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Macroeconomic Factors Influencing Real Estate Prices in Rwanda-Case of Kigali City Urban Areas, 2008-2017

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Abstract: ***For the past 20 years, Rwanda has experienced a rapid increase in the prices of real estate property raising concerns among policy makers and the government. The purpose of this study was to analyze the factors influencing real estate prices in Rwanda case of Kigali City Urban Areas. The study was based on three specific objectives namely to determine the influence of lending rates on real estate prices in Rwanda, to investigate the influence of inflation on real estate prices in Rwanda and lastly to assess the influence of GDP on real estate prices in Rwanda. The study adopted quantitative descriptive and correlational research designs. Quarterly time series secondary data was used for a period of 10 years from 2008 to 2017. Statistical tests of correlation, regression, unit root, cointegration and causality tests were carried out during data analysis. The findings of the study were presented in form of tables and graphs. The findings indicated that GDP and lending rates had significant influence on real estate prices whereas inflation and brokers were found to be insignificant. Lending rates had the greatest influence on real estate prices. Findings further exhibit positive association between real estate prices and lending rates, inflation and brokers while the association between GDP and real estate prices is negative. The study recommends financial institutions to reduce interest rates charged on mortgage loans in order to lower the cost of construction hence encouraging investments in the real estate sector. In addition the government should strive to achieve greater economic growth rate by encouraging investments in real property, increased supply hence reduced property prices.***

Keywords: Real Estate, Macroeconomic variables, Real estate brokers, Inflation, Interest rates, Gross Domestic Product

1. Introduction

Over the past years there has been a significant growth globally in capital investment in real estate than investment in other assets. According to the global investor (2018), real estate global prices have been rising overtime and in some markets they have gone beyond pre-crisis levels. According to the report(Global investor report, 2018) however, rising inflation and interest rates have been identified as the factors that have significantly brought changes in the global real estate market. Many Cities around the world have experienced rising housing prices over the last few years. This has led to a falling demand as the potential home buyers are struggling to afford the new hiked prices of housing. More over the existing home owners could not afford to buy the homes they are living in at the current situation of prevailing prices if they are offered for sale (Gilmour, 2018). Rising interest rates around the world and tighter lending criteria imposed by lenders and banks can indicate the end of a housing boom, as is currently the case in Sydney, Australia. Gilmour(2018) survey of housing prices in 20 major cities in America indicated that housing prices have increased by averagely 35% for the past five years in the cities with Hong Kong taking a lead with 10% annual increase. (Gilmour, 2018).

2. Statement of the Problem

For the past 15 years, the real estate sector globally has experienced a rapid increase in prices, which has raised concerns, and several discussions have been done on the same about the sustainability of the sector. In rapidly developing cities in Africa, this increased prices overtime has attracted several investors into this sector with both local and foreign investors taking huge loans from financial institutions to construct houses. Studies which have been carried out in various parts of the world experiencing this scenario of price sky rocketing in the real estate sector has indicated mixed results as regards the causes of price increases in the sector. These causes range from economic, social to political factors. For example structural problems that could lead to artificially high house problems (Stohldreier, 2012), income and interests which may shoot up house prices in the long run(Vizek, 2010), economic fundamentals, diaspora remittance and cost of construction effects on real estate prices (Kibunyi, 2015) and existence of efficient markets which have corrective mechanisms to imperfections. Therefore there is need for a study to clarify the real factors of real estates prices especially in Rwanda.

Macroeconomic variables are the possible drivers of real estate prices. For example, lending rates in the financial institutions can influence the housing prices since they affect the cost of construction. Moreover GDP can also have influence on property prices since as economy expands the income increases possibly which may indirectly affect the property prices. Inflation not left behind can also be a determinant of property prices since it affects the cost of goods and raw materials used for construction. (Amos, 2015).Most of the studies that have been done in real estate sector exist in other countries as shown in the empirical literature with few in Rwanda focusing on microeconomic factors. (Pierre Kolowe, 2014). There is no study that has been done concerning the effects of macroeconomic factors on real estate prices in Rwanda. This study therefore has adopted macroeconomic approach by seeking to investigate the influence of macroeconomic factors on the real estate prices in Rwanda.

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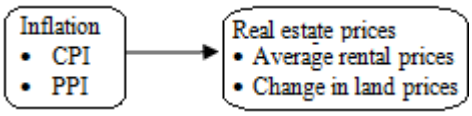
3. Objectives of the Study

The general objective of this study was to analyze the factors influencing real estate prices in Rwanda. Its second specific objective was to investigate the influence of inflation on real estate prices in Rwanda.

4. Conceptual Framework



5. Research Methodology

- **Research Design**: A research design is the overall strategy that is chosen to bring together the various components of a research study in an organized and logical way in order to address the research problem.
- **Target Population:** The items that this study sought to dwell on included the real estate prices and the economic fundamentals in Rwanda specifically inflation, GDP and interest rates.
- Data type and sources: The study utilized quarterly time series secondary data for the period 2008 to 2017 to achieve the research objectives. Secondary data is the data that is already collected and produced by others (Douglas, 2015). This is the data that was originally collected not for the purpose of the current research but for a different study done earlier. The secondary data sources include the government agencies, publications and reports among others. The data used in this research regarding economic fundamentals was retrieved from the data base of National Bank of Rwanda and National Institute of Statistics of Rwanda.
- **Data Analysis Techniques and Presentation:**The quantitative data collected was analyzed by carrying out five statistical tests. These included correlation and regression tests, unit root tests, cointegration tests and causality tests. Correlation tests was carried out to measure the degree of association between real estate prices and the economic fundamentals captured by the study. Regression analysis was conducted to come with a model that shows the relationship between the independent and dependent variables in terms of the magnitude and the direction of change of dependent variable due to changes in independent variables. The regression model that was be used was of a linear form;

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

Where
Y denotes real estate prices
$\beta_1, \beta_2, \beta_3$, β_4 are coefficients of regression
X_1 denotes lending rates
X_2 denotes inflation
X_3 denotes Gross Domestic Product
X_4 denotes brokers
ε denotes error term

Philips Perron test was carried out to test for the stationarity of time series data. This is a preliminary econometric test that is conducted on secondary data in order to avoid spurious results which may lead to misleading conclusions. The test eliminates the effects of outliers in the data set used which may interfere with the results of the study. According to (Brooks, 2008), a stationary series can be defined as one with a constant mean, constant variance and constant auto-covariance for each given lag.
HO: (α0,) = (α0, 0, 1) (Not stationary)

The alternative hypothesis
H1: (α0,) $\neq$ (α0, 0, 1) (Stationary). If the test reveals that null hypothesis should be rejected then the variable will be said to be stationary.

Cointegration is the existence of a long run relationship among the variables. The researcher used Engel granger cointegration test method.
The hypothesis to be tested will be,
HO: there is no cointegration among variables.
H1: There is cointegration among variables

Decision criteria: reject null hypothesis if the trace statistics is more than the critical value.

Causality between two variables indicates the causation effect between the variables. Causality indicates whether the past values of a variable Y is able to predict the future values of a variable Z. It further measures the direction of causation. The direction can be either one way or unidirectional. The researcher conducted Granger causality test to test for the causality between the variables.

The hypothesis to be tested for a case of two variables Y and Z is,
HO: Y does not granger cause Z
H1: Y granger cause Z
Decision criteria: the null hypothesis was rejected if the p value is greater than 5% otherwise accepted.

6. Summary of Findings

Table 1: Descriptive statistics of variables

	Mean	Std. deviation	Maximum	Minimum
Housing Index	3.58	0.65	4.5	2.5
Bank rates	16.97	0.35	17.33	16.25
Inflation	6.82	4.77	15.44	0.25
GDP	7.46	1.78	11.17	4.7
brokers	2	0.78	3	1

Source: researcher computation, 2019.

Descriptive variables that the researcher computed included mean, standard deviation, maximum and minimum. The finding indicated that housing index, bank rates, inflation, GDP and brokers averaged 3.58%, 16.97%, 6.82%, 7.46% and 2 respectively with corresponding standard deviations of 0.65, 0.35, 4.77, 1.78 and 0.78. The findings further show that Housing index reached a maximum of 4.5% and minimum of 2.5% within the study period whereas commercial bank rates was between 17.33% and 16.25%.Lastly inflation, GDP and brokers had a maximum value of 15.44%, 11.17% and 3 respectively and minimum value of 0.25%, 4.7% and 1.

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Table 2: Unit Root Test

	Philips Peron Test	
	Probability at level	probability at 1st difference
Housing Index	0.2088	0.0000
Bank Rates	0.4842	0.0000
Inflation	0.5774	0.0000
GDP	0.1637	0.0001
Brokers	0.1727	0.0001

Source: researcher's computation 2019.

To avoid getting misleading results regarding the association of the concerned variables the researcher tested for unit root to ensure that the variables are non- stationary. This was achieved through the Philips Peron method of unit root testing. A stationary series exhibits a constant mean, variance and covariance.
The researcher tested the following hypothesis for each variable.

Ho : Presence of unit root in the data set

$H1$: No unit root in the data set

Regarding the decision, the null hypothesis was to be rejected if the probability is less than 5% otherwise not.

From the findings in the table 4.2 below, the probabilities for all variables at level are greater than 0.05 hence we fail to reject null hypothesis of presence of unit root therefore no stationarity at level. At the first difference, the probabilities for all variables are less than 0.05 hence we reject null hypothesis of presence of unit root and conclude that the variables are stationary at first difference.

Table 3: Cointegration Test

	tau-statistic	Prob*	z-statistic	Prob*
Housing Index	-1.52	0.0484	-3.81	0.0492
Bank rates	-2.13	0.024	-5.23	0.039
inflation	-0.75	0.056	-1.88	0.048
GDP	-2.89	0.0456	-11.77	0.0483
Brokers	-2.45	0.0136	-28.86	0.0001

Source: researcher computation, 2019

Cointegration is the existence of a long run association between two variables. In this study the researcher adopted Engle Granger single equation test of cointegration.

The hypothesis tested is stated below

Ho : Series are not cointegrated

$H1$: Series are cointegrated

The findings are summarized in the following table 4.3.the findings indicated that both tau statistic and z statistic have probabilities of less than 0.05 except for tau statistic of inflation which has a probability of more than 0.05. This implies that or null hypothesis of series not cointegrated is rejected and we accept the alternative hypothesis indicating presence of series cointegration. From these findings we conclude that there exists a long run relationship between the variables captured in this study.

Table 4: Correlation analysis

		Bank rate	Inflation	GDP	Brokers	Housing index
Bank Rate	Pearson correlation	1	.181	.256	.074	0.767
	N	40	40	40	40	40
Inflation	Pearson correlation		1	.350	.087	0.402
	N		40	40	40	40
GDP	Pearson correlation			1	.425	-0.546
	N			40	40	40
Brokers	Pearson correlation				1	0.004
	N				40	40
Housing Index	Pearson correlation					1
	N					40

Source: Researcher, 2018

The researcher was interested in the association between the variables under study. Correlation analysis shows the strength and direction of association between two variables. Therefore the researcher conducted correlation analysis to ascertain the strength of association between real estate prices and GDP, inflation, bank rate and brokers. The findings in the following table 4.4 indicate that the Pearson correlation coefficients between housing index and bank rate, inflation, GDP and brokers respectively are 0.767, 0.402, -0.546 and 0.004. This implies that there is a positive correlation between housing index and bank rate, inflation and brokers and a negative correlation between housing index and GDP. These findings further imply that there is a strong positive association between housing index and bank rate and a strong negative association between housing index and GDP. Lastly there is a weak positive association between housing index and inflation and brokers.

Table 4.5: Regression Findings

Dependent Variable: HOUSING_INDEX				
Method: Least Squares				
Date: 04/01/19 Time: 20:30				
Sample: 2008Q1 2017Q4				
Included observations: 40				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATION	0.019942	0.021591	0.923626	0.3462
GDP	-0.025138	0.062532	-0.401999	0.0046
BANK_RATES	1.500725	0.336189	4.463931	0.0001
BROKERS	0.026799	0.119197	0.224826	0.5805
C	-21.89690	6.042964	-3.623536	0.0009
R-squared	0.601864	Mean dependent var		3.575000
Adjusted R-squared	0.556363	S.D. dependent var		0.653358
S.E. of regression	0.435176	Akaike info criterion		1.290338
Sum squared resid	6.628246	Schwarz criterion		1.501448
Log likelihood	-20.80676	Hannan-Quinn criter.		1.366669
F-statistic	33.22742	Durbin-Watson stat		0.578037
Prob(F-statistic)	0.000001			

Source: researcher computation, 2019

The researcher computed the OLS regression to ascertain the magnitude of the effects of inflation, GDP, bank rate and brokers on housing index in addition to showing the direction and significance of the effects. The findings in the following table indicate the coefficients of constant, GDP, inflation, bank rates and brokers are -21.90, -0.025, 0.012, 1.50 and 0.027 respectively with corresponding probabilities of 0.0009, 0.0046, 0.3462, 0.0001 and 0.5805. R squared

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value from the findings is 0.60 equivalent to 60%. The F-statistic value was found to be 33.22742.

Table 4.6: Pairwise Granger Causality Tests

Null Hypothesis	Obs	F-Statistic	Prob
HOUSING_INDEX does not Granger Cause BANK_RATES	38	0.59822	0.04982
BANK_RATES does not Granger Cause HOUSING_INDEX	38	1.01158	0.0374
HOUSING_INDEX does not Granger Cause BROKERS	38	0.69494	0.5254
BROKERS does not Granger Cause HOUSING_INDEX	38	0.93120	0.5458
HOUSING_INDEX does not Granger Cause GDP	38	0.79477	0.0365
GDP does not Granger Cause HOUSING_INDEX	38	0.69771	0.0456
INFLATION does not Granger Cause HOUSING_INDEX	38	0.07654	0.0432
HOUSING_INDEX does not Granger Cause INFLATION	38	0.68934	0.0631

Source: researcher computation, 2019

This tests the causation between two variables. Granger causality tests explain using F-statistic whether lagged information on a variable Y provides any statistically significant information about a variable X. The researcher tested for causality between Housing index and inflation, GDP, bank rates and brokers to ascertain whether there is one-way or two-way causation. The results show that the causation between Housing index and Bank rates and GDP is two way whereas the causation between housing index and inflation is one-way. Lastly there is no causation between housing index and brokers.

Inflation was found to have a positive insignificant influence on real estate prices. The correlation findings indicated a Pearson correlation coefficient of 0.402 imp-lying a weak positive correlation between inflation and real estate prices. Keeping all other factors constant, 1% increases in inflation index leads to a 1.99% increase in real estate prices. The cointegration findings indicated a long run association between inflation and real estate prices. The granger causality findings indicated that there is unidirectional causality between inflation and housing index running from inflation to housing index. This implies that the lagged values of inflation explain the current trend values of housing index. These findings are contrary to the theoretical expectations where inflation is deemed to play a significant role in real estate prices. Rising inflation have a direct influence on prices of construction materials and therefore it's expected to raise the real estate prices. from the empirical literature discussed in chapter two, the findings of this study concurs partially with the findings of Kibunyi (2015 who also found a weak association between the two variables and Ouma (2011) who found a positive impact of inflation on residential house prices. however these findings were significant whereas the findings of this study are insignificant regarding inflation and house prices. The findings however goes against the findings of Tafirenyika and Paul (2017) who found that changes in house prices were more sensitive to changes in inflation and that there is a bidirectional causation between the two. This study finds the housing prices insensitive to inflation changes and that there is unidirectional causation between inflation and housing prices

7. Conclusions and Recommendations

7.1 Conclusions

The researcher came up with a number of conclusions based on the above findings.

- First there is a long run relationship between real property prices and the independent variables under study which included inflation, lending rates, GDP and brokers. This is shown by the Engel granger cointegration findings where the null hypothesis of no cointegration was rejected for all the variables.
- Secondly, there is high significant positive association between real estate prices and lending rates. An increase in lending rates increases the real estate prices. On the other hand there is a high significant negative association between real estate prices and GDP. An increase in GDP leads to a decrease in real property prices. Furthermore there is a weak insignificant positive association between real estate prices and inflation and also between real estate prices and brokers. Increase in inflation and number of operating brokers increases the real estate prices.
- From the regression coefficients findings, it can be concluded that 1% change in inflation, GDP, bank rate and brokers leads to a change in real estate prices by 1.99%, -2.5%, 150% and 2.7% respectively, ceteris paribus. These coefficients are significant for GDP and bank rate and insignificant for inflation and brokers. Moreover inflation, GDP, bank rate and brokers account for 60% of the variations in real estate prices the remaining 40% accounted for by other determinants of real estate prices. Lastly the causality findings imply that there is bi-directional causality between real estate prices and GDP and bank rates. The causality between real estate prices and inflation is unidirectional from inflation to housing price. No causation between real estate prices and brokers.

7.2 Recommendations

The following suggested recommendations are deemed appropriate for implementation by policy makers based on the findings of this research.

- There is need for financial institutions to reduce the interest rates charged on loans advanced to the real property investors. This will go a long way in reducing the cost of construction and hence they are able to charge lower prices for the residential. Furthermore the reduced interest rates will encourage more investors in the real estate industry hence the supply of rental houses increases causing downward pressure on prices.
- Secondly the government should strive to achieve higher GDP growth rate by stimulating the demand aggregates like investments, government spending and external balance. Increased investments and expansion of government spending in infrastructure particularly real estate sector will increase the supply of residential property hence affordable housing prices.

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