

Currency Devaluation and Macroeconomic Variables Responses in Nigeria: A Vector Error Correction Model Approach: 1986-2016

Okoroafor O. K. David*, Adeniji Sesan Oluseyi

Department of Economics, University of Abuja, Nigeria

*Corresponding author: okoroaforo94@yahoo.com

Abstract Exchange rate devaluation is said to have ripple effects on macroeconomic variables. Hence, this study empirically examined how macroeconomic variables responded to currency devaluation in Nigeria: 1986-2016. In order to achieve our aim, the Augmented Dickey Fuller (ADF) and Philip Peron (PP) stationarity tests were employed to examine the stationarity properties of the variables stated in the model, while Johansen Co-integration test was employed to see if there is a long run relationship among the variables in the model. It was then revealed that, all the variables were integrated of the same order and were stationary at first difference $I(1)$, while the result of the co-integration test revealed that, there is long run relationship among the variables. These therefore necessitates the use of Vector Error Correction Model (VECM) model and Impulse Response in the analysis. The result revealed that, exchange rate devaluation have a positive and significant impact on macroeconomic variables tested, including economic growth in Nigeria. While the impulse response result showed that, real gross domestic product (RGDP), one period lag of exchange rate devaluation, money supply, external reserve, interest rate, balance of payment all responded positively to shocks generated by exchange rate devaluation in the economy; while inflation, trade openness and non-oil export responded negatively. In the same vein, while exchange rate devaluation revealed progressive and noteworthy impact on balance of payment, its impact on non-oil export were found to be negative which is in tandem with the findings from previous studies. It is equally important to state that, even though there are diverse benefits from currency devaluation, but these benefits can only be harnessed when there is improvement in the production of goods and services for both domestic consumption and export purposes.

Keywords: exchange rate devaluation, macroeconomic variables, impulse response, VECM

Cite This Article: Okoroafor O. K. David, and Adeniji Sesan Oluseyi, "Currency Devaluation and Macroeconomic Variables Responses in Nigeria: A Vector Error Correction Model Approach: 1986-2016." *Journal Name*, vol. 5, no. 6 (2017): 281-289. doi: 10.12691/jfe-5-6-4.

1. Introduction

Currency devaluation have become a pronounced and monumental issue in Nigeria from 1986 to present day. The Nigerian official legal tender (Naira) have suffered tremendous loss in value against other major currencies of the world. For instance the naira which use to have a superior value compared to US dollar pre- 1986 was N7.901 to US dollar in 1990, and persistently declined to an average of about N315 to a dollar in 2016. In fact within a period of about 27 years the decay in the worth of the naira is about 4329.82 percent (from authors' computation). As the naira suffered loss in value, so is everything that is associated with naira in the country. This further led to declination in the standard of living in the country as a result of skyrocketed cost of living beyond the reach of average households in Nigeria.

Meanwhile studies have indicated that the place of exchange rate in economic performance among nations are very obvious. Large volume of work has been devoted

to this concept, both at national and international arena. For instance, extensive empirical study on the concept has been done by: Edward [1]; Gylfason and Radetzki [2]; Rogers and Wang [3]; Kamin and Rogers [4]; Jameela [5]; Aliyu [6]; Kenneth [7] and Ikelikume [8], just to mention a few. Yet, there still remains room for further studies on this concept. Exchange rate is counted as an endogenous factor that affects an economy. It is the rate at which one country's currency is exchange with the currency of another country. It also represent the price in which one currency is traded with another in the international market, Iyoha [9] and Jameela [5]. Mordi [10] was of the opinion that, the essential role played by exchange rate involve comparing one country's currency with another. With it, nations determine how they are faring and stand in the midst of other nations.

Exchange rate devaluation is said to have ripple effects on macroeconomic variables. For instance it determines the economic wellbeing of every nation involved in international trade [11]. Devaluation of a country's currency is informed by different reasons such as: enhancing the balance of payment position, boosting

domestic employment, accumulation of foreign reserves and stimulation of economic growth. But controversies still abound on how devaluation impacts on aggregate output, particularly in developing economies [7,8]. In some quarters, it is argued that exchange rate devaluation is seen to be more of a curse than a blessing in an economy. The contention is that it makes the prices of both domestic and foreign goods and services to rise beyond control. In Nigeria for example, exchange rate devaluation from 1986 was adopted as a strategy to achieve short and long run economic growth; reduce external imbalance; correct perceived over valuation of domestic currency; increase international competitiveness and promote export.

It is further argued that exchange rate devaluation stimulates economic activities in the economy by increasing the prices of foreign goods and services in relation to domestic ones. This therefore enhance international competitiveness of domestic industries and led to diversion of expenditure from imported goods to local goods. It also promotes trade balances by substituting demand in appropriate way in line with the ability that the home economy can carry [12]. However, presently for Nigeria, the realities on ground seem to be contrary and suggests none attainment of the desires and purposes of exchange rate (currency) devaluation exercises.

On account of this information, this study is poised to examine empirically how key macroeconomic variables in Nigeria have responded to the continuous exchange rate devaluation. Starting from the period of introduction of Structural Adjustment Programme (SAP) in 1986, the naira has been on a free fall in value [13]. There have been continuous exchange rate policy summersault from pegged regime to regulated and deregulated regime to completely market determined exchange rate regime. In all, the value of naira has maintained persistent downward trend. In 1981, N0.61 was exchanged for a US dollar. After about ten years after, precisely 1990, there was a depreciation in the value of naira with N7.90 been exchanged for a US Dollar. From 1994-1998, the policy of guided deregulation was accepted and the worth of the naira came to N21.88 to the dollar. With further implementation of deregulation policy, Naira was exchange with Dollar with N86.32 in 1999. From 2002, the exchange worth of the naira to dollar took a permanent downward trend with the following figures on average: N120.97 in 2002 and N135.5 in 2004. However, it appreciated to N132.15 in 2005 and further to N118.57 in 2008. However, there was a drop in naira value to N150.01 in 2009 as a result of the global financial crises and further decline in value to N155.08 in 2012, while this continue as the value as officially announced at the end of 2015 was N220.34. With the Central bank decision to engage in fully market determined exchange rate, the naira value as at August 2016 was on average N310 to a dollar. Meanwhile, Obadan [14] gave an insight to factors which led to the inconsistency in the real exchange rate in Nigeria includes: weak production base, import dependent production structure, fragile export base and weak non-oil export earnings, expansionary monetary and fiscal policies.

Accordingly, macroeconomic variables of Inflation, money supply, the real gross domestic product, trade

openness, interest rate, foreign direct investment, gross capital formation, exports, unemployment and manufacturing output and so on have responded varyingly to naira (currency) devaluation situations in the economy. Consequence to these, this study seeks to establish whether exchange rate devaluation promoted or undermined economic growth in Nigeria. Again we want to find out if macroeconomic variables responded positively or negatively with currency devaluation as it is in Nigeria. Thirdly, has currency devaluation any significant impact on non-oil exports and the balance of payment position in Nigeria?

This study is structured into five sections, with the second section taking care of literature review. The third section is methodology. The fourth section contains the data analysis and interpretation of result, while the last section is the conclusion.

2. Review of Literature

There are literature on the theoretical and empirical stance on the association between exchange rate volatility, macroeconomic variables and economic growth.

2.1. Theoretical Review

According to Acharya [15], exchange rate devaluation are important elements of economic adjustment and stabilization programs frequently used to improve a countries balance of payment position, boost domestic employment and accumulate more foreign reserves. Presenting his views on the reasons for exchange devaluation, Paul [16] maintained that it is triggered when the country is experiencing adverse balance of trade / balance of payment crisis or by worsening economic conditions transmitted into the domestic economy from foreign market. Meanwhile Gafar [17] had posited that exchange rate devaluation is usually considered as a weapon of last resort by policy makers, particularly before or when the authorities approach the IMF for balance of payment support. In their own understanding, Rashid and Asif [18] explained that exchange rate devaluation is an attempt to regulator the shortfall balance of payment.

Considering an open market, speculators may sell currency so as to exchange for a country's foreign reserves due to devaluation speculation. This might be as a result of swelling pressure for devaluation put on the issuing country. Hence, balance of payment problem arises when speculators purchase all the foreign reserves. According to Krugman and Obstfeld [19], the balance of payment crunch happens at what time the real exchange rate is equal to the nominal exchange rate and when the real exchange rate after depreciation falls below the nominal rate. This is because the speculator lacks impeccable knowledge of the market and they occasionally understand that fallen real exchange rate leads to reduction in the country's foreign reserve. Therefore, this will make the currency value to fall rapidly as was recorded in the case of Mexico crisis of 1994.

Kalyoncu [20] in his opinion does not support devaluation as a way of improving the economy. He maintained that, this can be employed only if the

government rereads method of planning as well as execution of the plans or else, no amount of devaluation would calm the external value of the currency. Making contribution on the issue of exchange rate devaluation, Ratha [21] observed that it has several effects on macroeconomic variables. First, it reduces expenditure and stimulates the level of output through the multiplier effect. At the other extreme, it has an inflationary effect on import cost and the cost of production, particularly in import dependent country. It also increases the cost of servicing foreign debt.

Meanwhile, there are two major views on mechanism of exchange rate devaluation effects. These are expenditure switching effect and balance sheet effect. The orthodox school advocates that exchange rate devaluation is expansionary due to its expenditure switching effects and stimulates the production of tradable. However, the eclectics providing opposing argument maintains that export of transitional economies may not be as responsive to exchange rate devaluation since their products are not of the same quality as those of industrial economies.

According to Edward [1], on the balance sheet effect, if debts are denominated in Dollars while the firm's revenue are denominated in domestic currency, unforeseen changes in exchange rate will affect firms balance sheet. Due to deterioration of balance sheet debt becomes expensive, and it negatively affect production capacity.

The orthodox counter that exchange rate devaluation can cause output to contract because of other factors such as contraction of aggregate demand, income redistribution towards economic entities with high propensity to save. This makes capital investment more expensive, [22], and increasing debt and debt service payments in local currency. But if Marshal-Lerner condition applies, currency devaluation could enhance the gross domestic Product (GDP) as well as trade balance in the long run [23]. It then means that, if the summation of price elasticity of export and import is larger than one, exchange rate devaluation will show a positive effect on trade balance.

Paul [16] provides a support for the positive effect of exchange rate devaluation on growth of firms that produces for local and as well as foreign markets. When devaluation occur, the firm producing for foreign market makes more profit which can be converted to local currency to support research and development (R&D) as well as innovation of new technology that promotes increases in output. Gala [24] similarly added that increase in export and innovation will create "investment-led growth". The rise in investment will result in growth of GDP. Harris [25] supported the assertion that exchange rate devaluation may lead to higher growth by reducing relative firm prices, which enhances profit. As the cost of imported goods increase, people switch to domestic goods. Aliyu [6] maintained that appreciation of exchange rate results in increased imports and reduced export; while depreciation would expand export and discourage import.

2.2. Empirical Review

On the empirical front, Ratha [21] the impact of currency devaluation on export and GDP considering the short and long run effect. The result revealed that,

currency devaluation have a contractionary effect on export and GDP in the short run and an expansionary effect in the long run.

Edward [1] studied 12 developing countries based on a hypothesis about the negative effect of devaluation. Using lagged variable to distinguish the effect of exchange rate in the short and long run, the result revealed that, devaluation of exchange rate in the same year had a negative effect in the short run. But after a year, the effect converses into positive relation. He maintained that, in the long run, this contradictory effect cancels out and results to zero effect in the long run. Agar (2000) explored the relationship between growth and devaluation in 18 LDCs with different export performance. Even though Edward [1] and Acar [26] got the same result, the countries used in their samples as well as the functional form of the dependent and independent variables used in the study was different.

Meanwhile, Al-Abdulrazaq [27] investigated how devaluation in Jordan between 1969 and 1994 impacted on the country's trade balance. He employed elasticity approach in analyzing the balance of payment and the study revealed that devaluation does not have significant impact on balance of trade given the sum of demand elasticity for export and import that is less than one. Also, Navaretti et-al [28] examined the impact of currency devaluation on Cameroun economy. Their result indicated that devaluation had major consequences on firms already involved in trade. Such firms increased their exports; while none exporting but importing firms experienced increases in their cost of production. Bahmani-Oskoree [29] used time series cointegration framework on 23 LDCs to establish neutrality of devaluation on production in the long run. In the same vein, Chou and Chao [30] employed panel data unit root tests in a bivariate framework and concluded that devaluation hurt Asian economies output in the aftermath of the 1997 crisis. However it left no patterns in the long run. Again Mitchell and Pentecost [31] in a study of Bulgaria, Czech Republic, Poland and Slovenia using panel data confirmed that there is contractionary effect of currency devaluation in the short run and long run. The long run effect is a resultant effect of a rise in output a year after the occurrences of devaluation. But in a contrast study by Kardeloglou et-al [32], where 3 wage-price GDP model was applied on Bulgaria, Poland and Slovenia; they found that devaluation is slightly expansionary in Slovenia in the initial stage. It had no long run effect in Bulgaria, and was contractionary in Poland. In the same vein, Narayan and Narayan [33] examined the impact of currency devaluation on Fiji economy. The empirical analysis result revealed that, there is increase in the output of the country with 2.3% and 3.3% in both the short run and the long run as a result of the devaluation of the country's currency. This findings is in line with that of IMF approach which encourages devaluation of currency as a propeller of increased economic growth.

Acharya [15] examined the impact of devaluation of Nepalese currency on Agriculture and Industrial sectors. His findings reveals that devaluation increases the price of imports leading to high production of export products in the Agricultural and industrial sectors. Mori, et-al [34]

explored the impact of exchange rate on economic growth in Malaysia. He employed time series data for the period of 1974 – 2009. Using ARDL bound test for the analysis, the result revealed that, there is a long run relationship among the variables as indicated by the cointegration test. Attah-Obeng et-al [35] investigated the impact of exchange rate on economic growth of Ghana economy for the period of 1980 – 2012. Using descriptive analysis and ordinary least square (OLS) regression technique, the finding from the study revealed an existence of correlation between exchange rate and GDP which is in line with the postulation that devaluation stimulates economic growth in the short run.

Meanwhile there are several empirical studies with focus on the Nigerian economy. Some of these includes: Yaqub [36] whose study examined the impact of exchange rate on output of different sectors in Nigeria. The study adopted modified IS-LM framework on behavioral equation. The data covered 1970-2007. The result revealed that exchange rate had significant contractionary effect on Agriculture and Manufacturing sectors; while it had expansionary effect on the service sector. He concluded that existing structures in Nigeria could not support an expansionary depreciation argument in the basic sectors during the period of study.

Also, Opaluwa, et. al [37] investigated the impact of exchange rate variations on the Nigerian manufacturing sector for the period of 1986 to 2005. The findings from the study explained unfavourable impact of exchange rate on manufacturing sector in the period of study. In the study of Dada and Oyeranti [38], the influence of exchange rate on macroeconomic aggregates in Nigeria was examined using time series data for the period 1970 to 2009. The study employed simultaneous equations model as well as a vector autoregressive model in investigating the direct and indirect relationship between the real exchange rates and GDP growth and the result from the empirical findings showed that, there is no relationship between changes in the exchange rate and GDP growth but Nigeria's economic growth has been influenced by fiscal and monetary policies and other economic variables particularly the growth of exports (oil).

Also Onavwole and Oyovwi [39] examined the determinants of real exchange rate in Nigeria with data covering 1970-2010. The study employed parsimonious ECM and the result showed that ratio of government spending to gross domestic product, terms of trade and technological progress does not influence real exchange rate in Nigeria. Credence was given to capital flight, price level and nominal effective exchange rate as the chief determinants of real exchange rate as revealed in the study. Adeniran, et al [40] investigated the effect of exchange rate on economic growth in Nigeria for the period of 1986 to 2013. They employed correlation analysis and ordinary least square (OLS) regression techniques. The findings from the study showed a positive and insignificant impact of exchange rate on economic growth in Nigeria.

Ismaila [41] examined exchange rate depreciation and Nigerian economic growth during the SAP and Post SAP period. The study covered 1986-2012. He applied Johansson Cointegration test and ECM techniques of

analysis. The empirical analysis showed significant impact of broad money supply, Net export and total government expenditure on economic growth on one hand, while on the other hand, exchange rate possess a direct and insignificant impact on economic growth Nigeria . This implies that exchange rate depreciation during SAP period has no robust effect in Nigeria economic performance.

3. Methodology

3.1. Theoretical Framework and Model Specification.

This study employed the standard IMF Framework of Currency Devaluation as an endogenous factor that affects an economy. This is premised on the fact that Macroeconomic variables are expected to respond positively to Currency Devaluation, thereby resulting to increases in: employment, domestic output, balance of payment equilibrium, economic growth, and increased non-oil exports and so on. Therefore, given the objectives of this study, the functional relationship between the variables is specified below;

$$RGDP = F \left(\begin{matrix} CD, INF, MS, TOP, EXR, \\ INT, BOP, NOE, MO \end{matrix} \right) \quad (3.1)$$

Where;

RGDP is the Real Gross Domestic Product, MS is the money supply, CD is the Currency Devaluation proxy by exchange rate of Naira to dollar, INT is the real interest rate, INF is the inflation rate, EXR is the external reserves, TOP is the trade openness, NOE is the Non-oil export, BOP is the balance of payment, and MO is the manufacturing output of Nigeria over the period of the study.

3.2. Techniques of Analysis

Avoidance of spurious result in any empirical analysis make it very imperative to test and know the stationarity property of the variables in the model. Therefore, the empirical analysis starts with the examination of the stationarity level of the variables using the Augmented Dickey Fuller (ADF) and Philip Peron (PP) unit root tests. Also, long run relationship between the variables will be examined using Johansen-Juselius cointegration test. The result of these will aid our decision on the right techniques of analysis to be used. However, with the objective of this study which has to do with the interrelationship between the variables, equation 3.1 can be represented in its VAR from thus;

$$RGDP = \alpha + \beta_1 CD + \beta_2 INF + \beta_3 MS + \beta_4 TOP + \beta_5 EXR + \beta_6 INT + \beta_7 BOP + \beta_8 NOE + \beta_9 MO. \quad (3.2)$$

$$CD = \alpha + \beta_1 RGDP + \beta_2 INF + \beta_3 MS + \beta_4 TOP + \beta_5 EXR + \beta_6 INT + \beta_7 BOP + \beta_8 NOE + \beta_9 MO. \quad (3.3)$$

$$\begin{aligned}
 INF &= \alpha + \beta_1 CD + \beta_2 RDGP + \beta_3 MS \\
 &+ \beta_4 TOP + \beta_5 EXR + \beta_6 INT \\
 &+ \beta_7 BOP + \beta_8 NOE + \beta_9 MO.
 \end{aligned}
 \tag{3.4}$$

$$\begin{aligned}
 NOE &= \alpha + \beta_1 CD + \beta_2 INF + \beta_3 MS \\
 &+ \beta_4 TOP + \beta_5 EXR + \beta_6 INT \\
 &+ \beta_7 BOP + \beta_8 RGDP + \beta_9 MO
 \end{aligned}
 \tag{3.10}$$

$$\begin{aligned}
 MS &= \alpha + \beta_1 CD + \beta_2 INF + \beta_3 RGDP \\
 &+ \beta_4 TOP + \beta_5 EXR + \beta_6 INT \\
 &+ \beta_7 BOP + \beta_8 NOE + \beta_9 MO
 \end{aligned}
 \tag{3.5}$$

$$\begin{aligned}
 MO &= \alpha + \beta_1 CD + \beta_2 INF + \beta_3 MS \\
 &+ \beta_4 TOP + \beta_5 EXR + \beta_6 INT \\
 &+ \beta_7 BOP + \beta_8 NOE + \beta_9 RGDP.
 \end{aligned}
 \tag{3.11}$$

$$\begin{aligned}
 TOP &= \alpha + \beta_1 CD + \beta_2 INF + \beta_3 MS \\
 &+ \beta_4 RGDP + \beta_5 EXR + \beta_6 INT \\
 &+ \beta_7 BOP + \beta_8 NOE + \beta_9 MO.
 \end{aligned}
 \tag{3.6}$$

4. Analysis and Discussion of Results

4.1. Unit Root Test

Table 1 summarizes the results obtained for each variables from the various techniques used to test the hypothesis of unit root or no unit root as the case may be.

Table 1 revealed that, the null hypotheses that the variables are not stationary cannot be rejected at level given the asymptotic critical values that are less than the calculated values of ADF and PP. After all the variables have been transformed to their first difference all the variables became stationary. Hence, the conclusion is that the variables are said to maintain stationarity at an integration of order one I(1).

$$\begin{aligned}
 EXR &= \alpha + \beta_1 CD + \beta_2 INF + \beta_3 MS \\
 &+ \beta_4 TOP + \beta_5 RGDP + \beta_6 INT \\
 &+ \beta_7 BOP + \beta_8 NOE + \beta_9 MO.
 \end{aligned}
 \tag{3.7}$$

$$\begin{aligned}
 INT &= \alpha + \beta_1 CD + \beta_2 INF + \beta_3 MS \\
 &+ \beta_4 TOP + \beta_5 EXR + \beta_6 RGDP \\
 &+ \beta_7 BOP + \beta_8 NOE + \beta_9 MO.
 \end{aligned}
 \tag{3.8}$$

$$\begin{aligned}
 BOP &= \alpha + \beta_1 CD + \beta_2 INF + \beta_3 MS \\
 &+ \beta_4 TOP + \beta_5 EXR + \beta_6 INT \\
 &+ \beta_7 RGDP + \beta_8 NOE + \beta_9 MO
 \end{aligned}
 \tag{3.9}$$

Table 1. Unit Root Test Result

Variables	ADF TEST			PP TEST		
	LEVEL	1 ST DIFF	Order	LEVEL	1 ST DIFF	ORDER
LRGDP	-0.164625	-3.278383**	I(1)	-1.022467	-3.264644**	I(1)
CD	-0.174400	-4.858881*	I(1)	-0.216050	-4.856783*	I(1)
INF	-2.511173	-3.465261**	I(1)	-2.507193	-5.996010*	I(1)
LMS	-1.912382	-3.725607*	I(1)	-1.964558	-4.114088*	I(1)
TOP	-1.469792	-6.120466*	I(1)	-1.470588	-4.573022*	I(1)
LEXR	-0.449169	-7.393759*	I(1)	-1.436844	-8.217628*	I(1)
INT	-2.921774	-3.146960**	I(1)	-2.915162	-5.876422*	I(1)
BOP	-1.717860	-6.140142*	I(1)	-1.981421	-7.487447*	I(1)
LNOE	-0.753892	-3.012956*	I(1)	-1.784363	-3.109877**	I(1)
Asymptotic Critical Values						
1%	-3.689194	-3.689194		-3.689194	-3.689194	
5%	-2.971853	-2.971853		-2.971853	-2.971853	
10%	-2.625121	-2.625121		-2.625121	-2.625121	

*implies significant at 1% level and ** implies significant at 5% level

Source: Authors' Computation from E-views 7.5 Output, 2017.

Table 2. VAR Lag Order Selection Criteria

Endogenous variables: LRGDP CD INF LMS TOP LEXR INT BOP NOE						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3215.995	NA	8.29e+13	57.58920	57.80765	57.67783
1	-2295.258	1677.058	25578991	42.59388	44.77839*	43.48021*
2	-2277.521	29.45540	81206312	43.72359	47.87415	45.40760
3	-2246.174	47.01978	2.11e+08	44.61026	50.72688	47.09197
4	-2161.525	113.3701	2.26e+08	44.54508	52.62776	47.82448
5	-1961.366	235.9010	33935336	42.41726	52.46599	46.49435
6	-1930.346	31.57439	1.20e+08	43.30975	55.32454	48.18453
7	-1865.222	55.82051	2.83e+08	43.59325	57.57410	49.26572
8	-1454.040	286.3588*	1858451.*	37.69714*	53.64405	44.16731

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: Authors' Computation from E-views 7.5 Output, 2017.

4.2. Lag Length Selection Test

The Schwarz Information Criterion (SIC) was used in selecting the optimal lag length as guided by the information given by the test conducted. The result presented in Table 2 revealed that one (1) lag length is appropriate for the analysis as supported by all the information criterion used.

4.3. Johansen Cointegration Tests

Since the variables have been established to be integrated of the same order, it is very important to examine if there exists a long-run relationship among them. Cointegration describes the existence of an equilibrium or stationarity relationship between two or more times series each of which is individually non-stationary. We proceeded to testing for cointegration using the Johansen-Juselius maximum likelihood procedure in determining the cointegrating equation and the number of common stochastic trends driving the entire system. We reported

the trace and maximum Eigen-value statistics and its critical values at five per cent (5%) in the Table 3.

The result of multivariate cointegration test based on Johansen and Juselius cointegration technique revealed that there exist seven cointegrating equation at 5% level of significant as indicated by trace statistic and Max-Eigen statistic result revealed six cointegrating equation. This simply showed that, there is a long run relationship among the variables. This therefore necessitated the use of Vector Error Correction Model (VECM) as the suitable technique of analysis.

4.4. Estimation of the Vector Error Correction Model

The VECM is estimated and the result is presented in the first part of this section. The second part presents the interaction or response of other macroeconomic variables to changes in currency devaluation using impulse response derived from the VECM result and lastly, we extract from the same result the impact of currency devaluation on non-oil sector and balance of payment in Nigeria.

Table 3. Johansen Cointegration Test

Series: LRGDP CD INF LMS TOP LEXR INT BOP NOE				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.996770	505.9417	197.3709	0.0001
At most 1 *	0.974289	345.3569	159.5297	0.0000
At most 2 *	0.937750	242.8534	125.6154	0.0000
At most 3 *	0.877195	165.1086	95.75366	0.0000
At most 4 *	0.772887	106.3881	69.81889	0.0000
At most 5 *	0.681286	64.88352	47.85613	0.0006
At most 6 *	0.509818	32.86662	29.79707	0.0215
At most 7	0.366701	12.90321	15.49471	0.1184
At most 8	0.004008	0.112458	3.841466	0.7374
Trace test indicates 7 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.996770	160.5848	58.43354	0.0000
At most 1 *	0.974289	102.5035	52.36261	0.0000
At most 2 *	0.937750	77.74482	46.23142	0.0000
At most 3 *	0.877195	58.72047	40.07757	0.0002
At most 4 *	0.772887	41.50458	33.87687	0.0051
At most 5 *	0.681286	32.01690	27.58434	0.0126
At most 6	0.509818	19.96340	21.13162	0.0722
At most 7	0.366701	12.79075	14.26460	0.0843
At most 8	0.004008	0.112458	3.841466	0.7374
Max-eigenvalue test indicates 6 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors' Computation from E-views 7.5 Output, 2017.

4.4.1. Impact of Currency Devaluation and Some Macroeconomic Variables on Economic Growth

Table 4. Vector Error Correction Model Result

Dependent Variable: D(LRGDP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LRGDP)	0.269965*	0.11104	2.43122	0.0032
D(CD)	0.855605*	0.08238	10.3860	0.0040
D(INF)	-0.045177*	0.01536	-2.94121	0.0008
D(LMS)	0.072172*	0.01602	4.50511	0.0000
D(TOP)	-0.014763	0.11556	-0.12776	0.3521
D(LEXR)	0.054687*	0.01099	4.97606	0.0000
D(INT)	0.000103	0.00205	0.05005	0.4215
D(BOP)	2.59E-08	3.1E-07	0.08491	0.1034
D(NOE)	-0.937806*	0.02605	-9.76372	0.0000
ECM(-1)	-0.006249*	0.00623	-15.4467	0.0000
CONSTANT	0.020276*	0.00335	6.05326	0.0001

*implies significant at 1% level and ** implies significant at 5% level
 Source: Authors' Computation from E-views 7.5 Output, 2017.

The VECM result presented in Table 4 shows that all the explanatory variables' relationship are in line with the aprior expectation except the TOP and NOE that depict a negative relationship instead of the expected positive

relationship. The result also satisfy the stability condition, that is, the vector error correction term ECM (-1) in the models have the required negative sign and lie within the accepted region of less than unity. It is approximately 0.01 i.e 1% and is statistically significant. This shows a low speed of adjustment towards equilibrium in the case of any disequilibrium from the long run.

The result also revealed that, one period lag of RGDP have positive and significant impact on economic growth in Nigeria, meaning that current year RGDP is 0.26 per cent more by a percentage increase in previous year RGDP. Currency devaluation shows positive and significant impact on economic growth for the period of study. Hence, any increase in currency devaluation will bring about 0.85 per cent increase in economic growth. Also, money supply and external reserve have a positive and significant impact on economic growth and influence economic growth by 0.07 and 0.05 per cent with one per cent of their increase respectively. However, the result revealed that, inflation, trade openness, non-oil export tend to have negative impact on economic growth, while only inflation and non-oil export is significant in explaining the relationship.

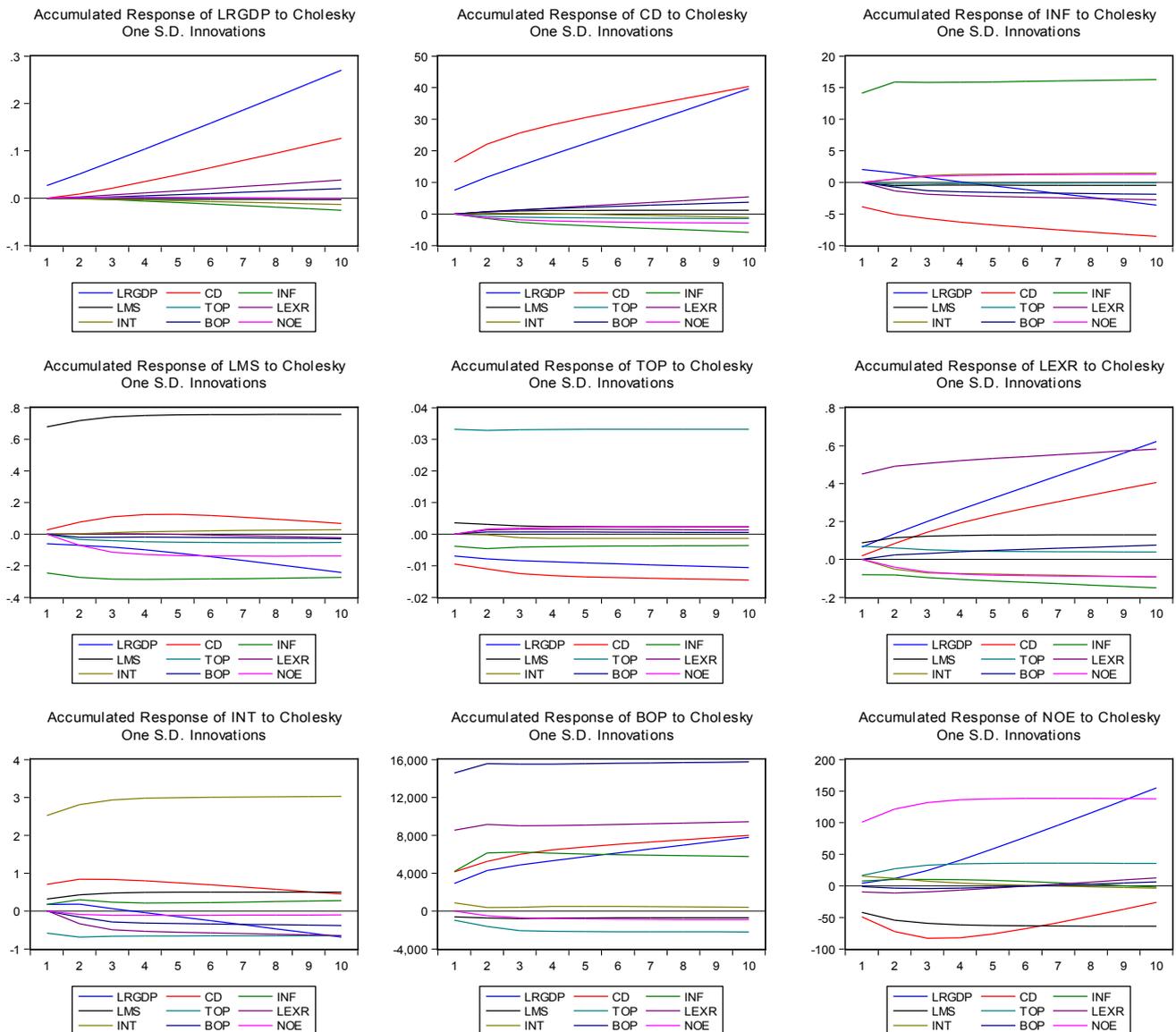


Figure 1. Impulse Response Function (IRF)

4.4.2. Response of Macroeconomic Variables to Currency Devaluation Using Impulse Response Function (IRF)

Impulse response function portrays the feedback of a dynamic system to a short-lived input signal or some external change, called an impulse. It labels the reaction of the system as a function of time and examines the consequence of cholesky one S.D innovation on time series. Consequently, we present the analysis of accumulated impulse responses of economic variables thus:

From Figure 1, it was revealed that, RGDP responded positively to one S.D innovation in currency devaluation, currency devaluation also responded positively to cholesky one S.D innovation in itself. In line with the result shown in the VECM result, money supply, interest rate and balance of payment also responded positively to cholesky one S.D innovation in currency devaluation, while trade openness, inflation and non-oil export responded negatively to on S.D innovation in currency devaluation in Nigeria for the period of study.

4.4.3. Impact of Currency Devaluation on Non-oil Sector and Balance of Payment in Nigeria

Table 5. VECM Impact Analysis Result

Dependent Variable: D(BOP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CD)	0.456923*	0.01986	23.0072	0.0000
Dependent Variable: D(NOE)				
D(CD)	-0.086199*	0.02386	-3.61269	0.0011

*implies significant at 1% level and ** implies significant at 5% level

Source: Authors' Computation from E-views 7.5 Output, 2017.

Table 5 showed result of how currency devaluation impacted on balance of payment and non-oil export in Nigeria for the period of study. The result showed that, currency devaluation have positive and significant impact on balance of payment, while it depicts negative and significant impact on non-oil export.

5. Conclusion

This study examined exchange rate devaluation and how macroeconomic variables responded to it in Nigeria. We specifically investigated the impact of this exchange rate devaluation on economic growth as well as its impact on non-oil export and balance of payment position. The results from the empirical findings revealed that, exchange rate devaluation have a positive and significant impact on economic growth in Nigeria, real gross domestic product (RGDP), one period lag of exchange rate devaluation, money supply, external reserve, interest rate, balance of payment all responded positively to shocks generated by exchange rate devaluation in the economy, while inflation, trade openness and non-oil export responded negatively. In the same vein, while exchange rate devaluation showed positive and significant impact on balance of payment, its impact on non-oil export is negative which is in line with the previous findings from the study. It is therefore

important to note that, even though there are diverse benefits from devaluating one's currency, but these benefits can only be harnessed when there is improved production of goods and services for both domestic consumption and export purposes.

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