DOI: 10.20472/EFC.2018.009.011

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EFFECT OF EXCHANGE RATE VOLATILITY ON ECONOMIC GROWTH IN NIGERIA (1986-2014)

Abstract:

This study evaluates the effect of exchange rate volatility on economic growth in Nigeria from 1986 to 2014. It determines the extent and manner to which economic growth responds to exchange rate volatility in Nigeria. The empirical analysis of this study is to determine the degree of volatility of real effective exchange rate using the Generalised Autoregressive Heteroskedasticity (GARCH) model and the Generalized Method of Moments is used to determine the effect of real exchange rate volatility on economic growth. The study finds that there is high volatility of real effective exchange rate. It also reveals that real effective exchange rate is negatively and significantly related to economic growth. This finding suggests that exchange rate volatility is harmful to the growth of the Nigerian economy. This study recommends that government should constantly seek to maintain a stable exchange rate, increase its expenditure, particularly capital expenditure and implement sustainable reforms to increase the depth of the financial sector.

Keywords:

exchange rate, volatility, economic growth and GARCH

JEL Classification: E44

1. Introduction

Exchange rate is the price of the domestic currency in relation to the currency of another country. It represents the quotation of the local currency with respect to foreign currencies (Azid, Jamil & Kousar, 2005). Exchange rate is an indicator of a country's international competitiveness. The lower the exchange rates of a country, the higher the country's competitiveness in the world market and vice-versa. Essentially, exchange rate influences four key relative prices in the economy, which are the price of tradable goods relative to non-tradable goods; the price of exports relative to the price of exports of competitor countries (in foreign currency); the price of imports relative to the price of domestic import substitutes (in domestic currency); and the price of exports or import substitutes relative to the cost of producing these goods. By influencing these relative prices, the exchange rate can affect the allocation of resources in the economy, including the volume of international trade (Umoh, 1994).

Exchange rate is associated with volatility. Exchange rate volatility is generally referred to as uncertainty associated with movements in exchange rate. This uncertainty has posed serious implication for the investment and growth in both developed and developing countries. Aizenman, (1992) observed that the increase in exchange rate volatility leads to the decrease in the level of investment. Private investors are more concerned about exchange rate volatililty because of its effect on their investment in form of capital gains or losses (Mordi, 2006). Excessive exchange rate volatility erodes the confidence of investors in the business environment. Obstfeld and Rogoff (1998) argue that excessive volatility of exchange rate is harmful to the domestic economy.

Exchange rate volatility became a prominent feature in countries as a result of the adoption of the flexible exchange rate system following the collapse of the Bretton Woods Agreement in 1973. The advocates of the fixed exchange rate system believe that a flexible exchange rate system increases uncertainty associated with international trade (Alagidede & Ibrahim, 2016). Exchange rates have been highly volatile in African countries since the adoption of the flexible exchange rate system (Omojimite & Akpokodje, 2010). Nigeria adopted the Structural Adjustment Programme recommended by the Bretton Woods institutions (World Bank and International Monetary Fund) in 1986. This led to shift from the fixed exchange rate system to the flexible exchange rate system.

Empirical studies such as Aghion, Bacchetta, Rancieri and Rogoff (2009) and Ndambendia and Alhayky (2011) argue that the level of financial development influences the impact of exchange rate volatility on economic growth. They posit that economies with a relatively low level of financial development tend to be more negatively affected than economies with relatively high level of financial development. Nigeria is an open economy with a relatively low level of financial development. Therefore, it is important to determine the extent and manner to which economic

growth responds to exchange rate volatility in Nigeria. This study contributes new evidence in the Nigerian context by using an estimation method that overcomes the problem of endogeneity and simultaneity bias as well as controlling for the effects of relevant growth-determining variables in order to overcome the problem of omitted variable bias. The rest of this study is structured as follows: Section 2 reviews literature, Section 3 presents the methodology, Section 4 reports the empirical findings and Section 5 concludes the study.

2. Literature review

Evidence from panel dataset: In a sample of 95 less developed economies, Dollar (1992) found an inverse association between exchange rate volatility and economic growth from 1976 to 1985. Bleaney and Greenaway (2001) examined the impact of terms of trade and real exchange rate volatility on investment and growth in 14 sub-Saharan African countries from 1980 to 1995. The authors observed that growth is negatively influenced of terms of trade volatility while investment is adversely affected by real exchange rate volatility. Kandil (2004) examined the effect of fluctuations in exchange rate on output growth and inflation in 22 developing countries. The author discovered that in the long run, exchange rate fluctuations significantly cause output growth and inflation to decrease and increase respectively.

De Grauwe and Schnabl (2005) employed the Generalised Least Squares (GLS) and Generalised Method of Moments (GMM) panel methodology on a dataset comprising of countries in the Central and Eastern Europe. The study found that there is a strong negative relationship between exchange rate volatility and economic growth. Schnabl (2007) investigated the impact of exchange rate volatility on the growth of 41 small open economies in the European Monetary Union (EMU) periphery. The estimation results showed significant impact of exchange rate volatility on economic growth.

In a panel data for 83 countries, Aghion, Bacchetta, Rancieri and Rogoff (2009) found that the impact of exchange rate volatility on the long-term productivity of an economy depends on its level of financial development. For countries with relatively low level of financial development, exchange rate volatility reduces growth while exchange rate volatility has no significant effect on countries with relatively high level of financial development. Holland, Vieira, Silva and Bottecchia (2011) evaluated the impact of real exchange rate volatility on growth for developed and emerging economies between 1970 and 2011. They found that high exchange rate volatility impacts positively on economic growth while low exchange rate volatility impacts negatively.

Ndambendia and Alhayky (2011) investigated the long-run relationship between effective real exchange rate volatility and economic growth of 15 sub-Saharan African countries from 1980 to 2004 using the Fully Modified Ordinary Least Squares (FMOLS) method. They found that real effective exchange rate volatility adversely affects economic growth when domestic credit-GDP ratio falls below the threshold

value of 57%. They concluded that the countries with less-developed financial sector tend to be more negatively affected by effective real exchange rate volatility. Mehdi, Arezoo and Alireza (2014) assessed the effect of exchange rate fluctuations on the growth of 18 developing economies between 1986 and 2010 and found that exchange rate fluctuations has a significant negative impact on economic growth.

Country-specific evidence: Azid, Jamil and Kasour (2005) found that exchange rate volatility does not have significant impact on manufacturing production in Pakistan between 1973 and 2003. Pokhariyal, Pundo and Musyoki (2012) used GMM to evaluate the impact of real exchange rate volatility on the economic growth of Kenya. The study found that real exchange rate volatility has a negative impact on economic growth. Dickson (2012) evaluated the effect of exchange rate volatility on Nigeria's economic growth from 1970 to 2009. The author found that in the short run, exchange rate volatility positively impacts on economic growth while in the long run, economic growth negatively responds to exchange rate volatility.

Ayinde (2014) examined the impact of exchange rate volatility on the performance of the manufacturing sector of Nigeria between 1986 and 2012. Employing the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) approach, the study revealed that exchange rate volatility did not significantly affect the sector. Adelowokan, Adesoye and Balogun (2015) utilized the Vector Error Correction Mechanism (VECM) to determine the effect of exchange rate volatility on investment and economic growth in Nigeria from 1986 to 2014. Their results showed that exchange rate volatility negatively affects investment and growth.

Using GMM, Alagidede and Ibrahim (2016) found exchange rate volatility to be negatively related to Ghana's economic growth between 1980 and 2013. Danladi and Uba (2016) assessed the impact of exchange rate volatility on the economic performance of Ghana and Nigeria from 1980 to 2013. The GARCH analysis revealed that exchange rate volatility has a significant negative effect on the performance of both economies.

3. Methodology

3.1 Data

This study evaluates the effect of exchange rate volatility on economic growth in Nigeria from 1986 to 2014. The rationale for the starting year (1986) is because the year marked a shift from the fixed exchange rate system to the flexible rate system.

Table 1: Variables and Sources

Variable(Code)	Description	Source
Gross Domestic Product Growth Rate (GDP growth)	It is the percentage change in the total monetary value of goods and services produced by a country and it is used to proxy for economic growth.	World Development Indictors (WDI)
Real Effective Exchange Rate (REER)	It is the nominal effective exchange rate divided by a price deflator.	WDI
Gross Fixed Capital Formation (GFCF)	It is a proxy for investment and it consists of land improvements, plant, machinery and equipment purchases, and the construction of infrastructural facilities.	WDI
Labour Force (LF)	It is an indicator of labour and consists of all individuals that supply labour for the production of goods and services.	WDI
Terms of Trade (TOT)	It is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured with respect to the base year 2000.	WDI
Trade Openness (OPEN)	It is the sum of export and import divided by nominal gross domestic product.	WDI
Government Expenditure (GE)	It refers to all government consumption, investment and transfer payments.	Central Bank of Nigeria (CBN)
Financial Depth (FD)	It is the ratio of broad money to nominal gross domestic product and it is a proxy for financial development.	CBN

Source: Authors

3.2 Model Specification

The model built for this study specifies gross domestic product (GDP) growth rate as dependent on volatility of real effective exchange rate (VolREER) and some other factors as control variables which have been identified in growth literature to influence economic growth. The variables are specified in logarithm form except GDP growth in the econometric model. The model presented as:

$$lnGDPgrowth_t = \beta_0 + \beta_1 lnVolREER_t + \beta_2 lnGFCF_t + \beta_3 lnLF_t + \beta_4 lnTOT_t + \beta_5 lnOPEN_t + \beta_6 lnGE_t + \beta_7 lnFD_t + \varepsilon_t \quad \ldots (1)$$

It is expected that all the regressors would be positive except β_2.

3.3 Method of Data Analysis

The empirical analysis of this study is in two parts. First, to determine the degree of volatility of real effective exchange rate using the Generalised Autoregressive Heteroskedasticity (GARCH) model was used. The model can be stated as:

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \qquad \ldots(2)$$

Where σ_t^2 is the conditional variance, ω is the constant term, ε_{t-1}^2 is the ARCH term (news about volatility from previous period), σ_{t-1}^2 is the GARCH term (last period's forecast variance), α is the coefficient of the ARCH term and β is the coefficient of the GARCH term.

The rule of thumb for determining the degree of volatility is to calculate the sum of the ARCH and GARCH term.

If $\alpha + \beta$ is less than 0.5, there is low volatility.

If $\alpha + \beta$ falls between 0.5 and 1, there is high volatility.

If $\alpha + \beta$ is greater than 1, this is a case of overshooting.

To evaluate the effect of exchange rate volatility on economic growth, the Generalized Method of Moments (GMM) was employed. The choice of GMM is to overcome the problem of endogeneity and simultaneity bias.

4. Empirical Findings

Table 2: Descriptive Statistics

Variable	Mean	Maximum	Minimum	Std. Dev	Skewness	Kurtosis	Jarque-Bera
lnREER	4.590265	5.607170	3.906700	0.444163	0.994037	3.301796	4.885923***
lnGFCF	22.66543	25.17456	21.42491	1.235189	0.978310	2.495972	4.932911***
lnLF	17.45404	17.83700	16.94338	0.242448	-0.337901	2.312140	1.123581
lnTOT	4.628283	5.419992	3.781403	0.516084	0.273697	1.680273	2.466596
lnOPEN	3.975443	4.404434	3.166182	0.296112	-0.996233	3.476950	5.071862***
GDPgrowth	4.785077	33.73578	-10.75170	7.390683	1.646130	9.946242	71.39950*
lnGE	6.297388	8.553587	2.786245	1.810011	-0.476409	1.988033	2.334425
lnFD	2.797460	3.637586	2.151762	0.336119	0.360451	3.271473	0.717020

*Note: * and *** denote rejection of hypothesis of normal distribution at 1% and 10% significance level respectively.*

Source: Authors' computation

4.1 Modelling Real Effective Exchange Rate Volatility

Real effective exchange rate volatility was modelled using GARCH model. Due to the non-normal distribution of real effective exchange rate, Gaussian error distribution

cannot be assumed. Therefore, a non-normal error distribution method (Generalised Error Distribution method) was used. The predicted (fitted) values are obtained for the estimated GARCH model as the volatility series. Table 3 presents the results of the GARCH model.

Table 3: GARCH Model Result

Variable	Coefficient	p-value
	Mean Equation	
C	2.176704	0.0000*
lnREER(-1)	0.525914	0.0000*
	Variance Equation	
ω	0.004251	0.1590
α	0.832651	0.0382**
β	0.011057	0.8346
$\alpha + \beta$	0.843708	---------
	Model Diagnostics	
ARCH LM(1)	0.047196	0.8298
ARCH LM(2)	0.033637	0.9670

*Note: * and ** denote statistical significance at 1% and 5% significance level respectively.*

Source: Authors' computation

From Table 3, the result of the mean equation shows that the immediate past value of real effective exchange rate positively and significantly affects present value of real effective exchange rate. The result of the variance equation indicates that the ARCH term is statistically significant, thus implying the presence of volatility clustering. It also shows that the GARCH term is not statistically significant and this indicates that there is no long term persistence in real effective exchange rate volatility. The sum of the ARCH and GARCH term tends to unity and this confirms that real effective exchange rate volatility is high. The ARCH LM test shows that ARCH effects remaining in the model.

Model Estimation

The Generalized Method of Moments (GMM) estimation result is presented in Table 4.

Table 4: GMM Estimation Result

Variable	Coefficient	t-statistic	p-value
C	2161.796	10.64364	0.0000*
lnVolREER	-16.32103	-7.895917	0.0000*
lnGFCF	-1.978898	-3.697952	0.0016*
lnLF	-125.5128	-10.58591	0.0000*
lnTOT	9.057189	14.46346	0.0000*
lnOPEN	-10.84048	-7.846383	0.0000*
lnGE	15.95393	9.330350	0.0000*
lnFD	1.736330	3.235316	0.0046*
Model Diagnostics			
J-statistic	6.506935		
J-statistic p-value	0.952054		
DW statistic	2.413476		

*Note: * denotes statistically significant at 1% significance level.*

Source: Authors' computation

The result in Table 4 reveals that all the variables are significantly related to GDP growth. Real effective exchange rate, gross fixed capital formation, labour force and trade openness are negatively related to GDP growth while terms of trade, government expenditure and financial depth are positively related to GDP growth. The J-statistic indicates that the null hypothesis of overidentifying restrictions is not rejected, thus implying that the instruments used in the estimation are valid instruments. The DW statistic is not significantly different from 2, thus indicating that there is no autocorrelation in the model.

5. Conclusion

This study analysed the effect of exchange rate volatility on the economic growth of Nigeria between 1986 and 2014. The study found that there is high volatility of real effective exchange rate. It also revealed that real effective exchange rate is negatively and significantly related to economic growth and this is consistent with the recent studies of Adelowokan, Adesoye and Balogun (2015) and Danladi and Uba (2016). This finding suggests that exchange rate volatility is harmful to the growth of the Nigerian economy. This further indicates that the flexible exchange rate system on the economy. This study recommends that government should constantly seek to maintain a stable exchange rate, increase its expenditure, particularly capital

expenditure and implement sustainable reforms to increase the depth of the financial sector.

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