



Volume 17, Number 1, 2018

ADVANCES IN MANAGEMENT

**A publication of the Department of Business Administration;
University of Ilorin, Ilorin, Nigeria**

DETERMINANTS OF EXCHANGE RATE VOLATILITY AND ECONOMIC GROWTH IN NIGERIA

Kenneth Sola ADEYEMI

Department of Accounting and Finance, Kwara State University, Nigeria
Skadeyemi849@gmail.com

&

Biliquees Ayoola ABDULMUMIN

Department of Finance University of Ilorin, Ilorin, Nigeria
bilbash@gmail.com

Abstract

An economic recession occurs when the Gross Domestic Product (GDP) of an economy drops for two consecutive quarters. Despite the plausible effect of economic recession on the economy, the determinants of exchange rate volatility and economic growth taking cognizance of the period of recession remain an open question. Against this background, this study examines the determinants of exchange rate volatility and economic growth in Nigeria from 1984 to 2016. This study further investigates the trend of GDP and exchange rate volatility. This study employs secondary data from Central Bank Statistical Bulletin and World Bank Development Indicators. Data obtained were analyzed using Error Correction Mechanism (ECM). The findings show that money supply, trade openness, total government expenditure and effect of the recession (dummy) have significant effect on exchange rate volatility and GDP in Nigeria. This study concludes that there is high propensity to achieve a better level of economic development if the economy is prevented from going into recession. This study recommends that the economy should be well diversified in order to increase GDP to prevent the economic recession.

Keywords: Exchange rate, exchange rate volatility, GDP, recession.

Introduction

The importance of exchange rate stability in the achievement of macroeconomic policy objectives such as economic growth in developing economies such as Nigeria cannot be overemphasized. The exchange rate is one of the factors that indicate the performance of an economy. A strong and stable exchange rate is a reflection of a strong and viable economy. While a weak exchange rate indicates a vulnerable and weak economy. Governments, particularly in developing economies over the years have adopted different exchange rate management policies with a view to achieving realistic and stable exchange rate. This is because, high exchange rate and reduction in oil price might lead to a general slowdown in economic activities when this happens for two consecutive quarters the economy enters into a recession. This relationship is established by the observed linkage between exchange rate and economic cycle.

Sani (2006) posits that exchange rate policy has undergone transformation between 1970 to date. The period of exchange rate regulation covers 1970 to 1985 characterized by a fixed parity with the British pound and the near collapse of the economy between 1982 and 1985. On the other hand, the exchange rate deregulation period covers from 1986 till date which is characterized by the economic recession of 1987 and 2016. Each of these regimes of exchange rate is believed to have important repercussions for the growth pertain to economic activities (Akpan & Atan, 2011).

Despite the different system adopted in order to achieve a vibrant economy, there exists a wide variance between the official and the parallel market and disequilibrium which is as a result of unstable and unfavorable exchange rate system (Obadan, 1994). These regimes or systems which were expected to ensure economic stability are characterized by exchange rate fluctuation, oil price instability, and economic recession, thereby leading to undesired economic growth. The uncertainty in exchange rate which is indicated through exchange volatility affects economic performance (Akpan & Atan, 2011; Bakare, 2011). This problem of exchange rate volatility has become a source of concern in the policymakers in the economy (Stephen and Sanmi, 2011).

In spite of the plethora of studies on the impact of exchange rate volatility on economic growth such as Adeoye and Atanda, 2010; Aliyu, 2011; Stephen and Sanmi, 2011; Ajao and Igbokoyi, 2013; Bala and Asemota, 2013, and others. Existing studies failed to investigate the determinants of economic growth taking note of the period of recession. In light of the aforementioned, this study seeks to; determine the trend of Gross Domestic Product (GDP) in Nigeria, examine the trend exchange rate in Nigeria, examine factors that determine exchange rate volatility and investigate the determinants of economic growth in Nigeria.

Literature Review

Conceptual Review

Concept of Exchange Rate Volatility

Exchange rate volatility is the unpredictable movements in the relative price in an economy. It is the fluctuations in exchange rate over a period of time, this can also be explained as the deviations from a benchmark or equilibrium exchange rate. The non-occurrence of exchange rate volatility promotes the achievement of macroeconomic policy objectives in both developed and developing economies. A stable exchange rate reflects a strong and viable economy while a weak and volatile exchange rate reflects a vulnerable weak economy (Adamu, Mika'ilu & Yusuf, 2017). Governments, particularly in Nigeria adopted different exchange rate management policies with a view to achieve stable exchange rate which could boost the achievement of macroeconomic policy objectives (Okolo, Ugwuanyi & Okpala, 2016).

Concept of Economic Growth

Economic growth is a situation whereby an economy's productive capacity increases, which in turn leads to the production of more goods and services. Economic growth of a country is measured by the increase in its gross domestic product (GDP) (Jhingan, 1997).

It is an important requisite to economic development. This identify the reason economic growth continuously dominates the main policy thrust of the Nigerian government. Policies aimed at transforming and restructuring the real economic sectors are usually associated with economic growth. Nevertheless, the lack of sufficient domestic resources, money supply, savings and investment to support and sustained the sectors is a major impediment to economic growth in an economy (Imimole & Imoughele, 2012). Oil revenue is also a major contributor to economic growth because oil revenue accounts for the highest share of the national income in Nigeria (Agwu, 2015).

Theoretical Framework

Purchasing Power Parity (PPP) Hypothesis

This hypothesis was propounded by Gustav Cassel in 1970 to determine the exchange rate between the currencies of two countries (Jhingan, 2008). The hypothesis postulates that an underlying tendency for changes in the nominal exchange rate to be fully offset by changes in the ratio of foreign to domestic price levels. In other words, exchange rate between two countries' currencies must be equal to the ratio of total price levels between the two countries (Adamu, *et al*, 2017). This hypothesis was derived from the assumption that there exist the law of one price in the world which helps determine the exchange rate between countries.

This theory has been relied upon by previous studies such as Adamu *et al*. (2017) and Ajao and Igbekoyi (2013).

The Monetary Approach

This was first formulated by J. J. Palok in 1957, this approach emerged as a result of the shortcomings of the balance of payment approach. This approach postulates that exchange rate is a function of relative shift in money stock, inflation rate and domestic output, between an economy and her trading partner. Thereby, emphasizing the importance of money as a unit of exchange. (Udoye, 2007). Obioma (2000) is of the opinion that the view that monetary approach links variation in exchange rate to interest rate differentials, expected rates of return and to other determinants of supplies of and demands for the various national monies.

This is approach has been used by Obioma (2000) and Udoye (2007).

Solow-Swan Model

This model was formulated by Robert Solow and Trevor Swan in 1956. The model believes that capital accumulation, labour and increases in technology explains long-run economic growth. This model falls within the framework of neoclassical economics. The Solow-Swan model assumes that all factors of production are fully employed. Initial values for labour and capital are known also labour increases at a constant rate (Solow, 1956).

The model holds that labour and capital are the most important for economic growth. It also notes that savings are important to achieve increase in capital stock, capital accumulation had limits to ensuring diminishing marginal returns. This model however, fails to identify the sources of technical changes (Essien & Bawa, 2007).

This model has been used in empirical studies such as Essien and Bawa (2007) and Uwakaeme (2015).

Empirical Review

Ruiz (2005) investigated the effects of inflation and exchange rate volatility on real economic activity in Columbia, using a generalized autoregressive conditional variance (GARCH) model of inflation and exchange rates, the conditional variances of the model's forecast errors were extracted as measures of uncertainty. The study shows that higher levels of inflation Granger cause uncertainty and vice versa for the Colombian economy. The study also emphasized that only inflation is important for output.

Aikaeli (2007) investigated money and inflation dynamics response in Tanzania using monthly data for the period 1994-2006. The study used GARCH model. The result shows that a current change in money supply would affect inflation rate significantly in the seventh month ahead. They show further that the impact of money supply on inflation is a persistent shock.

Wang and Barrett (2007) examined the effect of exchange rate volatility on international trade flows between Taiwan and United States from 1989-1999. The study used level monthly data and GARCH-M estimator with corrections for leptokurtic errors. The study reported that change in importing country industrial production and change in the expected exchange rate jointly drive the trade volumes. Interestingly, they also found that monthly exchange rate volatility affects agricultural trade flows, but not trade in other sectors.

Mordi (2006) used GARCH model which shows that failure to properly manage exchange rates can induce distortions in consumption and production patterns and that excessive currency volatility creates risks with destabilizing effects on the economy.

Olowe (2009) examined the weekly oil price volatility. The study adopted EGARCH (1, 1) and covered the period between 1997 and 2009. The study reported that oil price return series show high persistence of volatility, volatility clustering and asymmetric properties.

Bakare (2011) studied the consequences of the foreign exchange rate reforms on the performances of private domestic investment in Nigeria. The study used the ordinary least square multiple regression analytical method. The study found a significant but negative relationship between floating foreign exchange rate and private domestic investment in Nigeria. This suggests the need for the government to dump the floating exchange regime and adopt purchasing power parity which has been considered by researchers to be more appropriate in determining realistic exchange rate for naira and contribute positively to macroeconomic performances in Nigeria.

Taiwo, Abayomi, and Damilare (2012) investigated the impact of oil price on economic growth in Nigeria. The study used Johansen Co-integration Test and Error Correction Model, the study shows that crude oil price, stock price, and exchange rate have significant influence on economic growth.

Apere and Ijomah (2013) examined the macroeconomic impact of oil price levels and volatility in Nigeria between 1970 and 2009. The study employed EGARCH model, Impulse Response Function, and Lag-Augmented VAR. The study reported a significant impact of oil price on economic growth.

Danmola (2013) investigated the impact of exchange rate volatility on Macroeconomic variables using Correlation Matrix, Ordinary Least Square (OLS) and Granger Causality test. The study revealed that exchange rate volatility has a positive impact on Foreign Direct Investment, Trade Openness and economic growth, but has a negative impact on the inflation rate.

Eze and Okpala (2014) studied the impact of exchange rate policies economic growth in Nigeria. The Chow test procedure was used to determine the structural stability of the relationship between exchange rate and output of goods and services. Their study shows that exchange rate and money supply are highly significant in the determining economic growth in the country. The study noted that the type of exchange rate regime is not important, what is important is the effectiveness of the management.

Adelowokan, Adesoye, and Balogun (2015) examined the effect of exchange rate volatility on investment and growth in Nigeria. The study adopted the

vector error correction method. The study revealed that exchange rate volatility has a negative effect on investment and growth while exchange rate volatility has a positive relationship with inflation and interest rate in Nigeria.

Methodology

Model Specification

The first model on the determinants of exchange rate volatility was adapted from Victor and Dickson (2012). The model is stated thus:
The model is stated as:

$$EXV = f(FDI, RGDP, IR, INF, M2, OPEN) \dots\dots\dots (i)$$

The ECM model is specified as follows:

$$\begin{aligned} \Delta EXV = & \beta_0 + \beta_1 \sum_{t=1}^n \Delta FDI_t - 1 + \beta_2 \sum_{t=1}^n \Delta RGDP_t - 1 + \beta_3 \sum_{t=1}^n \Delta IR_t - 1 + \\ & \beta_4 \sum_{t=1}^n \Delta INF_t - 1 + \beta_5 \sum_{t=1}^n \Delta M2_t - 1 + \beta_6 \sum_{t=1}^n \Delta OPEN_t - 1 + \\ & \delta ECM(-1) + \mu_t \dots\dots (ii) \end{aligned}$$

Where:

EXV- Exchange Rate Volatility

FDI- Foreign Direct Investment

RGDP - Gross Domestic Product Growth Rate

IR- Interest Rate

INF- Inflation Rate

M2- Money Supply

OPEN- Trade Openness

β_0 = Constant

$\beta_1 - \beta_6$ = Parameter estimates

μ = Error term

The natural log form of FDI and INF were taken due to the fact that they were not normally distributed.

The ECM model becomes:

$$\begin{aligned} \ln \Delta EXV = & \beta_0 + \beta_1 \sum_{t=1}^n \ln \Delta FDI_t - 1 + \beta_2 \sum_{t=1}^n \Delta RGDP_t - 1 + \\ & \beta_3 \sum_{t=1}^n \Delta IR_t - 1 + \beta_4 \sum_{t=1}^n \ln \Delta INF_t - 1 + \beta_5 \sum_{t=1}^n \Delta M2_t - 1 + \\ & \beta_6 \sum_{t=1}^n \Delta OPEN_t - 1 + \delta ECM(-1) + \mu_t \dots\dots (iii) \end{aligned}$$

Where

Ln = Natural log.

The second model for the study was adapted from the Solow growth model and modified to accommodate other variables based on Essien (2001);

Advances in Management Volume 17, No. 1 (2018)

Amassoma and Odeniyi (2016) which assume an underlying relationship between this macroeconomic and economic growth.

The econometric model is as follows:

$$\Delta GDP = f(LB, CP, FEV, INF, M2, IR, OIL, OPEN, GX) \dots \dots \dots (iv)$$

The ECM model is specified as:

$$\begin{aligned} \Delta GDP = & \beta_0 + \beta_1 \sum_{t=1}^n \Delta LB_t - 1 + \beta_2 \sum_{t=1}^n \Delta CP_t - 1 + \beta_3 \sum_{t=1}^n \Delta INF_t - 1 + \\ & \beta_4 \sum_{t=1}^n \Delta M2_t - 1 + \beta_5 \sum_{t=1}^n \Delta IR_t - 1 + \beta_6 \sum_{t=1}^n \Delta OIL_t - 1 + \\ & \beta_7 \sum_{t=1}^n \Delta OPEN_t - 1 + \beta_8 \sum_{t=1}^n \Delta GX_t - 1 + \delta ECM(-1) + \\ & \mu_t \dots \dots \dots (v) \end{aligned}$$

Where GDP - Gross Domestic Product

LB - Labour

CP - Capital

FEV - Foreign Exchange Volatility

INF - Inflation

M2 - Money Supply

IR - Interest Rate

OIL - Oil Revenue

OPEN - Trade Openness

GX - Government Expenditure

β_0 = Constant

$\beta_1 - \beta_8$ = Parameter estimates

μ = Error term

The natural log form of INF, M2, Oil revenue and GX were taken due to the fact that they were not normally distributed.

The ECM model becomes:

$$\begin{aligned} \Delta \ln GDP = & \beta_0 + \beta_1 \sum_{t=1}^n \Delta \ln LB_t - 1 + \beta_2 \sum_{t=1}^n \Delta \ln CP_t - 1 + \beta_3 \sum_{t=1}^n \ln \Delta INF_t - 1 + \\ & \beta_4 \sum_{t=1}^n \ln \Delta M2_t - 1 + \beta_5 \sum_{t=1}^n \Delta \ln IR_t - 1 + \beta_6 \sum_{t=1}^n \ln \Delta OIL_t - 1 + \\ & \beta_7 \sum_{t=1}^n \Delta \ln OPEN_t - 1 + \beta_8 \sum_{t=1}^n \ln \Delta GX_t - 1 + \delta ECM(-1) + \mu_t \dots \dots \dots (vi) \end{aligned}$$

Where

Ln = Natural log.

Description of Data

Data for all the variables used were sourced from Central Bank of Nigeria statistical bulletin and World Bank data from 1986 to 2016.

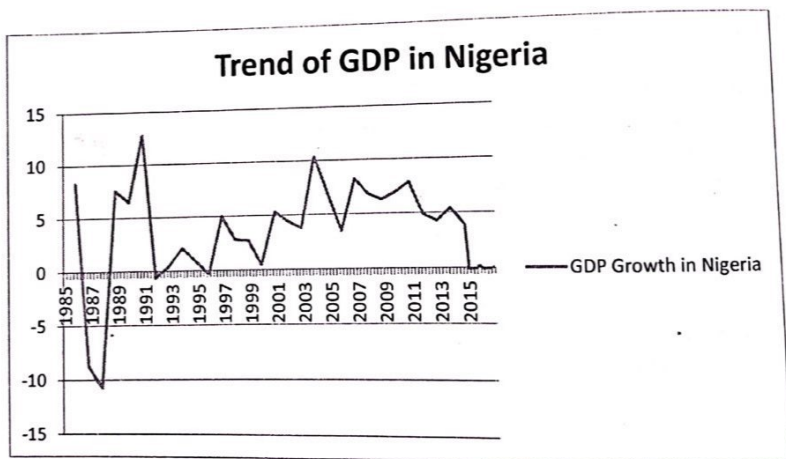
Analytical Procedure

The study used graphs to illustrate the trend of GDP and exchange rate in Nigeria from 1986 and 2016. Furthermore, the study used ECM model to investigate the determinants of exchange rate volatility and economic growth in Nigeria.

Presentation and Discussion of Findings

Trend of GDP in Nigeria

The first objective sought to determine the Trend of GDP in Nigeria, in order to achieve this the rate of return or growth rate of GDP is computed using the continuous compounded growth rate formula which is given as $GRGDP = \log(RGDP_t / RGDP_{t-1})$. The growth rate was used in the trend analysis to uncover the period of recession in Nigeria from 1981 to 2016 as shown in Figure 4.1 below.



Source: Authors' Illustration, (2018)

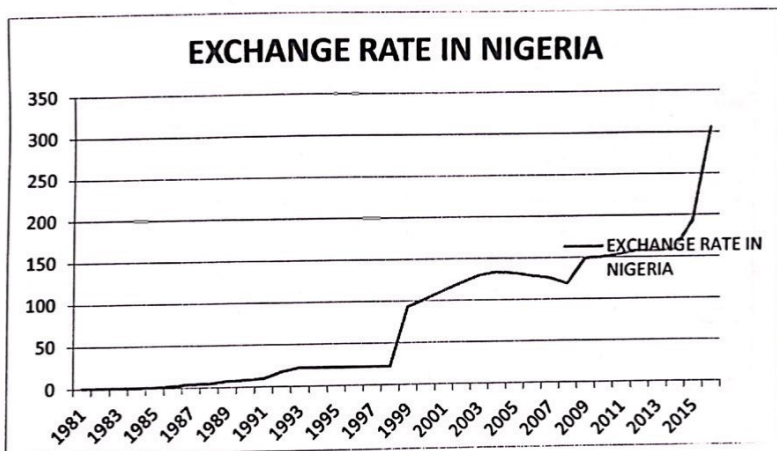
Figure 4.1 Trend of GDP in Nigeria

The Nigerian economy was negatively affected as showed in the above figure. From the GDP growth of figure 4.1 in the first quarter of 1986, the growth rate plummeted to -0.2 and remained in negative until the second quarter of 1988. Again, in the fourth quarter of 1991, the country witnessed

a negative reduction until the second quarter of 1992. The country further witnessed a reduction in the growth rate for two consecutive quarters in the third and fourth quarter of 1995. The country was relatively stable until the second quarter of 2015 fell back into recession. The reoccurring reduction in GDP in the economy may perhaps be a major contributor to the level of development in the economy.

Trend of Exchange Rate in Nigeria

The second objective investigates the trend of exchange rate in Nigeria. Figure 4.2 below illustrates the trend of exchange rate in Nigeria.



Source: Authors' Illustration, (2018)

Figure 4.2 Trends of Exchange Rate in Nigeria

The above illustration depicts the trend of exchange rate in Nigeria. The evidence of exchange rate crisis is noticeable. The exchange rate increased to N135/US\$ in 2004 and it hovered around 133 and 132. It later dropped to N117/US\$ in 2008. In 2009 it increased to 150 after which it hovered around 149 and 150. It increased to 157 in 2012 and continues to increase unsteadily over the years. This indicates that exchange rate in Nigeria witness unstable movements over the period of study.

Descriptive statistics

These are used to describe the basic features of the sample a research is working with, and can also show data anomalies as well as any patterns emerging from the data. The descriptive statistics include mean, standard deviation, the measures of skewness and kurtosis. These statistics enable the analysis of normality of the variables. Table 4.1 below shows the descriptive statistics for the variables used in the study

Descriptive Statistics

	FDI	FXV	GGD P	IR	INF	M2	LAB OR	CAPI TAL	OPE N	OIL	TGX
Mean	348 697. 7	6.8 739 62	- 0.04 148 3	7.4 275 00	19. 531 72	417 2.18 7	423 849 15	3.3 261 11	0.0 875 22	929.2 192	1381803.
Median	110 877. 0	- 0.07 018 3	- 0.04 645 8	5.4 100 00	12. 710 00	558. 5490	410 624 40	2.8 400 00	0.0 586 09	22.50 500	457664.3
Maximum	136 030 0.	253 .492 3	0.0 787 89	18. 800 00	72. 730 00	216 07.6 8	588 108 90	9.3 800 00	0.2 649 35	8025. 971	5185318.
Minimum	264 .300 0	- 1.44 344 6	- 0.13 631 6	0.0 000 00	5.4 000 00	14.4 7117	299 158 33	0.62 000 0	0.0 005 42	7.253 000	2693.907
Std. Dev.	437 172. 6	42. 278 47	0.0 429 91	5.2 460 15	16. 935 34	636 3.74 8	857 388 7.	1.88 924 1	0.0 895 84	2327. 092	1758186.
Skewness	0.9 800 48	5.7 465 96	0.2 883 31	0.6 597 11	1.6 232 26	1.45 0980	0.3 419 07	1.01 593 0	0.6 206 39	2.271 297	1.086180
Kurtosis	2.4 904 47	34. 025 21	3.3 298 57	2.1 246 09	4.7 517 04	3.74 2182	1.99 589 8	4.26 354 9	1.9 146 24	6.374 774	2.646978
Jarque-Bera	6.1 524 35	164 1.98 6	0.6 620 17	3.7 607 76	20. 411 88	13.4 5831	1.66 030 1	8.58 751 3	4.0 782 16	48.03 638	7.265652
Probability	0.0 461 33	0.2 630 80	0.7 181 99	0.1 525 31	0.0 000 37	0.00 1196	0.43 598 4	0.01 365 4	0.1 301 45	0.000 000	0.026441
Sum	125 531 17	247 .462 6	- 1.49 339 2	267 .390 0	703 .142 0	150 198. 7	1.14 E+0 9	119. 740 0	3.1 507 76	33451 .89	49744925
Sum Sq. Dev.	6.6 9E+ 12	625 61.4 1	0.0 646 88	963 .223 5	100 38.2 0	1.42 E+09	1.91 E+1 5	124. 923 1	0.2 808 85	1.90E +08	1.08E+14
Observations	36	36	36	36	36	36	27	36	36	36	36

Source: Authors Computation, 2018.

Table 4.1 presents the mean, median, maximum and minimum values and standard deviation for the variables used in this study. The Jarque-Beratests

whether the distribution that the data comes from is a normal distribution (Field 2005). The Jarque-Bera statistics for the variables under study show that foreign direct investment, inflation rate, money supply, oil revenue and total government expenditure variables are not normally distributed at 5% level of significance. This necessitates the need to log the variables whose Jarque-Bera probability is significant at 5% level.

Unit Root Test

It is necessary to examine the properties of the time series, i.e. the degree of integration because it is very important to determine whether the variables are integrated of order $n = 0, 1, 2$ as to avoid spurious results. In the presence of $I(2)$ variables, the computed F-statistic and W-statistic are not valid because the bounds test is based on the assumption that the variables are $I(0)$ or $I(1)$. In view of this, ADF test Dickey and Fuller, (1979) is considered. Results of unit root tests are shown in Table 4.2 below

Table 4.2: Augmented Dickey and Fuller (ADF) Unit root tests

	Level	Probability Value	1st Difference	Probability value	Order of Integration
LFDI*	-0.653986	-2.612874	-7.085704	-3.639407	$I(1)$
FXV*	-0.363836	-2.612874			$I(0)$
RGDP*	-0.709419	-3.639407	-5.095498	-3.646342	$I(1)$
IR*	-0.677323	-3.632900	-5.795322	-3.539407	$I(1)$
LINF**	-3.350535	-3.632900			$I(0)$
LM2**	-1.121719	-3.661661	-3.2977546	-3.639407	$I(1)$
OPEN*	-1.076591	-3.632900	-4.888711	-3.639407	$I(1)$
LOIL*	0.122897	-3.632900	-5.839480	-3.639407	$I(1)$
LTGX**	-1.425888	-3.632900	-3.114513	-3.646342	$I(1)$
Capital*	-1.184720	-3.639407	-8.776681	-3.639407	$I(1)$
Labor*	2.038697	-2.632604	-5.542606	-3.737853	$I(1)$

Source: Authors Computation, 2018. *Significant at 1%

**Significant at 5%

It is noticeable that the ADF test indicates a stationarity of the inflation rate and the exchange rate volatility in levels. However, considering that series. The unit root test above reflects that all the variable except the inflation rate and the exchange rate volatility are stationary after first difference, that is they are integrated of first order, $I(1)$. Therefore, the study will employ an ARDL approach to co-integration because unlike the Johansen and Julius (1990) co-integration method, which requires that all variables be integrated

DETERMINANTS OF EXCHANGE RATE VOLATILITY AND ECONOMIC GROWTH IN NIGERIA 72

of the order one, bounds testing is more flexible as it allows $I(0)$ and $I(1)$ variables to be combined.

Model 1

In testing for co-integration, in the model 1, the study employs the ARDL approach to co-integration introduced by Pesaran and Shin (1998) and Pesaran *et al.* (2001). Unlike other co-integration techniques, the ARDL does not impose a restrictive assumption that all the variables under study must be integrated of the same order. Therefore, ARDL can be applied irrespective of whether underlying regressors are entirely $I(0)$, entirely $I(1)$ or mutually co-integrated (Pesaran and Shin, 1999). The result of the bound test is shown in table 4.3 below

Table 4.3: Bound Test Result

ARDL Bounds Test		
Test Statistic	Value	K
F-statistic	4.799227	8
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	1.95	3.06
5%	2.22	3.39
2.5%	2.48	3.7
1%	2.79	4.1

Source: Authors Computation, 2018.

Since the model variable passed the stability tests (see table 4.3), the existence of a long run relationship was then tested using the bound test. This test for a long run relationship amongst the variables was conducted using the bound test for the joint significance of the coefficients of the variables. The calculated F-statistic for the model is 4.799, which is greater than the upper bound of 3.94 for the chosen explanatory variables, thus indicating that there is a long-run relationship amongst the variables in the model.

Short-Run Dynamics of Model 1:

A short run adjustment of the model 1 can be constructed according to an ECM that is, taking into account deviations from long-run relationships. The most important term in the short run is the error correction which

represents that whether the co-integration relationship moves towards the stable equilibrium in the long run or not.

Table 4.4: Short Run Result

Dependent Variable: FXV				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(LFDI)	4.334082	1.678295	2.582431	0.0174
D(RGDP)	-0.001725	0.000875	-1.971147	0.0620
D(IR)	-0.020225	0.388456	-0.052065	0.9590
D(LM2)	20.871639	3.903676	5.346662	0.0000
D(LOIL)	0.929178	0.935985	0.992727	0.3321
D(OPEN)	33.650595	27.775299	1.211530	0.2391
D(LINF)	-1.783378	1.373098	-1.298800	0.2081
D(LTGX)	-31.140712	0.804007	-38.731887	0.0000
D(DUMMY)	-3.568176	1.986895	-1.795855	0.0869
CointEq(-1)	-9.171112	2.740393	-3.346641	0.0031
R-squared	0.995682	Mean dependent var		7.073165
Adjusted R-squared	0.993009	S.D. dependent var		42.87856
S.E. of regression	3.585293	Akaike info criterion		5.680732
Sum squared resid	269.9409	Schwarz criterion		6.302871
Log likelihood	-85.41281	Hannan-Quinn criter.		5.895494
F-statistic	372.4665	Durbin-Watson stat		2.627687
Prob(F-statistic)	0.000000			

Source: Authors Computation, (2018).

The negative sign of error term shows that the model moves towards the stable position in the long run (Bannerjee, *et al*, 1998). Therefore, the magnitude of coefficient of error correction term represents the speed of adjustment. In the case of foreign exchange volatility, the coefficient of the error term is 917% that suggests that 917% of the adjustment in exchange rate volatility towards equilibrium takes place within a year. Also, the result found foreign direct investment, money supply, and total government expenditure to be significant on exchange rate volatility.

Long-Run Effect of Model 1

Table 4.5: Long Run Result

ARDL Cointegrating And Long Run Form				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI	1.081251	0.369173	2.928851	0.0080
RGDP	-0.000020	0.000029	-0.677826	0.5053
IR	-0.002205	0.042269	-0.052173	0.9589
LM2	2.275802	0.837712	2.716689	0.0129
LOIL	0.101316	0.105303	0.962135	0.3469
OPEN	-9.656895	4.814033	-2.005988	0.0579
LINF	-0.194456	0.183816	-1.057882	0.3021
LTGX	-3.395522	0.997812	-3.402967	0.0027
DUMMY	-0.389067	0.237088	-1.641022	0.1157
C	19.143553	5.794963	3.303482	0.0034

Source: Authors Computation, (2018).

Table 4.5 shows the outcome of long-run estimates. The results show that real gross domestic product, interest rate, oil revenue, inflation rate and dummy (recession) has no significant effect on exchange rate volatility. However, foreign direct investment, money supply, trade openness and total government expenditure significantly affect exchange rate volatility.

Foreign direct investment which is significant at 1% has a coefficient of 1.081251 which implies that one percent change in foreign direct investment will induce 0.01 unit change in exchange rate volatility. Also, money supply was found to be significant at 1% with a coefficient of 2.275802 which implies that one percent change in money supply will induce 0.022 unit change in exchange rate volatility. Similarly, total government expenditure was found to be significant at 1% with a coefficient of -3.395522 which implies that one percent change in total government expenditure will induce -0.033 unit change in exchange rate volatility. Finally, trade openness has a significant coefficient (Significant at 5%) of -9.656895 which implies that a unit change in trade openness will induce -9.65 unit change in exchange rate volatility. The study proceeds to conduct residual test on the ARDL result. The result is shown in table 4.6 below

Table 4.6: Residue Test Result of Model 1

Breusch-Godfrey Serial Correlation LM Test:			Normality Test	
Obs*R-squared	Prob. Chi-Square(2)		Jarque-Bera	probability
4.437861	0.1087		4.234172	0.120382

Source: Authors Computation, (2018).

The study went to conclude the first model by conducting a serial correlation test to examine if the error term in the series is serially correlated. The result of the serial correlation LM test with a probability not significant at 5% indicates that the error term is not serially correlated. Similarly, the normality result presented in table 5.6 for with Jarque-Bera value of 4.234172 and probability above 5% shows that the variables are normally distributed.

Model 2

Having established the stationarity of the data (see table 5.2), the study used the ARDL bounds test procedure to determine the presence of long-run relationship among the model. The results are presented in Table 4.7 below

Table 4.7: Bound Test Result

ARDL Bounds Test		
Test Statistic	Value	k
F-statistic	6.758136	10
Critical Value Bounds		
Significance	10 Bound	11 Bound
10%	1.83	2.94
5%	2.06	3.24
2.5%	2.28	3.5
1%	2.54	3.86

Source: Authors Computation, (2018).

The F-statistic is greater than the upper bound test. As a result, the joint null hypothesis of no co-integration is rejected at 5% significant level. That is since the F - statistic (6.758136) is greater than the upper bound critical value at 5% significant level, there is evidence of co-integration and hence long-run relationship among the variables in the study

Short-Run Dynamics of Model 2

Table 4.8 below shows the result of the short run analysis. It shows the various contribution of the explanatory variable on the dependent variable.

Table 4.8: Estimated ARDL short-run coefficients

Dependent Variable: RGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FXV)	-146.408539	43.849166	-3.338913	0.0066
D(LABOR)	0.000978	0.000493	1.984159	0.0728
D(CAPITAL)	-473.805132	129.284459	-3.664827	0.0037
D(LINF)	-255.295604	284.629351	-0.896941	0.3890
D(LM2)	617.402011	1281.534331	0.481768	0.6394
D(IR)	-141.495957	123.848388	-1.142493	0.2775
D(LOIL)	-261.031743	186.953793	-1.396237	0.1902
D(OPEN)	13546.191918	6289.015884	2.153945	0.0543
D(LTGX)	-4341.578687	1409.085995	-3.081131	0.0105
D(DUMMY)	-2187.268841	589.497202	-3.710397	0.0034
CointEq(-1)	-0.398942	0.128314	-3.109104	0.0099
R-squared	0.999681	Mean dependent var	37274.79	
Adjusted R-squared	0.999245	S.D. dependent var	17796.49	
S.E. of regression	489.0546	Akaike info criterion	15.51007	
Sum squared resid	2630919.	Schwarz criterion	16.27797	
Log likelihood	-193.3859	Hannan-Quinn criter.	15.73841	
F-statistic	2294.550	Durbin-Watson stat	2.136363	
Prob(F-statistic)	0.000000			

Source: Authors Computation, 2018.

The result of the ARDL short run estimation shows that interest rate has an insignificant effect on real gross domestic product. The negative sign of error term (CointEq(-1)) which is significant shows that the model moves towards the stable position in the long run that is there is a long run relationship among the model variable see Table 4.9.

Table 4.9: Estimated ARDL long-run coefficients

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FXV	-4676.816625	1482.701451	-3.154254	0.0092
LABOR	0.002453	0.000609	4.025255	0.0020
CAPITAL	-779.643334	433.191031	-1.799768	0.0994
LINF	-639.931914	826.630969	-0.774145	0.4552
LM2	15379.925234	5684.433194	2.705622	0.0205
IR	-354.678173	303.902445	-1.167079	0.2679

LOIL	-654.310299	423.927966	-1.543447	0.1510
OPEN	33955.306650	8719.797039	3.894048	0.0025
LTGX	-24681.178799	5267.964584	-4.685145	0.0007
DUMMY	-5482.676213	1680.085767	-3.263331	0.0076
C	170131.050321	50611.879037	3.361485	0.0063

Source: Authors Computation, 2018.

Table 4.9 shows the outcome of long-run estimates. It was evident from the result that exchange rate volatility, labor supply, money supply, trade openness, total government expenditure and effect of recession (dummy) has significant effect on gross domestic product in Nigeria. Thus, exchange rate volatility which is significant at 1% has a coefficient of -4676.81 which implies that one percent change in exchange rate volatility will induce -4676.8 unit change in real gross domestic product. Also, money supply was found to be significant at 1% with a coefficient of 15379.92 which implies that one percent change in money supply will induce 15.37 unit change in real gross domestic product.

Furthermore, labor supply and trade openness has a coefficient of 0.002453 and 33955.30 respectively which are both significant at 1% which implies that a unit increase in labor supply and trade openness will cause no change (0%) to real gross domestic product. Similarly, total government expenditure has a coefficient of -24681.17 which is significant at 1% also implies that a unit increase in total government expenditure will induce -24.681 change in real gross domestic product.

Finally, the variable dummy which is the effect of recession has a significant coefficient (Significant at 1%) of -5482.67 which implies that a unit change in dummy will induce -5482.67 unit change in real gross domestic product in Nigeria. However, Capital, inflation, interest rate and oil revenue are not significant at 5% level of significance. The study proceeds to conduct residual test on the ARDL result. The result is shown in table 4.10 below.

Table 4.10: Residual Test of Model 2

Breusch-Godfrey Serial Correlation LM Test:		Normality Test	
Obs*R-squared	Prob. Chi-Square(2)	Jarque-Bera	Probability
10.59941	0.0050	0.053710	0.973503

Source: Authors Computation, 2018.

The study also conducted Serial Correlation test on the model regression to examine if the error term in the series is serially correlated. The result of the serial correlation indicates that the error term is serially correlated. While the normality result with Jarque Bera value of 0.053710 and probability above 5% shows that the variables are normally distributed.

Discussion of findings

Consequent upon the results of the first regression, some implications can be highlighted. The study reveals that total government expenditure significantly affects exchange rate volatility, this is in line with the study of Ajao and Igbekoyi (2013) while Money supply was found to be significant. This is in contrast to the finding of Ajao and Igbekoyi (2013) on determinants of exchange rate volatility. The study also reported a significant impact of trade openness on exchange rate volatility and it is in line with the study of Ajao and Igbekoyi (2013) but against the findings of Adamu, *et al.* (2017). The study went further to confirm the significant impact of foreign direct investment on economic growth in Nigeria.

The study also revealed that Gross Domestic Product does not significantly affect exchange rate volatility in the studied period, this is in line with the prediction of the Ricardo-Balassa thesis and the finding of Adamu, *et al.* (2017) but in contrast with the findings of Victor and Dickson (2012). Furthermore, the recession period been captured with the dummy variables has no significant effect on exchange rate volatility while interest rate and inflation were not reported as major determinants of exchange rate volatility as confirmed by the findings of Udoye (2009). Oil revenue was also reported to have an insignificant impact on exchange rate volatility in line with the findings of Adamu, *et al.* (2017) but against the findings of Orji (2015).

From the second model, the regression result revealed that money supply affects economic growth in Nigeria. This is in line with the theoretical postulation of Keynesian (1936) that a positive relationship exists between money supply and GDP in an economy. This is also in line with the empirical findings of Masha (2002); Oyeyemi and Awujola (2014). Furthermore, total government expenditure was reported to affect economic growth in Nigeria, this is in conformity with the result of Ogiogio (2001); Oyeyemi and Awujola (2014); Agwu (2015). Interestingly, the period of recession affects economic growth in the country is supported by the assertion that recession occurs significant relationship with growth; this implies that trade liberalization

efforts in Nigeria have impacted on economic growth in Nigeria. However, this finding is not in line with the findings of Obi, Onire, and Nnadi (2016). The study also shows that labour supply affects economic growth which supports the Solow growth theory.

However, this study shows that inflation does not affect economic growth in the studied period which is in line with the study of Nwobi (1999); Oyeyemi and Awujola (2014) but in contrast with the theory of stagflation. Surprisingly, oil revenue does not affect economic growth in the studied period. This in contrast to the findings of Oyeyemi and Awujola (2014) and the belief of Ozumba (1996) that oil contributes to economic growth. Interest rate revealed a negative relationship with economic growth but this was not significant. This negative relationship is in line with the findings of Romer (1990) that higher interest rates may influence human capital to move away from the production of knowledge-based goods into final good production and the study of Ashar (2012). The study also shows that the relationship between exchange rate and economic growth is not significant this is in line with the findings of Adeniran, Yusuf, and Adeyemi (2014). Exchange rate is reported to have a negative relationship with GDP, this finding is in line with the findings of Yougbaré (2008) and Obi *et al.* (2016). It is important to mention that the impact of capital on growth in Nigeria in the studied period is not as postulated by the Solow growth theory because the study shows that it has an insignificant relationship with economic growth.

Conclusion and Recommendations

Against the background that provision of a plausible explanation for the economic recession in relation to exchange rate has called the attention of researchers and policymakers in recent time, the study examines the trend of GDP and exchange rate in Nigeria from 1986 to 2016. The study also investigated the determinants of exchange rate volatility and GDP in Nigeria from 1986 to 2016. The findings show that GDP and exchange rate follows an unsteady pattern and this suggests evidence of economic recession at some point in time and volatility clustering respectively. It was further evidenced from the result obtained from the long run estimates that real gross domestic product, interest rate, oil revenue, inflation rate and dummy (recession) has no significant effect on exchange rate volatility. However, foreign direct investment, money supply, trade openness and total government expenditure significantly affect exchange rate volatility. Furthermore, exchange rate volatility, labor supply, money supply, trade

openness, total government expenditure and effect of recession (dummy) have significant effect on GDP in Nigeria. While capital, inflation, interest rate and oil revenue are not significant. On this basis, the following recommendations were made:

- i. Policymakers should provide an enabling environment so as to attract more foreign direct investment into the country in order to generate more economic activities in Nigeria.
- ii. Monetary policy committee should map out strategies to stabilize exchange rate movement since it has been reported to impact economic growth in Nigeria.
- iii. Employment opportunity should be generated since more supply of labour will help stimulate economic growth.
- iv. Finally, government should increase money supply into the economic in order to increase aggregate demand and boost more economic activities.

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- Advances in Management Volume 17, No. 1 (2018)
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