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Currency Devaluation and Fiscal Adjustment in Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author EMC designed the study, wrote the literature, first draft of the manuscript and carried out the analysis. Author OK reviewed the draft manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

This study empirically examined currency devaluation and fiscal adjustment in Nigeria. Specifically it also examined the extent to which currency devaluation affects government expenditure and revenue in Nigeria. Cointegration, Vector Error Correction, Ordinary Least Square and Granger Causality methods were adopted in the analysis. The data spanning between 1981 and 2014, and essentially sourced from the Central Bank of Nigeria Statistical Bulletin were also used. The result of the empirical study principally shows that a positive and causal relationship exists between currency devaluation and some selected fiscal variables. Given the observed direct relationship between government expenditure and currency devaluation, it is recommended that the Nigerian government should rationalize and restructure her expenditures towards productive economic activities and reduce fiscal deficits significantly.

Keywords: Currency devaluation; fiscal adjustment; cointegration; causality.

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1. INTRODUCTION

Currency devaluation is the official act of reducing the exchange rate at which one currency is exchanged for another in the international currency markets (Microsoft Encarta Encyclopedia [1]). The decision by a government to devalue its currency is prompted by export promotion policies and chronic imbalance among others, which exists in its balance of trade or overall balance of payments, which weakens the international acceptance of its currency as a legal tender. This fundamental act occurs when a country had been maintaining a fixed exchange rate relative to other major currencies. Okoduwa [2] postulated that exchange rate adjustment is a means of affecting the balance of payments through prices. Anietie [3] also stated that the purpose nations devalue their currency is to raise the relative price of foreign goods so that the prices of local goods are reduced. The economic logic behind this action according to him is to make sure that imported goods are expensive thereby swaying domestic residents from buying foreign goods and buying locally made goods. Adebisi [4] stated that foreign exchange intervention occurs when the monetary authority of a country (CBN) buys or sells foreign exchange in the foreign exchange market in order to affect the exchange rate.

The Nigeria's economy has operated numerous exchange rate regimes. These range from fixed exchange rate to intermediate and the free – floating regimes. Fixed exchange rate regime usually entails pegging the exchange rate of the domestic currency to a reference currency. A floating exchange rate regime on the other hand, implies that the forces of demand and supply will determine the exchange rate. The Nigerian currency was pegged to the US dollar. However, following the international financial crisis of the early 1970s that made the dollar to be devalued in 1971, Nigeria abandoned the dollar peg. Consequently, the country reverted to the pound sterling until 1973. Again, the failure of the Nigerian authorities to devalue the Nigerian pound in response to the US dollar's devaluation resulted in another appreciation of the former from \$2.80 to \$3.04 to the Nigerian pound in 1973 (Anietie [3]).

These developments revealed the shortcomings of pegging the Nigerian currency to a single currency. For instance, the naira had to undergo

a *defacto* devaluation in sympathy with the dollar in 1973 and 1975 when macroeconomic fundamentals dictated otherwise. Thus, the need to manage the Naira exchange rate was firmly established. In 1974, the country decided to implement an adjustable exchange rate system. This entailed pegging the naira to the US dollar and the pound, although the rate could be adjusted through administrative action. In effect, the naira exchange rate was fixed independently from 1974 to 1977 to the US dollar and Pound sterling. Following the crash of crude oil in the world market in 1981 and the resultant shortfall in Nigeria's foreign exchange earnings, the monetary authorities embarked on a policy of gradual depreciation of the naira. This was also informed by the emergence of chronic balance of payments and external debt crisis. Thus, the value of the naira fell from 55 kobo in 1980 to one Naira to a dollar in 1985. According to the IMF however, this did not significantly address the problem of Naira overvaluation, which was said to be above the 2% limit (Anietie [3]).

For a fairly long time, Nigeria's currency, the Naira, has been sliding in value against most of the foreign currencies, especially the US dollar at the foreign exchange market. In 2000, the official price of Naira to US dollar was 102.10 (₦:US\$) and this continued to depreciate till 2004, to a value of 133.50(₦:US\$). Within the period of 2010 and 2011, the official rate of Nigeria Naira to US dollar hovered between ₦150 and ₦155 to \$1 particularly the greater part of 2011. As the CBN finally endorsed the devaluation of the Naira, the Naira, interestingly, firmed against the US dollar at the inter-bank rate. For instance, the unit steadied at N158.99 against the dollar before the CBN finally announced the devaluation (Layi, [5]). A number of factors had naturally prepared the Naira for the fall before its official devaluation. Key among these was the heightening demand for dollar, orchestrated by the increasing importation of foreign products. The impending crisis had stirred the Central Bank of Nigeria to the logical reasoning on the need to further devalue the naira. An import dependent nation, like Nigeria, has a number of challenges to cope with any time the national currency sheds its value. Most of the raw materials needed for production purposes in the country are imported, the effect of the devaluation would always translate into higher costs of production, which would subsequently be passed on to consumers which automatically will lead to inflation (Layi [5]).

The unprecedented economic and financial crisis, resulted in the introduction and implementation of different reforms and policies, specifically organized within the successive Structural Adjustment Programme (SAP), and later the National Economic Empowerment and Development Strategy (NEEDS) and so on, which were supported by the International Monetary Fund (IMF) and the World Bank and currently fight against financial corrupt practices. The major objective of these reforms was to ensure fiscal adjustment. But Nigeria, in spite of the reforms, has been running ever increasing budget deficits (Anyanwu & Oaikhenan [6]). Despite the fact that realized revenues are often above budgetary estimates, extra “political” – budgetary expenditures have been rising so fast and resulting in ever bigger fiscal deficits. The dramatic fall in oil export revenues entailed a sharp deterioration in the country’s public finances and balance of payments.

The current devaluation of the Naira is linked to shocks emanating from the falling oil price driven by a global supply glut and a declining world demand for crude oil. Between Q1:2013 and Q4:2014 Nigeria posted an average GDP growth rate of 5.8%, a single digit inflation of 8.2% in Q4:2014 and a relatively stable exchange rate regime. By end of second quarter 2014, crude oil price started a free fall with OPEC reference basket declining from US\$105.38/barrel in

February 2014 to US\$54.06/barrel in February 2015 and US\$50.92/barrel at 24th March 2015. CBN in reaction to the falling oil and dwindling international reserves devalued the Naira from N155/\$1 to N168/\$1 and further to N199/\$1. The series of devaluation that followed since November 2014 has created new risks in the form of transactions losses for local firms and translation losses for multinational corporation and firms exposed to dollar denominated debt. In the face of dwindling foreign reserves, declining oil price, unstable political environment, election cycle, rising government borrowing and tight monetary & fiscal policies, firms in Nigeria are confronted with new and rising cost of doing business (Lagos Business School [7]).

According to (Jide [8]) international analysts are expecting the Naira to weaken further and hit N170 to US\$1 by the end of 2012. This view is logically based on the dwindling revenue from sale of crude oil which accounts for more than 90 percent of Nigeria’s foreign exchange earnings. The reality of this fact is seen from the current status of our Nigeria Naira value. There is bound to be shortfall in demand and supply situation in the foreign exchange market.

From Fig. 1 arising from Table 1, exchange rate has been on the rise over the years. But between the periods of 2004 through 2008 the institutional and markets reforms that were introduced produced some outstanding results.

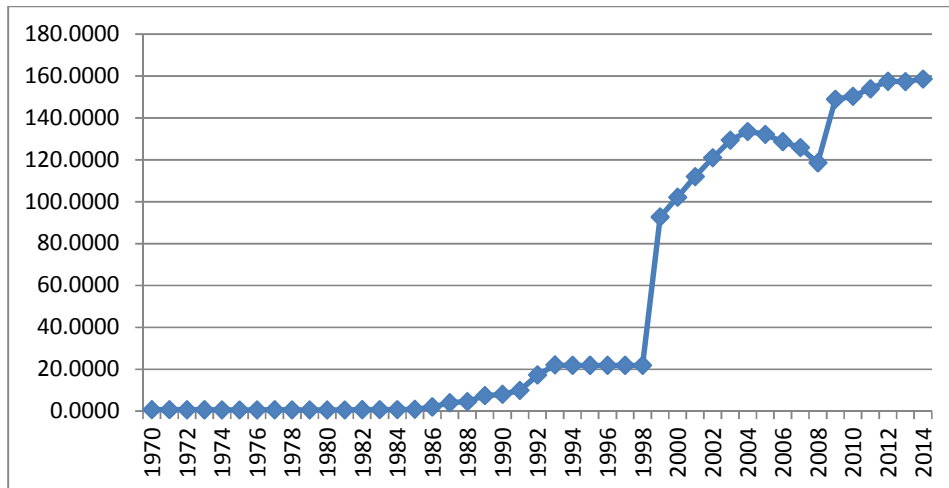


Fig. 1. The flow of exchange rate adjustment in Nigeria (1970-2014)

Source: Computed by the Researcher using data from CBN Statistical Bulletin

Table 1. Movements in the exchange rates between 1970 and 2014 (In 1973, the local currency was decimalized, changed from pound to naira, and fixed to the US dollar)

Year	Official market		Parallel market	
	Rate (N:US\$)	Depreciation/ Appreciation (%)*	Rate (N:US\$)	Depreciation/ Appreciation (%)*
	(1)	(2)	(3)	(4)
1971-75	0.65	-2.64	0.75	10.04
1976-80	0.81	16.30	1.00	0.86
1981-85	0.73	10.14	2.19	36.14
1986-90	5.20	62.10	7.19	23.52
1991-95	30.52	79.16	42.68	54.88
1996	81.20	0.00	83.10	-0.70
1997	82.00	1.00	85.00	2.30
1998	84.00	2.40	87.90	3.40
1999	93.90	11.80	99.20	12.90
2000	102.10	8.70	112.00	12.90
2001	111.90	9.60	132.40	18.20
2002	120.50	7.70	136.80	3.30
2003	129.36	8.86	137.30	0.50
2004	133.50	4.14	141.82	4.52
2005	132.47	-1.35	145.40	3.58
2006	128.65	-3.50	146.20	0.80
2007	125.83	-2.82	148.10	1.90
2008	118.57	-7.27	n.a.	
2009	148.90	30.34	n.a.	
2010	150.30	1.40	n.a.	
2011	153.86	3.56	n.a.	
2012	157.50	3.64	n.a.	
2013	157.31	-0.19	n.a.	
2014	158.55	1.24	n.a.	

*Note: + denotes depreciation while – means appreciation.

n.a. = not available

Sources: Anietie [3] and computed & updated by the Researcher.

On March 27, 2006, the CBN announced the convergence of the official and inter-bank foreign exchange markets rates. Continuous rise of the price of crude oil in the international market saw a rapid growth of the foreign reserves to an impressive \$51.32 billion by 2007 year end. In the 17 months between Jan. 2006 and May 2007, the Naira appreciated by 10.07 per cent against the US dollar. More remarkably, the Naira value stabilized at about \$116/US\$1 for sixteen months leading to November, 28, 2008 (Jide [8]). From 2009 till date, the exchange rate is on the continuous rise. Its effects on fiscal adjustments constitute the major focus of this study.

Normally, currency devaluation is adopted in response to balance-of-payments difficulties. It is expected to have implications for other macroeconomic activities. Generally therefore, this study majorly examined empirically the fiscal consequences of exchange rate adjustment in

the Nigerian economy. Specifically, the study aims at (i) identifying the extent to which currency devaluation affects government expenditures and (ii) examining the relationship between currency devaluation and government revenue.

Apart from the introductory aspect of this study, which is contained in section 1, the rest of the study is organized into four sections. Section 2 is the review of relevant literatures. Section 3 covers the theoretical framework and methodology, section 4 shows the empirical results of the study while, section 5 contains the summary, conclusion and recommendations of the study.

2. EMPIRICAL STUDIES REVIEWED

The fiscal effect of currency devaluation has long been recognized, although, it was in the context of income distribution and its expenditure

consequences (Adeoye [9]). Mohsin and Lizondo [10] researched on "Devaluation, Fiscal Deficits, and the Real Exchange Rate". They examined the use of fiscal policies to sustain the effects of a nominal devaluation on the real exchange rate. It was shown that the magnitude of the change in the real exchange rate depends not only on the size of the devaluation and the degree of fiscal adjustment, but also on the means by which the fiscal deficit is reduced. The change in the normal exchange rate necessary to maintain the depreciation of the real exchange rate will depend on whether the fiscal deficit is eliminated by increasing taxes, or by reducing government expenditures on traded and non-traded goods. The required depreciation of the domestic currency will be larger if the fiscal deficit is reduced by increasing taxes than it will be if the deficit is cut by lowering government expenditures. Further, the depreciation would be smaller if the cuts in expenditure fell on traded rather than non-traded goods. This result implies that the authorities must ensure consistency between exchange rate action and policies to reduce fiscal imbalances in order to achieve a desired level of real exchange rate necessary to attain balance of payments equilibrium.

Also, Yiheyis [11] examined the fiscal consequences of exchange rate adjustment, drawing on the experiences of selected African economies. The salient channels through which the exchange rate is expected to influence fiscal variables were also examined. The fiscal effects of devaluation were shown to depend, *inter alia*, on the size of the real devaluation, the share of traded goods in government and aggregate expenditure, and the output effect of devaluation.

In addition to the above, (Ayodele and Obafemi [12]) examined the fiscal consequences of exchange rate adjustments in Nigeria, and concluded that Naira depreciation resulted in real depreciation that neither had discernible real expenditure effect nor led to higher government revenue. Looking backward, (Krueger [13]) reported that only the Turkish devaluation of 1958 produced changes that significantly and automatically increased government revenues, while empirical evidence shows that in most other countries the automatic revenue and expenditure effects were relatively weak. According to (Gulhati et al. [14]), devaluation reduced budget deficit in India and increased it in

Israel. Therefore, the debate on the fiscal impacts of devaluation remains inconclusive.

A country specific study by (Roca and Priale [15]) on the fiscal effect of exchange rate devaluation in Peru, during the period of economic deregulation suggested that stabilization programmes, of which devaluation is a part, have increased fiscal deficit as a percentage of GDP. Zambia was reported to have had a similar experience, unlike Ghana where an increase in tax revenue was observed (Loxley [16]). Edward as cited in (Adeoye [9]) supported the notion that real exchange rate is closely associated with the behaviour of the fiscal variables in many developing countries. His study found that the real effect of nominal devaluations lasts only if the devaluations are accompanied by fiscal adjustment.

Rawlins and Praveen [17] in their studies on "Devaluation and the Trade Balance" stated specifically that structural adjustments in most developing countries have been built on the twin application of economic liberalization and currency devaluation. Since currency devaluation may create inflation pressures even as it may provide some positive effects on a country's trade balance, the critical issue is what effects will dominate. Using a standard econometric model, they estimated these effects for a sample of 19 countries in Sub-Saharan Africa. It was found that in no case did real exchange rates revert to their pre-devaluation levels.

Jameelah [18] also found that nominal depreciation resulted in real depreciation and that real depreciation has augmented real fiscal revenue. The expenditure effect was found insignificant while budget deficit and increased openness are found to promote depreciation of real exchange rate. Ajakaiye [19] made an attempt to empirically assess the contributions of exchange rate depreciation to increase in prices at the sectoral level. The results of the study indicated that the continuous depreciation of the naira exchange rate contributed to continuous increase in sectoral prices.

In summary, there is no much comprehensive study for now, that has investigated the fiscal effect of exchange rate adjustment in Nigeria, apart from the work of (Adeoye [9]) on "an econometric analysis of fiscal adjustment to currency devaluation in Nigeria". This provides an additional justification for this study.

3. THEORETICAL FRAMEWORK AND METHODOLOGY

The theory underpinning the effect of currency devaluation and fiscal adjustment is formalized in (Adeoye [9]). The major channels through which currency devaluations is expected to influence the fiscal sector are revenue and expenditure effects. The behaviour of revenue and expenditure to changes in exchange rate are examined below.

3.1 Revenue Effects

The revenue of the government is generated through taxes, grants, interest income on government owned foreign assets, net receipt of public enterprises and so on. Placing emphasis on taxes and interest income on government owned foreign assets, as tax is decomposed into economic activity from which they originate, that is, domestically produced traded goods (Y_t), non-traded goods (Y_n) and imports. Government revenue in units of aggregate price index is expressed as:

$$R = [t_n P_n Y_n + t_t EP^* Y_t + t_m E \cdot IM^* + E \cdot i^* F_{g-1}] / P \quad (3.1)$$

where R is real government revenue; t_n and t_t are the tax rate applied to the production and sale of non-traded and traded goods, respectively; t_m is the tax rate on imports, including imports duties and sales and excise tax rates on the sale of imports in the domestic market; E is the local currency price of a unit of foreign exchange; IM^* is the foreign currency value of imports; i^* is the foreign rate of interest; F_{g-1} is government holdings of foreign currency denominated assets at the end of the previous period; P_n is the average price of non-traded goods; P^* is the foreign price level; and P is the aggregate price level, which is $P_n \delta (EP^*)^{1-\delta}$ where δ is the share of non-traded goods in aggregate expenditure. Assuming that $F_{g-1}' = t_n' = t_t' = t_m' = P' = 0$ (where prime denotes growth rate), and noting that $P' = \delta P_n' + (1 - \delta)E'$, revenue adjustment to devaluation takes the following form:

$$R' = [\delta (\eta_t + \eta_m + \eta_f) - (1 - \delta) \eta_n] (E' - P_n') + (\eta_n Y_n' + \eta_t Y_t' + \eta_m IM^*) \quad (3.2)$$

where η is the revenue share of non-traded goods and the subscripts n , t , m and f represent, respectively, non-traded goods, domestically produced traded goods, imports and capital gain on holdings of foreign assets (Adeoye [9]).

From the model of revenue adjustment (equation, 3.2), a real devaluation also boosts government revenue in the presence of foreign currency denominated assets (Lizondo and Montiel [20]; Reisen [21]; Adeoye [9] and Yiheyis [11]). The revenue effect model also shows that the price effect of a real devaluation on revenue is not always positive. As long as it is inflationary, devaluation can be shown (Lizondo and Montiel [20]) to affect tax revenue negatively through the "Tanzi effect" (Tanzi [22]). This effect obtains in the presence of tax collection lags and an inelastic tax system, even if the relative price effect of the exchange rate change is zero. The overall price effect of devaluation on government revenue depends on the initial shares of non-traded goods in domestic expenditure and total government revenue (Adeoye [9]).

3.2 Expenditure Effects

Fiscal expenditure, in units of the aggregate price index, is decomposed as follows to derive the expenditure adjustment equation:

$$G = [P_n G_n + EG_t + iDD_{-1} + I^*E \cdot EXD_{-1}] / P \quad (3.3)$$

where G is real government expenditure; G_n is real government expenditure on non-traded goods and services as measured in units of non-traded goods; G_t is real government expenditure on traded goods measured in terms of traded goods; DD_{-1} is the domestic public debt outstanding at the end of previous period; EXD_{-1} is external debt owed by the public sector at the end of previous period; i is the domestic interest rate; I is the foreign interest rate; and the other variables are as defined before. If $DD_{-1}' = I^* = EXD_{-1}' = 0$, the adjustment of real government expenditure to devaluation can be expressed as:

$$G' = [\delta (\sigma_t + \sigma_{exd}) - (1 - \delta) \sigma_n] (E' - P') - [\sigma_{dd} \{I' - \delta P_n' - (1 - \sigma)E'\} + [\sigma_n G_n' + \sigma_t G_t']] \quad (3.4)$$

where σ_t , σ_{exd} , and σ_{dd} denotes, respectively, the expenditure share of traded goods, non-traded goods, and interest payments on external and internal debts.

The assumptions of expenditure effects of currency devaluation (equation, 3.4) also states that devaluation affects government spending through its impact on the real exchange rate, real interest payment on domestic public debt, and discretionary fiscal policy action, which was respectively represented in the said equation. Among other effects of exchange rate adjustment

on government expenditure, given debt position, a real devaluation leads to a rise in government expenditure because of the added local currency cost of debt servicing. This, however, is a channel emphasized in the literature as a major determinant of fiscal deficit for countries with sizable public debt (Adeoye [9]). The larger the proportion of government expenditure absorbed in interest payment on the domestic debt, the larger the spending-reducing effect of an inflationary devaluation (Adeoye [9]).

The above theoretical assumptions revealed that the revenue and expenditure effects of devaluation are ambiguous, a priori. That is, the fiscal effect of devaluation depends inter alia, on the size of the devaluation, the share of traded goods in government and aggregate expenditure and the output effect of devaluation. This study, therefore, seeks to evaluate empirically the fiscal consequences of exchange rate adjustment in the Nigerian economy.

3.3 The Empirical Model

This study followed the above analytical framework using econometric approach to show the empirical effect of currency devaluation on the fiscal variables as expressed in equations (3.2) and (3.4) above.

3.3.1 Model 1

$$GR = f(GDP, CD, NER, NEDO, DUM) \quad (3.5a)$$

The above equation (3.5a) shows that Government Revenue (GR) is defined as a function of Gross Domestic Product (GDP), Currency Devaluation (CD) using exchange rate as proxy, Nigeria External Reserve (NER), Nigeria's External Debt Outstanding (NEDO), and the Dummy variable (DUM) for reforms. The linear form of the relationship is thus presented:

$$GR = \beta_0 + \beta_1GDP + \beta_2CD + \beta_3NER + \beta_4NEDO + \beta_5DUM + U_t \quad (3.5b)$$

where $\beta_1 > 0$, $\beta_2 \geq 0$, $\beta_3 > 0$, $\beta_4 < 0$, and $\beta_5 > 0$.

Adeoye [9] stated that the higher the level of economic development using output per head as proxy, the more efficient tax collection and the higher tax revenue would become. From equation (3.5b), the a priori expectation of exchange rate is theoretically ambiguous (Lizondo and Montiel [20]). If devaluation is

contractionary in the non-traded goods sector, the tax revenue from that sector will fall as output, hence wages and profits decreases, leading to a fall in income and business taxes. The converse holds in the event of an expansionary outcome in that sector. This is also applied to traded goods. If import demand in foreign currency falls following devaluation, and demand is price elastic, revenue from the import sector would decline. Evidently, as shown in revenue equation, as derived from (Yiheyis [11]), devaluation also boosts government revenue in the presence of foreign currency denominated assets.

The external debt is expected to reduce the tax base revenue of the government. Tax revenue, which is a component of the total revenue, depends not only on the size of the tax base, but also on the extent to which it is exploited (Tanzi [23]). The hypothesis is that the greater the need for revenue the higher will be the tax level that government strives to generate from a given taxable capacity. We represent revenue needs by the level of government expenditure in the previous period, which serves as a proxy for expected outlays. The dummy variable also represents the effect of reforms on government revenue. The programme is said to have entailed "broadening the tax base, deregulating prices, lowering external tariffs, liberalizing imports, shifting the taxation system toward domestic transactions, and reforming the income tax" (Nashashibi and Bazzoni [24]).

3.3.2 Model 2

$$GE = f(GDP, CD, NEDO, FGDDO, DUM) \quad (3.6a)$$

Equation (3.6a) shows that there is a functional relationship between Government Expenditure and currency devaluation whose effects are shown in changes in GDP, CD, NEDO, Federal Government Domestic Debt Outstanding (FGDDO) and DUM as defined. The estimable linear form of the above equation is thus presented below:

$$GE = \alpha_0 + \alpha_1GDP + \alpha_2CD + \alpha_3NEDO + \alpha_4FGDDO + \alpha_5DUM + U_t \quad (3.6b)$$

Where $\alpha_1 > 0$, $\alpha_2 \geq 0$, $\alpha_3 > 0$, $\alpha_4 < 0$, $\alpha_5 < 0$,

In the above equation, based on the a priori expectation, GDP representing the level of economic growth has a positive effect or relationship with the level of government

expenditure. The two variables have much influence on each other based on the fact that when government decides to make provisions for goods and service, this will increase or boost the economy.

Following the traditional demand analysis, a rise in income is expected to boost the demand for public goods and services due to “the technological requirements of industrialization and the urbanization that accompanies it” (Lindauer and Velenchik [25]; Yiheyis [11]). On the other hand, an increase in the level of income as a result of changes in the level of economic development could induce or stimulate government expenditure. On the same basis of the theoretical analysis, devaluation affects government expenditure through its impact on the exchange rate. A change in exchange rate affects government spending either positively or negatively depending on the circumstances. Devaluation may increase government spending on traded goods while it reduces fiscal expenditure by lowering spending on non-traded goods. However, the net effect of devaluation with respect to changes in exchange rate depends on the initial shares of traded goods and interest payment on foreign debt in fiscal spending and also on the share of non-traded goods in aggregate expenditure (Yiheyis [11]).

The external debt in the model has influence in increasing the expenditure burden of the government due to the influence of currency devaluation on the exchange rate and interest payment on the debt. The external debt burden recognizes the expenditure implications of the interest payments on, and amortization of, the public debt (Bartoli [26]). Domestic debt in the model inversely creates a further link between devaluation and government expenditure. The effect of domestic debt is imparted if price index and/or interest rate are sensitive to change in the exchange rate. Since devaluation causes a rise in the aggregate price level, given the normal interest rate and value of the debt, it lowers real interest payment on the debt by eroding the real value of the latter (Adeoye [9]).

The dummy variable in the model stand for structural adjustment programme. The major objective of such programme is to create fiscal restraint. The programme ought to increase development through individual persons and reduce or retrench government outlays. This is in

reference to government removal of subsidies and downsizing of the public sector.

4. EMPIRICAL RESULTS

The empirical results of the econometric analyses of fiscal adjustment to currency devaluation in Nigeria as specified above in equations (3.5b) and (3.6b) were obtained, using the regression analysis which commenced with the unit root test, cointegration, Ordinary Least Square (OLS) technique, Vector Error Correction Mechanism (VECM) and Granger Causality analysis.

4.1 Time Series Property of the Variables

The Augmented Dickey-Fuller (ADF) Unit Root test was used to test the status and the order of integration of each of the variables.

The ADF unit root test suggests that GDP is stationary at level $I(0)$, GR, CD, NER and NEDO became stationary only after taking their respective first difference $I(1)$, while GE and FGDDO became stationary after taking their respective second difference. The GE, GR, NER, NEDO, and FGDDO are stationary at the 1% critical value, CD is stationary at the 5% significance level and at 10% critical value GDP became stationary. This sets the pace for cointegration test.

4.2 Cointegration Test and Error Correction Mechanism (ECM)

The test of the long-run properties of the variables were also examined using Johansen Cointegration test as shown in Table 2 on the structural models. This reveals the existence of six and six cointegrating relationship for Government Revenue (GR) and Government Expenditure (GE) models respectively, which implies the existence of a long-run relationship in the variables of the respective models. In addition, Vector Error Correction (VEC) was also used to correct their short run dynamics.

From Table 3 generally, the two models estimated are well behaved. This is as judged by the values of the coefficient of determination (R^2), with the independent variables explaining well over 99% of the variation of the dependent variables that is the Government Revenue (GR) and Government Expenditure (GE).

Table 2. Summary of augmented Dickey-Fuller (ADF) unit root test

Variable	Level data	1 st Difference	2 nd Difference	Order of integration
GDP	2.957296***	-2.102848	-6.234989	I(0)
GE	1.741948	-2.000101	-7.543239*	I(2)
GR	0.425502	-5.69645*	-8.467011	I(1)
CD	-0.289489	-3.620706**	-6.206062	I(1)
NER	-1.578804	-4.252772*	-5.233304	I(1)
NEDO	-2.394722	-3.891281*	-5.884865	I(1)
FGDDO	1.324638	-1.196502	-4.426758*	I(2)

*indicates stationary at the 1% level

**indicates stationary at the 5% level

***indicates stationary at the 10% level

1% critical value = -3.6661

5% critical value = -2.9627

10% critical value = -2.6200

Table 3. Summary of Johansen cointegration test for equation 1 & 2

Equation	Null hypothesis	Alternative hypothesis	Eigen value	Likelihood ratio	5% critical value	1% critical value
GR	Series: GR GDP ER NER NEDO DUM					
	R = 0	R = 1	0.976384	261.9763	94.15	103.18
	R = 1	R = 2	0.857600	145.8552	68.52	76.07
	R = 2	R = 3	0.742122	85.43260	47.21	54.46
	R = 3	R = 4	0.549188	43.41928	29.68	35.65
	R = 4	R = 5	0.361241	18.72144	15.41	20.04
GE	Series: GE GDP ER NEDO FGDDO DUM					
	R = 0	R = 1	0.939747	205.1543	94.15	103.18
	R = 1	R = 2	0.842764	118.0692	68.52	76.07
	R = 2	R = 3	0.667572	60.71901	47.21	54.46
	R = 3	R = 4	0.319712	26.57770	29.68	35.65
	R = 4	R = 5	0.268325	14.63531	15.41	20.04
	R = 5	R = 6	0.147590	4.950318	3.76	6.65

Source: Computed using Eview package

Government Revenue (GR) in model 1 showed good performance arising from the value of the coefficient of determination (R^2) showing that 99% of the total variations in government revenue have been explained by all the explanatory variables in the model taken together. The unexplained variation is just 1%. The signs of the estimated parameters seem to follow the a priori expectations apart from the Dummy for reforms which assumed negative relationship. The result also shows that exchange rate is positively related to revenue and statistically significant. Consistent with the findings of (Yiheyis [11]), devaluation also boosts government revenue in the presence of foreign currency denominated assets. The gross domestic product and reforms are also statistically significant in

explaining the variation in government revenue. The higher the level of gross domestic product the wider the tax base and the higher will be the level of tax revenue expected. External revenue did not contribute much to the revenue base of the Nigerian economy, giving the insignificant nature of the estimated parameter.

The model of the estimated Government Expenditure (GE) showed good performance following the value of the coefficient of determination (R^2), which assumed that 99% of the total variation in government expenditure has been explained by the exchange rate, gross domestic product, Nigeria's external debt outstanding, federal government domestic debt outstanding and the dummy variable taken

together. Currency devaluation, that is, exchange rate adjustment and gross domestic product followed their theoretical expectations. They showed respectively positive relationship with government expenditure and are respectively statistically significant and External debt also but negatively related. Domestic debt and reforms are not statistically significant. The reforms showed a negative relationship which agrees with a priori expectation.

4.3 Causality Test

The Pairwise Granger Causality tests were able to show the directions of the causality between the currency devaluation and fiscal variables that is government expenditure and government

revenue. The result shows that there exists bidirectional causality between: GR and GDP, NER and GE, and FGDDO and GR respectively. Unidirectional causality flows from: GE to GDP, CD to GDP, NER to GDP, GE to GR, CD to GE, CD to GR, GR to NER, ER to NER and NEDO to NER. While there is no causal relationship between: NEDO and GDP, FGDDO and GDP, DUM and GDP, NEDO and GE, FGDDO and GE, DUM and GE and others as shown in the result. This is also in relation to the work of (Kalu, Amaka & Athan [27]) on the behaviour of real exchange rate and fiscal variables in Nigeria using OLS and IV approach. They found that real devaluation improves fiscal balance and that budget deficit influences the behavior of the real exchange rate.

Table 4. Summary of ECM augmented OLS Equation

Independent variables	Dependent variable	
	Model 1 LGR	Model 2 LGE
C	-0.145228 (-0.187367) (0.8527)	0.226334 (0.537187) (0.5954)
LCD	0.778527 (5.122367) (0.0000)	0.589535 (5.536974) (0.0000)
LGDP	0.518578 (6.693993) (0.0000)	0.506681 (3.586701) (0.0013)
LNER	0.088239 (1.227278) (0.2299)	
LNEDO	-0.067369 (-0.784136) (0.4395)	-0.119343 (-2.182010) (0.0377)
LFGDDO		0.083540 (0.505109) (0.6174)
DUM	-0.742912 (-3.230018) (0.0032)	-0.217679 (-1.342435) (0.1902)
R ²	0.992571	0.994253
\bar{R}^2	0.991244	0.993227
F Stat	748.1587	968.9026
Pro (F Stat)	0.000000	0.000000
DW	1.596926	1.681972
n	34	34
∞	5%	5%

Source: Computed using Eview package

NB: Values in parenthesis are the relevant t values and probabilities

Table 5. Summary of pairwise granger causality tests

Null hypothesis	Obs	F-Statistic	Probability
GE does not Granger Cause GDP	32	12.5296	0.00014
GDP does not Granger Cause GE		24.2675	9.3E-07
GR does not Granger Cause GDP	32	10.2951	0.00048
GDP does not Granger Cause GR		9.87515	0.00060
ER does not Granger Cause GDP	32	3.10686	0.06104
GDP does not Granger Cause ER		0.02159	0.97865
NER does not Granger Cause GDP	32	9.79809	0.00063
GDP does not Granger Cause NER		1.65112	0.21062
NEDO does not Granger Cause GDP	32	0.00282	0.99718
GDP does not Granger Cause NEDO		0.07818	0.92501
FGDDO does not Granger Cause GDP	32	34.3514	3.8E-08
GDP does not Granger Cause FGDDO		1.41700	0.25990
DUM does not Granger Cause GDP	32	0.09214	0.91226
GDP does not Granger Cause DUM		1.3E-06	1.00000
GR does not Granger Cause GE	32	0.51617	0.60257
GE does not Granger Cause GR		5.40834	0.01058
ER does not Granger Cause GE	32	2.86863	0.07419
GE does not Granger Cause ER		0.25516	0.77664
NER does not Granger Cause GE	32	8.78432	0.00115
GE does not Granger Cause NER		3.35770	0.04986
NEDO does not Granger Cause GE	32	0.95245	0.39838
GE does not Granger Cause NEDO		0.31665	0.73125
FGDDO does not Granger Cause GE	32	18.9297	7.3E-06
GE does not Granger Cause FGDDO		13.8125	7.4E-05
DUM does not Granger Cause GE	32	0.43463	0.65196
GE does not Granger Cause DUM		0.00011	0.99989
ER does not Granger Cause GR	32	4.56566	0.01959
GR does not Granger Cause ER		0.14207	0.86821
NER does not Granger Cause GR	32	1.50182	0.24075
GR does not Granger Cause NER		5.96454	0.00716
NEDO does not Granger Cause GR	32	1.19940	0.31693
GR does not Granger Cause NEDO		0.46930	0.63045
FGDDO does not Granger Cause GR	32	9.74032	0.00065
GR does not Granger Cause FGDDO		3.51675	0.04392
DUM does not Granger Cause GR	32	0.20554	0.81547
GR does not Granger Cause DUM		5.2E-06	0.99999
NER does not Granger Cause ER	32	0.35915	0.70156
ER does not Granger Cause NER		4.58725	0.01927
NEDO does not Granger Cause ER	32	0.43741	0.65020
ER does not Granger Cause NEDO		0.20419	0.81655
FGDDO does not Granger Cause ER	32	0.11833	0.88886
ER does not Granger Cause FGDDO		0.60476	0.55344
DUM does not Granger Cause ER	32	0.45384	0.63994
ER does not Granger Cause DUM		1.3E-05	0.99999
NEDO does not Granger Cause NER	32	4.24453	0.02495
NER does not Granger Cause NEDO		0.29358	0.74794
FGDDO does not Granger Cause NER	32	2.20316	0.12992
NER does not Granger Cause FGDDO		15.4917	3.3E-05
DUM does not Granger Cause NER	32	0.20890	0.81277
NER does not Granger Cause DUM		0.02408	0.97623
FGDDO does not Granger Cause NEDO	32	0.10469	0.90097
NEDO does not Granger Cause FGDDO		0.51159	0.60524
DUM does not Granger Cause NEDO	32	0.47886	0.62465
NEDO does not Granger Cause DUM		1.1E-05	0.99999
DUM does not Granger Cause FGDDO	32	0.10966	0.89654
FGDDO does not Granger Cause DUM		0.00014	0.99986

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study examined the relationship between currency devaluation and fiscal adjustment in Nigeria using cointegration/VECM techniques, Ordinary Least Square (OLS) regression analysis, and Granger Causality test. The data were sourced from CBN Statistical Bulletin and spanning the period between 1981 and 2014. The study found that currency devaluation is statistically significant in explaining government revenue and government expenditure respectively. Devaluation has a way of decreasing or boosting government revenue or expenditure depending on the circumstances. This implies that currency devaluation is an important variable that should be considered when explaining government revenue and expenditure. Also, the GDP showed a significant relationship with government revenue and expenditure, respectively, indicating that an increase in economic growth will boost the revenue and expenditure bases in Nigeria. Nigeria's external reserve was found insignificant in explaining government revenue. This is an indication that currency devaluation indirectly affects the Nigeria's external reserve. Domestic debt was found to be insignificant in explaining government expenditure. The dummy variable for reforms showed negative relationship to government revenue and expenditure respectively, though statistically significant to government revenue. The results further found a long run relationship among the variables in the respective models and that a unidirectional causal relationship runs from currency devaluation to government expenditure and to revenue respectively.

5.2 Conclusion

In conclusion, this empirical analysis suggests that a strong positive and causal relationship exist between currency devaluation and the fiscal variables which include government's expenditures and government's revenue.

5.3 Recommendations

The study revealed that currency devaluation caused a strong depreciation of the Naira (Nigeria's currency). The nature of the Nigerian economy as an import dependent nation did not

position the economy to benefit from the devaluation. The obvious implication of the depreciating rate for businesses is higher operating and production costs, due to high import content in production and value chain of many firms. The development in the foreign exchange market further underscores the need to reduce Nigeria's dependence on imports, and this can only happen when Nigerians have an enabling environment that creates a competitive domestic capacity. It is crucial to improve on macroeconomic management to moderate money supply growth and inflation. There should be discipline and harmony between fiscal and monetary policy. Expansionary monetary and fiscal policies in the past worsened exchange rate depreciation. It is, thus, important that monetary and fiscal policies are properly coordinated and harmonized in order to achieve macroeconomic stability.

Government expenditure has a direct relationship with the exchange rate. It is therefore necessary that government should rationalize and restructure her expenditures towards productive activities and reduce the fiscal deficits significantly. Government should in addition adopt a measure that can reveal the trend in government expenditure within the period so as to ensure that they are not affected by shift, due to different administrative weaknesses periodically.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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