates both macroeconomic and housing-related variables
b) Determine the short and long run relationship between housing demand and macro-economic and housing related variables
c) Examine the causal relationship between housing demand and its determinants
d) Derive policy implications from the research findings.

Literature Review

According to economists houses are typically treated as standard financial assets, leading to the conventional view that home ownership is quite risky. Since house prices are volatile and home owners allocate a substantial proportion of their net worth to their house, fluctuations in house prices can have a sizeable effect on homeowners' balance sheets (Poterba and Samwick, 1997). Further, studies have shown that changes in housing wealth can lead to significant changes in homeowners' consumption (Case, Quigley and Shiller, 2003) and over-investment in housing can distort their financial portfolio allocations (Brueckner, 1997, Flavin and Yamashita, 1998).

Households that do not own a home must rent, purchasing their housing services on a spot market and thus subjecting themselves to annual fluctuations in rent. Owners by contrast avoid this rent uncertainty by buying a long lived asset that delivers a guaranteed stream of housing services for a known up-front price. Linneman (1986), Rothenberg, et. al (1991) and Hansen and Skak(2005) provide a theoretical argument for a range of economic determinants for homeownership. They argue that individuals or households choose to own a stock from which housing services flow if it is optimal or welfare maximizing given their specific economic conditions. They further argue that changes of the economic environment may lead to change in the optimal choice away from ownership or into ownership.

Housing characteristics and the process by which housing is constructed and occupied are key aspects of the living standards of households in developing countries. In addition, housing is important to households in both developed and developing economies because it is the largest fixed capital investment that households make. In developing countries, housing accounts for 10-30 percent of household expenditure, 6-20 percent of the GNP and 10-50 percent of gross fixed capital formation (Malpezzi, 2000). Other than human capital, housing and land are the two types of capital that are most widely owned. Housing is a form of consumption that can be overlooked when analysts estimate overall standards of living using housing survey data. For example families that rent, their housing include rent payments as part of their overall expenditure whereas families that own their housing often report incurring little current expenditure on housing since they are consuming the fruits of the previous investment.

Empirical Literature review

The factors that determine demand for housing have been discussed at length in the literature. However the relative importance of these factors in explaining housing demand remains a matter

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

of controversy among many writers. There are two broad categories of studies: microeconomic and macroeconomic studies.

Macroeconomic studies of housing demand

Lewis-Bynoe, Archibald and Howard (2005), provide empirical estimates for the demand function for new housing in Barbados using time series data for the period 1965-2004. They used an Autoregressive Distributed Lag (ARDL) modeling process to capture the effect of prices, income, interest rates and demographic factors on demand. The computed elasticities indicated that income is the most significant variables in explaining the demand for new housing. The price of housing has no measurable impact, which would indicate that the ability to service one's mortgage may be more critical to the householder. The results of this study also indicate that income, the price of non-housing items and interest rates largely explain the pattern of demand for housing in Barbados, with interest rates apparently having a positive impact on the demand for housing through their effects on mortgage credit availability.

Belayet and Latif (2007) identified the determinants of housing price volatility and to examine the dynamic effects of those determinants on housing price volatility using quarterly data for Canada. The generalized Autoregressive conditional Heteroskedastic (GARCH) and the Vector Autoregressive (VAR) models were employed to analyse possible time variation of the housing price volatility and the interactions between the volatility and the key macro-economic variables. They found the evidence of time varying housing price volatility for Canada. Their VAR, Granger causality and the variance decomposition (VDC) analyses demonstrate that housing price volatility is affected significantly by gross domestic product (GDP) growth rate, housing price appreciation and volatility itself. The impulse response analyses reveal the asymmetric of the positive and negative shocks. The findings of this article have important implications, particularly for those seeking to develop derivatives for housing market prices.

Halicioglu (2005) estimated an aggregate private housing demand function for Turkey using the ARDL. The results suggest that the most significant factor in determining the level of housing demand is real income, which is followed by the house prices and urbanization level. The CUSUM and CUSUMSQ stability tests show that the estimated private housing demand function represented a stable long run relationship between its independent and dependent variables.

Taufiq (2010) investigated empirically the effects of real interest rate volatility on demand for total housing and new housing in USA. He used monthly data from 1975-2006 using the ARDL lag bounds testing approach to co-integration and the Hendry "general- to-specific" causality test. The results indicated a long run equilibrium relationship between housing demand and its determinants including interest rate volatility. The causality tests indicate housing demand determinants (including interest rate volatility) cause demand for both total and new housing in the long run.

Microeconomic studies of Housing demand.

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.

.

Boehm and Schlottmann (2006) used data from the national sample of the American Housing Survey to analyze the mobility decisions of families in traditional owned homes and rental units. They used a continuous time probability model (CTM) to estimate the likelihood of these families moving over the period of 1993-2001. Their empirical results indicate that families occupying both owned manufactured housing and traditional owned housing are associated with lower probabilities of moving than those in rental units. They argued that other things remaining constant, families in both traditional owned homes and owned manufactured housing exhibit negative duration dependence or a decreasing probability of moving over time, while for those in rental units duration dependence is positive. They concluded that manufactured housing was the most viable and affordable housing alternative for lower income families.

Davidoff (2006) developed a one- period model in which households may hedge against their labor income risks purchasing houses today and selling off tomorrow. In his model, the capital gains from housing investment and labor income are the only two sources of income to the households. He found that the co movement of house price growth and labor income growth has a negative impact on both the probability of homeownership and the size of housing investment. Home ownership is not attractive to households who are likely to experience negative shocks to labor income and house price to the same time. The author concludes that households enter financial markets with a greater exposure to risks than is typically modeled.

Thomas (2003) analyzed how labor income and house prices would influence home ownership. In his analysis he found that among US 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 owner occupied housing. This result arises in the presence of controls for the level and distribution of home prices. He found positive correlations between income and home prices. This suggests that households enter financial markets with a greater exposure to risk than in typically modeled.

Sinai and Souleles (2005) proposed a different view of homeownership and argue that owning house is not as risky as people have thought. They point out that the conventional wisdom ignores the fact that the alternative to homeownership, that is, renting is also risk. They argue that all household are in effect born "short'' housing services since they have to live elsewhere. Households that do not own must rent, purchasing their housing services on spot market, and thus subjecting themselves to annual fluctuations in rent. Homeownership can hedge households from rent risks and house price risks. They find empirically that the longer people expect to stay in their houses or the higher the local rent fluctuations the higher the probability of ownership.

Zhang (2007) explores the impact of co movements of labor income, house price and rent on a household's house tenure choice and portfolio choice over the life cycle. He shows that the two hedging functions of home ownership which are to hedge against labor income risk and rent risk, significantly affect the household's decision to rent or own a house and her portfolio choice over the life cycle. He argues that a household whose labor is less correlated with house price is more likely to be an owner, to invest less in stocks and to hold more in bonds. Zhang concluded

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

that in the areas where rents are volatile, a household finds homeownership attractive and therefore has more wealth invested in home equity, less in stocks and more in bonds.

Serrano (2004) investigated the effect of labor income uncertainty in the probability of home ownership in Germany and Spain. He developed a simple theoretical formula that highlighted a pivotal role of risk attitudes in the housing tenure decision that would allow introduction of the phenomenon. He carried out his test using an income uncertainty measure based on panel data labor income equations. He found 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. He concluded that income uncertainty analysis in housing decision has important implication for the design of private mortgage insurance products.

Lauridsen and Skak (2007) analyzed the determinants of home ownership using a 20 per cent random sample of Danish homes with data covering characteristics of both the homes and their inhabitants. Their sample data was from the beginning of the year 2004 and the analysis is based on a logistic regression. By using data directly related to individual household home ownership, the analysis reveals the characteristics and restrictions that influence choice between renting and ownership. Among the characteristics is civil and social status of the bread winner and income. The results suggest that the impact of the determinants correspond to theory.

Overview of the Literature review

The studies of housing demand can be divided into two categories. Macroeconomic studies which analyze time series data and the microeconomic studies which analyze cross-sectional data on households. From the literature reviewed, there is a general consensus that the demand for housing, like the demand for other commodities depends on its own price, income, prices of other commodities. However, other factors also play a role including migration status, demographic factors and neighborhood characteristics (see Goodman, 1988; Skak, 2005; and Scolttman, 2006).

The survey of housing literature indicates that there are discussions about the housing problem in Kenya (e.g Mulei, 1990). Further, research on housing has concentrated on understanding the housing problem using survey methodology and descriptive analysis. There has been a lack of empirical studies to understand the aggregate behavior of housing market yet the housing sector is crucial for the aggregate economy (aggregate consumption and investment).

This study aims to fill this gap in the literature on housing in Kenya with regard to determinants of aggregate housing demand. It falls under macro-economic studies of housing demand. Such studies are useful for forecasting housing demand and designing appropriate policies directed at the housing market. Estimates of housing demand elasticities can also be useful for analyzing taxation policies and also macroeconomic policies. An attempt is made to model housing demand using econometric techniques that leads to more precise results.

Research Methodology

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

The study adopted descriptive research design and used secondary data for analysis. Time series techniques were applied to test for unit roots, cointegration and Granger causality. Tests of unit roots are critical to avoid spurious results in the estimation of the model. An error-correction model (ECM) was also estimated to capture short-run dynamics toward the long-run equilibrium.

Table 3 shows the summary statistics of the variables used in this study. The purpose was to characterize the distributions of the variables by checking normality. The statistics indicated whether each variable is skewed to the left or skewed to the right or it's normally distributed. For the normally distributed series the expectation is that the skewness coefficient ranges from -2 to +2.

Table 3: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
logH	30	7.308699	.321923	6.542472	7.995306
logPQ	30	3.84602	1.066101	2.070653	5.444623
logY	30	7.023085	.2519487	6.501154	7.46784
IR	30	20.892	12.01869	11	72
∏	30	12.523	8.897472	1.55	45.98
D1985	30	.2	.4068381	0	1
D2001	30	.7333333	.4497764	0	1

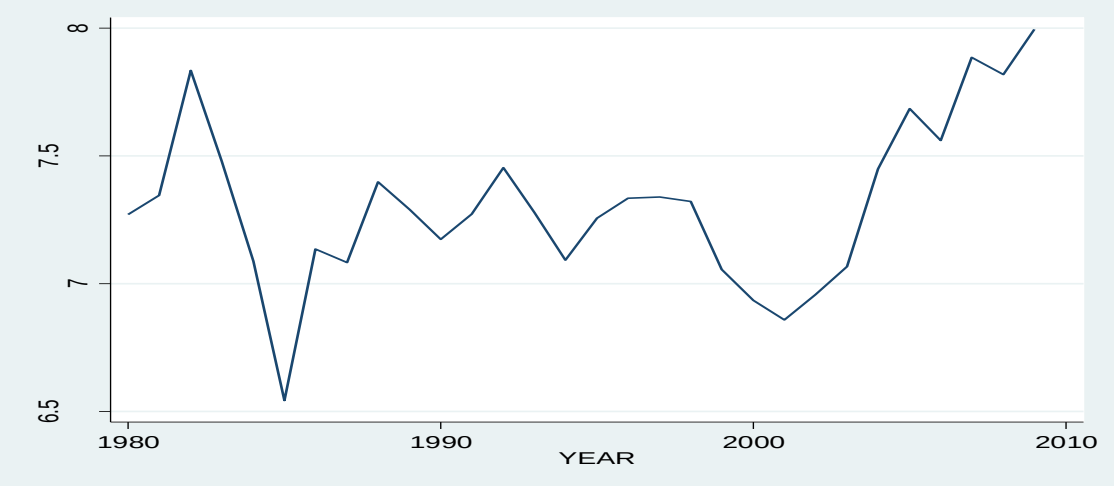
Source: Own Computations

Time plots of the variables can also be used to show the trend of the variable over the sample period. Figure 2 plots the natural logarithm of number of housing units bought.

Figure 2: Natural logarithm housing units bought (H) in Kenya, 1980-2009

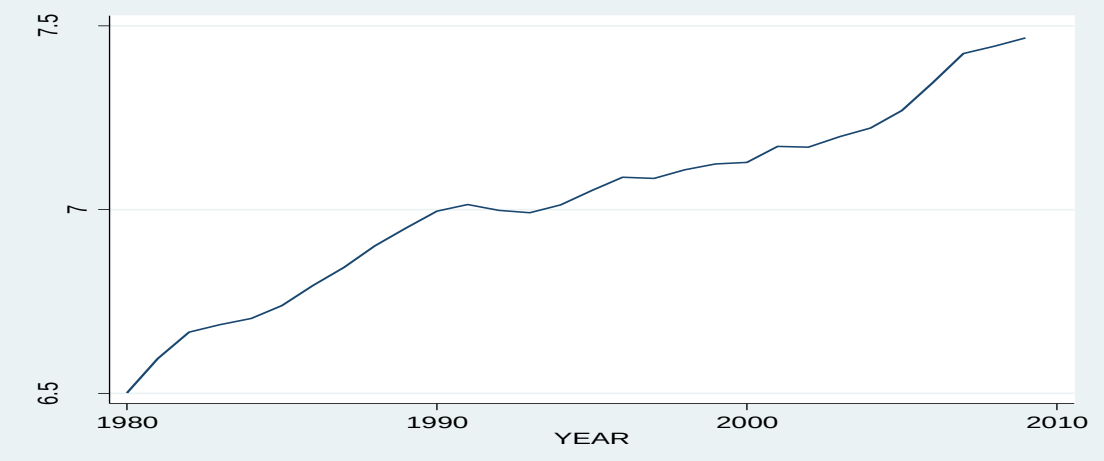
Journal of Popular Education in Africa
January – April, 2017, Volume 1, Number 2
ISSN 2523-2800 (online)
Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.



The graph shows that there was a steady growth in the number of houses demanded from 1980 to 1982 after which a sharp decline was experienced up to 1985. From 1985 to 2001, there was no consistency in the trend on the number of housing units bought. From 2001 to 2009 there was an increasing trend in the number of housing units bought. This period coincided with improved economic performance recorded from 2003 to 2007. The pattern of GDP per capita over the sample period is shown in Figure 3. The graph shows that the GDP per capita increased steadily from 1980 to 2009. This steady growth has contributed positively to the growth in the number of housing units bought as evidenced by the positive coefficient. The index of prices of non-housing goods (Figure 4) shows a positive trend.

Figure 3: Natural logarithm of real per capita income(Y) in Kenya, 1980-2009.



Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.

.

Figure 4: Natural logarithm of price of non-housing goods (PQ), 1980-2009

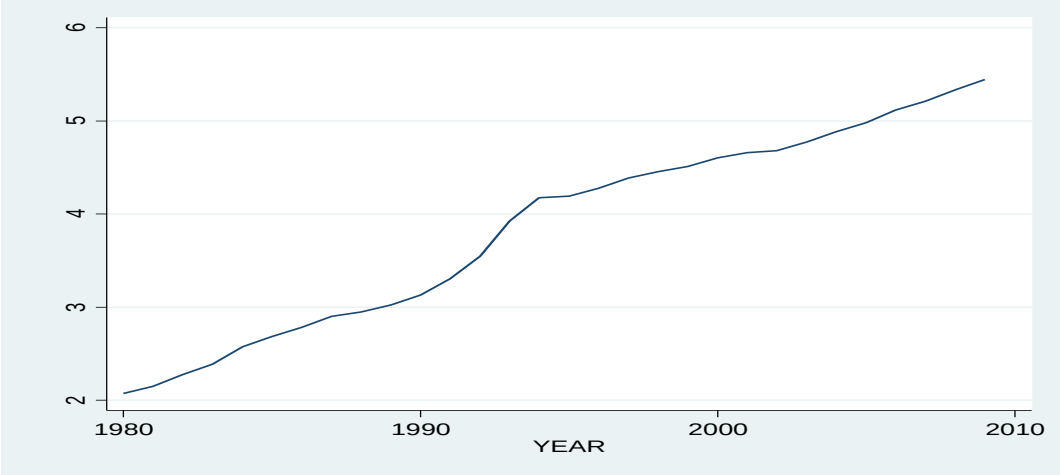
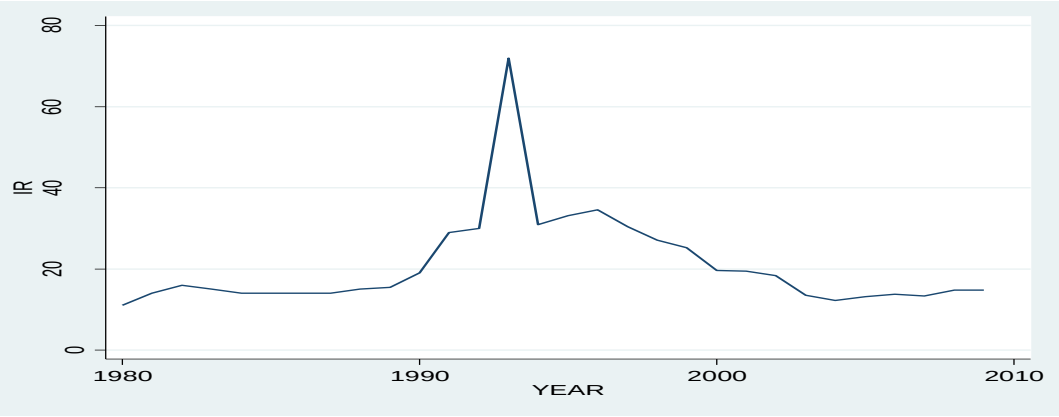


Figure 5 depicts the average commercial banks' lending rate. Although there is no clear overall pattern, the graph there seems to be positive trend in the average interest rate from the years 1980-1993. The interest rates declined but from around 2003 leveled off.

Figure 5: Average lending interest rate in Kenya, 1980-2009

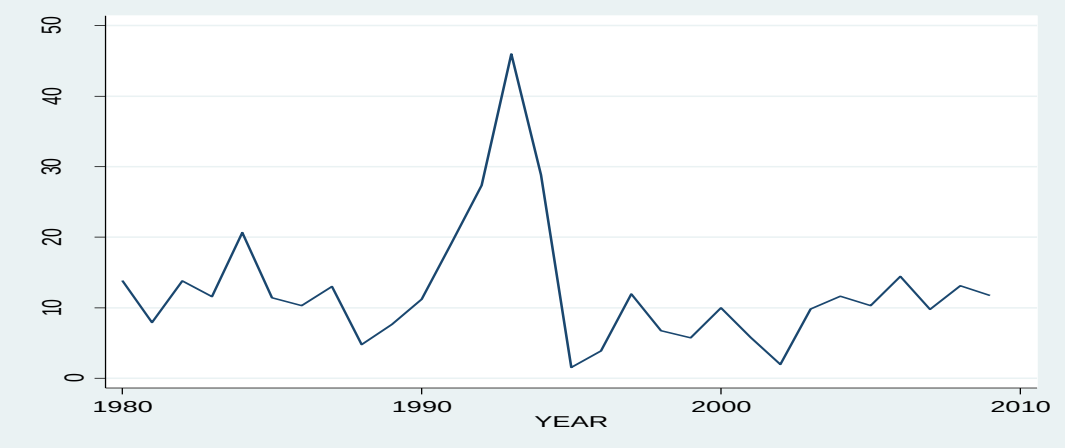


The inflation rate over the sample period is plotted in figure 6. The graph shows that the inflation rate has been quite volatile-very high in some years (e.g. early 1990s) and very low in some other years. This uneven trend could impact negatively on the demand for housing since it would make it difficult to make consumption decisions.

Figure 6: Inflation rate in Kenya, 1980-2009

Journal of Popular Education in Africa
January – April, 2017, Volume 1, Number 2
ISSN 2523-2800 (online)
Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.



Unit Roots Tests

The least squares estimation method is only appropriate for stationary, I(0) time series data. If time series are not stationary, the standard t-tests and F-tests are unreliable and give misleading results. Therefore, the first step is to test whether the time series are stationary or not. Table 4 presents the results of the Augmented Dickey Fuller and Phillips-Peron tests to the level of the variables. The advantage of the PP test over the ADF test is that the PP test is robust to a large variety of serial correlation.

The results in table 4 indicate that for all the variables, the computed ADF and P-P test statistics are not negative enough to reject the null hypothesis of unit root. It can be concluded that that all variables are non-stationary at levels. Thus using least squares method to estimate the demand for housing would yield misleading results.

Table 4: ADF test and P-P test for unit root (levels)

Variable name	ADF test	PP test	COMMENT
Log H	-2.810(-3.592)	-2.144(-3.584)	Non- stationary
Log Y	-1.70(-3.592)	-2.604(-3.584)	Non-stationary
Log PQ	-1.689(-3.592)	-1.503(-3.584)	Non-stationary
Log PH	-1.960(-3.592)	-1.502(-3.584)	Non-stationary
IR	-1.519(-3.592)	-2.692(-3.584)	Non-stationary
∏	-2.612(-3.592)	-2.912(-3.584)	Non-stationary

Note: The critical values are within parenthesis (5% level of significance).
Source: Own calculation.

However, variables can be non-stationary in levels but stationary in first difference. ADF test and P-P test statistics for the first differences are reported in table 5.

Table 5: ADF test and P-P test for unit root (First difference)

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

Variable name	ADF stat	PP stat	COMMENTS
dLog H	-4.821(-3.596)	-5.413(-2.992)	Stationary
dLog Y	-2.883(-2.997)	-3.611(-2.992)	Stationary
dLog PQ	-2.505(-3.596)	-2.946(-2.626)	Stationary
dLog PH	-2.471(-2.997)	-7.056(-3.588)	Stationary
IR	-3.204(-2.997)	-8.641(-2.992)	Stationary
∏	-3.535(-2.997)	-4.992(-2.992)	Stationary

Note: The critical values are within parenthesis (5% and 10% level of significance).
Source: own calculation

The ADF test and P-P test statistics are negative enough to permit the null hypothesis of unit root in first-difference to be rejected. The conclusion is that the time series are first-difference stationary. The time series are integrated of order one, 1(1).

Tests for Co-integration: The Engle-Granger Method.
Given that the variables are integrated of order one, the next step is to establish whether there is a long run relationship among the variables, that is, whether non-stationary variables at levels are co-integrated. The Engle-Granger two step procedure was used. In the first step is to generate the residuals from the long run equation of the non-stationary variables. Then stationarity of the residual was tested for using both ADF and Phillip-Peron tests. Table 6 below shows the results of the cointegrating regression in levels.

Table 6: Results of Cointegrating Regression (long-run model)

Variables	Coefficient	Standard error	t-statistic	P-Value
logY	2.443195	0.9766011	2.50	0.020
logPQ	-0.4673343	0.2046996	-2.28	0.032
IR	0.0060422	0.0078086	0.77	0.447
∏	0.0005717	0.0084125	0.07	0.946
D1985	0.3550594	0.2373623	1.50	0.148
D2001	0.2728428	0.2313755	1.18	0.250
Number of obs = 30 F(6, 23) = 2.58 Prob > F = 0.0465 R-squared = 0.4022 Root MSE = .2795				

Note: D1985 and D2001 are dummy variables

In order to establish whether or not there is cointegration among the variables a test of stationarity of residuals is conducted. The ADF and P-P test statistics and critical values are shown in Tables 7. The results indicate that the residuals are stationary at 5% and 10% levels of

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.
significance using ADF test. The results of the P-P test also show that the residuals are stationary at 5% and 10% levels of significance. It can then be concluded that the results suggest that there is a long-run relationship among the variables in the demand for housing.

Table 7: Cointegration test: two-step Engle and Granger test

	Test statistic	1% critical value	5% critical value	10% critical value
ADF test	-4.073	-4.362	-3.592	-3.235
P-P test	-3.584	-3.723	-2.989	-2.625

Long-run Results

Having established that the variables are stationary at first-difference and that they are cointegrated, estimation results presented in Table 6 can be interpreted as long-run results. The overall goodness of fit of the model is satisfactory. The R-squared of 0.40 indicates 40 percent of the variations in log of the number of housing units bought is explained by the variables included in the model. The F-statistic measuring the joint significance of all regressors in the model is statistically significant at 5 per cent level.

The results indicate that log of GDP per capita and log of the index for prices of non-housing goods have statistically significant estimated coefficients at 5% level of significance. The coefficient of logY is 2.44 which suggest that in the long-run an increase of one percent in the GDP per capita is associated with a positive increase of 2.44 percent in number of housing units bought. Conversely, a drop in GDP per capita would be associated with a drop in housing units bought. The coefficient on log of the index for prices of non-housing goods -0.4673. Hence, a one percent change in this index is associated with decrease in number of housing units bought of 0.4673 percent.

Table 8: Estimation results-ECM of the housing demand in Kenya

Variable	Coefficient	Std. Error	T-statistic	P-value

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

DlogY	3.857883	1.830913	2.11	0.047
DlogPQ	-.2618119	.7080937	-0.37	0.715
DIR	.0027963	.0044271	0.63	0.534
D∏	.0014251	.0066282	0.22	0.832
D1985	-.1644283	.1257595	-1.31	0.205
D2001	.0634351	.1016763	0.62	0.539
ECT	-.4285398	.182379	-2.35	0.029
R-squared = 0.4356 F(7, 21) = 2.32; Prob> F = 0.0645 Number of obs = 29				

Short-run Results

If variables are cointegrated, then an error-correction model can be specified to link the short-run and the long-run relationships. Residuals from the cointegrating regression are used to generate an error correction term (lagged residuals) which is then inserted into the short-run model. The estimates of the error-correction model are presented in Table 8.

The R-squared of 0.4356 indicates that the model explains 44% of the variations in the number of housing units bought. The joint F-test statistic is significant at close to 5 percent level. This indicates that the variables jointly explain housing demand. This means that there are other variables not included in the model which would be responsible for the housing demand. The short-run coefficient on the log GDP per capita is positive and statistically significant at the 5 percent level. However, the short-run coefficients on the other hypothesized determinants are not statistically significant. These results suggest that changes in income per capita is a key driving force in explaining growth of housing demand.

The error correction term (ECT) measures the speed of adjustment to restore long-run equilibrium in the dynamic model. The estimated coefficient is negative and is statistically significant at the 5 percent level. This implies that there is gradual adjustment (convergence) to the long-run equilibrium. The coefficient on the ECT at -0.4285 implies that 43 percent of the disequilibrium in log of the number of houses bought in one period is corrected in the subsequent period.

4.4 Granger causality tests

To answer the causality question, Granger causality test is applied. The vector auto regression in (13) and (14) were estimated. Table 9 presents the null hypotheses and respective F-test statistics for the Granger causality tests. The results indicate that the null hypothesis of no Granger causality may not be rejected in majority of cases. However, the null hypothesis regarding of no Granger causality from GDP per capita to number of houses bought is rejected at the 5 percent level of significance (p-value=0.015). This indicates Granger causality running from GDP per capita to number of houses bought. But there is no evidence for Granger causality from houses bought to income per capita.

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

Table 9: Granger Causality Tests for Housing Demand Variables

Null hypothesis	F-statistic	P-value
LogY does not Granger-cause logH	4.99	0.0159l
LogH does not Granger-cause logY	0.42	0.6651
LogPQ does not Granger-cause logH	0.74	0.4860
LogH does not Granger-cause logPQ	1.32	0.2877
IR does not Granger-cause logH	0.59	0.5604
LogH does not Granger-cause IR	0.41	0.6695
∏ does not Granger-cause logH	0.45	0.6448
LogH does not Granger-cause ∏	0.72	0.4993

Summary, Conclusion and Policy Implications

Summary of the Results

The main objective of this study was to analyze the factors that determine the aggregate demand for residential housing in Kenya over the period 1980 and 2009. A housing demand model that incorporates both macroeconomic and housing related variables was estimated to determine the short run and long run relationships between housing demand and these variables. The study also investigated the causal relationship between housing demand and its determinants. The study utilizes co-integration and error-correction methods to determine whether the variables were stationary or non-stationary. Co-integration analysis is conducted to establish whether or not the variables in the model have a long-run relationship. An error-correction model is constructed to link the short-run dynamics with long-run equilibrium. Finally Granger-causality tests are conducted to establish whether there are feedback effects between housing demand and its determinants.

It is found that the variables are non- stationary in levels but become stationary after the first differencing. Results from the Engle-Granger two step procedure indicate that the variables were co-integrated. The study finds that in the long-run income per capita and the index for non-housing goods are the key factors influencing housing demand. In the short-run only changes in income per capita are associated with significant growth in demand for housing. In addition, the error- correction term is negatively and significantly associated with changes in housing demand. Finally, Granger causality tests indicates unidirectional causality from income per capita to housing demand.

Conclusion and Policy Implications

Income per capita and the prices of non-housing commodities largely explain the demand for housing in Kenya in the long-run. In addition, unidirectional granger causality reinforces the result. This implies that increasing income per capita would positively affect demand for formal

ISSN 2523-2800 (online)
Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.
.

housing. On the basis of these findings one can suggest that the government should continue with efforts to empower households to achieve higher levels of income which would enable them to finance decent formal housing. The negative impact of prices of other goods on housing demand implies that housing and non-housing goods are substitutes. Policy makers should try to stabilize prices of other goods to reduce the negative effect on housing demand.

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.

.

References

Asabere, P. K & Forrest, Huffman (2008); FHA/VA Financing and price Discounts. A Journal of real estate research, American Real Estate Society, vol. 30 (2), pg 191-206

Baffoe B. J. (1998), "The Dynamic impact of macro-economic aggregates on housing prices and stock of houses; A National and Regional Analysis., Journal on Real Estate Financing and Economics.

Cocco, J. (2005). "Hedging House Price Risk with incomplete markets." Mimeo, London Business School.

Davidoff, M. (2003) "Labor income, housing prices and home ownership.'' Mimeo, University of Califonia, Berkeley.

Duca, J. V. (1995). Regulatory changes and housing coefficients; Working paper.Odense: University of Southern Denmark, Department of Business and Economics. papers 95-12, Federal Reserve Bank of Dallas

Ferda, K. (2005), "The demand for new housing in Turkey: An application of ARDL model". The University of Greenwich, UK.

Flavin, M and Takashi, P. (2002) "Owner-occupied Housing and the composition of the household portifolio over the life cycle." American Economic Review, vol.92 (1), 345-362.

Goodman, A.C. (1988), "An econometric model of housing price, permanent income, tenure choice and housing demand," Journal of Urban economics,23,327-353.

Halicioglu, H. (2007), The demand for new housing in Turkey: an application of ARDL model. Global Business and Economic Review 9(1), 62-74

Hansen, J. D and M. Skak (2005) "Economics of housing Tenure Choice". Working

Hargreaves, R.V (2003): "Determinants of Housing Tenure Choice in New Zealand" Pacific Rim Property Research Journal, volume (3) pp 203-223.

Harmon, O.R. (1988), "The income elasticity of demand for demand of single-family owner occupied- occupied housing: an empirical conciliation, Journal of Urban Economics, 24, 173-185.

Horioka, C.Y. (1988), "Saving for housing purchase in Japan", Journal of the Japanese and International economics, vol.2 issue paper 3 pages 351-384.

Linneman, P.(1986): "A new look at the Home-ownership Decision".Housing Finance Review vol.5, pp 159-187.

Malpezzi, M & Stephen, K, (1987b).The demand for housing in developing countries: empirical estimates from household data. Economic Development and Cultural Change 35(4), 687-721.

Munnell, A. H. (1992). Mortgage lending in Boston: Interpreting HMDA data, working papers 92-7, Federal Reserve Bank of Boston.

Rapaport, C. (1996). Housing demand and community choice: An empirical analysis. Staff reports 16, Federal Reserve Bank of New York.

Olsen, E.O. (1987), "The demand and supply of housing service: a critical survey of the empirical literature," in Handbook of Regional and Urban Economics, vol.2

Citation: Mwania, P. M. (2017). Residential Housing Demand in Kenya. *Journal of African Interdisciplinary Studies*: 1, 2, 67 – 84.

.

.

Opinya, O. N (1982): Population pressure on urban housing. The case of Nairobi, Unpublished M.A. research paper, University of Nairobi.

Raymond, Y.C and Raftery, J. (1998), "Income elasticity of Housing Consumption in Hong Kong: a cointegration Approach. Journal of Property Research, 16 (2) 123 -138

Serrano (2004), Labor income uncertainty, Risk Aversion and home ownership, National University of Ireland, May nooth, discussion paper No 1008.

Sinai,, T.(1998) "Are Tax Reforms Capitalised in House Prices?"mimeo, The Wharton school.

Taufiq, C. (2010), "Does interest rate volatility affect the US demand for housing? Evidence from the Autoregressive Distributed Lag Method"

Theriault, M. Francois Des Rosiers, Pal Villeneuve, Yan Kestens (1983), "Modelling interactions of location with specific value of housing attributes". Property management, vol. 21, issue 1.

Thomas P. and Ian (2006) A comparison of household mobility for owned manufactured, traditional, and rental units using the American Housing Survey. Journal of Housing Economics, Vol.15, Issue 2 pages 126-142.

Wahome, G. J. (1884): An economic evaluation of Kibera sites and services project. Unpublished M.A research paper, University of Nairobi.

Wheeler, M., Abdur R. Chowdhury(1993), " The housing market, macro economic activity and financial innovation" An empirical analysis of US data.

Yinger, J. (1982), "Capitalization and the theory of local public finance," Journal of Political Economy,90,917-942.