WILLINGNESS AND ELIGIBILITY TO MORTGAGE FINANCING IN UASIN GISHU COUNTY, KENYA: APPLICATION OF DOUBLE HURDLE MODEL

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Abstract

Mortgage financing plays a significant role in enabling people to be real estate property owners and or homeowners. Despite its significance, past statistics indicated that very few people accessed mortgage finance in Kenya. Previous research indicated that at best only 3% of households in urban areas in Kenya were eligible for mortgage financing. The purpose of this study was to investigate the factors that influence willingness to participate in mortgage financing and eligibility to mortgage financing in Uasin Gishu County, Kenya. The study sought to: determine the role of demographic factors, socio-economic variables and financial variables on willingness and eligibility to mortgage financing. The study adopted explanatory research design. The target population was obtained by visiting all financial institutions licensed by Central Bank of Kenya offering mortgages in Uasin Gishu County. Purposive and simple random sampling techniques were used to obtain 749 respondents for the study distributed proportionately to the 16 financial institutions in Uasin Gishu County. The study administered structured questionnaires individually to all respondents and analyzed using descriptive and inferential statistics. Findings were presented in form of tables, cumulative frequency counts, percentages, graphs and charts. A Double Hurdle Model was employed using data collected on the assumption that willingness and eligibility to mortgage financing by respondents were two independent decisions and were influenced by the same decision factors. The results showed that the age, rental income, tax benefit, income level, loan repayment period and lending interest rate significantly influenced the willingness to participate in mortgage financing by the respondents. The results also showed that age and income level of the respondents significantly determined the eligibility to mortgage financing.

Key words: Mortgage financing, willingness, eligibility, double hurdle model, Uasin Gishu, Kenya

Background of the Study

Globally, the problem of housing markets resonates across many countries, both the developed and developing. For example, in the United States of America, the nation's housing market was said to have gone from boom to bubble and to bust over the past decade, with a devastating impact on the global economy and financial system. Millions of bad mortgage loans were made, homeowners would have had difficulty repaying under the best of circumstances and as a consequence, millions were losing their homes (Zandi & Deritis, 2011). Against this background, it is important to note that, a growing body of research has shown that correctly structured mortgage financing systems can deliver improved housing for larger population segments, which has caused mortgage financing to rise to the top of urban policy and research agendas (Datta & Jones, 2000).

The aim of a formal mortgage financing system is to create institutional arrangements which can efficiently mobilize and channel funds from savers to borrowers to finance a housing investment (Chiquier & Lea, 2009). At an individual level, mortgage financing makes it possible for people to have shelter and a real asset, which might be the largest investment a household makes. Moreover, at a macro level, it generates economic growth via job creation, economic linkages and stimulates entrepreneurial activities (IFC, 2010).

According to Akinwunmi et al. (2008), mortgage financing plays an important role in determining

a country's wider housing system. It also provides the stability and effectiveness of the financial system and the overall financial portfolio of the public, providing social stability and promoting economic development. Datta and Jones (2000), however, argued that for mortgage financing to be effective, those seeking to be home owners have to be motivated to invest in homeownership. For example, Zandi and Deritis (2011) found that the aggressive pursuit of homeownership in U.S since 1930s was largely due to subsidies provided via mortgage interest and gains treatment, and the lower mortgage rates and affordable housing mandates. The Clinton and Bush administrations often pointed to the rising homeownership rate as evidence of their economic policies success. With both parties set on this policy objective, many households that should not have received mortgage loans got them.

In Kenya, some of the mortgage lenders have designed mortgage products that would encourage Kenyans to save from the early years of employment with a view of accumulating enough savings that would enable them access mortgage finance (Housing Finance, 2011). The Retirement Benefits Authority (2009) provided policies that would entice Kenyans towards mortgage financing. Such policies included the use of accumulated pension funds to act as security for mortgage borrowing.

Mortgage loans are generally structured as long-term loans, the periodic payments for which are similar to an annuity and calculated according to the time value of money formulae. The most basic arrangement would require a fixed monthly payment over a period of ten to thirty years, depending on local conditions. Over this period the principal component of the loan would be slowly paid down through amortization (Tse, 2002). According to Dolde (2006) changes in mortgage design do not always lead to fundamentally different mortgage instruments. The emergence of a fixed rather than a variable rate mortgage would be an example of a new mortgage instrument.

According to Njoroge (2013) most real estate firms concentrated their operations in Kenya. Kenya's mortgage market has grown from Kshs 19 billion in 2006 to just over Kshs.91 billion by May-2012. This translated to an annual average growth of 34%, indicating an exponential increase in mortgage loans. He posit that the increase of mortgage financing in Kenya was influenced by sustained economic growth, cross-selling potential, profitability and market penetration and liberalizations of market. Kenya's mortgage market has more than tripled in the past five years.

The nature of housing in Kenya represents major investment requiring substantial capital outlay (Nabutola, 2004). In the majority of housing projects, the developer whether as a corporate or an individual has to borrow and hence the need for mortgage financing (Nabutola, 2004). According to Jared and David (2014) over 70 percent of Kenyans financed construction and acquisition of their homes through personal savings, only 28 percent of Kenyans financed homes and acquisition using bank loans, out of which only six percent prefer mortgage financing. Mortgage financing terms were also perceived to take long before one completely owned a home. Most mortgage financing were repaid in 15 years or more and a good number of homeowners did not know how mortgage works.

It is virtually every Kenyan's dream to own a home. But the reality is that very few of them were likely to be able to save enough to pay for one in cash. The most likely fall back plan is mortgage financing (James, 2014).

Housing Policy in Kenya

Ministry of Lands (2009) formulated a national land policy to provide an overall framework and the key measures required to address the critical issues of land administration, access to land, land use planning, restitution of historical injustices, environmental degradation, conflicts, unplanned proliferation of informal urban settlements, outdated legal framework, institutional framework and information management. It also addressed constitutional issues, such as compulsory acquisition and development control as well as tenure. It recognized the need for security of tenure for all socio-economic groups in Kenya. The policy objectives had the potential of enhancing the realization of the right to adequate housing by enhancing ownership of housing through expanded access to mortgage financing, in addition to promoting security of tenure for land for all groups, particularly low-income earners.

Mortgage Financing in Kenya

In Kenya there are two types of lenders which are authorized by the Central Bank of Kenya. These are ordinary banks, which have the right to engage in mortgage business and mortgage companies. The

largest lender in Kenya is now Kenya Commercial Bank (KCB) following its acquisition of Savings and Loans, which remains as a mortgage subsidiary of KCB. Overall the two largest lenders control over half the market and only 9 banks (6 large, 2 medium and 1 small bank) have a mortgage portfolio exceeding Ksh 1 billion (World Bank, 2011). The current cost of mortgage financing is prohibitive for the vast majority of the population. It is calculated in a report by the World Bank that just 12 percent of the urban population could consider taking out a mortgage loan which represents just 2 or 3 percent of the national population therefore mortgages are completely out of reach for the entire rural population (World Bank, 2011).

According to Hassler and Walley (2007), the Kenyan housing finance sector had grown rapidly over recent years in both value of loans and number of loans. The market had gone through the initial stages and was preparing to enter its next development phase. Consideration was needed to be given to the requirements for ensuring continued growth. The mortgage market was the third most developed in Sub-Saharan Africa with mortgage assets equivalent to 2.5 per cent of Kenya's GDP. Namibia and South Africa only rank higher with Botswana just slightly smaller.

In Nairobi, with a population of around 4 million people at that time, nearly 60% of households lived in slum areas. A recent survey of these settlements showed that 73% of households lived on less than a dollar a day. Moreover around 90% were tenants, forced into this type of tenure by poor access to land and in some cases, by the deliberate choice to invest in their rural homes (Mutero, 2007).

Kenya's mortgage market had more than tripled in the past five years (World Bank and Central Bank of Kenya, 2010). It had grown from Kshs 19 billion in 2006 to just over Kshs 61 billion by May 2010. This translated to an annual average growth of 34% indicating an exponential increase in mortgage loans. The number of new loans had also been rapidly increasing. Since 2006 there had been a steady growth in new loans further validating the growing mortgage market. In 2006 new loans were approximately 1278 whereas by 2009 new loans portfolio had grown to over 6,000. By May 2010 the number of new loans was 2,966 which was in line with the steady growth seen in the previous years. But the mortgage market was still relatively small standing at 15,049 loans, even though it had more than doubled since 2006. While the growth rate in mortgage loans had been rapid at just under 50% since 2006 and had been growing steadily at 14% annually, the loan portfolio remained small (Central Bank of Kenya, 2012). Kenya's mortgage market was dominated by the large banks and represented over 90% of the total mortgage portfolio (Mutero, 2007).

Importance of Mortgage Financing

One of the factors which underlined the American Dream, strategy plan to ensure that mortgage financing increased, consisted of purchasing and officially owning a house. Only a slim margin of the middle class could outwardly afford to purchase a home without applying for a mortgage financing to achieve what many pursued to make a reality Bernstein et al., (2003). The mortgage market had evolved with ever-changing face of real estate.

The mortgage financing history in the United States had been fraught with booms and busts that had enriched and devastated families affected by recessions and depressions. Nevertheless, mortgage financing remained as the primary form of lending when it came to property transactions. The mortgage financing process entailed the granting of monies to obtain a home with good faith that the debtor would repay the loan with interest (Richard and Susan, 2005). According to Bernstein et al. (2003), home mortgages had continually loomed large in the financial situation of American households.

This enormous growth of American home mortgages, as a percentage of Gross Domestic Product (GDP), had been accompanied by a transformation in their form such that American mortgages were distinctively different from mortgages in the rest of the world. In addition, the growth in mortgage debt outstanding in the United States had closely tracked the mortgage market's increased reliance on securitization (Chiquier & Lea, 2009). The structure of the modern American mortgage had evolved over time. The U.S. mortgage before the 1930s would be nearly unrecognizable today: it featured variable interest rates, high down payments and short maturities. Before the Great Depression, homeowners typically renegotiated their loans every year.

The U.S. mortgage provided many more options to borrowers than were commonly provided elsewhere. American homebuyers could choose whether to pay a fixed or floating rate of interest; they could lock in their interest rate in between the

time they applied for the mortgage and the time they purchased their house; they could choose the time at which the mortgage rate resets and the term and the amortization period; they could prepay and generally borrow against home equity freely. They could also obtain home mortgages at attractive terms with very low down payments. The U.S. government had intervened in home mortgage markets that had led to the specific choices available to American homebuyers. The unique characteristics of the U.S. mortgage provided substantial benefits for American homeowners and the overall stability of the economy (Richard & Susan, 2005).

According to Moss (2003), there was inadequacy in the shelter delivery system in Tanzania to cater for the urban population. This had led to an extensive development of squatter or unplanned settlements. The gap between the supply and demand for housing had been widening with time. It was estimated that the deficit in Tanzanian urban centers was about 1.2 million housing units. Lack of appropriate policies on housing development had contributed to overcrowding in housing and poor housing conditions. Among them were those, which concerned the acquisition of building plots, land title, building permit, housing credit facilities and the operation of the main stakeholders in housing development.

According to Moss (2003), housing shortage in Tanzania was fuelled by the lack of formal housing credit facilities. Under the shelter policy, financial institutions lending for housing were to be responsive to the needs of low-income groups in both rural and urban areas. It was envisaged that new financial institutions be created to increase lending opportunities. The Tanzania Housing Bank (here after THB) was created in 1973 and became the sole source of formal housing finance. It was only marginally able to lend to low-income groups and over the years, lending declined in real terms as both building costs and interest rates increased. The THB was liquidated effective from August 1995. There was no formal source of financing for shelter development in Tanzania.

Moss (2003) posited that the main problem associated with housing finance in Tanzania was a near complete lack of formal mortgage housing finance facilities in the country. This had made house construction a difficult process for many households especially those in the low income categories. The government allocation of the national budget to housing had been generally low and was declining and there was lack of capacity for housing development both at national and local levels.

Statement of the Problem

In common with much of Africa, Kenya has a large housing gap which is growing every year and is increasingly prevalent in urban areas. The current annual housing deficit is estimated at 156,000 units per annum based on the population growth and urban migration taking place. There is limited data on current levels of construction but according to the Ministry of Housing, it is 50,000 units a year. The deficit is largely filled by the growth in slum dwellings and continued self-construction of poor quality traditional housing. Mortgages have a big role to play in filling this gap; mortgages have great potential to reach levels such as the average mortgage debt to GDP level in European countries that is in the region of 50 percent, whilst in the United States it reaches 72 percent (World Bank, 2011).

The shortfall in formal housing is that populations that are not catered for or could not afford to given prevailing prices have to turn towards self-built and informal housing. In urban areas this translates into the growth of slums. According to the Kenyan 2009 population census, over 30% of the country's population lives in slums. In Nairobi alone, it was estimated that over 1 million out of a city population of 3.2 million lived in slums, with only 3% living in a house with permanent walls, water and electricity (World Bank 2011). According to Giddings (2007), it was established that Kenya required 234,000 new housing units every year yet only 20,000-30,000 units per year were currently being produced and a mere 20% of these are affordable to low and moderate income families.

The government has estimated a housing need of 190,000 dwellings per year in Kenya's urban areas though it is not clear what assumptions underlie this estimate (Ministry of Housing, 2011). The government further estimates that formal production by the public and private sectors is not more than 30,000 units per year and concludes that the annual deficit of more than 120,000 housing units is met by slum housing. Uasin Gishu County is currently experiencing gross inadequacies in housing for both residential and commercial purposes.

The Ministry of Housing (2011) indicated that 27,000 housing units are required annually in the Uasin Gishu County but only an estimated 4,500

units were being produced annually. The inadequacies in the generation of these units have made the units unaffordable to a majority of residents in the county. The average mortgage loan was approximately Kshs4 million while the median household income in the county was estimated at just over KShs 10,000 (USD 125), an indication that houses were quite expensive for most Kenyans (Mutero, 2007).

There is a general shortage of decent housing in almost all the urban and trading centers in Uasin Gishu County (Uasin Gishu County, 2013). Regardless of the above-mentioned, substantial open spaces and land that could be utilized to provide housing to residents still exist. The increased demand for housing is brought about by an upsurge of immigrants from neighboring countries such as Uganda and South Sudan. This factor has brought pressure on the available land and has occasioned a spiral in land prices. The high cost of land coupled with high cost of building materials has also contributed to the slow development of housing in Uasin Gishu County. Moreover, there are no immediate plans to construct low cost decent housing.

From the foregoing, there is one obvious opportunity for County Government to forge a public private sector participation project in housing development. The county indicated that 1033 units were approved for construction in the year 2013 (Uasin Gishu County Government, 2013-2018). It is therefore critical to examine the factors that influenced willingness to participate in mortgage financing and eligibility to mortgage financing be investigated with a view of bridging the gap between the current production of housing units and the demand for the housing units in the County.

General Objective

The general objective of this study was to investigate factors that influence willingness and eligibility to mortgage financing in Uasin Gishu County.

Specific Objectives

The study sought to achieve the following specific objectives:

1. To determine the influence of demographic factors, that is, gender and age on willingness to mortgage financing.
2. To establish the influence of socio-economic factors, that is, income level, educational level and rental income on willingness to mortgage financing.
3. To determine the influence of financial factors, that is, lending interest rate, loan repayment period and tax benefit on willingness to mortgage financing.
4. To determine the influence of demographic factors, that is, gender and age on eligibility to mortgage financing.
5. To establish the influence of socio-economic factors, that is, income level, educational level and rental income on eligibility to mortgage financing.
6. To determine the influence of financial factors, that is, lending interest rate, loan repayment period and tax benefit on eligibil ity to mortgage financing.
7. To establish whether willingness and eligibil ity decisions to mortgage financing are joint decisions.

Hypotheses

This study tested the following hypotheses:

Ho1: There is no significant relationship between any of the demographic factors that is, gender and age on willingness to mortgage financing.

Ho2: There is no significant relationship between any of the socio-economic factors, that is, income level, educational level and rental income on willingness to mortgage financing.

Ho3: There is no significant relationship between any of the financial factors, that is, lending interest rate, loan repayment period and tax benefit on willingness to mortgage financing.

Ho4: There is no significant relationship between any of the demographic factors that is, gender and age on eligibility to mortgage financing.

Ho5: There is no significant relationship between any of the socio-economic factors, that is, income level, educational level and rental income on eligibility to mortgage financing.

Ho6: There is no significant relationship between any of the financial factors, that is, lending interest rate, loan repayment period and tax benefit on eligibility to mortgage financing.

Model Specification

In this study, a double-hurdle model is used to analyze the respondent mortgage financing. The Double-Hurdle Model (DHM), originally formulated by Cragg (1971), assumes that households make two decisions with regard to purchasing an item, each of which is determined by a different set of explanatory variables. In order to observe a positive level of expenditure, two separate hurdles must be passed. The Double Hurdle Model can be specified as follows:

$$y_{1i}^{*} = \alpha X_{1i} + \mu \quad \text{.....Participation decision.....} \quad (1.1)$$

$$y_{2i}^{*} = \beta X_{2i} + \nu_i \quad \text{.....Eligibilty decision.....} \quad (1.2)$$

$$y_i = \beta X_{2i} + \nu_i \quad \text{.....} \; If \quad y_{1i}^{*} > 0 \; and \quad y_{2i}^{*} > 0 \quad \text{.....} \quad (1.3)$$

$$y_i = 0 \quad \text{.....} \quad (1.4)$$

Where; y_{1i} is a latent variable describing the respondent's willingness decision to participate in mortgage financing, y_{2i} is a latent endogenous variable representing respondent's eligibility to mortgage financing, is the observed dependent variable (mortgage financing), x_{1i} is a set of respondent characteristics explaining the willingness to participate in mortgage financing decision, x_{2i} is variables explaining the eligibility to mortgage financing decision and μ_i and ν_i are independent, homoscedastic, normally distributed error terms.

Following Cameron and Trivedi (2005) and Cameron and Trivedi (2009) the double hurdle model that was estimated using maximum likelihood techniques with the log likelihood was given as follows:

$$LL = \sum_{0} In\left[1 - \Phi(\alpha x_{1i})\Phi\left(\frac{\beta x_{2i}}{\sigma_i}\right)\right] + \sum_{+} In\left[\Phi(\alpha x_{1i})\frac{1}{\sigma_i} f\left(\frac{y_i - \beta x_{2i}}{\sigma_i}\right)\right] \quad \text{.....} \quad (1.5)$$

Where; f and Φ are the probability density functions and cumulative distribution function for a standard normal random variable respectively (Jun and Long, 2005; and Jones, 1989).

Bi-Probit Regression Model

The Double-Hurdle Mode (DHM), originally proposed by Cragg (1971), assumes that two separate hurdles must be passed before a positive level of consumption can be observed. In the context of mortgage financing analysis, the first hurdle involves whether the respondent is willing or not to participate in mortgage financing (participation decision). It is reasonable to assume that willingness to participate in mortgage financing is not only an economic decision, but also influenced by social and demographic factors. The second hurdle concerns the eligibility to mortgage financing (consumption decision). DHM was employed in determining the willingness of the clients to participate in mortgage financing and the subsequent eligibility to mortgage financing as shown below:

$$Y_{i1}^{*} = \alpha_1 Gender + \alpha_2 Age + \alpha_3 Educ + \alpha_4 Rent + \alpha_5 Tax + \alpha_6 Income + \alpha_7 Period + \alpha_8 Rate + \mu \text{.....} Willingness \; Mortgage \; Financing \text{.....} (1.6)$$

$$Y_{i2}^{*} = \alpha_1 Gender + \alpha_2 Age + \alpha_3 Educ + \alpha_4 Rent + \alpha_5 Tax + \alpha_6 Income + \alpha_7 Period + \alpha_8 Rate + \mu \text{.....} Willingness \; Mortgage \; Financing \text{.....} (1.7)$$

$$y_i = x_i'\beta + u_i \qquad \text{if } Y_{i1}^* > 0 \text{ and } Y_{i2}^* > 0$$
$$y_i = 0 \text{ Otherwise.}$$

Where y_i is the observed dependent variable (willingness to participate in mortgage financing or eligibility to mortgage financing) and the independent variables, units and expected signs are shown in table 1.

Table 1

Independent Variables and Units of Measure with Expected Signs

Variable Abbreviation	Variable	Unit of measure	Expected sign
Gender	Gender	Female=0; Male=1	Positive (+)
Age	Age	Number of years	Positive (+)
Income	Income	US Dollars per annum	Positive (+)
Educ	Education Level	Number of years in formal education	Positive (+)
Rent	Rental Income	US Dollars per annum	Positive (+)
Period	Loan Repayment Period	Number of years	Positive (+)
Tax	Tax Benefit	Integer between 3(being weak) and 17 (being strong)	Positive (+)
Rate	Lending Interest Rate	Percentage (%)	Negative (-)

Descriptive Statistics

There were a total of 749 respondents during the study and Table 2 presents their summary statistics.

Table 2

Summary Statistics of the Surveyed Respondents

Variable	Observations	Mean	Std. Error	Minimum	Maximum
Willingness	749	0.6435	0.4793	0	1
Eligibility	749	1.3525	1.3188	0	8
Gender	749	0.5714	0.4956	0	1
Age	749	42.5341	8.0568	30	60
Education	749	12.2924	2.2831	5	17
Rent Income	749	2267.011	595.9228	175	5010
Tax Benefit	749	12.4993	3.0242	3	17
Income	749	23105.99	12202.2	1500	96000
Loan repayment Period	749	9.0160	3.3868	0	17
Lending interest rate	749	8.6162	3.1153	3	14

Normality Tests

The results of normality test are reported in table 3.

Table 3

Results of Normality Test

Variable	Anderson-Darling		Cramer-von-Mises	
	Statistic	P – Value	Statistic	P - Value
Willingness	149.8943	0.000	28.8432	0.000
Eligibility	34.1112	0.000	5.3371	0.000
Gender	138.4914	0.000	22.8489	0.000
Age	7.1893	0.000	1.024	0.000
Education Level	44.3675	0.000	9.7277	0.000
Rental Income	10.6886	0.000	2.0108	0.000
Tax Benefit	18.413	0.000	3.3638	0.000
Income	17.786	0.000	2.9388	0.000
Repayment Period	36.8489	0.000	7.4015	0.000
Lending interest Rate	20.891	0.000	3.3826	0.000

The results of normality tests using Anderson-Darling and Cramer-von-Mises showed that the modelled variables were normally distributed, p–values were $0.000 < 0.05$ for all the variables under study. Therefore statistical inference was amenable to normal distribution processes.

Probit Regression Results for Willingness to Participate in Mortgage Financing

The results from individual probit regression for willingness to participate in mortgage financing are reported in table 4.

Table 4

Results of Individual Probit for Willingness to Participate in MF

Eligibility to mortgage financing	Coefficient	Std. Error	Z Value	P > |Z|
Gender of the respondent (X_1)	-0.1539	0.1063	-1.45	0.148
Age of the respondent (X_2)	-3.1466	02887	-10.90 (*)	0.000
Education level of the respondent (X_3)	-0.3771	0.3353	-1.12	0.261
Rental income of the respondent (X_4)	0.3676	0.1826	2.01	0.044
Tax benefit (X_5)	-0.4183	0.2488	-1.68	0.093
Income of the respondent (X_6)	0.3607	0.1159	3.11 (*)	0.002
Loan repayment period (X_7)	-0.0273	0.1341	-0.20	0.839
Lending interest rate(X_8)	-0.0988	0.1275	-0.78	0.438
Intercept	7.7288	1.9410	3.98 (*)	0.000

(*)Indicates that the coefficient is statistically significant at 95% confident interval.

The willingness to participate in mortgage financing is specified via the following equation:

$$InWill = \underset{(1.9983)}{-7.1030} - \underset{(0.1049)}{0.1105}\,Gender + \underset{(0.2733)}{0.7695}\,Age - \underset{(0.3329)}{0.1361}\,Educ - \underset{(0.1918)}{0.6632}\,\mathrm{Re}nt + \underset{(0.2451)}{0.8642}\,Tax$$
$$+ \underset{(0.1125)}{0.6092}\,Income + \underset{(0.1328)}{0.2653}\,Period - \underset{(0.1277)}{0.6680}\,Rate + e \quad \text{..... ....} \quad 2.1$$

The corresponding measures of fit statistics are reported in Table 5. The estimated binary probit regression results on willingness to participate in mortgage financing are discussed here under.

The results showed that the intercept was negative and significantly determined the willingness to participate in mortgage financing. The intercept is the parameter in an equation derived from a regression analysis corresponding to the expected value of the response variable when all the explanatory variables are zero (Everitt, 2002). From the above regression equation it was revealed that holding gender, age, education, rental income, tax benefit, income loan repayment period and interest rate to a constant zero; the intercept was negative 7.1030 meaning the study accounted for most of the determinants of willingness to participate in mortgage financing.

Table 5

Measure of Fit for Statistics Probit Regression for Willingness to MF

Measure of Fit for Probit Regression			
Statistic	Value	Statistic	Value
Log-Lik Intercept only	-487.871	Log-Lik Intercept Full Model	-431.435
D(744)	862.870	LR(8)	112.872
		Prob > LR	0.000
McFadden's R^2	0.116	McFadden's Adj R^2	0.099
ML Cox-Snell R^2	0.140	Crag-Uhler (Nagelkerke) R^2	0.192
McKeley and Zavoina's R^2	0.229	Efron's R^2	0.150
Variance of Y	1.296	Variance of Error	1.000
Count R^2	0.720	Adj Count R^2	0.213
AIC	1.173	AIC*n	878.870
BIC	-4041.615	BIC*	-66.541
BIC used by STATA	915.820	AIC Used by STATA	878.870

The result showed that a one percent increase in rental income and lending interest rate would lead to a reduction in willingness to participate in mortgage financing by 0.6632 and 0.6680 percent respectively. The results indicated that a one percent increase in age, tax benefit, income of the respondent and loan repayment period would lead to an increase in willingness to participate in mortgage financing by 0.7695, 0.8642, 0.6092 and 0.2653 percent respectively.

The results showed that age of the respondent had a positive responsiveness and significantly determined the willingness to participate in mortgage financing, p-value 0.005 < 0.05. Therefore based on these results the first hypothesis was rejected. These results were consistent with Honohan and King (2009) who concluded that middle aged respondents had more usage of mortgage financing than the youngest and the old group.

The results showed that rental income significantly determined the willingness to participate in mortgage financing, p - value 0.001 < 0.05. The effect was a negative responsiveness. This implied that when the rental income increased investors opted for other sources such as savings and credit cooperative organisations (SACCOs) of finance. In other words, when the rental income was low the investors had no option other than mortgage financing but when the rental income was high the investors opted for other available and flexible sources of mortgage financing. This was also true because in mortgage financing the ownership of the property remains with the mortgagee and therefore the mortgagor cannot use the property

as collateral to access other loan facilities. The results showed that income level and rental income significantly determined willingness to participate in mortgage financing. Therefore based on these results the second hypothesis was rejected.

The results of joint significance test (see table 6) showed that income level, rental income and education level jointly determined willingness to participate in mortgage financing , p – value 0.000 < 0.05. Based on these results the second hypothesis was therefore rejected. These results were consistent with Pittman (2008) who concluded that younger and poorer household's investment was often financed through mortgage financing. Similarly income level had a positive responsiveness and significant effect on willingness to participate in mortgage financing, p – value 0.000 < 0.05.These results were consistent with Pittman (2008) who concluded that there was a positive but relatively limited association between income and subjective well-being for owning personal home.

Table 6

Results of Joint Significance Test for Willingness to Participate in MF

Joint Hypothesis	χ^2	Prob > χ^2	Remarks
$X_1 = X_2 = 0$	9.68	0.0079	Reject Null
$X_3 = X_4 = X_6 = 0$	35.99	0.0000	Reject Null
$X_5 = X_7 = X_8 = 0$	45.22	0.0000	Reject Null
$X_1 = X_2 = X_3 = X_4 = X_5 = X_6 = X_7 = X_8 = 0$	118.81	0.0000	Reject Null

The results also showed that tax benefit had a positive responsiveness and significant effect on willingness to participate in mortgage financing, p – value 0.000 < 0.05. Therefore based on these results the third hypothesis was rejected. This finding was consistent with Gubta and Kabundi (2009) who suggested that if mortgage interest were no longer tax deductible, many households would retire some of their mortgage debt by drawing down their holdings of taxable financial assets.

It was established that lending interest rate had a negative responsiveness and significant effect on willingness to participate in mortgage financing, p – value 0.000 < 0.05. These results were consistent with Demewez (2011) who found that there was strong inverse relationship between interest rates and house price changes and strong impact of changes in interest rates on house prices. Similarly Wong et al. (2003), Oio and Liow (2004), and Ndirangu (2004) found that housing prices displayed a significantly high correlation with interest rate and reduced interest rates were linked to higher housing prices inversely.

The corresponding measures of fit statistics are reported in Table 7. With four iterations, Likelihood ratio was found to be 108.49. The Pseudo R^2 value obtained by estimation of equation 3.06 was 0.2507. This showed that the model satisfied the goodness of fit test. The Pseudo R^2 value (0.2507) for the overall model was satisfactory for survey studies; Cameron and Trivedi (2005). The Log likelihood was found to be small and negative (-162.16806) as expected in categorical data (Yamano, 2009). These results also showed that the model fitted the data very well (Prob > χ^2 = 0.0000). Joint significance test for willingness to participate in mortgage financing for the selected demographic, socio-economic and financial factors is depicted in table 7.

Table 7

Results of the Test of Goodness of Fit Results for Probit Eligibility to MF

Measure of Fit for Probit Regression Eligibility to Mortgage Financing			
Statistic	Value	Statistic	Value
Log-Lik. Intercept only	-481.019	Log-Lik. Intercept Full Model	-409.530
D(744)	819.060	LR(8)	142.979
		Prob > LR	0.000
McFadden's R^2	0.149	McFadden's Adj R^2	0.132
ML Cox-Snell R^2	0.174	Crag-Uhler (Nagelkerke) R^2	0.240
McKeley and Zavoina's R^2	0.271	Efron's R^2	0.204
Variance of Y	1.372	Variance of Error	1.000
Count R^2	0.768	Adj Count R^2	0.320
AIC	1.115	AIC*n	835.060
BIC	-4085.426	BIC*	-96.647
BIC used by STATA	872.009	AIC Used by STATA	835.060

Probit Regression Results on Eligibility to Mortgage Financing

The regression results for individual Probit for eligibility to mortgage financing are reported in table 8.

Table 8

The Results from Individual Probit Regression for Eligibility to MF

Eligibility to mortgage financing	Coefficient	Std. Error	Z Value	P > |Z|
Gender of the respondent (X_1)	-0.1539	0.1063	-1.45	0.148
Age of the respondent (X_2)	-3.1466	02887	-10.90 (*)	0.000
Education level of the respondent (X_3)	-0.3771	0.3353	-1.12	0.261
Rental income of the respondent (X_4)	0.3676	0.1826	2.01	0.044
Tax benefit (X_5)	-0.4183	0.2488	-1.68	0.093
Income of the respondent (X_6)	0.3607	0.1159	3.11 (*)	0.002
Loan repayment period (X_7)	-0.0273	0.1341	-0.20	0.839
Lending interest rate(X_8)	-0.0988	0.1275	-0.78	0.438
Intercept	7.7288	1.9410	3.98 (*)	0.000

(*)Indicates that the coefficient is statistically significant at 95% confident interval.

The eligibility to mortgage financing is specified via the following equation:

$$InElig = \underset{(1.9410)}{7.7288} - \underset{(0.1063)}{0.1539}\,Gender - \underset{(0.2887)}{3.1466}\,Age - \underset{(0.3353)}{0.3771}\,Educ + \underset{(0.1826)}{0.3676}\,\mathrm{Re}nt - \underset{(0.2489)}{0.4183}\,Tax$$

$$+ \underset{(0.1159)}{0.3607}\,Income - \underset{(0.1341)}{0.0273}\,Period + \underset{(0.1275)}{0.0988}\,Rate + e \qquad 2.2$$

The results showed that the intercept was a positive responsiveness and significantly determined the eligibility to mortgage financing. From the above regression equation it was revealed that holding gender, age, education, rental income, tax benefit, income loan repayment period and interest rate to a constant zero; the intercept was positive 7.7288 meaning there are other determinants not included in the study that could account for eligibility to mortgage financing.

The result showed that a one percent increase in age of the respondent would lead to a reduction in eligibility to mortgage financing by 3.1466 percent. The results also revealed that a one percent increase in income level of the respondent would lead to an increase in eligibility in mortgage financing by 0.3607 percent. The age of the respondent had a negative responsiveness and significantly determined eligibility to mortgage financing, p – value 0.000 < 0.05.

Joint significance test for eligibility to mortgage financing for the selected demographic, socio-economic and financial factors is depicted in table 9. The joint significance test $X_1 = X_2 = 0$ (Table 3.6) showed that gender and age of the respondent jointly determined eligibility to mortgage financing, p – value 0.000 < 0.05. The fourth hypothesis of this study stated that demographic factors like age and gender of the respondent did not significantly determine eligibility to mortgage financing. Therefore based on these findings the fourth hypothesis was rejected. It was concluded that gender and age of the respondent were joint determinants of eligibility to mortgage financing. These results were consistent with Johnson and Noni-Zarazua (2009) who observed that age and gender were key factors explaining formal financing services.

Table 9

Results of joint significance test for eligibility to mortgage financing

Joint Hypothesis	χ^2	Prob > χ^2	Remarks
$X_1 = X_2 = 0$	118.84	0.000	Reject Null
$X_3 = X_4 = X_6 = 0$	16.01	0.0011	Reject Null
$X_5 = X_7 = X_8 = 0$	3.50	0.3212	Accept Null
$X_1 = X_2 = X_3 = X_4 = X_5 = X_6 = X_7 = X_8 = 0$	126.95	0.000	Reject Null

The results showed that income of the respondent had a positive responsiveness and significant effect on eligibility to mortgage financing, p – value 0.002 < 0.05. The joint hypothesis test for showed that income, education level and rental income jointly determined eligibility to mortgage financing. The fifth hypothesis of this study stated that socio-economic factors such as income level, education level and rental income of the respondent did not significantly determine eligibility to mortgage financing. Therefore based on this finding the fifth hypothesis was rejected. This was consistent with practice because high income investors were less likely to default their mortgage obligations (Fuster and Willen, 2013). Further, these results were consistent with Johnson and Noni-Zarazua (2009) who observed that income was one of the key factors that explained access to formal financial services.

The results also showed that neither individual nor joint significance test on tax benefit, loan repayment period and lending interest rate significantly determined eligibility to mortgage financing p – value 0.3435 > 0.05. The sixth hypothesis of this research stated that financial factors such as lending interest rate, loan repayment period and tax benefit did not determine eligibility to mortgage financing. Based on the results this hypothesis was maintained. Therefore it was concluded that tax benefit, loan repayment period and lending interest rate neither individually nor jointly determined eligibility to mortgage financing. Moffat, (2003) found that high interest rate increased chances of loan default.

The regression result for individual probit showed that the variables fitted the model very well prob > χ^2 was 0.000, LR χ^2 (8) was 165.917, and pseudo was 0.153 and was as expected in sample surveys (Cameron & Trivedi, 2005; Cameron

&Trivedi, 2009). The model fit statistics are reported in table 10. The statistics showed that the log likelihood was also small -401.043.

Table 10

Regression results for bi-probit willingness and eligibility to MF

First Hurdle Willingness	Coefficient	Std. Error	Z Value	P > |Z|
Gender of the respondent	-0.1106	0.1049	-1.05	0.292
Age of the respondent	0.7686	0.2732	2.81*	0.005
Education level of the respondent	-0.1363	0.3328	-0.41	0.682
Rental income of the respondent	-0.6623	0.1918	-3.45*	0.001
Tax benefit	0.8646	0.2451	3.53*	0.000
Income of the respondent	0.6085	0.1125	5.41*	0.000
Loan repayment period	0.2654	0.1328	2.00*	0.046
Lending interest rate	-0.6681	0.1276	-5.23*	0.000
Intercept	-7.0998	1.9974	-3.55*	0.000
Second Hurdle Eligibility				
Gender of the respondent	-0.1538	0.1063	-1.45	0.148
Age of the respondent	-3.1461	0.2887	-10.90*	0.000
Education level of the respondent	-0.3769	0.3351	-1.12	0.261
Rental income of the respondent	0.3668	0.1825	2.01*	0.044
Tax benefit	-0.4168	0.2487	-1.68	0.094
Income of the respondent	0.3604	0.1158	3.11*	0.002
Loan repayment period	-0.0275	0.1341	-0.21	0.837
Lending interest rate	-0.0984	0.1274	-0.77	0.440
Intercept	7.7325	1.9405	3.98*	0.000
/athrho	0.0227	0.0686	0.33	0.741
Rho	0.0227	0.0686		

Likelihood-ratio test of rho = 0: Chi Sq = 0.109037 Prob > Chi Sq = 0.7412.

Biprobit Regression Results

The results of bi-probit regression for willingness and eligibility to participate in mortgage financing are reported in table 4.11. Fitting of comparison equation one reached convergence after 0 – 4 iterations with log likelihood of -418.0972. Fitting of comparison equation two reached convergence after 0 – 3 iterations with log likelihood of -409.3013. Fitting of full model reached convergence after 0 – 2 iterations with log likelihood of -827.34398. These results were consistent with survey studies according to Cameron and Trivedi (2005) Cameron and Trivedi (2009). The Wald statistics was 246.05 with prob > 0.0000. Therefore the modelled variables fitted the model very well. The overall log likelihood was -827.3985 which large and negative as it was expected as per Park (2009) and Greene (2012).

The study sought to determine if willingness to participate in mortgage financing and eligibility to mortgage financing were independent decisions. The results from bi-probit regression showed that willingness to participate in mortgage financing and eligibility to mortgage financing were joint decisions. This result could guide the policy makers in relation to mortgage financing.

Conclusions

From the data collected and analysed, it can be concluded that in Uasin Gishu county, age of the respondent, rental income, tax benefit, income, loan

repayment period and lending interest rate are key determinants influencing willingness to participate in mortgage financing. However, gender and education level of the respondents were found to be insignificant in influencing the willingness to participate in mortgage financing. This implied that gender and education level as factors did not play a big role when one was considering willingness to participate in mortgage financing in Uasin Gishu, Kenya. The study also concluded that female compared to male respondents were more willing to participate in mortgage financing at all ages in all referenced points.

Age and income of the respondents were significant factors influencing eligibility of the respondents to mortgage financing. However, gender, rental income, tax benefit, loan repayment period and lending interest rate were insignificant factors in influencing the eligibility to mortgage financing. This implied that gender, rental income, tax benefit, loan repayment period and lending interest rate as factors do not play a key role when a financial institution is considering eligibility to mortgage financing in Uasin Gishu, Kenya. Eligibility to mortgage financing was demonstrated to be higher for female compared to male at all referenced points.

Willingness to Participate in Mortgage Financing

The results showed that there was significant relationship between socio-economic factors, that is, income level, education level and rental income on willingness to participate in mortgage financing. Income level and rental income individually affected willingness to participate in mortgage financing but education level did not individually determined.
The joint significance test showed that these socio-economic factors jointly and significantly determined willingness to participate in mortgage financing. Therefore it was concluded that socio-economic factors that is; education level, income and rental income determined willingness to participate in mortgage financing.

This study sought to determine if there was significant relationship between any of the financial factors; lending interest rate, loan repayment period and tax benefit on willingness to participate in mortgage financing. The results showed that tax benefit, loan repayment period and lending interest rate individually and jointly influenced willingness to participate in mortgage financing. Therefore it was concluded that modelled financial factors were significant determinants of willingness to participate in mortgage financing.
The study also sought to determine if there was significant relationship between demographic factors that is, gender and age of the respondent on willingness to participate in mortgage financing. The results showed that age significantly determined willingness to participate in mortgage financing but gender did not. The results from joint significance test showed that age and gender jointly affected the willingness to participate in mortgage financing.

Eligibility to Mortgage Financing

The results showed that there was significant relationship between any of the socio-economic factors, that is, income level, educational level and rental income on eligibility to mortgage financing. There was significant relationship between any of the financial factors, that is, lending interest rate, loan repayment period and tax benefit on eligibility to mortgage financing. From the study findings the study concluded that tax benefits influenced potential home owner's eligibility to acquire a mortgage from the respective financial institutions and that in their institution, most of the potential house buyers acquired funds from taxable deductions.
Further the study concluded that the loan repayment made for mortgages by potential homeowners were free of tax and hence was an incentive for more people to acquire mortgages. The study established that tax deductions enabled savings for purchase of houses through mortgage financing. The study also concluded that acquisition of mortgages by potential home owners in relation to tax benefit was good.

The study also concluded that lending interest rate influenced the potential buyers decision to high extent and that the institutions lending interest rate was high. The study also concludes that the acquisition of mortgages by potential home owners in relation to lending interest rate was negative. The study further concluded that low lending interest rate increased demand for housing, low lending interest rate made willingness and eligibility to participate in mortgage financing cheaper, that low lending interest rate increased the borrower's capacity to acquire a mortgage and that higher lending interest rate reduced affordability to acquire a mortgage.

The results from individual probit regressions

showed that gender and education level of the respondent did not individual significantly determine eligibility to mortgage financing. Therefore it was concluded that gender and education level did not determine eligibility to mortgage financing. Age and income of the respondent individually determined eligibility to mortgage financing.

From the research findings it was found that demographic factors; that is gender and age, jointly determined eligibility to mortgage financing. An interesting result from the study was that gender did not individually determine eligibility to mortgage financing.

Selection Problem using Double Hurdle Model

The study also sought to determine if willingness and eligibility were independent decisions to mortgage financing. The results from bi-probit, showed that the two decisions were dependent. Therefore it was concluded that willingness to participate in mortgage financing and eligibility to mortgage financing were simultaneous decisions. The other individual and joint significance tests from sample selection models were consistent with the results of individual probits. There was significant relationship between willingness decision and eligibility decision in mortgage financing.

Recommendations

The government should use tax benefit to encourage more people to participate in mortgage financing and hence enabling them to own their own homes. This is because the results of the study showed that tax benefit acted as an incentive that encouraged participation in mortgage financing.

The Government, financial institutions and other stakeholders should empower women and develop programs that incorporate women economic empowerment because the results showed that women were more willing to participate in mortgage financing than men at all referenced points of the study.

The loan repayment period should be made flexible so that the terms of the contract may be modified (for instance by reducing the principal, decreasing the monthly payment, or by increasing the loan term) to encourage willingness and eligibility to mortgage financing.

The study proposes that mortgage financing institutions should make loan repayment period a little longer to spread the burden of the potential customers to repay the loans. The study suggests that the acquisition of loans in relation to maturity period should be made attractive to enable the loan maturity period feasible to potential homeowners to acquire mortgage financing.

The study puts forward that the acquisition of mortgages by potential home owners in relation to lending interest rate should be enhanced through giving cheaper lending interest rates.

Suggestions for Further Research

The study focused on the selected independent variables of gender, age, income level, educational level, rental income, lending interest rate, loan repayment period and tax benefit. There are other variables that may have equally important contribution towards mortgage financing by potential homebuyers. Other studies should focus on other factors not considered and how they can be incorporated in the variable to enhance willingness and eligibility to mortgage financing by the potential homebuyers.

This study used cross-sectional data it was therefore suggested that a similar study should be done using time series data to determine the effect of independent variable allowing for time dimension.

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