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Exchange rate Fluctuation and Sustainable Economic growth in Nigeria: VAR Approach

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Abstract
The essence of this research is to ascertain the relationship between real exchange rate and economic growth applying those variables that adjudged to make up equilibrium exchange rate thereby defining how interrelated are RER, GDP, EXP, IMP, FER and FDI. The major aim was to define how exchange rate fluctuation stimulates economic development in Nigeria from 2004 to 2014. Analysing the data using VAR technique, based on the prevailing situation in Nigerian economy within these period, one can envisage that RER fluctuation was significantly controlled by its positive relation with real import as well as its negative relation to real GDP and foreign direct investment. Similarly, GDP are positively controlled by depreciating exchange rate, increasing previous GDP, FER and FDI. Nigerian economic growth within these period were characterised by sustainable growth enhanced by sustainable increase in these factors. The inference being those investors, policy-makers and others of common interest should understand that Nigeria however, benefited from currency depreciation.
Key words: VAR, Real exchange rate, Nigeria, FDI

1 Introduction

Economic policy makers and researcher alike are face with the tremendous problem of choosing the most appropriate exchange rate model and this has been a topical issue in recent time. In other words, one of the major concerns of economic policy analyst is the choice of befitting exchange rate regime for a country, which will engineer accelerated growth of the economy and its future sustainability. Since independence, Nigeria has witnessed a number of exchange rate regimes and their impact therein where envisaged. While commentators have had their views on the consequences of these exchange rate regimes in Nigeria, researchers have also tried to make their names in this area contesting the relevance and impacts of different regimes.

However, The Central Bank Act of 1959, the Exchange Control Act of 1962 and Decrees 24 and 25 of 1991 as amended, empowered the Central Bank of Nigeria (CBN) with the maintenance of a healthy balance of payments position and a stable exchange rate. The CBN documents the objectives of exchange rate policy as to preserve the value of the domestic currency, maintain a buoyant external reserve position, ensure internal and external balance and achieve macroeconomic stability. While it is obvious that country's apex bank saddled with major monetary policy responsibilities, can bring economic stability through floating exchange applying simple and popular textbook models, it should be reminded that the situation is practically complex. The apex bank takes its decision under imperfect information and monetary policy affects the economy with lags (Berger 2005). Traditional macro-economic theory has it that prices and wages do tend to adjust to stabilize the economy. The implication being that the apex bank can strive to employ effective monetary policy in a floating exchange rate regime but that hinges on how rapidly and dissolute it can respond and how promptly the monetary policy shakes the general economy, as against to how quickly prices and wages adjust. Also, maintaining stable economic yield is not the only goal of the apex bank, more focus are also highlighted in tackling inflation rate but the uncertainties of the monetary policy could adversely damage the exchange rate.

Nonetheless, currency undervaluation might lead to overheating the economy and rise inflation which would depress growth of the economy particularly in the medium run. For instance, Major trade partners with China have accused them of manipulating low level of Yuan against major currencies like dollar and euros to finance its rapid economic growth (Bereau et al., 2009). Taiwan and Korea experienced slow economic growth in the recent years because of growing overvaluation (Rodrik, 2008). Nigeria has achieved considerable economic growth for the past decades and improving as the largest and one of the fastest growing economies in Africa. Recent government have been adopting various monetary and fiscal policies to stabilize and continue to improve the economy and most importantly curtail the rate of unemployment which is alarming despite positive result in the overall economy.

According to the World Bank data, in 2003 and 2004, the growth rate surged by overwhelming 10.3% and 10.60% respectively, a positive and outcome of economic revival as at that time. And from 2003 till 2012, the growth rate has been considerably satisfactory at an average of 6.61%. These attributed to sound and workable monetary and fiscal policy reforms complimented by favourable and enhanced performance largely driven by non-oil sector. In 2011 and 2012, agriculture, wholesale and retail trade, and telecommunication were the key sub sectors which drove growth and contributed an average 27.64, 28.4 and 24.38 per cent, respectively, to the real GDP growth of Nigeria.

The Nigeria naira exchange rate has been controversial particularly in the couple of months before the 2015 general election in the country where naira was seen to have depreciated from N165 per dollar to over N200 per dollar and at the same time witnessing the decline in economic growth from 7.2% to 6.5%. The decline which some quotas attributed to heavy falling oil prices in the international market. Though common economic literature has it that the devaluation of country's currency would stimulate export hence export-led growth like in China and Japan but others view that such depreciation would generate favourable balance of payment and foreign reserve. Contrary, Koske (2008) has examine that pegging exchange rate like Malaysia did during the world economic recession, amount to current account continuously in surplus and foreign reserves been rising steadily to reflect exchange rate intervention by the authority to prevent real appreciation of the Malaysian ringgit.

Unlike Malaysia, Nigeria balance of payment has continuously been positive across various regimes. The issue here is that with these positive balance of payment and recently increasing export in Nigeria due to government export promotion strategy, can one be right to say that change in exchange has account to more improvement in Nigerian economy, how about the recent decline in growth and currency values? Nevertheless, the overall external reserve has been on the rise, from over US$29.4 billion in 2011, over US$36.2 billion to US$49.1 billion 2013. One should be careful in judgment as the economy envisage a continuous increase in foreign investment which increased by 46.07% to US$8.91 billion in 2011 and US$7.03 billion in 2012, compared to US$6.10billion in 2010. These are the pinnacle that could stimulate economic growth.

Be as it may, this research paper aimed at determining the dynamism of the real exchange rate and its relation to sustainable economic growth. In the process, the research will try to find the balanced relationship between the real exchange rate and sustainable economic growth in Nigeria; the effect of exchange rate on some of the selected variable that promote growth in Nigeria and also the correlation between these variables. It is crucial to note that some researchers have attempted to examine such problems in many developed country but the scenario in Nigeria has yet been achieved hence this research will be significant in this regard and also the uniqueness of this paper will be seen in the use of VAR model and the determinant of real exchange rate will encompass real GDP, foreign reserve, foreign trade, and foreign direct investment which, as earlier pronounced, are indicators of sustainable economic growth. The success of this research will no doubt make its mark in the field; most importantly it will also serve as reference to policy makers in developing countries who have similar foreign exchange scenario to Nigeria and Nigerian decision makers in particular.

2 Literature Review

Recent studies revealed relation between exchange rate regime and economic growth. Some school of thought found a robust correlation between the adoption of different exchange rate regimes and economic growth. In the view of Gosh et al., (2002) applying peculiar regime classification technique, learnt that fixed exchange rate regimes offers slight superiority to inspire economic growth, conversely the outcome of this research exposed non-robustness. But the authors proceed to conclude that there is no strong correlation between economic growth and the operational exchange rate regime. In Levy-Yeyati and Sturzenegger (2005), applying *de facto* classification best suited for them, revealed that fixed regimes in non-industrialized nations seems to be connected with abridged and very unpredictable, unstable rates of economic growth. To larger extend, the influences of exchange rate regimes to economic progress are largely dependent on the management; implying that no matter the exchange rate regime, its management is paramount to economic development stimulation.

Notwithstanding, Hussain et al (2005) proofed there is a positive consequence on the growth of the economic in most developed nations, following adoption of Reinhart flexible regimes, but within the selected emerging and developing nations, they could not determine any impact. In Iuhia and Bogdan (2012), it was told that 'the superiority of intermediate and floating exchange regimes over the fixed ones in stimulating a higher growth in

the economy[29]. Moreover, Aghion et al. (2006) following the sampled countries, attested that the real exchange rate volatility may possess significant impression on the long run productivity growth rate, nonetheless this effect is largely dependent on the development of financial sector in the adopted sampled countries. Hence, countries with lower financial development experience drop in economic growth, since exchange rate will tend to be more flexible, but there is no significant effect in the high financially developed countries. In another dimension, Tze-Wei and Lin (2012) using VECM analysis, dictated the existence of co-integration between real exchange rate and unemployment rate, which implies that a higher unemployment would cause the price of domestic currency to go down (depreciation) and vice versa. The author advised that, before delving into studying exchange rate regimes, the rate of unemployment should be thoroughly examined.

Furthermore, the consequences of exchange rate fluctuation on economic growth have been approached by diverse author with manifestation of diverse results. For instance, Glüzmann et al (2012) as well as Levy-Yeyati and Sturzenegger (2007) examined the relationship between exchange rate and economic growth in their study by looking directly at the intervention measures aimed at depressing the real exchange rate and found that generally lead to faster long-run output and productivity growth[30]. In real situation, most developing and emerging economies usually undervalued or overvalued their currencies to coincide with their economic policies and sometime as a corrective measure. Exchange rate undervaluation (depreciation) means that the currency is lower than its real exchange rate while exchange rate overvaluation (appreciations) implies that the exchange rate of one currency is higher than its real exchange rate. However, considering the linkages between the RER and growth, most studies found a positive relationship between RER undervaluation and economic growth, but this nexus are said to be much stronger in developing countries (Hausmann et al, 2005, Rodrik, 2008, Abida, 2011).

Be as it may, some authors will concur and many still object, different views abound but it should be well noted that the fluctuation of real exchange rate around its equilibrium could cause negative or positive impacts on growth depending on the direction of these movement. Tharakan, (1999) and Vieira et al (2013) all ascertained that highly fluctuated exchange rate has negative impacts on economic growth but moderately volatile exchange rate has positive impacts on growth as revealed in (Tarawalie, 2010), overvalued exchange on the other hand rate reduces growth (Elbadawi and Kaltani, 2012). However, Iuhia and Bogdan (2012) are of the view that the stability of exchange rate does not encourage economic growth especially if obtained by enormous government official interventions to sustain the exchange rate regime, similar to Harms and Kertschnman (2009). Razmi et al (2012) also discovered positive relationship between investment growth and real exchange rate undervaluation. They further recommended that given the model employed in their research, if the presence of underemployment and over reliance on imported capital goods establishes important networks through which the economy is being affected by the real exchange rate affects, targeting the latter may be more operational in promoting capital accumulation and unemployment reduction in low income countries compared to developed countries. Not too similar result was posted by Tang (2014) which suggests that 'China's growth has not benefited from the depreciation of RMB, since the Chinese economy is stimulated from the expansion of exports and inflow of foreign capital according to the empirical evidence'. The author further stated that in the long run, both exports and FDI have positive impacts on the real exchange rate and real GDP[31]. Without ruling out that there are effects of overvaluation and undervaluation towards economic development and growth, it should be well-known and explained that exchange rate regimes adopted by any country is also of very considerable interest toward its economic growth but not that alone, consequences implies for any mismanagement.

3 Data Collection and Methodology

3.1 Data Collection and Transformation

Data collected for the applicable variables used for the purpose of the analyses in this paper are quarterly, ranging from 1st Quarter, 2004 to 4th Quarter 2014. These data include GDP of Nigeria import, export, exchange rate, foreign exchange reserve and FDI, all related to Nigerian Economy. Exchange Rate, Import and Exports

[29] This result is anchored on de-jure classification in determining the economic growth and exchange rate regimes in Eastern and Central European countries.
[30] Though this study failed to ascertain the significant response to devaluation in export and import, it did find positive effects on saving, investment and employment. The two studies were based on selected developing countries.
[31] The author investigated the long run equilibrium and short run dynamics between the RER and economic growth in China applying a CVAR approach, and capturing change in regime in 2005 and the effect of the financial crises in 2008.

were sourced from IMF database, GDP and Foreign exchange reserve from CBN and FDI from UNCTAD. These data required transformation as follows:

- The GDP were reported in Naira and will be adjusted for its real term following: RGDP = (NGDP/CPI) X 100; Where RGDP is the Real Gross Domestic Product, NGDP is the Nominal Gross Domestic Product, CPI is the Consumer Price Index.
- The exchange rate are also in nominal values and will be transformed to real exchange rate as follows: RER = S X P_{dollar}/P_{naira} , where S is the nominal exchange rate, RER is the Real Exchange Rate, P_{dollar} is Price level in US dollar and P_{naira} is Price level in Nigeria Naira.
- The real export volume as applied in the paper is defined as; $EXP_t = (EX_t/EXUV_t) \times 100$; where EXP_t denotes the Nigeria's real export in time t, EX_t is Nigeria export in time t; and $EXUV_t$ stands for the export unit value index of Nigeria in time t.
- $IMP_t = (IM_t/IMUV_t) \times 100$; where IMPt stands for the real Nigeria in particular time t, IMt denotes Nigeria's import in time t ; and IMUVt is import unit value index of Nigeria of a time t.

It should be noted that FDI was reported annually by UNCTAD, but was converted to quarterly figures through interpolation. All the variables used in this research will be transformed into natural logarithm and applied in the model used herein.

3.2 Methodology

The data that will be used for this research is obviously time series data set. Therefore, the stationarity of the data should be taken into consideration otherwise; any analysis conducted without first conducting a stationery test can leave us with a bias result, a case which the researcher will lean towards avoiding.

3.2.1 Estimating the Model

The focus of this study is to determine the dynamic relation of the real exchange rate to sustainable economic growth in Nigeria. Edward (2011), Gluzmann et al (2012) and Tang (2014) reasoned that the real exchange rate (RER) equation can be adopted and applied by transforming the equilibrium exchange rate and exchange rate fundamental equations. Hence, drafted theoretical model indicates that:

$$RER = f(GDPt, FER, Import, Export, FDI) \quad (1)$$

$$lnRER_t = \beta_0 + \beta_1 lnGDP_t + \beta_2 lnFER_t + \beta_3 lnIMP_t + \beta_4 lnEXP_t + \beta_5 lnFDI_t + \beta_6 lnD + \varepsilon_t \quad (2)$$

Above equation will be wholly adopted with the exception of the Dummy (D), as follows:

$$lnRER_t = \beta_{10} + \beta_{11} lnRER_{t-j} + \beta_{12} lnGDP_{t-j} + \beta_{13} lnEXP_{t-j} + \beta_{14} lnIMP_{t-j} + \beta_{15} lnFER_{t-j} + \beta_{16} lnFDI_t + \varepsilon_t \quad (3)$$

The model exhibit relationship between exchange and its determinant as related to this paper. Except for real import (IMP), all variables (including real GDP, Foreign Reserve (FER), real export (EXP), and Foreign Direct Investment (FDI)) are expected to be positively related to real exchange rate (RER), and εt represent Error term. Please note that all data used in during the analyses will be converted to natural logarithm. The situation which necessitated the adoption of Dummy was not applicable in this research give the time selected.

3.2.2 Stationarity and VAR Analysis

The means, variances and covariance of non-stationary data changes over time, hence the need for unit root test and conversion of non-stationary variables to stationary ones. Otherwise, they could be unpredictable and cannot be projected nor be used to make any future decision. Applying time series data of non-stationary status will be tantamount to mislead assumptions, as they may designate relationship between two or more variables wherever one does not occur. So as to obtain consistent, dependable outcomes, Gujarati (2006) advocated that non-stationary data required to be converted to stationary data. So, for adequate realization of the major objective of this paper, the researcher will first apply Unit Root test to determine the stationarity of the variables using Augmented Dickey-Fuller (ADF) test and verified with Phillips-Perron Test Equation to ensure that a perfect root test is achieved.

Subsequently, will be analysing data applying VAR technique, rewriting the model equation (2) as follows:

$$lnRER_t = \beta_{10} + \beta_{11} lnRER_{t-j} + \beta_{12} lnGDP_{t-j} + \beta_{13} lnEXP_{t-j} + \beta_{14} lnIMP_{t-j} + \beta_{15} lnFER_{t-j} + \beta_{16} lnFDI_t + \varepsilon_t \quad (3)$$

$$lnGDP_t = \beta_{20} + \beta_{21} lnRER_{t-j} + \beta_{22} lnGDP_{t-j} + \beta_{23} lnEXP_{t-j} + \beta_{24} lnIMP_{t-j} + \beta_{25} lnFER_{t-j} + \beta_{26} lnFDI_t + \varepsilon_t \quad (4)$$

$$lnEXP_t = \beta_{30} + \beta_{31}lnRER_{t-j} + \beta_{32}lnGDP_{t-j} + \beta_{33}lnEXP_{t-j} + \beta_{34}lnIMP_{t-j} + \beta_{35}lnFER_{t-j} + \beta_{36}lnFDI_t + \varepsilon_t \quad (5)$$

$$lnIMP_t = \beta_{40} + \beta_{41}lnRER_{t-j} + \beta_{42}lnGDP_{t-j} + \beta_{43}lnEXP_{t-j} + \beta_{44}lnIMP_{t-j} + \beta_{45}lnFER_{t-j} + \beta_{46}lnFDI_t + \varepsilon_t \quad (6)$$

$$lnFER_t = \beta_{50} + \beta_{51}lnRER_{t-j} + \beta_{52}lnGDP_{t-j} + \beta_{53}lnEXP_{t-j} + \beta_{54}lnIMP_{t-j} + \beta_{55}lnFER_{t-j} + \beta_{56}lnFDI_t + \varepsilon_t \quad (7)$$

$$lnFDI_t = \beta_{60} + \beta_{61}lnRER_{t-j} + \beta_{62}lnGDP_{t-j} + \beta_{63}lnEXP_{t-j} + \beta_{64}lnIMP_{t-j} + \beta_{65}lnFER_{t-j} + \beta_{66}lnFDI_t + \varepsilon_t \quad (8)$$

J=1, 2 …44

The dependent variable will be lagged to determine the point at which higher order autocorrelation will be experienced. The lag time will be selected using various lag selection criteria and choosing the options number that has highest recommendation. In finding the relationship between RER, GDP, EXP, IMP FER and FDI, the VAR technique will be applied especially if all the endogenous variables in the system do have the same integration of order.

4 Results and Discussion

4.1 Stationarity Test

Unit root test became paramount in that the time series are expected to be non-stationary across time as most instances proved. Table 1 reports the unit root test which was carried out using ADF and Phillips-Perron models. The result which displays t-statistic indicates that not all variables are stationary at the same level of order. For instance, according to ADF test, FER and EXP are stationery at level while applying constant only, RER, GDP and IMP are all stationary at 1st diff. but FDI's stationarity proves to be at 2nd diff. Subsequent result when applying constant and trend is consistent with that obtained in constant only. Similarly, considering the second option of Philipps-Perron, the result is consistent with ADF using constant only. Apparently, the only variation appear to exist when adopting constant and trend, where, EXP, FER and FDI are all stationary at level whereas others are stationary at 1st diff. More to it, table 1 shows more of the result and the techniques. In all cases, where the variables are stationary, the absolute value of the t-statistic determined are greater than the critical value; which revealed statistical relevance.

Table 1 Unit Root Test (ADF and Phillips-Perron)

Variables	Level		1st Difference		2nd Difference	
	ADF	PP	ADF	PP	ADF	PP
			Constant only			
*ln*RER	-1.34318	-1.4022	-6.16317*	-6.3435*	-7.53255*	-34.5183*
*ln*GDP	-2.41926	-2.3427	-6.96539*	-6.00633*	-4.83041*	-12.5649*
*ln*EXP	-4.60229*	-4.77924*	-8.29692*	-14.0751*	-8.9829*	-23.9905*
*ln*IMP	-1.74747	-1.76361	-7.12925*	-7.9111*	-8.1398*	-24.7995*
*ln*FER	-3.76516*	-4.16108*	-3.09016**	-2.81984***	-10.6612*	-13.2979*
*ln*FDI	-0.31771	0.337019	-2.22981	-2.36126	-6.12847*	-6.12847
			Constant and Trend			
*ln*RER	-2.86821	-2.86538	-6.15434*	-6.37674*	-7.43001*	-34.1109*
*ln*GDP	-0.0646	-1.20281	-8.02393*	-12.6498*	-4.83342*	-12.4807*
*ln*EXP	-5.31477*	-4.91141*	-8.21839*	-14.805*	-8.88526*	-23.6245*
*ln*IMP	-2.82895	-2.85032	-7.16746*	-8.83966*	-8.02282*	-24.4868*
*ln*FER	-3.2744***	-3.12275	-3.90475**	-3.77843**	-10.5435*	-13.6601*
*ln*FDI	-3.22392***	-2.22839	-2.21609	-2.36852	-6.05453*	-6.0545*
Critical		Constant only			Constant and Trend	
Values	1%	5%	10%	1%	5%	10%
ADF	-3.59662	-2.93316	-2.60487	-4.1985	-3.52362	-3.1929
PP	-3.61559	-2.94115	-2.60907	-4.18648	-3.51809	-3.18973

Note: Defining the variables in table 1, *, ** and *** denotes rejection of null hypothesis a 1%, 5% and 10% significant levels respectively. Schwartz information Criteria (SIC) and Newey-West Bandwidth (using Bartlett Kernel) selection criteria were applied for ADF and Phillip-Perron test respectively.

4.2 Descriptive Statistics

Table 2 reports the summary statistics and correlation which amongst other things, shows the interrelationship and individual summary of the variables in-use. This was conducted with the help of Stata, software as likewise applied in every other subsequent analysis that follows. The result revealed that most of these variables are inter-correlated at different degrees. For instance, FER is having weak correlation with EXP but positive while EXC has negative correlation with all variables used in the research, according to product of the analysis. Another weak correlation is between FDI, EXP and FER. Other descriptive statistic and correlations are shown in Tables 2. Please beware that every variables were expresses in natural logarithm before all the analysis were made.

Table 2 Descriptive Statistics and Correlation

Stats	*ln*EXC	*ln*RGDP	*ln*EXP	*ln*IMP	*ln*FER	*ln*FDI
Mean	5.069003	29.60995	22.55335	22.67838	25.37517	10.72691
Median	5.049531	29.64923	22.55897	22.73858	25.48207	10.72718
Maximum	5.416387	29.83924	22.76346	23.04098	25.9307	11.31419
Minimum	4.785602	29.25274	22.08912	22.16753	24.03238	10.17903
Std. Dev.	0.170653	0.152661	0.13333	0.245796	0.434269	0.383787
Skewness	0.301555	-0.74142	-1.10745	-0.56572	-1.58553	0.089073
Kurtosis	2.34271	2.703659	4.969215	2.166087	5.222542	1.487591
Jarque-Bera	1.359443	3.906375	15.00528	3.374901	25.61702	3.961822
Probability	0.506758	0.141821	0.000552	0.184991	0.000003	0.137943
Sum	207.8291	1214.008	924.6872	929.8137	1040.382	439.8033
Sum Sq. Dev.	1.164896	0.932209	0.711078	2.416629	7.54357	5.891711
Observations	44	44	44	44	44	40
*ln*EXC	1					
*ln*RGDP	-0.84377	1				
*ln*EXP	-0.53393	0.566664	1			
*ln*IMP	-0.93201	0.884766	0.532819	1		
*ln*FER	-0.68722	0.701163	0.276453	0.741833	1	
*ln*FDI	-0.88553	0.718932	0.406161	0.830348	0.386143	1

Note: Sources and variable definition; Real exchange rate (RER), Import (IMP) and Export (EXP) were obtained from IMF database, while Foreign Exchange Reserve (FER), Gross Domestic Product (GDP) were obtained from CBN database and FDI from UNCTAD database. All variables were transformed into natural logarithm.

4.3 VAR Result

Before delving into VAR analysis proper, it was pertinent to identify the appropriate lag period that should be applied. The writer applied econometric models to ascertain the most suitable lag period which best-fitted the analysis, given the available data. Obviously lag 4 was chosen given that from table 3, there indicated more asterisk at 4 which signifies most criteria preference, hence the author's adoption of this preference. Therefore, VAR analysis will be done applying lag 4. Note that aside SBIC and FPE criteria which chooses lag 1 and 2 respectively, no other criterion stated otherwise.

Table 3 Lag Selection Criteria

Lag	LL	LR	DF	P	FPE	AIC	HQIC	SBIC
0	167.454				5.10E-12	-8.96965	-8.87753	-8.70573
1	388.259	441.61	36	0	1.80E-16	-19.2366	-18.5918	-17.3892*
2	447.845	119.17	36	0	5.9e-17*	-20.547	-19.3495	-17.116
3	484.403	73.115	36	0	9.50E-17	-20.5779	-18.8278	-15.5635
4	547.114	125.42*	36	0	7.40E-17	-22.0619*	-19.759*	-15.4639

Note: Lag is selected based on the level that has most *(asterisk) among all the criteria
Source: Author's computation

The essence of this research is to ascertain the relationship between real exchange rate and economic development applying those variables that adjudged to make up equilibrium exchange rate. The researcher deemed it fit to apply vector autoregression (VAR) analysis in determining the connections between RER, GDP, EXP, IMP, FER and FDI. The results are dependent of the data obtained from the sources stated in the previous section and the economic situation in Nigeria within the period in review.

Table 4 VAR Result

Dependent Variables	Independent Variables						
	*ln*RER	*ln*GDP	*ln*EXP	*ln*IMP	*ln*FER	*ln*FDI	CONST
*ln*RER	0.259614	-0.32552**	0.011746	0.260684**	-0.03972	-0.25666*	5.314489**
	(1.15)	(-2.21)	(0.14)	(2.08)	(-0.85)	(-3.51)	(2.06)
*ln*GDP	0.56917**	0.744811*	-0.04059	-0.2238	0.160879*	0.224955**	4.193101
	(2)	(4.02)	(-0.37)	(-1.42)	(2.75)	(2.45)	(0.63)
*ln*EXP	0.36894	0.456332	0.105728	0.073869	-0.01493	0.053532	2.920953
	(0.66)	(1.26)	(0.5)	(0.24)	(-0.13)	(0.3)	(0.22)
*ln*IMP	0.368109	0.739381*	0.195	-0.35803***	0.266036*	0.348085*	-7.79422
	(1.06)	(3.25)	(1.45)	(-1.86)	(3.71)	(3.09)	(-0.95)
*ln*FER	-1.46777**	0.033187	-0.04818	-0.46075	0.361374*	-0.41533**	38.79639*
	(-2.41)	(0.08)	(-0.21)	(-1.37)	(2.89)	(-2.11)	(2.71)
*ln*FDI	-0.15346	0.260672***	-0.0675	0.076805	0.092694**	0.811759*	-7.38235
	(-0.72)	(1.86)	(-0.82)	(0.65)	(2.1)	(11.72)	(-1.46)

Note: The table summarises the coefficient of the independent variables, in parenthesis are z-statistics and the mark asterisks *, ** and *** denotes rejection of null hypothesis at 1%, 5% and 10% significant levels respectively.

Having said that, Table 4 displays the VAR results, which reveals that RER as a dependent variable, is positively related to previous real exchange rate (RER), real export (EXP) and real import (IMP) but also negatively related to real GDP, foreign exchange reserve (FER) and foreign direct investment (FDI); though these results are only significant with GDP, FER and FDI. In other words, increasing GDP will tend to appreciate the naira; mathematically, a one percent increase in GDP will stir over 0.3 percent reduction in naira exchange rate to US dollar. This could be rightly so given that an economic growth may respond toward pressurizing the exchange rate to appreciation. One peculiar outcome here being that increasing importation will depreciate the naira, while RER indirectly varies with FDI, implying that just like GDP, FDI increase tends to appreciate naira against dollar but an increase in import states otherwise, other things being equal. However, having ascertained the co-efficient of all the variables, and to replace the co-efficient in equation 3, in 2 dp, can be rewritten as follows:

$$ln\text{RER}_t = 5.31 + 0.26ln\text{RER}_{t-j} - 0.33\ln\text{GDP}_{t-j} + 0.01ln\text{EXP}_{t-j} + 0.26ln\text{IMP}_{t-j} - 0.04ln\text{FER}_{t-j} - 0.26ln\text{FDI}_t + \varepsilon_t \quad (9)$$

Moreover, given GDP as a dependent variable, it is revealed that exchange rate depreciation would stimulate the economy in Nigeria. Similarly, GDP varies directly as lagged GDP, FER and FDI, other things being constant. Nigerian economy are envisaged to be stimulated by these factors which has contributed to employment, though, unemployment rate within the period are steadily rising and some analyst have reasoned that is the resulting increase in graduates or labour force year-in year-out which cannot be matched foot-to-foot with the amount of job opportunities created in the country within the stated period. Substituting the derived βs in equation 4, hence;

$$ln\text{GDP}_t = 4.19 + 0.57ln\text{RER}_{t-j} + 0.74\ln\text{GDP}_{t-j} - 0.04ln\text{EXP}_{t-j} - 0.22ln\text{IMP}_{t-j} + 0.16ln\text{FER}_{t-j} + 0.22ln\text{FDI}_t + \varepsilon_t \quad (10)$$

The VAR result further tells that exports were not significantly influenced by any of the factors employed as variables in this research but indicated that RER, GDP, lagged EXP, IMP and FDI have positive relationship with exports while FER is related negatively but in which case are not meaningful to incite judgement. One the other hand, import is been determined positively by GDP, FER and FDI but negatively by previous importation. That is to say previous imports will discourage import at a given time especially in machineries and equipment which accompanies increasing FDI. As will be seen later, FDI stimulates import in Nigeria especially as it emanates many long term assets. Furthermore, a 1% increases in GDP, FER, and FDI will definitely contribute over 0.74%, 0.27% and 0.35% increase in import respectively, ceteris paribus, but 1% increase in previous importation will result to over 0.36% decrease in importation at a time, given other factors. GDP represent the size of the market and its growth will rightly attract more importation so also in Nigeria. Nevertheless, RER and EXP are said to be positively related to IMP but this research certify them not significant therefore could not be justified.

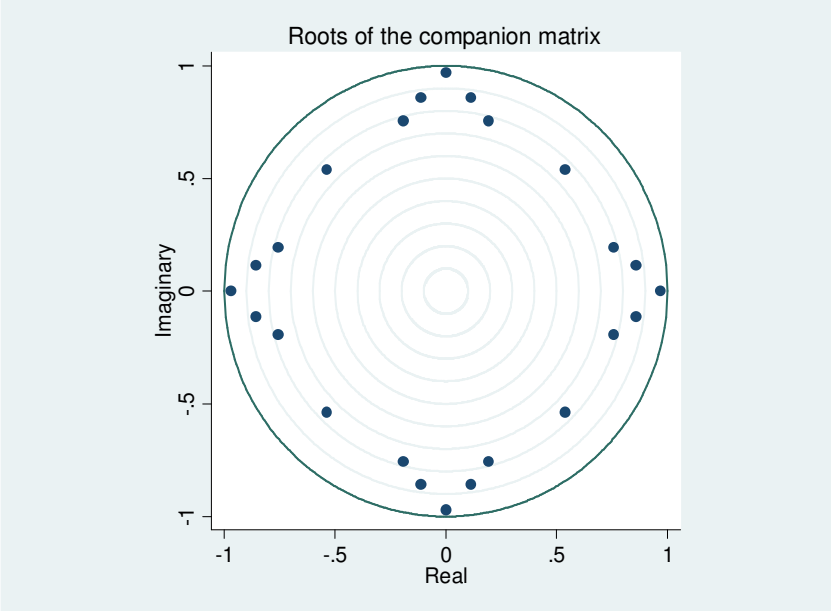

Fig 1 Variable Stability Test
Source: Authors Computation

Furthermore, RER do have much control on FER and is negative. Previous FER and FDI seemingly do affect FER positively and negatively in that order and also very significant. There is frequent government interference in FER which could also add more pressure to its reduction in value. Depending on this result, trade values-either as import or export cannot be reasonably defined to possess any control on FER. Numerically, a depreciation of RER by 1% will tend to reduce FER by excess of 0.15%, so do FDI which its increment by 1% will generate rather reduction in FER in excess of 0.42%. Likewise, a percentage increase in previous FER will metamorphose into over 0.36% acceleration of present FER, all things being equal.

Moreover, the data employed in this research is proved to be statistically stable given the eigenvalue stability condition in table 5 below; therefore, the result of the analysis could be ascertained to be reliable. It would amount to inconclusive if the stability of the data employed in this research is not determined; as this will encourage relying on the outcome of this research. From fig 2 also, one could envisage that the data is

established stable in the model employed, since all the dots are located within/inside the circle, hence the result is consistence and dependable.

Table 5 Eigenvalue stability condition

Eigenvalue		Modulus
0.9695714		0.969571
-0.9695714		0.969571
-1.110e-16 +	.9695714i	0.969571
-1.110e-16 -	.9695714i	0.969571
-.1138871 +	.8582859i	0.865809
-.1138871 -	.8582859i	0.865809
.8582859 +	.1138871i	0.865809
.8582859 -	.1138871i	0.865809
.1138871 +	.8582859i	0.865809
.1138871 -	.8582859i	0.865809
-.8582859 +	.1138871i	0.865809
-.8582859 -	.1138871i	0.865809
-.7572785 +	.1925524i	0.781375
-.7572785 -	.1925524i	0.781375
.1925524 +	.7572785i	0.781375
.1925524 -	.7572785i	0.781375
.7572785 +	.1925524i	0.781375
.7572785 -	.1925524i	0.781375
-.1925524 +	.7572785i	0.781375
-.1925524 -	.7572785i	0.781375
.5378798 +	.5378798i	0.760677
.5378798 -	.5378798i	0.760677
-.5378798 +	.5378798i	0.760677
-.5378798 -	.5378798i	0.760677

All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.
Source: Authors Computation

5 Conclusions

The essence of this research is to ascertain the relationship between real exchange rate and economic development applying those variables that adjudged to make up equilibrium exchange rate thereby defining how interrelated are RER, GDP, EXP IMP, FER and FDI. Analysing the data using VAR technique, based on the prevailing situation in Nigerian economy within the period of study, one can envisage that RER fluctuation was significantly controlled by positive relation to real import as well as its negative relation to real GDP and foreign direct investment. In as much as the naira is been devalued by the CBN or forces of demand and supply in the foreign exchange market, the research shows that the tendency of increasing FDI will definitely pressurise for the appreciation of the naira, likewise will GDP growth. Similarly, GDP are being positively influenced by depreciating exchange rate, increasing previous GDP, FER and FDI. Nigerian economic growth within these period were characterised by sustainable growth enhanced by sustainable increase in these factors. In it all, EXP could not be significantly be defined by any of the variables in-use, within the period choice in the research, but increasing FDI and FER contributes to increasing importation to Nigeria. This suggests that both investors and policy-makers, alike, should understand that Nigeria however benefits from currency depreciation.

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