FACTORS AFFECTING THE SUPPLY OF HOUSING CREDIT IN KENYA: A STUDY OF FINANCIAL INSTITUTIONS

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ABSTRACT

The main objective of this study was to establish the factors that affect the supply of housing credit (mortgage) in Kenya. It focused on the effects of firm-level factors and macroeconomic variables on the supply of housing credit. The firm level factors included profitability (return-on-assets), liquidity (capital-to-asset ratio), and deposit liability. The macroeconomic variables included lending interest rate, GDP growth, and inflation rate. The study used panel data for the period 2005 to 2014, which was analyzed using the Fixed Effects Model (FEM), Random Effects Model (REM), and the General Method of Moments (GMM). Liquidity had a positive and statistically significant relationship with housing credit supply in the FEM. Interest rate and deposits had a positive and statistically significant relationship with housing credit supply in FEM and REM. The coefficient of inflation rate was negative and statistically significant in the FEM and REM. The GMM model results showed that interest rate, inflation rate, bank deposit liabilities, and profitability had a positive and statistically significant relationship with housing credit supply. However, bank liquidity and GDP had no effect on housing credit supply.

Key words: housing credit supply, panel data, Kenya, GMM

1. INTRODUCTION

1.1 Background

Kenya experienced a strong economic growth, which was accompanied by rapid urbanization in the last decade. Rapid urbanization and population growth led to high demand for housing (CAHF Africa , 2015). According to Arvanitis (2013), the annual demand for housing in Kenya is approximately 206,000 units. However, the country is able to supply only 50,000 units annually.

Thus, there is an annual shortfall of 156,000 units, which has since accumulated to a backlog of about 2 million units. The populations that are not able to afford the supplied units at the prevailing prices have had to resort to self-built and informal housing (World Bank, 2011). As a result, nearly 30 per cent of the country's population lives in slums. In urban areas such as Nairobi, nearly 70 per cent of the population lives in slums.

According to Wagura (2013), inadequate housing supply in Kenya is attributed to among other factors, insufficient housing credit supply, high cost of construction, low income among buyers, and poor land tenure system. Insufficient supply of housing credit affects both developers and buyers. Among developers, lack of adequate capital to invest in residential housing has led to dependency on credit, which is often expensive due to high interest rates.

Among buyers, lack of adequate and affordable housing credit is a significant constrain to owning a home (Arvanitis, 2013). Majority of Kenyans are not able to access adequate housing credit due to among other factors high cost of accessing existing credit facilities. Although Kenya has the largest mortgage market in East Africa, the value of its outstanding mortgages is only 2.5% of its GDP. This is significantly low compared to South Africa and Zambia where the outstanding mortgages are approximately 25% and 19% of the countries' respective GDPs (Arvanitis, 2013).

It is against this background that this study sought to determine whether changes in various firm-specific factors and macroeconomic variables affect (increase or decrease) housing credit supply. Firm-specific factors refer to the internal characteristics of lending institutions (banks) such as their return-to-equity ratio, deposit liabilities, and liquidity among others.

Housing Finance in Kenya

Housing acquisition in Kenya is predominantly financed through savings and credit, as well as funds obtained from institutional investors and the capital market. Savings is mainly used by individuals who cannot afford or cannot qualify for mortgages. Individual savings are often limited due to low income and lack of financial discipline (Arvanitis, 2013). As a result, most people often take long or fail to complete constructing their homes. Potential homeowners also organize themselves into SACCOs, housing schemes, and investment clubs to pool resources together to purchase or construct residential units. Although SACCOs and investment clubs have increased access to housing credit, their membership restrictions prevent them from serving the majority of the population.

Lending by commercial banks/ mortgage companies is the main source of housing credit in Kenya. Nearly 43 banks and one mortgage company have been licensed by the Central Bank of Kenya (CBK) to supply housing credit. However, majority of Kenyans cannot access housing credit from banks because of inability to qualify for them (Ngugi & Njori, 2013).

Institutional investors such as insurance companies, pension schemes, and fund managers, are also involved in the supply of housing finance in Kenya (World Bank, 2011). Institutional investors often collaborate with developers by investing financial capital in real estate projects. Nonetheless, they do not provide loans/ mortgages to potential homeowners.

1.2 Problem Statement

Kenya has an annual housing shortage of over 150,000 units. The value of residential mortgages supplied increased from Kshs. 90 billion in 2011 to Kshs. 164 billion in 2014 (Central Bank of Kenya, 2015). This represents an increase of 81.42%. However, the number of mortgage accounts increased by only 37.33% from 16,029 to 22,013 over the same period. This means that the banking

industry has been able to supply only 22,000 individuals out of a total adult population of nearly 17 million people with mortgages. Inadequate supply of affordable credit will limit access to housing, thereby increasing slums and reducing overall quality of life.

Most previous studies on housing finance in Kenya focused on the factors that determine the demand for mortgage. These include tax incentives, lending interest rates, income levels, and banks' terms and conditions for issuing loans (Wambui 2013; Njongoro 2013; and Ngugi and Njori 2013). The factors that influence the supply of credit have been ignored in the existing literature. Moreover, most previous studies analyzed the effects of firm-specific and macroeconomic variables on housing credit supply in isolation. Thus, they do not shed light on how firm-specific factors and macroeconomic variables would affect housing credit supply if they were included in the same model.

Descriptive statistics is the main analytical technique used in previous studies (Makori and Memba, 2015; Njiru and Moronge 2013; and Munywoki 2012). Descriptive statistics often fail to provide deeper insights into the relationships between housing credit supply and its determinants. In light of these shortcomings, this study sought to bridge the knowledge gap by using panel data analysis techniques to establish the factors that determine the supply of housing credit in Kenya. The results are expected to inform public policy concerning investments in the housing sector to improve the supply of housing credit.

1.3 Objectives

The broad objective of the study was to determine the factors that influence the supply of housing finance in Kenya. The specific objectives were:

1. To determine the firm/ bank specific factors that explain housing credit supply in Kenya
2. To determine the macroeconomic variables that explain housing credit supply in Kenya

2. LITERATURE REVIEW

2.1 Theoretical Literature

Conceptually, the supply of housing credit is influenced by internal and external factors that affect banks' balance sheets, profitability, and access to capital. At the firm level, supply of housing credit is influenced by banks' liquidity proxied by capital-to-asset ratio. Banks with a high capital are more likely to access funds from depositors, lenders, and investors to create new credit (Angbazo, 1997). This allows adequately capitalized banks to provide housing credit to their clients. High capital is also an incentive to investors to closely monitor banks to avoid heavy losses in the event of distress in the banking industry. As a result, banks with high capital might refrain from lending to risky clients, thereby reducing overall credit supply (Dagher & Kazimov, 2015).

Low levels of capital can also have both positive and negative effects on housing credit supply. Banks with low levels of capital can create excess credit because their shareholders have little stake to lose in the event of a bank collapse or lose (Bust & Yang, 2000). On the other hand, low capital-to-asset ratio may give the impression that a bank is not financially healthy. As a result, low capitalized banks find it difficult to attract external funds to create credit.

Angbazo (1997) argues that commercial banks that exhibit low profitability and liquidity are perceived to present high default risks that increase their cost of borrowing. Generally, banks with a high liquidity can borrow more funds to supply housing credit at a low cost and vice versa. In

addition, profitable banks are likely to attract more deposits and funds from investors than less profitable banks. Thus, profitability is likely to affect banks' ability to supply credit.

Housing credit supply is also expected to respond to changes in macroeconomic factors such as inflation rate, GDP growth, and interest rates. Raj (2007) argues that lending interest rate is a key determinant of housing credit supply because it determines the profitability of lenders. In a competitive market, banks are expected to lower their interest rates in order to lend to a large number of customers, thereby increasing credit supply (Valverde, Fernandez, & Qi, 2010). Nonetheless, banks often prefer high interest rates in order to increase their profits. High lending rates can have a negative effect on housing finance supply by making mortgages too expensive to borrowers.

GDP growth can influence the supply of housing credit through its impact on interest rate. During recession, the central bank can lower interest rates to increase money supply and economic growth. This leads to increased credit supply. Economic boom, on the other hand, can result into high interest rates if it is accompanied by inflationary pressures in the medium and long-term. In this case, credit supply is likely to reduce (Addai, 2011). However, high economic growth can also lead to increased savings (deposits), which in turn increase housing finance supply. Banks that are able to attract funds from savers through attractive deposit rates are more likely to provide housing credit than banks with a limited deposit base.

Inflation rate is expected to influence the supply of housing credit in two ways. First, during high inflation the CBK can respond by increasing the Kenya Bankers Reference Rate (KBRR). The resulting increase in cost of funds will reduce commercial banks' ability to supply housing credit. The reverse effect would occur during low inflation. Second, according to Ruin (2004) customers will demand high deposit interest rates during high inflation. Thus, deposits are likely to reduce if banks fail to increase deposit interest rates. This in turn reduces the supply of housing credit.

2.2 Empirical Literature

In their study of the mortgage market in Kenya, Mogaka, Mboya, and Kamau (2015) concluded that macroeconomic variables affect housing credit supply. Their panel data analysis revealed that GDP per capita, inflation rate, informal sector employment, and formal sector employment had a positive and statistically significant relationship with mortgage supply. However, national savings and exchange rate had positive but statistically insignificant relationship with mortgage supply. This finding is inconsistent with Addai (2011) who found that exchange rate had statistically significant negative relationship with mortgage supply in Ghana. However, Addai (2011) did not find a statistically significant relationship between mortgage supply and interest rate and inflation rate.

Focusing on the European Union market, Wolswijk (2005) concluded that housing credit supply is determined by factors that are external to the firm. Specifically, his pooled regression results showed that financial deregulation policies, house prices, and improved performance of the stock market had a positive effect on the supply of mortgage. By contrast, interest rate and inflation rate had a negative effect on mortgage supply. This contradicts Mogaka, Mboya, and Kamau (2015) who found a positive relationship between inflation and mortgage supply in Kenya.

Damar, Meh and Terajima (2015) concur with Wolswijk (2005) in their study of credit supply in Canada, which revealed that interest rate is a major determinant of mortgage supply. The researchers found that banks that heavily depended on market-based funding to create credit

increased mortgage supply during periods of low interest rate. This means that interest rate has a negative effect on housing credit supply. Black, Hancock and Passmore (2010) support this perspective in their study, which showed that US banks that had limited deposit liabilities relied heavily on borrowed funds to supply mortgages. Thus, an increase in interest rate led to a reduction in the supply of housing credit due to high cost of capital.

Focusing on regulation of bank deposit interest rate in the US, Koch (2014) showed that the cost of accessing funds by banks had negative effects on housing credit supply. Specifically, credit growth reduced the more binding the deposit interest rate ceiling. This means that banks were not able to attract adequate capital to supply funds at the fixed deposit interest rate ceiling.

In China, Valverde, Fernandez and Granada (2010) found that housing prices and urbanization increased the supply of mortgage. This is consistent with Wolswijk (2005) who found a positive relationship between housing price and credit supply. Interest rate also had a positive effect on credit supply, suggesting that an increase in lending rate did not discourage the uptake of housing credit. This finding is inconsistent with Damar, Meh and Terajima (2015) who found a negative relationship.

According to Bust and yang (2000), housing credit supply increases with an increase in real income and house prices. However, the cost of borrowing (interest rate), and mortgage risk premium reduce housing credit supply in the long-run.

According to Lou and Yin (2014), mortgage supply is affected by factors that influence financial institutions' loan pricing strategies. Their study of the Australian mortgage market showed that banks' pricing strategy was influenced by the degree of their risk aversion, competition, and access to funding. Banks with large deposit liabilities had a greater capacity to supply mortgage, especially during the Global Financial Crisis. High bank liquidity, on the other hand, had a negative effective on the supply of mortgage during the financial crisis. This suggests that financial institutions with a large amount of liquid assets tend to be risk averse, which in turn limits supply of housing credit.

Calem, Covas and Wu (2011) supported the argument that housing credit supply is determined by firm-specific factors. The researchers found a negative relationship between bank size proxied by total assets and credit supply. Additionally, a bank's tier 1 capital ratio had a negative relationship with housing credit supply.

Focusing on the US market, Dagher and Kazimov (2013) concluded that housing credit supply is influenced by both, economic, bank characteristics, and demographic factors. At the firm level, bank size, leverage, and liquidity had a positive effect on credit supply. However, profitability had a negative effect on housing credit supply. Among the macroeconomic variables, income growth and unemployment rate had a positive and negative effect on credit supply respectively. In addition, delinquency rate had a negative effect on housing credit supply.

In sum, the literature shows that the effect of various firm-specific and macroeconomic variables on housing credit supply varies from country to country. Additionally, the effects of firm level and macroeconomic variables on credit supply have been estimated in isolation. Empirical studies that have estimated the relationship between firm-level and macroeconomic variables and housing credit supply in Kenya are hardly available; hence the need for this study.

3. METHODOLOGY

3.1 Theoretical Framework

Theoretically, the supply of credit is determined by firm specific factors, as well as, factors that are external to the firm. The factors that are external to the firm include among others, regulation, GDP growth, inflation, central bank reserve requirements, and competition (Wolswijk, 2005). At the firm level, housing credit supply is likely to be influenced by factors that influence banks' ability to access external funds from depositors and lenders, as well as, to increase their earnings. In this respect, the firm-level variables that are expected to influence housing credit supply include bank's asset-to-equity ratio, customer deposits, size of the bank, non-performing loan ratio, return on assets (ROA), and cost of transactions (Lossifov & Khamis, 2009). Thus, we posit that housing credit supply in Kenya is a function of GDP, inflation rate, interest rate, return on assets (profitability), bank liquidity, and deposits.

3.2 Analytical Framework

This study used panel data estimation techniques to determine the firm-level and macroeconomic variables that influence housing credit supply. According to Baltagi (2004), using panel data is advantageous due to three main reasons. First, panel data allows the researcher to account for the heterogeneity across individual units (banks in this study). Second, panel data provide a large number of data points, which increase the degrees of freedom and reduce co-linearity among the independent variables. This increases the efficiency of the estimated parameters. Finally, it enables the researcher to deal with the bias associated with the omission of time-invariant variables. Given these advantages and following Kupiec et al. (2014) and Pouvelle (2012), this study employed three panel data analysis techniques, namely, fixed effect, random effects, and general method of moments (GMM) to determine the factors that influence the supply of housing credit.

3.3 Model Specification

The empirical model was specified as:

$$Lnhcs_{it} = \beta_0 + \sum_{n=1}^{N} \beta_n X_{n,i,t} + \varepsilon_{i,t} \qquad (1)$$

Where

Ln denotes natural logarithm

i identifies a particular bank

t denotes time (year)

hcs is bank $i's$ housing credit supply

β_0 is a constant

$\beta_n, n = 1 \cdots N$ are the N coefficients of the independent variables

$X_{n,i,t}$ are the independent variables (liquidity, interest rate, inflation rate, profitability, deposit liabilities, and GDP)

$\varepsilon_{i,t}$ is a white noise error term

Table 3.1: Definition of Variables

Variable	Description
Housing credit supply	Value of mortgage provided by banks for home acquisition

Liquidity	Each bank's capital-to-asset ratio
Interest rate	Annual lending rate
Inflation rate	The reported annual inflation rate
Profitability	Each bank's return-on-assets (ROA) ratio
Deposits	Amount of deposit liabilities held by a commercial bank
GDP	The annual change in Kenya's Gross Domestic Product

3.4 Data Sources

The study focused on 32 commercial banks and used annual data for the period 2005 to 2014. The data for the firm specific variables namely, housing credit supply, liquidity, profitability, and deposit liabilities was obtained from annual Central Bank of Kenya (CBK) supervision reports. Inflation rate, GDP, and interest rate data were also obtained from CBK.

3.5 Estimation Strategy

The Fixed Effects (FE) and the Random Effects (RE) Models

The FE model was defined as:

$$lnhcs_{it} = \alpha_i + \beta_1 X_{it} + u_{it} \qquad (2)$$

Where:

$\alpha_i (i = 1 \cdots n)$ is the intercept for each bank

$lnhcs_{it}$ is natural log of housing credit supply; $i = bank$ and $t = time$

X_{it} represents the independent variables

β represents the coefficients of the independent variables

u_{it} is a white noise error term

The model is based on the assumption that the non-observed individual effects are represented by fixed parameters. In addition, the independent variables are not correlated with the idiosyncratic error term. The rationale of using this model is that each bank has its unique characteristics that may or may not determine the supply of housing credit.

The RE assumes that variation across entities (banks) is random and uncorrelated with the independent variables. RE also assumes that the error terms of individual entities are not correlated with the independent variables. The RE model was defined as:

$$lnhcs_{it} = \alpha_i + \beta_1 X_{it} + u_{it} + \varepsilon_{it} \qquad (3)$$

Where

u_{it} is the between-entity (bank) error term

ε_{it} is the within-entity (bank) error term

Other terms are as defined in Equation 2

The FE has the weakness of eliminating all time-invariant variables from the regression. In addition, it may suffer from endogeneity problems, thereby providing biased results. Although RE allows for estimation of time-invariant parameters, it does not address possible endogeneity problem. Thus, we also conducted dynamic panel data analysis using GMM to address

endogeneity. The GMM technique involves estimating the model in first difference and using the lagged values of the variables as instruments. Thus, the model in levels is given as:

$$lnhcs_{i,t} = \tau lnhcs_{i,t-1} + \gamma X_{i,t} + \varepsilon_{i,t} + \mu_i \quad (4)$$

Where: τ and γ are parameters to be estimated, $X_{i,t}$ is a vector of independent variables that are assumed to be weakly exogenous, μ_i are the bank level effects, and $\varepsilon_{i,t}$ is an error term.

In first difference, Equation 4 becomes:

$$\Delta lnhcs_{i,t} = \tau \Delta lnhcs_{i,t-1} + \gamma \Delta X_{i,t} + \varepsilon_{i,t} \quad (5)$$

4. EMPIRICAL RESULTS AND DISCUSSION

4.1 Correlation

Table 4.1: Correlation matrix

	Lnhcs	Liquidity	Int. rate	Infl. rate	Profitability	Deposits	GDP
Lnhcs	1.0000						
Liquidity	-0.1859* (0.0008)	1.0000					
Interest rate	0.2487* (0.0000)	0.0618 (0.2706)	1.0000				
Inflation rate	-0.1381* (0.0134)	-0.1007 (0.0719)	-0.0976 (0.0812)	1.0000			
Profitability	0.2078* (0.0002)	0.0050 (0.9288)	0.0519 (0.3545)	-0.0936 (0.0948)	1.0000		
Deposits	0.6326* (0.0000)	-0.2101* (0.0002)	0.2030* (0.0003	-0.1461* (0.0089)	0.4777* (0.0000)	1.0000	
GDP	0.0368 (0.5120)	0.0735 (0.1898)	0.0060 (0.9155)	-0.2669* (0.0000)	-0.0919 (0.1009)	0.0330 (0.5570)	1.0000

Where star means significant at 5% level and the figues in parentheses are p values

The correlation matrix in Table 4.1 shows the relationship between the variables considered in the study. All the coefficients except that for correlation between deposits and Lnhcs are less than 0.8. This suggests that multicollinearity was not a major problem in the data. Deposits had a statistically significant correlation with all variables expect GDP at 1 per cent. Liquidity, interest rate, and profitability had a significant correlation with housing credit supply and deposits. GDP had a significant correlation with inflation rate only.

4.2 Heteroskedasticity Test

The presence of heteroskedasticity was tested using modified Wald test for group-wise heteroskedasticity. The p-value of 0.0000 in appendix 1 clearly shows presence of heteroskedasticity. Thus, robust standard errors were used in the estimation to correct for heteroskedasticity.

4.3 Regression Results

Regression analysis was done using the random effects model (REM), fixed effects model (FEM) and GMM. However, we interpret and base our conclusions only on the GMM results since both REM and FEM are not able to control for endogeneity. We use the FEM and REM results for comparison.

The results for the fixed effects and random effects models are presented in table 4.2. Liquidity has a positive and statistically significant relationship with credit supply, albeit at 10 per cent significance level in the FEM. The coefficient of interest rate and deposits are positive and statistically different from zero at 1 per cent significance level in both models. The coefficient of inflation rate is negative and statistically different from zero at 10 per cent in the FEM and 5 per cent in the REM. However, GDP and profitability did not have statistically significant relationship with housing credit supply in both models.

Table 4.2: Fixed effects and random effects model results

Variable	FEM			REM		
lnhcs	Coefficient	Std errors	$P > \|t\|$	Coefficient	Std errors	$P > \|z\|$
Liquidity	0.0049	0.0027	0.075	0.0042	0.0026	0.113
Interest rate	0.2420	0.0451	0.000	0.2382	0.0428	0.000
Inflation rate	-0.0143	0.0073	0.061	-0.0143	0.0070	0.044
Profitability	0.0236	0.0435	0.592	0.0236	0.0419	0.709
Deposits	0.00002	4.82e-06	0.000	0.00002	4.33e-06	0.000
GDP	0.0083	0.0173	0.636	0.0083	0.0170	0.652
Constant	14.32	0.6555	0.000	14.32	0.7683	0.000
Sigma_u	1.6058			1.5335		
Sigma_e	0.8793			0.8793		
rho	0.7693			0.7526		

Hausman Specification Test

The results of the Hausman specification test are presented in appendix 2. The p-value of 0.2137 means that the REM is the appropriate model.

GMM Results

The GMM model results are presented in table 4.3. Since the regression model was estimated as a log-linear model, we interpret the coefficients as elasticities. The Sargan over-identifying restriction test results presented in appendix 3 shows that the instruments used in the GMM are valid. Additionally, the results for the Arellano-Bond test for autocorrelation presented in appendix 4 shows that there is no autocorrelation in the residuals at lag 2. Thus the results are consistent and can be interpreted. The coefficient of interest rate is positive and statistically different from zero at 1 per cent significance level. This means that 1 per cent increase in interest rate increases housing credit supply by nearly 9.86 per cent. The result is consistent with Guo and Stepanyan (2011) and Valverde, Fernandez and Granada (2010) who found similar results. However, it is at variance with Damar, Meh and Terajima (2015) who found a negative relationship between credit supply and interest rate. Banks are likely to lend at a high interest rate in order to increase their profits, especially in markets were the demand for credit is high and alternative sources for housing credit are limited. Additionally, high interest rates encourage banks to lend to risky borrowers. Therefore, an increase in lending rate can increase credit supply.

The coefficient of inflation rate is positive and statistically significant at 10 per cent significance level. A 1 per cent increase in inflation increases housing credit supply by approximately 0.82 per cent. The result is consistent with Mogaka, Mboya, and Kamau (2015). However, it is inconsistent with Wolswijk (2005) who established a negative relationship between credit supply and inflation

rate. As inflation increases, the cost of acquiring a home also increases. This means that homeowners will require more money to acquire homes. Thus, they will demand for higher amounts of loans to acquire homes. This explains in part the positive relationship between inflation rate and housing credit supply.

Deposit liability has a positive and statistically significant relationship with housing credit supply in line with *a priori* expectation and economic theory. Although the coefficient is very small, the result is consistent with Lou and Yin (2014), Koch (2015) and Parra (2015) who showed that an increase in deposits increased credit supply. The positive relationship could be attributed to the fact that banks normally use a fraction of deposits to issue new credit to their customers. Thus, an increase in deposit liabilities leads to an increase in housing credit supply.

Profitability also has a positive and statistically significant relationship with housing credit supply. This means that 1 per cent increase in profitability proxied by ROA increases housing credit supply by nearly 10.53 per cent. The result is consistent with a priori expectation and Jimenez et al. (2010) who found a positive relationship between ROA and credit supply. However, it is at variance with Dagher and Kazimov (2013) who concluded that profitability had a negative effect on housing credit supply. The positive relationship between profitability (ROA) and credit supply is based on the fact that profitable banks are likely to attract capital and deposits from investors since they are likely to be stable and capable of providing high returns on investments. This enables profitable banks to supply more credit than their counterparts that are making losses. The coefficients of liquidity and GDP were positive. However, they were not statistically significant. The lagged value of housing credit supply (lnhcs(L1)) is also positive and statistically significant at 1 per cent significance level as expected a priori. A possible explanation of this result is that interest income from mortgages provided in the previous period can be used to issue new loans in the current period, thereby increasing housing credit supply.

Table 4.7: GMM model results

Wald chi2(6) = 2437.69 Prob> chi2 = 0.0000				
	Coefficient	Std. errors	z	$P > \|z\|$
Lnhcs (L1)	0.73325	0.07439	9.86	0.000
Liquidity	0.00202	0.00245	0.83	0.407
Interest rate	0.09861	0.02648	3.72	0.000
Inflation rate	0.00815	0.00431	1.89	0.059
Profitability	0.10532	0.04176	2.52	0.012
Deposits	4.41e-06	2.66e-06	1.66	0.098
GDP	0.00429	0.01638	0.26	0.793
Constant	-0.64169	0.44524	-1.44	0.150

5. Conclusions and Policy Recommendations

The objective of this study was to determine the firm-level factors and macroeconomic variables that affect the supply of housing credit in Kenya. The dynamic panel data analysis based on our favored GMM model shows that banks' profitability and deposit liability have a positive effect on housing credit supply. Similarly, interest rate has a positive rather than negative effect on housing credit supply. The results also show that inflation rate does not discourage lending due to its

positive relationship with housing credit supply. However, GDP growth and banks' liquidity do not have any effect on housing credit supply.

Given the results and conclusions discussed in the foregoing paragraphs, the following recommendations should be considered by banks and policymakers to improve the supply of housing credit, with the aim of increasing access to decent and adequate housing. First, the positive effect of deposits on housing credit supply means that banks should incentivize the public to save through savings accounts. This calls for striking a balance between reducing interest rate spread and improving profitability. The Central Bank of Kenya, on the other hand, should ensure stability in the banking industry through effective regulation to encourage savings. This will improve access to loanable funds, thereby increasing housing credit supply.

Second, banks should focus on lending at an optimal interest rate that increases their profitability without compromising access to housing credit among citizens. Empirical evidence in the literature shows that an increase in housing credit supply due to high interest rate can only be realized in the short run when borrowers have no alternative sources of credit (Kupiec, Lee, & Rosenfield, 2014). In the long run, banks have to charge affordable interest rates to avoid losing customers. This means that an optimal lending rate is central to sustainable supply of housing credit.

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APPENDIX

Appendix 1: Heteroskedasticity test

Ho: $sigma(i)^2 = sigma^2\ fo\ all\ i$	
Chi2 (32)	8685.46
Prob> chi2	0.0000

Appendix 2: Hausman specification test

	Coefficients			
	(b) fe	(B) re	(b-B) difference	Sqrt(diag(V_b-V_B)) S.E
Liquidity	0.0048894	0.0041716	0.0007178	0.004088
Interest rate	0.2420387	0.2381759	0.0038628	0.0050112
Inflation rate	-0.0142778	-0.0141815	-0.0000963	0.0001912
Profitability	0.0235585	0.0156033	0.0079553	0.0051449
Deposits	0.0000243	0.000025	-6.49e-07	6.43e07
GDP	0.0082715	0.0076859	0.0005856	0.000
b = consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
$chi2(5) = (b-B)'[(V_b - v\_B)^(-1)](b-B)$ = 8.35 Prob> chi2 = 0.2137				

Appendix 3: Sargan test of over-identifying restrictions

Ho: over-identifying restrictions are valid
Chi2(97) = 111.9337
Prob.> chi2 = 0.1426

Appendix 4: Arellano-Bond test for zero autocorrelation in first-differenced errors

Ho: no autocorrelation	
Lag order	Z prob.> z
1	-3.1855
2	-0.4531