



Exchange Rate Volatility and Domestic Investment: Evidence from Nigeria

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Abstract

This study examined the relationship between exchange rate volatility and domestic investment in Nigeria. Quarterly time series data on gross fixed capital formation a proxy for investment and exchange rate are used over the period 1981Q1 to 2017Q4. Exchange rate volatility was generated using exponential generalized autoregressive conditional heteroscedasticity (EGARCH). The study found that the core variable (exchange rate volatility) of the study was inversely related to domestic investment during the investigated period. It also revealed that income and exchange rate were strong drivers of domestic investment. Sequel to the findings, the study recommends that government should via the Central Bank of Nigeria monitor the exchange rate volatility, pursue sustainable exchange rate policy and adopt appropriate monetary and fiscal policies to ensure stability in exchange rate so as to attract more domestic investment and move the economy forward.

Keywords: Exchange Rate, Exchange Rate Volatility, Domestic Investment

JEL Classification: F31, D5, E22

1.0 Introduction

Scholars have continued to link the rate as well as pace of economic growth of countries worldwide to the level of investment (both domestic and foreign). As such, investment has been recognized as an important factor that plays vital roles in shaping and reshaping any economy especially the developing nations. Capital formation precedes investment; Bakare and Olubokun (2011) defined capital formation as the proportion of present income saved and invested in order to augment future output and income. It usually results from acquisition of new factory along with machinery, equipment and all other productive capital goods. Capital formation is equivalent to an increase in physical capital stock of a nation with investment in social and economic infrastructure.

Since the productive capacity of any country is determined by the level of capital formation (which is directly linked to the level of investment), deficiency of capital has been cited as the most serious constraint to sustainable economic growth (Shuaib & Dania, 2015). It is crucial to keep in mind that an understanding of the impact of capital formation is a crucial prerequisite in designing a policy intervention towards achieving economic growth. Jhingan (2006) noted that the process of capital formation involves three inter-related conditions which are the existence of real savings and rise in them; the existence of credit and financial institutions to mobilize savings and to direct them to desired channels; and to use these savings for investment in capital goods.

The government of Nigeria in 1986 considered the need for improvement in capital formation and pursued an economic reform that shifted emphasis to private sector. This gave rise to the adoption of Structural Adjustment Program (SAP), which caused a radical shift from inward-oriented trade policies to outward-oriented trade policies in Nigeria. The aim of these policy measures is to emphasize production and trade along the lines dictated by a country's comparative advantage i.e. export promotion, diversification, reduction or elimination of import tariffs, and the adoption of market-determined exchange rate (Adedipe, 2004) The major policies reforms of the SAP include the deregulation of the exchange rate; deregulation of the financial sector; trade liberalization; abolition of commodity marketing boards; adoption of appropriate pricing policies especially for petroleum products and lastly the rationalization and privatization of public sector enterprises (Onasanya, 2013).

According to Ugwuegbe & Uruakpa (2013), the reforms were expected to ensure that interest rates were positive in real terms and to encourage savings, thereby ensuring that investment funds would be readily available to the real sector. In addition, the reforms were expected to lead to efficiency in productivity of labour; efficient utilization of economic resources; increase in aggregate supply; reduction in the rate of unemployment and maintenance of low rate of inflation. Data from World Bank (2017) revealed that the trend of gross fixed capital formation (GFCF), a popular proxy for investment in literature for Nigeria has remained unstable. For instance, the GFCF (at the current price) was ₦18.2 billion in 1981. The value continued to decline until 1986 when it began trending upward until it reaches ₦11.4billion. The GCFC rose to ₦40.1billion in 1990; ₦141.9billion in 1995; ₦331.1billion in 2000; ₦804.4billion in 2005 and to over ₦4.2 trillion 2016.

The study of Kanu, Ozurumba & Anyanwu (2014) showed that during the 1980s, gross fixed capital formation averaged 21.3 percent of the gross domestic product (GDP) in Nigeria. This proportion which increased to 23.3 percent in 1991, declined to as low as 14.2 percent of GDP in 1996. It later picked and rose to 17.4 percent in 1997 and average 21.7 between that time and 2000. Bakare (2011) also noted that GFCF rose from 22.3 percent of GDP in 2000 to 26.2 percent in 2002 and declined drastically to 21.3 percent in 2005.

Exchange rate is regarded as one of the major indicators of competitiveness of the currency of any country. Thus, it is an important macroeconomic variable used in determining international competitiveness. Fluctuations in exchange rate have significant effect on the volume of international trade. It is therefore an essential requirement for developing nations like Nigeria

to accord special attention via ensuring adequate policy measures for an efficient exchange rate management system. The swerve from the fixed exchange rate after the collapse of the Bretton-Woods system in the 1970s and the adoption of the managed-float exchange rate in the mid-1980s resulted in extreme volatility of the Naira (Opaluwa, Umeh & Ameh, 2010). Therefore, it is against this background that this study is undertaken to ascertain the relationship between exchange rate volatility and domestic investment in Nigeria between the early noted period.

2.0 Literature Review

Substantial numbers of studies have shown evidences on how exchange rate volatility affects countries economic growth through effects of investment, interest rate, inflation, foreign direct investment, trade and other macroeconomic variables. Adelowokan, Adesoye and Balogun (2015) examined the effect of exchange rate volatility and growth in Nigeria and the result shows that the volatility has negative effect on investment and growth and positive effect on interest rate and inflation. On the relationship with foreign direct investment, the study of Omorokunwa & Ikponmwosa (2014) established a weak form of relationship; exchange rate volatility has a very weak effect on inflow of foreign direct investment (FDI) to Nigeria, both in the long run and in the short run and that exchange rate volatility has a weak effect on foreign portfolio investment in the short run but a strong positive effect in the long run. Similarly, on the performance of manufacturing sector in Nigeria, the exchange rate volatility is found to have significant negative relationship (Ayinde, 2014).

Conversely other studies however show absence of significant relationship between exchange rate volatility and investment growth in Nigeria. Ugwuanyi&Onyeka (2012) found that exchange rate volatility had positive non-significant impact on Nigeria's GDP growth and investment rate. Similarly, using the GARCH approach, the Oyovwi (2012) findings shows that in the short run, economic growth is positively responsive to exchange rate volatility while in the long run a negative relationship exists between the two variables.

On the other hand, large number of country specific empirical literature can be found investigating the effect of exchange rate volatility on the general economic growth. Ekanayake and Chatrna (2010) show that exchange rate volatility effects differ across category of goods in Sri Lanka. Using the ARDL approach, Abdallah (2016) established the evidence of the effect of exchange rate variability on manufacturing sector performance in Ghana. Similar study is also carried out by Polodoo, Seetanah and Sanasee (2013) Mauritius with varied result however. Using EGARCH techniques to capture the asymmetric effect of volatility the study found that exchange rate volatility does not affect real agricultural export, imports, but lagged values of real agricultural imports are jointly significant in explaining exchange rate volatility.

Ghazali (2010) on the other hand, studied causal relationship between private domestic investment and economic growth (GDP) in Pakistan over the period 1981 to 2008 using time series data. The research revealed that there is a bi-directional causality between private domestic investment and economic growth; increased economic growth encourages large private domestic investment and vice versa.

Although, extensive literature can be seen on the effect of volatility on domestic investment across countries as above, little evidence is shown on the analysis of exchange rate volatility and domestic investment especially for Nigeria. This study has provided an insight to the actual efficiency of monetary policies in managing exchange rate volatility over the years and how it can better affect economic growth and expansion in the level of domestic investment. The study intends to guide policymakers and economic advisors on the best line of action that can create an enabling environment for investment in Nigeria. The findings of this study has improved the dearth of domestic studies (i.e. studies carried out in Nigeria) on exchange rate volatility and its consequential impacts on the behaviour of domestic investment and is also of interest to policymakers as it has aid in the quantitative measuring and critical analysis of the impact of exchange rate volatility on domestic investment in Nigeria. Finally the study is of immense benefit to future researchers and the academia due to its robust empirical discourse

3.0 Methodology

The review of literature revealed that scholars and researchers have continued the debate on the most suitable theory that can pinpoint the relationship between exchange rate volatility and domestic investment. This may perhaps be because there are numerous theories that can be used to analyse the connections between exchange rate volatility and the variable of interest. Since there is no unanimity as to which of the theories best explain the relationship between the concerned variables, this study followed the lead of Bahmani-Oskooee and Hajilee (2010). In this study, the model of Bahmani-Oskooee and Hajilee (2010) was augmented to make room for inclusion of exchange rate volatility (the core variable of this study) as follows:

$$\text{Dominv} = f(\text{Incom}, \text{Intrate}, \text{Exchrte}, \text{Exratevol}) \quad (1)$$

Where:

Dominv = Domestic Investment (using gross fixed capital formation as a proxy)

Income = A measure of Income (using real gross domestic product as a proxy)

Intrate = Interest Rate

Exchrte = Exchange Rate

Exratevol = A measure of Exchange Rate Volatility

Note that all the variables not in percentage are logged while the econometric form of equation (1) is expressed as follows:

$$\text{LgDominv}_t = \beta_0 + \beta_1 \text{LgDominv}_t + \beta_2 \text{Intrate}_t + \beta_3 \text{LgExchrte}_t + \beta_4 \text{LgExratevol}_t + \mu_t \quad (2)$$

It is expected that the estimate of β_1 will be positive. The reason behind this is that at high level of income, investors become more optimistic about the future of an economy and they invest more. An estimate of β_2 is expected to be negative since increase in the interest rate raises the cost of borrowing. Changes in the exchange rate could have positive or negative impact on domestic investment. When Alexander (1952) introduced the absorption approach, he argued that since wages do not adjust fully to effects of currency depreciation, real income is shifted

from workers to producers in the form of profit. Increases in profit margin would create an incentive for producers to invest more. On the other hand, since depreciation raises the cost of imported inputs, profits could be hurt. Depending on which of the effect is stronger, domestic investment could be affected in either direction.

It is important to note that the exchange rate volatility (LgExratevol) listed in the model as core variable was generated using Exponential Generalized Autoregressive Conditional Heteroscedasticity (Egarch) approach. The main differences between the GARCH and the EGARCH model is that symmetric models which includes ARCH and GARCH do not capture leverage effects in time series as opposed to the asymmetric models which includes EGARCH. Leverage effects here means the tendency for volatility to rise more following a large price fall than following a price rise of the same magnitude (Brooks, 2008). The EGARCH (p, q) model for mean and conditional variance is specified as:

$$EXR_t = \alpha_0 + \alpha_1 EXR_{t-1} + \varepsilon_0 \quad (3)$$

$$\log(\sigma_t^2) = \omega + \sum_{j=1}^q \beta_j \log(\sigma_{t-j}^2) + \sum_{j=1}^p \alpha_j \left| \frac{\mu_{t-j}}{\sigma_{t-j}} \right| + \sum_{k=1}^r \lambda_k \frac{\mu_{t-k}}{\sigma_{t-k}} \quad (4)$$

where σ_t^2 is the conditional variance of the exchange rate. ω , β , α and λ are parameter estimates. β measures the persistence in conditional volatility irrespective of the market situation. When β relatively large volatility is takes a long time to die out following a crisis in the market (Alexander, 2009). α measures the asymmetric effect of the past shocks which is usually negative, that is ceteris paribus positive shocks generate less volatility than negative shocks. The leverage effect can be tested if $\alpha < 0$, which shows that positive shocks (good news) generate less volatility than negative shocks (bad news). When $\alpha = 0$, then the model is symmetric. When $\alpha > 0$, it implies that positive shocks are more destabilizing than negative shock. When $\alpha \neq 0$, the model is asymmetric. μ_{t-i} and μ_{t-k} are the residuals which is a measure of information about volatility in the previous period. σ_{t-j}^2 is the GARCH term representing last period's forecast variance. Predicted values of $\log(\sigma_t^2)$ are applied as an estimate of exchange rate volatility (Takaendesa et al., 2005). The asymmetric effect of past shocks is captured by the λ coefficient which is usually negative, that is ceteris paribus positive shocks generate less volatility than negative shocks. The leverage effect can be tested if $\lambda < 0$, but if $\lambda \neq 0$, the news impact is asymmetric.

4.0 Results and Discussion

Regression result for Equation (2).

Dependent Variable: Lgdominv

Variable	Coefficient	Std Error	t-Stat at 5%	Prob.
Constant	-22.24931	4.225339	-5.265686	0.0000

Lgincom	1.671061	0.136451	12.24660	0.0000
Intrate	0.013139	0.007516	1.748237	0.0840
Lexchrte	-0.258555	0.033149	-7.799686	0.0000
Lgexchrtevol	-1.859146	0.899452	-2.066976	0.0232
R-squared	0.842566			
Adjusted R-squared	0.815618			
Durbin-Watson Stat.	2.007894			
F-stat.	55.22550			
Prob (F-statistics)	0.00000			

Source: Author's computation using Eviews 9

The above result shows that the core variable, exchange rate volatility (Lgexchrtevol), of the study is statistically significant (with t-stat of -2.0669 and p-value of 0.0232); the coefficient (i.e. -1.8591) carries a negative sign thus depicting an inverse relationship with the dependent variable, domestic investment (Lgdominv). In addition, it shows that a unit rise in exchange rate volatility will decrease domestic investment on the average by about 18.6 percent assuming other variables are held constant. Among the control variables incorporated in the model, income and exchange rate were observed to have statistically significant positive and negative impacts on the dependent variable respectively while interest rate carried a positive sign, the variable is not statistically significant. The R^2 , dutbin Watson and prob (f-stat) showed that the model is stable.

EGARCH Regression Result for equation (3) & (4).

Dependent Variable: Lgexchrte

Variable	Coefficient	Std. Error	z-Statistic	Prob.
$\alpha(1)*C$	0.004470	1.15E-05	388.9268	0.0000
$\alpha(2)*Lgexchrte(-1)$	1.000060	3.33E-07	3003300.	0.0000
$\alpha(3)*Lgdominv(-1)$	-0.000161	4.78E-07	-337.4610	0.0000
$\alpha(4)*C$	-5.033648	1.916183	-2.626914	0.0346
$\alpha(5)*GARCH(-1)$	0.430290	0.212040	2.029286	0.0388
$\alpha(6)*ABS(RES(-1)/GARCH(-1))$	-2.010529	0.304172	-6.609842	0.0000
$\alpha(7)*RES(-1)/GARCH(-1)$	-1.621289	0.466426	-3.475983	0.0160

R-squared = 0.992391; Adj. R-squared= 0.992285; Durbin Watson Stat.=1.999985

Source: Author's Computation using Eviews 9.

Equation Estimated

$$Lgexchrte_t = \alpha_1 + \alpha_2 Lgexchrte_{t-1} + Lgdominv_{t-1} + \varepsilon_t \dots \dots \dots \text{(Mean equation)}$$

$$\log(\sigma_t^2) = \alpha_3 + \alpha_4 \log(\sigma_{t-1}^2) + \alpha_5 \frac{\mu_{t-1}}{\sigma_{t-1}} + \alpha_6 \frac{\mu_{t-1}}{\sigma_{t-1}} \dots \dots \dots \text{(Variance equation)}.$$

Here, the focus will be on the variance equation, α_5 is the one lagged period value of exchange rate volatility, interpreted in absolute term. The necessary and sufficient condition that is satisfied by this result is that the value of this coefficient is less than 1. α_5 measures the persistence in conditional volatility irrespective of the market situation and has a value of 0.430290 which is statistically significant (considering the probability). If the value of this parameter is large, it implies that volatility takes a long time to die out following a crisis in the market. The result shows that about 0.43 percent of exchange rate volatility in the last period persists in the current period. So there is persistence of exchange rate volatility on domestic investment in Nigeria.

Parameter α_7 is usually used in econometric practice to determine the asymmetric and leverage effect. If the value of $\alpha_7 = 0$, then the model is symmetric, if $\alpha_7 \neq 0$, then the model is asymmetric and can be tested for leverage effect. If $\alpha_7 < 0$ (negative), it shows that negative shocks to exchange rate is higher than the effect of than positive shocks and it implies exchange rate volatility rises faster following news of an increase in exchange rate and falls slower following news of a decrease in exchange rate thus confirming presence of leverage effect. The coefficient of α_7 is -1.621289 and it is statistically significant with a probability value of 0.0160. So there is the presence of leverage effect. This implies that negative shocks to exchange rate have a negative effect on domestic investment.

5.0 Conclusion and Policy Recommendations

This study examined the impact of exchange rate volatility on domestic investment in Nigeria, using quarterly data covering the period between 1981Q1 and 2017Q4. This study employed the EGARCH model as developed by Nelson (1991) to measure exchange rate volatility in Nigeria. It was confirmed that the volatility estimator adequately measured the volatility of the exchange rate by testing for ARCH effect, serial correlation and normality test after running the EGARCH model. This is a timely study given the relatively low level of domestic investment in Nigeria most especially amid recent high level of fluctuations in the exchange rate. This study has therefore made recommendations and policy intervention measures to be adopted in order to check the volatile nature of exchange rate. The findings support the view that exchange rate volatility affects domestic investment negatively, the researcher therefore calls for more urgent and reasonable policy formulation to encourage more domestic investment in order to hasten sustainable economic growth and development in Nigeria.

The government via the Central bank of Nigeria (CBN) should monitor the exchange rate volatility, pursue sustainable exchange rate policy and adopt appropriate monetary and fiscal policies to ensure stability in exchange rate so as to accelerate and enhance domestic investment in order to propel (in the long-run) growth and development of the Nigerian economy. There

is also need for policymakers to always consider the exchange rate level, prior to implementation of any financial policy in relation to exchange rates. The CBN should also consider taking control of short-run depreciation of the Naira due to its possible adverse effects on domestic investment. Government should provide the required infrastructures such as; good road, security and favourable atmosphere for investment in order to encourage/attract more domestic investments in the country.

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