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Exchange Rate and Performance of the Residential Property Market in Kenya

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Abstract

Purpose: *The purpose of the study was to establish the effect of exchange rate on the performance of the residential property market in Kenya.*

Methodology: *The study used secondary data that was accumulated using secondary data collection sheet from first quarter of 2005 to fourth quarter of 2018. The study carried out several test statistics and diagnostic tests in order to achieve the most optimal solution. Vector error correction model and auto-regressive distributed lag model were employed to test the hypothesis in the short run and long run respectively.*

Findings: *Interestingly, the study results found that exchange rate had a negative effect on performance of residential properties in Kenya in the short run while a positive effect in long run was observed.*

Implications: *The study findings narrowed down the research gap brought about by the conflicting empirical literature though there is room for further analysis on the reasons behind this difference between short run and long run relationship of the two markets.*

Keywords: *Exchange Rate, Performance, Residential Property*

1.1 Introduction

The surge of the residential property prices in Kenya has ignited concerns about the affordability of residential property houses in Kenya (Murungi, 2014). This escalation of residential property prices raises questions as to whether the housing development objective as per Kenya Vision 2030 is achievable. The average value for a property has gone up from 7.1 million in December 2000 to 31.4 million in December 2016, an increase of 342.3 per cent (HassConsult Limited, 2016). Only one per cent of Kenyans in urban areas can afford a home of Kshs.5.7 million and above, five per cent can afford a home of Kshs. 3.9 million and above, twenty per cent can afford a home of Kshs.1.1 million and above (Kariuki & Hassanali, 2014).

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Whereas exchange rates are expected to impact on residential property market performance, it is not clear how they affect the property market returns especially in Kenya. Evidently, different researchers have established that exchange rates are important in examining the performance of residential property market. However, the researchers have inconclusive findings on the direction of causation or the strength of the relationship that exists between the exchange rate and residential property market return. In addition, there was an observed confounding empirical, conceptual and theoretical literature with regard to the two markets that necessitated this research in the Kenyan context.

2.1 Literature Review

This research adds to already existing significant empirical literature. Mallick and Mahalik (2015) used quarterly data (2010Q1 – 2013Q4) to explain the housing prices for fifteen major cities of different regions in India. Among the fundamental factors they observed was that the real effective exchange rate did not have any influence on the housing prices. Thus Mallick and Mahalik (2015) found that real effective exchange rate has no significant influence on housing prices in India. This could be an indication that the Indian housing market was not dominated by other foreign nationals a situation that varies from country to country.

In contrast, some other researchers argued that exchange rate and house price were positively correlated. Meidani, Zabihi and Ashena (2011) investigated the existence of causality among house prices, economic growth, and inflation in Iran using the Toda and Yamamoto approach during the period 1990:1-2008:3. Meidani, Zabihi and Ashena (2011) revealed that demand of house price will increase when exchange rate appreciate. They explained that this is because house owners wish to preserve their asset value. Besides, Meidani, Zabihi and Ashena (2011) found that no causality relationship exists in between exchange rate and housing price in their research.

Their finding was supported by Glindro et al. (2011) who stated that positive relationships between exchange rate and house price can be found in those countries which pay attention on foreign direct investment. Glindro et al. (2011) investigated the characteristics of house price dynamics and the role of institutional factors in nine Asia-Pacific economies during 1993–2006.

Their study discovered that on average, house prices tend to be more volatile in markets with lower supply elasticity and a more flexible business environment. At the national level, Glindro et al. (2011) observed that the current run-up in house prices mainly reflected adjustment to improved fundamentals rather than speculative housing bubbles.

Diala, Kalu and Igwe-Kalu (2017) examined the effects of Niara/Dollar exchange rate volatility on low income residential real estate investment returns in Nigeria using EGARCH model. They employed a time series data for an eleven year period between 2000 and 2010. Their findings revealed that exchange rate volatility had a significant positive effect on low income residential real estate investment returns in Nigeria within the period of study. This implies that, in their period of study, higher exchange rate volatility had a positive effect on low income residential property market returns volatility in Nigeria. According to their findings, volatility of returns was not highly persistent and leverage effect was not significant.

Rebi (2014) while investigating the determinants of house prices employed error correction analysis in Albania in an attempt to explain the effect of exchange rate on the housing prices. The results revealed that the relationship between house prices and the exchange rate in Albania was positive and statistically significant. The interpretation was that when households perceive the depreciation of the domestic currency as an erosion of their wealth they may be tempted to purchase houses which to them may act as a better store of value than keeping cash.

Liu and Hu (2012) undertook a study on the relationship between RMB real effective exchange rate and real estate price by VAR test by using the monthly data from January 2007 to December 2010. Their study empirical results showed that in the short run housing prices had an inverse relationship with RMB exchange rate, while in the long run; housing prices had a positive impact on RMB exchange rate. They study showed that the relationship between exchange rate and property market performance could vary depending on whether the relationship is short run or long run.

Similar results as Liu and Hu (2012) were observed by Liu and Zhang (2013) who carried-out a study on the relationship between exchange rate and real estate prices by VAR model. Liu and

Zhang (2013) used monthly data of exchange rate and real estate price from July 2005 to December 2012 and conducted an empirical analysis on the correlation effect of the exchange rate and real estate price by using economic theory, combined with the econometric model. There observed that the two markets have a positive relationship and they concluded that there was need for China to control foreign capital entering the Country since appreciation of exchange rate had a positive impact on maintaining the stability of China's real estate prices.

Kok, Ismail and Lee (2018) carried out a study on the sources of house price changes in Malaysia from 2002 to 2015. They employed structural vector autoregressive regression to estimate the unexpected changes in both house demand and prices based on economic theoretical reasoning that considered shock from macroeconomic determinants. Their study result revealed that a positive effective exchange rate played an important role when demonstrating the housing market transaction volume i.e. exchange rate had a strong impact on the housing demand in Malaysia.

Cherono (2013) examined the effect of remittances and financial development on private investment in Kenya using data from 1980-2011. Further, the study attempted to establish how financial sector development influences the effect of remittances on private investment in Kenya. Cherono (2013) employed the neoclassical model of investment, the accelerator investment model and the Q-model of investment. Cherono (2013) noted that the impact of real exchange rate on private investment was unclear. A depreciation of the currency inhibits private investment by raising the cost of imported capital goods which are critical in most production processes. Consequently this leads to decrease in new investments. In extension firms with foreign debt would experience credit constraints and thus forced to reduce investment in order to meet the rising costs of foreign debt.

As per the literature review the relationship between exchange rate and performance of residential property market may be positive, negative or otherwise. In consideration to the above, this study examined the effect of exchange rate on the residential property market returns in Kenya and will purpose to test the following hypothesis:

H0: Exchange rate (Kenya Shilling per US Dollar) has no significant effect on the performance of the residential property market in Kenya.

2.2 Theoretical Framework

According to Hyrina and Serletis (2010) theory of purchasing power parity (PPP) asserts that relative goods prices are not affected by exchange rates based on the law of one price. They note further that the relationship is important not only because it has been a cornerstone of exchange rate models in international economics, but also because of its policy implications. Langston (2016) by considering the construction industry across the world notes, that perhaps the best way to describe PPP-adjusted values is to say that they express local prices in terms of purchasing power by weighting them according to a standard basket of construction items (comprising common material, labor, and plant items) priced in-country. The higher the PPP-adjusted value, the higher are the relative costs of building in one location over another. The PPP exchange rate alone does not show the relative costs associated with a given project, in the same way the USD exchange rate does not explain any relative cost. But when the local prices are divided by it, the result is a comparative international value.

According to Chand (2014) purchasing power parity doctrine provides a sensible explanation of long-term changes in exchange rates under all monetary condition. The theory also explains what determines the balance of payments itself. However there are a number of limitations of purchasing power parity that were pointed out by Chand (2014). First, the conception that the exchanges represent relative price levels; that the monetary unit of a country has the same purchasing power both within the country and outside, it is correct only upon the never existing assumption that all goods and services can be transferred from one country to another without cost which does not hold. Secondly the theory overlooks the influence of demand and supply factors in foreign exchange. Thirdly, tradable goods are not always perfect substitutes when they are produced in different countries, for example a housing unit in one country may differ in price significantly when compared to a similar housing unit in another county even if all other factors are held constant. In addition, the theory unrealistically assumes free trade and absence of

exchange control for a steady exchange rate based while in reality governments interfere with free trade flow and or provide incentives, for example, government incentives geared towards availing affordable mortgages and or taxation incentives to house builders/investors. This theory, however, provides for a non-biased perspective on the relationship between foreign exchange rate and performance of residential property. By providing information on the effects of foreign exchange rate, the theory offers a neutral platform to undertake an incisive empirical analysis.

3.1 Methodology

The study reflected the philosophy of positivism which is an approach that seeks facts or causes of social or business phenomena, with little regard to the subjective state of the individual (Saunders, Lewis, & Thornhill, 2007). Bevir (2010) observes that positivism is a philosophical attitude. Its features are that the researcher should trust in science, opposition to metaphysics, and unified science. Bhattacherjee (2012) contends that positivism holds that science or knowledge creation should be restricted to what can be directly tested.

The study adopted causal research design since the researcher was interested with assessing the relationship between exchange rate market and residential property market in Kenya. Kumar (2014) states that, the causal research design helps to isolate or quantify the effect of different sets of variables influencing the dependent variable. It is conducted when researchers want to explore the extent to which changes in one variable are reflected in changes in the other variable (Creswell & Garrett, 2008). Tashakkori and Teddlie (2010) posit that explanatory research is intended to explain, rather than to simply describe the phenomena studied. This design does not involve manipulation of the independent variable in making inferences about causality (Kerlinger & Lee, 2000).

The target population for this study was composed of 56 market quarter observations from 2005 to 2018 of the Kenya Shilling/ US Dollar and quarterly house price index of residential property market for secondary data. Kothari (2004) argue that secondary data means data that are already available. Census was employed in collecting the data of the market quarterly observations for the entire period as the sampling technique. Pandey and Pandey (2015), notes that a research should identify schedules and procedures to be used for acquiring the data and recording it

accurately. A data collection sheet was therefore used to organize the data that was collected. This data was authentic and reliable since it was secondary data that was collected by credible agents and published reports.

Exchange rate data was transformed into logarithmic form to allow for ease estimation of parameters, reduce it into manageable form and stabilization of the variance. The research used Eviews econometrics software for analysis of the data. The data analytical techniques that were used were quantitative techniques in nature. Time series econometric analysis was employed to analyses the secondary data collected over the study period.

According to Gujarati and Porter (2009) descriptive statistics consist of methods for organizing, displaying, and describing data by using tables, graphs and summary measurers. Descriptive statistics was presented to show the normality of the data. The tests employed included estimation of mean, medium, maximum, minimum, skewness, kurtosis and Jarque-Bera. Gujarati and Porter (2009) further note that, if a variable is normally distributed the standard value for skewness that has been set is zero implying the distribution of the variable is normally distributed without the positive or negative skewness. Brook (2002) argue that, Kurtosis measurers the peakedness of the data, and if a variable is normally distributed the standard value of kurtosis is three. Jarque and Bera (1987) note that, if a variable is normally distributed the probability value of the Jarque-Bera statistic should be very close to one.

The concept of integration and stationarity was the building blocks of this research. These concepts were used since empirical literature has suggested that most financial market time series data are integrated of order one I(1) which is greater than order zero I (0). Kennedy (2008), assert that there are several fundamental differences between a stationary and an integrated (non-stationary) series. A stationary series has a mean of zero and there is tendency for the series to return to that mean, whereas an integrated series tends to wander widely. Stationary series tend to be erratic, whereas integrated series tend to exhibit smooth behavior. A stationary series has a finite variance, shocks are transitory, and its autocorrelations ρ_k die out eventually, whereas an integrated series has an infinite variance (variance that grows over time), shocks are permanent, and its autocorrelations tend to one.

This study employed pairwise granger causality in order to determine the direction of causality. The term causality was first formalized in econometrics by Orcutt (1952). Orcutt defines causal relations as an asymmetrical or unidirectional relations such as, if A, then B. The study noted that causal relations are taken to be unidirectional, and that they are more restricted in nature than relations which are understood to be of a symmetrical or non-directional in nature.

Engle and Granger (1987), assert that, if each element of a vector of time series first achieves stationarity after differencing, but a linear combination is already stationary, the time series are said to be co-integrated with co-integrating vector α. Gujarati and Porter, (2009) assert that two variables are said to be co-integrated if they have a long-term, or equilibrium, relationship between them. This paper tested for the existence of co-integration in the process of coming up with the model.

Akter (2014), argue that in time series or econometric analysis, the aim is to forecast or predict future behavior of variables. The estimates of the parameters may be inefficient if the error term of the model does not follow certain assumptions. Akter (2014), assert that if the usual testing procedure is executed despite autocorrelation problem whatever the conclusions is made may be misleading. Thus the study purposed to carry out an autocorrelation test of the series under study. Breusch and Pagan (1979) note that in some applications of the general linear model, the usual assumptions of homoscedasticity disturbances and fixed coefficients may be questioned. When these requirements are not met, the loss in efficiency in using ordinary least squares may be substantial and, more importantly, the biases in estimated standards errors may lead to invalid inferences. Engle (1982) notes that the problem caused by heteroskedasticity is that it causes the mean and the variance of a variable to evolve over time. This makes any inference from such variable to be erroneous. The study purposed to carry out a heteroskedasticity test of the secondary data set.

Kumar (2014) assert that hypothesis is an assumption, suspicion, assertion or an idea about a phenomenon. Creswell (2013) note those hypotheses are predictions the researchers make about the expected outcomes of relationship among variables. Testing hypothesis on the other hand

employs statistical procedures in which the investigator draws inferences about the population from the study sample. According to Gujarati and Porter (2009) several criteria are used for selection of a model. These include R-squared, adjusted R-squared, F-statistic, Akaike's information criteria, Schwarz's information criterion and Hannan-Quinn information criteria. No one of these criteria's is necessarily superior to the others. The study therefore employed these statistics to arrive at conclusive inference. In particular the study used t-statistics and the p-value to test the significance of the null-hypothesis for any type of individual test. Other statistics that were relevant in models selection are Durbin-Watson, adjusted R-squared and likelihood ratio. Confidence intervals were also used to test the reliability of the estimated coefficients. A five per cent level of significance has been used in many studies like Amatete (2016), Mwangi (2016), and Gatuhi (2015) in the past hence a good benchmark. The five per cent level of significance was compared with the p-value and significance of the predictor variable(s) concluded if the latter is less than five per cent (Filho et al., 2013). P-value is the exact lowest probability of rejecting the null hypothesis when it is true (Gujarati & Porter, 2009).

Vector error correction model (short-run) and auto-regressive distributed lag (long-run) model were employed to test the hypothesis. According to Baum (2013) VECM are employed when the time series appear to be first-difference stationary with their levels exhibiting unit root or nonstationary behavior. Conventional regression estimators, including VARs, have good properties when applied to covariance-stationary time series, but encounter difficulties when applied to nonstationary or integrated processes. Baum (2013) further states that the VECM has an advantage as the resulting VAR from VECM representation has more efficient coefficient estimates. Further, according to Tserkezos (2013) it has a better interpretation of short run relationship between variables that have a co-integration relationship thus VECM was employed to measure the short-run relationship of the series under study.

Applying the VAR (4) model we create a matrix Zt = [RPMt,EXRt,] that has four lags as follows:

$$Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + \cdots + A_4 Z_{t-4} + u_t \qquad (1)$$

The VAR (4) model can be reformulated in a vector error correction model as follows:

$$\Delta Z_t = \prod_1 \Delta Z_{t-1} + \prod_2 \Delta Z_{t-2} + \prod_4 \Delta Z_{t-3} + \prod Z_{t-1} + u_t \, (2)$$

Where the matrix Π contains information regarding the relationships between performance of residential property market and exchange rate. We can decompose $\Pi = \pi\beta'$ where π will include the speed of adjustment to equilibrium coefficients, while β' will be the matrix of coefficients. Then, the term β'Zt-1 term will be the error correction term.

Autoregressive distributed lag (ARDL) model was employed to measure long relationship of exchange rate and performance of residential property market in Kenya. According to Nkoro and Uko (2016) ARDL co-integration technique does not require pretest unlike other techniques. Thus ARDL co-integration technique is preferable when dealing with variables that are integrated of different order or combination of both. ARDL co-integration technique is robust when there is a single long-run relationship between the underlying variables in a small sample size (30 observations to 80 observations). The long run relationship of the underlying variables is detected through the F-statistic (Wald test) i.e. when the F-statistic exceeds the critical value band. The major advantage of the ARDL co-integration technique, as explained by Nkoro and Uko (2016), lies in its identification of the co-integrating vectors where there are multiple co-integrating vectors. The ARDL approach has the additional advantage of yielding consistent estimates of the long-run coefficients that are asymptotically normal, thus ARDL was employed to test the long run relationship of the variables under study. The research employed the Eview econometric software and room was given for the econometric software to automatically determine the lag structure that was employed in the ARDL. Nevertheless the general ARDL (p, q) model will be as follows:

$$Y_t = A_1 Y_{t-1} + ...A_p Y_{t-p-1} + B_0 X_t + B_1 X_{t-1} + ...B_q X_{t-q-1} + u_t \quad (3)$$

Where $u_t \sim iid\ (0, \sigma 2)$

The long run dynamic (equilibrium effect will be determined as follows)

$$\frac{\partial Y_T}{\partial Xt} = \frac{B_0 + B_1 + B_2 \cdots + B_q}{1 - A_1 - A_2 \cdots - A_p} \quad (4)$$

4.1 Findings

Table 1 presents secondary descriptive statistics for the variables under study.

Table 1: Summary statistics for the secondary data set

	RPM	EXR
Mean	1.18	4.41
Median	1.25	4.40
Maximum	5.10	4.63
Minimum	-3.10	4.13
Std. Dev.	2.13	0.13
Skewness	-0.09	0.10
Kurtosis	2.23	2.17
Jarque-Bera (JB)	1.48	1.68
JB Probability	0.47	0.43
Observations	56	56

Residential property market performance (RPM) was measured by the percentage change in quarterly house price index. The positive mean of 1.18 shows that on average there was an increase in residential property market prices by 1.18 per cent over and above the previous quarter price. The standard deviation of 2.13 indicates that even though there was a noticeable increase in residential property prices over time, the fluctuations in percentage change between one period and another were considerable. Residential property market performance portrays a negative skewness -0.09 indicating a left tail of distribution that was approximately symmetric (Brown, 2011). Kurtosis value was 2.23 which was less than 3, which shows that the variable was platykurtic. The platkurtic observation of residential property market performance shows that this market was considered less risky than would be a normal market in Kenya. This series had a Jarque-Bera value of 1.48 and its p-value of 0.47 shows that the residential property market performance had no significant departure from normality.

Exchange rate (EXR) was measured by the natural log of average quarterly exchange rate in Kenya shilling per US dollar. Positive exchange rate mean of 4.41 was slightly larger than its median of 4.40. The standard deviation of 0.13 was associated with volatility of the series. This standard deviation shows that the exchange rate was less volatile in the period under study. The gap between maximum and minimum value (Maximum; 4.63, Minimum; 4.13) of exchange rate indicates that there was a considerable difference between low and high exchange rate values. Exchange rate portrays a positive skewness 0.10 indicating a right tail of distribution which indicates that the variable was approximately symmetric (Brown, 2011). Kurtosis value was 2.17 which was less than three, which shows that the variable was platykurtic. The observed kurtosis shows that the series has less extreme outliers than a normal distribution thus the risk of a random change in the price of exchange market in Kenya was slightly minimal than would be normally expected. This can be explained by the role the Central Bank of Kenya and the Monetary Policy Committee plays in checking excesses in exchange of currencies. This series had a Jargue-Bera value (1.68) with a p-value of 0.43 that shows that the variable had no significant departure from normality using the 0.05 significance level.

Table 2: Stationarity test at level for the secondary data set

Group unit root test: Summary: Series: RPM, EXR : Sample: 2005Q1 2018Q4: Exogenous variables: Individual effects: Automatic selection of maximum lags: Automatic lag length selection based on AIC: 0 to 3: Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.49270	0.6889	2	107
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.94513	0.1723	2	107

Table 2 shows the results of stationarity test at level of the performance of the residential property market in Kenya and Kenya Shilling per US Dollar exchange rate. The time series data was subjected to stationarity test as a test of the stability of the variables. The null hypothesis of common unit root was not rejected for the variables at level. This was because the p-values of the critical values of test statistics were greater than 0.05 significance level i.e. the Levin, Lin & Chu

t* had a probability of 0.6889 and the Im, Pesaran and Shin W-stat had a probability of 0.1723. The interpretation of the results was that the series had unit root at level.

Table 3: Stationarity test at first difference for the secondary data set

Group unit root test: Summary : Series: RPM, EXR: Sample: 2005Q1 2017Q5: Exogenous variables: Individual effects: Automatic selection of maximum lags: Automatic lag length selection based on AIC: 0 to 7: Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.69998	0.0035	2	101
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.62525	0.0000	2	101

Table 3 shows the results of stationarity test of the series under study at first difference. As shown in Table 3, the null hypothesis of common unit root was rejected for the variables at first difference. This was because the p-values of the critical values of test statistics were less than 0.05 level of significance. The result therefore shows that the time series was stationary after first differencing i.e. integrated of order one I (1). The interpretation was that given these two tests of stationarity the variables were stationary after first differencing.

Table 4: Pair-Wise Granger Causality Test

Pairwise Granger Causality Tests: Sample: 2005Q1 2018Q4: Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
EXR does not Granger Cause RPM	52	0.20231	0.9357
RPM does not Granger Cause EXR		1.35535	0.2653

From Table 4 it can be observed that the probability of the Granger Causality test between exchange rate and residential property market performance were 0.9357 in one direction and 0.2653 in the other direction. The probabilities were above the 0.05 level of significance thus the null hypotheses could not be rejected. The interpretation was that there was no Granger causality

between exchange rate and performance of residential property market in Kenya in either direction i.e. exchange rate does not Granger cause performance of residential property market in Kenya, also, residential property market in Kenya does not Granger cause exchange rate performance.

Table 5: Unrestricted co-integration rank test (trace) for the secondary data set

Trend assumption: Linear deterministic trend: Series: RPM, EXR: Lags interval (in first differences): 1 to 3: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.272095	16.64864	15.49471	0.0334
At most 1	0.002578	0.134212	3.841466	0.7141

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level: * denotes rejection of the hypothesis at the 0.05 level: **MacKinnon-Haug-Michelis (1999) p-values

Table 5 shows the results of the unrestricted co-integration rank test for residential property market performance in Kenya and exchange rate. This study sought to test for the existence of co-integration in the process of coming up with the model to eliminate the problem of spurious regression. Spurious regression leads to misleading regression coefficients in the model (Gujarati & Porter, 2009). It was noted two test statistics (trace test and maximum Eigenvalue) were statistically significant as depicted by their respective p-values which were found to be highly statistically significant. In particular, the trace test indicated one co-integrating equation at the 0.05 level of significance. In other words, the results denoted the rejection of the null hypothesis of no co-integration at the 0.05 level. The interpretation was that there was evidence of a long-run relationship among the variables since the probability of drawing test statistic greater than one observed was very high with the first equation. The conclusion was that the variables could be used in the same regression since they had one long-run equilibrium. The study used the co-integration equation after employing restrictions.

Table 6: Vector error correction residual serial correlation LM test of *exchange rate* and residential property market performance in Kenya

VEC Residual Serial Correlation LM Tests, Null Hypothesis: no serial correlation at lag order h, Sample: 2005Q1 2018Q4, Included observations: 52

Lags	LM-Stat	Prob
1	1.947926	0.7453
2	2.720927	0.6056
3	0.587435	0.9644
4	2.588865	0.6288

Probs from chi-square with 4 df.

Table 6 presents the results for the test of residual serial correlation LM test of exchange rate and residential property market performance in Kenya. The test results failed to reject the null hypothesis of the model. The null was not rejected on the basis that the p-value of the chi-square (langrange-multiplier-LM) was statistically insignificant for all the four quarters. In particular for lag one the LM-Statistic was 1.947926 and p-value was 0.7453. This shows that there was no serial correlation at lag one since the p-value was above 0.05 level of significance. The same was observed for lags two to four where their p-values were above the 0.05 level of significance. This implied absence of serial correlation for the time series with four lags.

Table 7: Vector error correction residual heteroskedasticity test of exchange rate and residential property market performance in Kenya

VEC Residual Heteroskedasticity Tests: No cross terms (only levels and squares)

Sample: 2005Q1 2018Q4, Included observations: 52

Joint test:

Chi-sq	df	Prob.
37.46919	42	0.6700

Individual components:

Dependent	R-	F(14,37)	Prob.	Chi-sq(14)	Prob.

	squared				
res1*res1	0.32471	1.270844	0.2707	16.88526	0.2623
res2*res2	0.15127	0.471064	0.9344	7.866394	0.8962
res2*res1	0.21177	0.710072	0.7504	11.01239	0.6851

Table 7 presents the result of vector error correction residual heteroskedasticity of the secondary data set. From the above results the presence of heteroskedasticity was rejected since the p-values for the joint test were statistically insignificant. In the individual components the presence of heteroskedasticity was also rejected.

Table 8: VECM result of exchange rate and residential property market performance in Kenya (short-run)

Cointegrating Eq:	CointEq1
RPM(-1)	1.000000
EXR(-1)	-0.268326
	(0.07623)
	[-3.51992]
Error Correction:	D(RPM)
CointEq1	-0.586221
	(0.18268)
	[-3.20901]
R-squared	0.385087
Adj. R-squared	0.303098
F-statistic	4.696839
Akaike AIC	4.081156
Schwarz SC	4.343823

Table 8 presents the vector error correction model results used to measure the short run relationship of exchange rate and performance of residential property market in Kenya. From the results, in the short run, exchange rate had a negative effect on the performance of residential property market in Kenya. This shows that depreciation of Kenya shilling negatively affects the performance of residential property market in the short run i.e. stability of the Kenya shilling is desired for better performance of the residential property market. The regression coefficient of

exchange rate had an associated t-statistic value of -3.51992 which was statistically significant. The result also shows the error correction term value of -0.586221. This value showed that the speed of adjustment toward equilibrium value was 58.6%. The associated t-statistic value of -3.20901 was also statistically significant. Looking at the R-squared it shows that variations in the exchange rate in the short run explain 38.5087 per cent of the performance of residential property market. The F-statistic value of 4.696839 is interpreted to mean that the model was significant.

Table 9: ARDL long run form result of exchange rate and performanceof residential property market in Kenya

ARDL Cointegrating And Long Run Form: Dependent Variable: RPM: Dynamic regressors (4 lags, automatic): EXR: Selected Model: ARDL(4, 0) : Sample (Adjusted) 2005Q1 2018Q4: Included observations: 52: Maximum dependent lags: 4 (Automatic selection): Model selection method: Akaike info criterion (AIC): Selected Model: ARDL(4, 0)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	0.315967	0.086009	3.673639	0.0006

R-squared	0.350663	Mean dependent var	1.375192
Adjusted R-squared	0.295400	S.D. dependent var	2.042317
S.E. of regression	1.714330	Akaike info criterion	4.007134
Sum squared resid	138.1296	Schwarz criterion	4.194753
Log likelihood	-99.18547	Hannan-Quinn criter.	4.079063
Durbin-Watson stat	1.935958		

Cointeq = RPM - (0.3160*EXR)

Table 9 illustrates the results of autoregressive distributed lag (ARDL) model that was employed to measure the long run relationship of exchange rate and performance of residential property market in Kenya in the long run. The results show that, in the long run, exchange rate had a positive effect on the performance of residential property market in Kenya. This finding was different to that observed in the short run period. This shows that in the long run depreciation of Kenya shilling improves performance of residential property market in the Country. The regression Kenya shilling/USD exchange rate had an associated t-statistic value of 3.673639 which was statistically significant since the associated probability value was 0.0006. From the R-squared it can be observed that in the long run variations in exchange rate explained 35.0663 per

cent of performance of residential property market in Kenya. Durbin-Watson statistics of 1.935958 shows absence of first-order serial correlation in the error terms.

5.1 Discussion

With regard to Granger Causality test, the study findings indicated no causality between the exchange rate and performance of residential property market in Kenya and the inverse was also true. Similar findings were observed by Meidani, Zabihi and Ashena (2011) found that there was no causality relationship in between exchange rate and housing price in Iran in their research. This implies that performance of one market does not cause performance of the other market.

The study results both in the short run and long run conquered with Liu and Hu (2012) whose study results showed that in the short run housing prices had an inverse relationship with RMB exchange rate, while in the long run; housing prices had a positive impact on RMB exchange rate. They study showed that the relationship between exchange rate and property market performance could vary depending on whether the relationship is short run or long run.

The long run findings of this study agreed with Liu and Zhang (2013) and Kok, Ismail and Lee (2018) who observed that the exchange rate and real estate price had a positive relationship and concluded the need for their respective countries to keep watch on their exchange rates as it influences house prices. Similar findings were observed by Rebi (2014) whose results revealed that the relationship between house prices and the exchange rate in Albania was positive significant. The interpretation was that when households perceive the depreciation of the domestic currency as an erosion of their wealth they may be tempted to purchase houses which to them may act as a better store of value than keeping cash.

In the short run, the study finding agreed with Cherono (2013) in that depreciation of the Kenya shilling inhibits property investment by raising the cost of imported capital goods which are in house construction. Consequently this leads to decrease in new investments in this particular market.

The study results differed with Mallick and Mahalik (2015) who found that real effective exchange rate has no significant influence on housing prices in India. This could be an indication that the Indian housing market was not dominated by other foreign nationals a situation that varies from country to country.

5.3 Conclusion

The research set to establish the effect of exchange rate on the market returns of the residential property market in Kenya. Descriptive statistics were used to determine whether exchange rate was normally distributed. The results showed that the variable was slightly skewed. The kurtosis results also showed that the normality assumption was slightly violated. The Jarque-Bera test indicated that the variable had no significant departure from normality. The diagnostic results showed that the secondary data series had a unit root at level but stationary at first difference. Granger Causality test results showed that there was no Granger causality between exchange rate and performance of residential property market in Kenya in either direction. There was observed absence of significant serial correlation and presence of heteroskedasticity was rejected.

Comparison of exchange rate and performance of residential property market in the short run specific model revealed that exchange rate had a negative effect on performance of residential property market in Kenya. This implies that depreciation of the Kenya shilling in the short run would lead to decrease in performance of the residential property market in the Country. This can be explained by the wealth effect, that is, if investors in the residential property market feel that the sudden change in exchange rate would erode their wealth then they will tend to hold on to their units.

Under the long run overall model exchange rate had a positive effect on the performance of residential property market in Kenya. This implies that in the long run a gradual depreciation of the Kenya shilling will actual lead to improvement in performance of the residential property returns. This may imply that a depreciation of the Kenya shilling in the long run encourages investors holding foreign currencies to buy residential units in the Country. This shows that stability of exchange rate is desirable in the short run for better performance of the residential property market while in the long run a weaker shilling contributes towards a better performance

of the residential property market. The conclusion was that exchange rate was a pertinent factor in explaining the performance of the residential property market in Kenya.

This study showed that exchange rate had a statistically significant effect on the performance of the residential property market in Kenya. The study therefore recommends that investors make calculated moves that take advantage presented by variations in exchange rate and/or minimize any adverse situation created by the same variations. There is also need for residential property market investors to focus their marketing strategies to investors with foreign currencies. From the study findings there is need for the Kenyan Government to keep check on the performance of the exchange rate since it influence the performance of the residential property market in the Country.

There is room for further studies especially with regard to the measuring the volatility effect, if any, between the performance of either market on the other.

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