

Effects of Exchange Rate Volatility on Low Income Residential Real Estate Investment Returns in Nigeria

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Abstract

This paper examined the effects of Naira/Dollar exchange rate volatility on low income residential real estate investment returns in Nigeria using EGARCH model. Time series data for an 11 year period between 2000 and 2010 was used in this study. The findings reveal that exchange rate volatility has a significant positive effect on low income residential real estate investment returns in Nigeria within the study period. Magnitude of volatility and volatility persistence measured as β and α respectively were found to be low and insignificant at 5% level of testing. Leverage effect measured as γ was insignificant. However, their insignificance means that they were not pronounced within the study period.

Keywords: Exchange rate volatility, Residential property, Leverage effect, Volatility persistence.

Introduction

An exchange rate constitutes the price of one currency in terms of another. In the Nigerian situation, it is the units of naira that is needed to purchase one unit of another currency. Exchange rate risk or volatility is the risk of a loss or gain in the value of a business activity or investment that results from changes in the exchange rate of world currencies. In other words, it has to do with the fluctuation of the exchange rate of a currency relative to others. Since exchange rate volatility represents a measure of uncertainty that investors must face about the future, it is therefore an important factor that real estate investors should take into consideration in their decision to invest. Osinubi and Amaghionyeodiwe (2009) also identified exchange rate and its volatility as some of the factors that affect inflow of investments into developing countries or economies.

Recent globalization of real estate activities has necessitated the need to examine the link between exchange rate movement and real estate returns.

Exchange rate volatility (risk) can significantly affect investments such that a country with a high degree of exchange rate volatility will have a more volatile stream of profits than a country with a low degree of exchange rate volatility.

Osinubi and Amaghionyeodiwe (2009) opined that Nigeria is one of the countries with a high degree of currency risk. This exchange rate instability especially after the discontinuation of exchange rate control policy is a major factor to optimal investment in Nigeria. This high exchange rate volatility in Nigeria, among others have led to a precarious operating environment which can be attributed to the reason why Nigeria was not only unable to attract foreign investment to its fullest potentials but also has had a limited domestic investment.

According to Adjasi, Harvey, and Agyapong (2008), the openness of a country's economy is recognized as a cause of volatility in its market. Nigeria is an example of an open economy that engages in international trade transactions; hence its market is susceptible to exchange rate volatility. A historic examination of foreign exchange movement in Nigeria shows a considerable level of volatility, thus necessitating the need to determine its effect on real estate returns. Incorporating exchange rate fluctuations into real estate investment analysis can have a considerable effect on its risk – return characteristic.

Despite the vast investment opportunities in residential real estate investment (considering the shortfall of housing supply in Nigeria relative to increase in demand) very little foreign investment capital have been attracted to it. Hence it has become relevant for a study like this to investigate if there exists any relationship between exchange rate volatility and low income residential real estate investment returns in Nigeria.

Statement of the Problem

Onyike (2009) opined that the low income category in Nigeria make up about 40- 50% of the Nigerian population. These low income earners invariably occupy the low income houses which is in short supply. This has resulted in overcrowding in most Nigerian cities thereby making investment in low income houses a lucrative venture.

The volatility of real estate investments has been of concern to property investors all over the world who desire to make gains by diversifying their real estate investment across countries. High volatility of residential real estate is attributable to high risk, since most investors are risk averse, they tend to shy off from the market due to uncertainty in expected returns. (Olweny and Omondi, 2011).

Exchange rate volatility therefore have implications on the economy of a country especially on the real estate sector as it can alter the diversification benefits associated with real estate investments.

Nigeria as an emerging economy with great opportunities in real estate investment into the residential sector (considering shortfall in housing supply) offer great diversification benefit which could be affected by currency risk. The advent of floating exchange rate, the mass surge into real estate investment as an alternative asset class (especially during this downturn in the Nigerian stock exchange), increase in foreign direct real estate investment, have prompted the need to determine the link between these two market (i.e. foreign exchange and property market).

As Nigeria is seeking and implementing strategies to boost it economic development, there is therefore the need to determine the effect of exchange rate volatility on real estate values. Thus it will be expedient to find out if exchange rate volatility increases or reduces the returns from low income residential real estate investments in Nigeria, or does not have any effect at all.

Olowe (2009) posits that the Nigerian foreign exchange market is characterized by high volatility persistence, hence there is the need to determine how this volatility of exchange rate (US Dollar to Naira) affects low income residential real estate investment returns in Nigeria.

Aim & Objectives of the study:

The aim of the study is to investigate the effects of exchange rate volatility on low income residential property returns in Nigeria from 2000 – 2010.

The objectives of the study are three fold namely:

1. To determine the effects of US/Naira exchange rate volatility on low income residential property investment returns in Nigeria.
2. To determine the pattern of correlation between low income residential property returns and exchange rate movement.

Scope of the study.

The scope of this study will be limited to low income residential (Tenement) property returns and exchange rate movement from 2000 to 2010 using Naira US Dollar exchange rate. The property markets that were chosen for this work are Lagos, Port Harcourt and Abuja because a lot of real estate transactions in Nigeria occur in these cities. This study utilized direct real estate investment data over the study period.

Statement of Hypothesis

H₁ There is no relationship between exchange rate volatility and low income residential property returns.

The rest of the paper is divided into four sections. Section two follows this introduction with the review of the existing literature, section three describes the research methodology, section four describes the data presentation and analysis while section five concludes the study.

Literature review

Low income residential real estate refers to properties built solely for dwelling purposes for the low income category. A large portion of real estate investment in Nigeria is apportioned to residential real estate. Kalu(2005) opined that more than 80% of real estate investment in Nigeria constitute of residential real estate and that residential real estate account for the largest investment in the world. Igboko (1992) found out that residences make up the single largest category of real estate investments found in urban and rural areas of Nigeria. Despite the fact that residential real estate account for the largest property investment in Nigeria, very little work has been done in areas of its quantity or stock, returns and risks – while no study has looked at the effects of exchange rate volatility on residential real estate returns in Nigeria.

An exchange rate constitute the price of one currency in terms of another. Exchange volatility refers to the fluctuation of the exchange rate of a currency relative to others. It represents a measure of uncertainty that investors must face about the future which makes it an important factor that investors should take into consideration in their decision to invest. Osinubi and Amaghionyeodire (2009) identified exchange rate and its volatility as one of the factors that affect the inflow of investment into developing countries or economics.

According to Hashim and Zarma (1996), exchange rate is an important economic variable as its appreciations or depreciation affects the performance of other macro-economic variables in any economy. Exchange rate value can be used to access the overall performance of the economy, hence it is a very important variable in a country's policy decision making. Countries at any point in time seek the stability of their exchange

rate because it provides economic agents the opportunity to forge ahead without fear of varying costs and prices of goods and services (Joseph and Akhanonu, 2011). They also opined that the instability of exchange rate can cause a negative distortion in any economy. In their research on the link between exchange volatility and trade in Nigeria, volatility was measured using the generalized ARCH (GARCH) as introduced by Bollersleve (1986). This methods of measuring volatility is one of the best measures because it is useful in capturing non constant, clustered time varying variance in the higher moments, which represents stochastic process by which risk terms are generated (Bollersleve, 1992).

Aghion, Philippe, Romain and Kenneth (2009) found out that exchange rate volatility has a negative effect on economic growth. Peter, Warelia, Shan, Azin and Li (2004) also confirmed this finding by stating that currency crisis in emerging market economies are special examples of high exchange rate volatility. Bleaney and Greenaway (2001), Lastrapes and Koray (1990), Larraun and Vergara (1993) Cushman (1988) caballero and Corbo (1989) also found a negative effect of exchange rate on investment.

Zibuwski and Curicio (1991) Radcliffe (1994), Zibowski and Boyd (1991) Zibnwski and Ziburiski (1999) Worzala (1995), Newell and Webb (1996) Udoh and Egwakhide (2008) found substantial effect of exchange rate volatility on investments. Fidora, Fratzscher and Thomas (2006) opined that the exchange rate of the currency in which a portfolio holds the bulk of its investments determines that portfolio's real return. Ogunleye(2008)observed that exchange rate volatility generates air of uncertainty as the variance of expected profits rises and its net present value falls. Zibrowski and Curicio (1991) identified extreme exchange rate volatility as being the major factor in the determination of real estate diversification benefit.

Patrick (2008) noted that there has been limited empirical work on the effects of exchange rate in relation to property market. Some of the studies include. Newell and Webb (1996) who examined the effects of exchange rate volatility for five property markets (UK, US, Canada, Austria and New Zealand) between 1985 and 1993 using bi-annual data and identified impacts similar to the stock and bond market. Theirs finding are consistent with Tarbert and McAllister (1998), who examined the similar markets over a longer period. On the contrary, Quin and Titman (1997) examined the relationship between changes in annual property values and rents from 17 urban centers in different countries and found out that exchange rate changes did not severely distort the relative average returns in these countries.

Research Methodology

Research Design

This study undertook explanatory survey research in order to give answer to the puzzle on the effect of exchange rate volatility on residential (low income) property investment returns volatility in Nigeria.

Data Collection

Data was collected from 398 firms of Estate Surveyors and Valuers within the study area who supplied data on rental trends of the various residential property classes from 2000 to 2010 from the different property markets (Abuja, Lagos and Port Harcourt) in Nigeria.

Data Analysis Technique

Real estate returns for the different property classes were calculated using

$$R_t = \frac{(CV_t - CV_{t-1}) + NI_t}{CV_{t-1}} \dots\dots\dots(1)$$

Where:

- R_t = Return at time t
- CV_t = Capital value at time t
- CV_{t-1} = Capital value at time t -1
- NI_t = Net income at time t

The correlation analysis is expressed as:

$$p = \frac{COV(X,Y)}{\sigma_x \sigma_y} \dots\dots\dots(2)$$

Source: Gujarati, (1995)

Where:

p = correlation value (a measure of linear association between two variables and lies between +1 and -1. +1 indicates perfect positive association while -1 indicates perfect negative association.)

COV(X,Y) = Co-variance of variable X and Y

σ_x = Standard deviation of variable X

σ_y = Standard deviation of variable Y

Econometric model was used in the study to analyze the results so as to ensure accurate result. One of the variants of the GARCH models the Exponential Generalized Autoregressive Conditional Heteroskedasticity

(EGARCH) was used in determining the effects of exchange rate volatility on medium income and high income residential property investment return volatility in Nigeria. The EGARCH is most often preferred to the GRACH model in studying financial markets. Koulakiotis, Papasyriopoulos and Molyneux (2006) opined that the GARCH (Generalized Autoregressive Conditional Heteroskedasticity) is relatively Weaker than the EGARCH in studying financial markets phenomenon. The weaknesses of the GARCH according to them include; (i) it assumes that there is a negative correlation between current returns and future volatility;(ii)it imposes parameter restrictions that are often violated by estimated coefficients which may unduly restrict the dynamics of the conditional variance process; (iii) it is difficult to interpret whether shocks to conditional variance persist or not in GARCH. Statistical software (Eviews 7.0) was used in the analysis of the EGARCH models. The models are:

$$Y_t = \beta_0 + \beta_1(\Delta ER_t) + \beta_2(ALIRPR_t) + \beta_3(ALIRPR_{t-1}) + \mu_t \dots \dots \dots (3)$$

$$\ln(\sigma_t^2) = \omega + \beta \ln(\sigma_{t-1}^2) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] \dots \dots \dots (4)$$

Where in equation (3)

- Y_t = **Low income** residential property returns
- ΔER_t = Changes in exchange rate at time t of first differencing
- ALIRPR = Aggregate low income residential property returns
- $\beta_{1,2,3}$ = Model coefficient parameters
- μ_t = Random Error which is assumed to be : $N(0, \sigma_t^2)$

Where in equation (4)

- σ_t^2 = The conditional variance at time t.
- ω = Constant.
- σ_{t-1}^2 = Lag 1 conditional variance.
- u_{t-1} = Lag 1 of Random Error.
- β = Magnitude of volatility
- α = Volatility persistence
- γ = Assymetry or Leverage Effect.

The model specification for aggregate medium income residential property returns and aggregate high income residential property returns are specified below

$$ALIRPR_t = \beta_0 + \beta_1(\Delta ER_t) + \beta_2(\Delta ER_{t-1}) + \beta_3(ALIRPR_{t-1}) + \mu_t \dots \dots \dots (5)$$

Where:

$$t = 1, 2, \dots, 10$$

$$\ln(\sigma_t^2) = \omega + \beta \ln(\sigma_{t-1}^2) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] \dots \dots \dots (4)$$

Where in equation (5):

- ALIRPR = Aggregate low income residential property returns
 - β_0 = constant or the regression intercept
 - μ_t = the error term at time t of the first difference
 - ΔER_t = exchange rate at time t of the first difference
 - ΔER_{t-1} = exchange rate of the first difference at lag 1
 - $\beta_{1,2,3}$ = The model parameters of equation (5), the mean equation
- Other variables and parameters are as defined in equations (4).

DATA ANALYSIS AND PRESENTATION

Table 1. Low Income Residential Property Returns (2000 – 2010)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Low Income Residential Property Returns	-	0.0961	0.1914	0.2010	0.0880	0.1627	0.1943	0.0532	0.1850	0.3111	0.1110

Source: Diala O.A (2015)

The low income residential property returns represent aggregate returns from the various study locations.

Table 2. Naira/UD Dollar Exchange Rate (2000 – 2010)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EXCHANGE RATE	-	111.94	120.97	129.36	133.50	132.15	128.65	125.80	118.57	148.88	150.30

Source: Central Bank of Nigeria

The data on exchange rate were reported as seen from the CBN

The instruments that were used to determine the effects of exchange rate volatility on low residential real estate return include descriptive statistics, the unit root Augmented Dickey Fuller (1979, 1981); EGARCH (Nelson,1991).

TEST FOR STATIONARITY:

Testing for stationarity is usually done in time series data so as to ascertain if the series is stationary because inferences cannot be made on non-stationary data. In order to address the issue of non-stationarity and also avoid the problem of spurious regression, the researcher used a quantitative analysis known as the Augmented Dickey - Fuller test (ADF).

DECISION RULE FOR AUGMENTED DICKEY-FULLER TEST

If $t^* > ADF$ (Augmented Dickey-Fuller) critical value do not reject null hypothesis this implies that unit root exist which indicates non-stationarity.

If $t^* < ADF$ (Augmented Dickey-Fuller) critical value reject null hypothesis this means unit root do not exist which indicates stationarity.

In this analysis, the researcher is testing at $t^* = 5\%$ level.

where t^* refers to MacKinnon critical values.

Table 3: Summary of the Augmented Dickey-Fuller unit root test analysis.

VARIABLES	LEVEL(t^*)	ADF	FIRST DIFF(-1)	ADF	DECISION
ALIRPR _t	-3.259808*	-3.656899*			Stationary
ER _t	-3.259808**	-1.452181**	-1.995865*	-2.827286*	Stationary

* Stationary at 5%

** Not stationary at 5%

According to the statement of Augmented Dickey-Fuller decision rule, it is indicated in the Table 3 above that ALIRPR, is stationary at t^* while ER became stationary after the first differencing. The researcher ascertained that the series is stationary.

Table 4 Correlation Analysis of Exchange Rate and Aggregate Low Income Residential Property Returns

	Exchange rate	Aggregate low income residential returns
Exchange rate	1	.313
Aggregate low income residential returns	.313	1

Table 4 above shows the Pearson correlation matrix analysis of all the aggregate variables. The value shows the relationship between aggregate low income residential property returns and Exchange rate as .313. The correlation between low income residential and Exchange rate is positive. The positive correlation between ALIRPR and Exchange rate indicates that when foreign exchange volatility increases, low income residential aggregate returns volatility also increases.

Having ascertained the stationarity of the variables, Exponential Generalized Conditional Autoregressive Heteroscedasticity Model (EGARCH) was used to test the effects of exchange rate volatility on low income residential property returns.

Table 5. Result of the EGARCH model on the effect of exchange rate volatility on low income residential property returns
 Dependent Variable: ALIRPR

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.232356	0.017715	13.11623	0.0000
D(ER)	0.007852	0.000267	29.44953	0.0000
D(ER(-1))	0.003452	0.001289	2.678762	0.0074
ALIRPR(-1)	-0.740350	0.095800	-7.728103	0.0000
Variance Equation				
C(5)	-5.479213	5.268443	-1.040006	0.2983
C(6)	-3.355255	4.625054	-0.725452	0.4682
C(7)	-1.265478	1.798422	-0.703660	0.4816
C(8)	-0.117929	1.164386	-0.101280	0.9193
R-squared	0.555381	Mean dependent var		0.163288
Adjusted R-squared	0.221917	S.D. dependent var		0.080379
S.E. of regression	0.070902	Akaike info criterion		-3.200256
Sum squared resid	0.020108	Schwarz criterion		-3.120815
Log likelihood	20.80102	Hannan-Quinn criter.		-3.736057
Durbin-Watson stat	2.111988			

The summary of the result of the analysis is presented below

Table 6. MEAN EQUATION FOR ALIRPR

	Coefficient	Probability
C	0.232356	0.0000
D(ER)	0.007852	0.0000
D(ER(-1))	0.003452	0.0074
ALIRPR(-1)	-0.740350	0.0000

From the mean equation, all the variables are statistically significant. The first difference of $D(ER_t)$ positively affects aggregate low income residential property returns. This implies that an increase in exchange rate (ER_t) will lead to an increase in the returns and volatility of aggregate low income residential property returns (ALIRPR). The first difference of exchange rate at the previous year $D(ER_{t-1})$ positively affects ALIRPR which implies that an increase in $D(ER_{t-1})$ due to high price level will lead to a significant increase in ALIRPR volatility.

Table 7 VARIANCE EQUATION FOR ALIRPR

	Coefficient	Probability
ω	-5.479213	0.2983
α	-3.355255	0.4682
β	-1.265478	0.4816
γ	-0.117929	0.9193

In the variance equation, none of the ARCH, GARCH and ASYMMETRIC effects is significant. However, γ is negative (-0.117929) and less than zero ($\gamma < 0$) indicating leverage effect in the EGARCH model showing the tendency for volatility to rise more following a large price fall than a price rise of the same magnitude. It was however not pronounced in the sample period. β (a determinant of the degree of persistence) is also negative (-1.265478) and less than one (1) indicating that the degree of volatility persistence is low though not significant at the conventional level of testing. The estimated parameter, α , a measure of persistence of volatility is low at -3.355255, but not pronounced within the sample period. Also the non-significance of GARCH effects imply that there are no news of volatility from previous periods since the coefficient is negative and less than one showing that volatility is persistent but low and insignificant at the conventional level of testing.

The insignificance of the variance equation parameters indicates that they were not pronounced within

the study period.

Conclusion

Exchange rate volatility was found to have a significant positive impact on low income residential real estate investment aggregate returns i.e. higher exchange rate volatility has a positive effect on low income residential property returns volatility in Nigeria. Volatility of returns was not highly persistent. Leverage effect was not significant. The findings of positive effects of exchange rate volatility on real estate investment returns in this study are contrary to the findings of Lee & Thomas (2006), Addae-Dapaah & Goh (1998), Addae-Dapaah & Loh (2005), Lee (2001), Newell & Webb (1996).

This implies that investors and would be investors in real estate market in Nigeria may use macro economic data such as exchange rate in forecasting property market volatility. The positive correlation between exchange rate and low income residential property returns indicate that they move in direction which implies that as exchange rate volatility increases low income residential property returns volatility also increases and vice versa.

The study found a significant relationship between exchange rate volatility and low income residential real estate investment returns in Nigeria.

Recommendations

Based on the findings and conclusions made in this study, the following recommendations have been made.

Policy makers should seek measures that will lead to stability in exchange rate, since any disturbance in exchange rate will affect low income residential real estate investment returns. Such measures if established will lead to a better property market performance in Nigeria. It will also attract foreign direct real estate investment into the country.

Real estate investors who are seeking diversification benefits should critically consider the effects of exchange rate risk before building their international property portfolio.

Firms that import raw materials or finished products for housing construction in Nigeria should make use of forward contract for hedging purposes. This will enable them go round the problem of exchange rate volatility.

Finally, the government should ensure that all the market players comply with the policies and regulations on exchange rate so as to ensure efficiency and effectiveness.

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