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Fiscal Adjustment to Currency Depreciation in Nigeria: An Empirical Analysis

Jameelah Omolara Yaqub
Department of Economics, University of Ibadan, Nigeria

Abstract: Nigeria underwent currency depreciation on a number of occasions in response to balance of payment difficulties, among other reasons. However, depreciation has implications for some other macroeconomic activities in a nation. Among such activities are the fiscal sector performances, which this study focuses on. The fiscal consequence of depreciation is of practical significance especially in Nigeria where a great proportion of tax revenue is from international transactions, which is expected to respond to exchange rate changes. To gain empirical insight into the relationship between real exchange rate and fiscal variables, a simple model was formulated and estimated. The findings of the study suggest that nominal depreciation resulted in real depreciation and that real depreciation augmented real fiscal revenue. The expenditure effect is however, insignificant. Budget deficit and increased openness are found to promote depreciation of real exchange rate. Where the current account is favourable, real depreciation by its fiscal consequences is found to reinforce, rather than dampen the position of the current account.

Key words: Real exchange rate, government revenue, expenditure, depreciation, budget deficit, Nigeria

INTRODUCTION

In the last few decades, the foreign exchange management in Nigeria has undergone tremendous changes especially as a result of the adoption of the Structural Adjustment Programme (SAP) sponsored by the International Monetary Fund (IMF) and the World Bank. The Nigerian currency has been depreciated on a number of occasions to facilitate the attainment of both internal and external equilibrium.

The depreciation of currency is normally implemented in response to balance of payment difficulties among others; it is however expected that depreciation would have implications for some other macroeconomic activities in a nation. Among such macroeconomic activities is the fiscal sector performance, which this study focuses on. Focussing on the fiscal effect of exchange rate depreciation is significant because the attainment of the basic objective of depreciation which is sustained improvement in the current account, partly hinges on fiscal adjustment to exchange rate changes.

The fiscal effect of depreciation has long been recognised in the literature but in the context of income distribution and its expenditure consequences (Diaz-Alejandro, 1963; Krugman and Taylor, 1978). Depreciation can redistribute income from the private sector to the public sector, through increased real tax burden on the private sector (Lizondo and Montiel, 1989). The fiscal consequence of depreciation is of practical significance especially in Nigeria where a great proportion of tax revenue is from international transactions which is expected to respond to exchange rate changes. This study investigated in a comprehensive manner, the fiscal implications of exchange rate depreciation in Nigeria especially from 1986, when the structural adjustment programme.

Despite the significance of the fiscal consequence of depreciation, the empirical evidence on this subject matter is scanty and inconclusive (Yiheyis, 2000). Krueger (Yiheyis, 2000) reports that of all the cases covered by the NBER project, only the Turkish devaluation of 1958 produced changes that significantly and automatically increased government revenues.

Loxley (1990) found that devaluation in Ghana was associated with an increase in tax revenue. Yiheyis (2000) found that depreciation augmented real fiscal revenue in a number of developing countries but its effect on expenditure was negligible.

The objective of this study is to investigate in a comprehensive manner, the fiscal implications of exchange rate depreciation in Nigeria especially from 1986, when the structural adjustment programme which ushered in persistent depreciation of the domestic currency was introduced.

MATERIALS AND METHODS

Theoretical framework: In this, the theoretical underpinning of the relationship between exchange rate depreciation and the fiscal sector is presented. Here the

major channels through which currency depreciation is expected to influence the fiscal sector are discussed. To identify the channels, the responses of fiscal revenue and expenditure to changes in the exchange rate are examined.

Revenue effects: The sources of government revenue (exclusive of grants) include taxes, interest income on government-owned foreign assets and net receipt of public enterprises. In this study, we focus attention on taxes and interest income on government-owned foreign assets.

We assume there are three types of goods in the economy on which tax revenues are derived. These are domestically produced traded goods (Y_t), non-traded goods (Y_n) and imports. We also invoke the small country assumption hence the price of traded goods in foreign currency is treated as given. Based on these assumptions, government revenue in units of the aggregate price index can be written as:

$$R = \left[t_n P_n Y_n + t_t EP^* Y_t + t_m E.M^* + E.i^* F_{g-1}^* \right] / P \qquad (1)$$

Where:

R = Real government revenue
t_n, t_t = The tax rate on the production and sale of non-traded and traded goods, respectively
t_m = Tax rate on imports including import duties and sales and excise duties on the sale of imports in the domestic market
E = Exchange rate, which is expressed as the number of unit of domestic currency that exchanges for one unit of foreign currency
M* = The foreign currency value of imports
i* = The foreign rate of interest
F_{g-1}* = The government holdings of foreign currency denominated assets at the end of the previous period
P_n = The average price of non-traded goods
P* = The foreign price level
P = The aggregate price level, which is;

$$P_n^{\delta} \left(EP^* \right)^{1-\delta}$$

where δ is the share of non-traded goods in aggregate expenditure.

Assuming there is no change in foreign asset holding of the government as well as in fiscal regime and that foreign price is assumed given; the revenue adjustment to depreciation will take the following form.

$$R' = \left[\delta\left(\varphi_t + \varphi_m + \varphi_f\right) - (1-\delta)\varphi_n \right]\left(E' - P_n'\right) + \left(\varphi_n Y_n' + \varphi_t Y_t' + \varphi_m M^{*'}\right) \qquad (2)$$

where φ denotes revenue share and the subscripts t, m, f and n stand for traded goods, imports, capital gains on foreign assets and domestically produced non-traded goods, respectively and the prime denotes growth rate.

From Eq. 2, we observe that depreciation affect government revenue through its value and volume effects given the tax structure and the level of foreign asset holding. The value effect is given by the expression in the square bracket and this occurs only if depreciation produces a relative price change. Krugman and Taylor (1978) stressed the revenue effect of devaluation and this is captured in Eq. 2 by δ ($\varphi_t + \varphi_m$). Given the volume of domestically produced traded goods, import and tax rate, a real depreciation increases real trade taxes by increasing their value in terms of domestic currency. From Eq. 2, depreciation also raises government revenue where there is foreign assets holding by the government, by generating capital gains on those assets. This effect is captured by $\delta\varphi_f$ (Lizondo and Montiel, 1989).

The price effect of real depreciation on revenue is not always positive as shown in Eq. 2. Given the level of output in the non-traded sector and a non-indexed tax structure, depreciation reduces tax base in that sector in real terms by causing domestic price level to rise. This effect is captured by - (1 - δ) φ_n.

The revenue effect from this source is negative as long as aggregate expenditure includes spending on traded goods (δ<1) and the price of non-traded goods does not fall as a result of depreciation. Lizondo and Montiel (1989) show that depreciation would reduce tax revenue as long as it is inflationary, through the Tanzi effect. This effect occurs when there is tax collection lag and an inelastic tax system. The overall price effect of depreciation on government revenue depends on the initial shares of non-traded goods in domestic expenditure and in total government revenue.

Equation (2) further indicates the response of government revenue to changes in tax base which is represented by the volume of production and sales in both the tradable and non-tradable sectors. The effect of depreciation on the output of the tradable and non-tradable sectors as well as on volume of imports is ambiguous a priori in the context of a developing country like Nigeria (Lizondo and Montiel, 1989), hence its effect on tax base is also ambiguous. For instance if depreciation is contractionary in the non-traded goods sector $\left(Y_n' < 0\right)$, the tax revenue from that sector will fall as output, wages and profit would also decrease leading to a fall in income and business taxes. The induced reduction in consumption and investment expenditure lowers sales and excise taxes not only on non-traded goods but also

on other goods sold in the domestic market. The opposite holds in case of expansionary depreciation. A similar analysis is applicable to the traded goods sector. If import demand in foreign currency falls ($M^{*1}<0$) due to depreciation and demand is price elastic, revenue from import sector would decline.

However, if the decline in imports stimulates economic activity in the import competing sector, the loss in revenue may be offset. From the discussion, one can deduce that the effect of depreciation on government revenue is theoretically uncertain despite the assertions to the contrary in some discussions.

Expenditure effects of depreciation: The fiscal expenditure of the government G, in units of aggregate price index is assume to be made up of four components namely: real government expenditure on traded goods EG_t measured in unit of traded goods; real government expenditure on non-traded goods P_nG_n measured in units of non-traded goods, interest paid on domestic debt outstanding in previous period, iDD_{-1} and foreign interest paid on external debt owed by the public sector i^*EXD_{-1}, where i*, I, EXD, DD represent foreign interest rate, domestic interest rate, external debt owed by the public sector and internal debt owed by the public sector respectively.

G_t and G_n represent government expenditure on traded and non-traded goods, respectively while other variables are as earlier defined. The government expenditure equation is expressed as:

$$G = \left[P_nG_n + EG_t + iDD_{-1} + i^*E.EXD_{-1} \right] / P \qquad (3)$$

where all variables are as earlier defined.

Assuming $DD\text{-}1' = i^{*\prime} = {}^*EXD\text{-}1' = 0$, the adjustment of government expenditure to currency depreciation can be expressed as Eq. 4:

$$G' = \left[\delta(\eta_t + \eta_{exd}) - (1-\delta)\eta_n \right](E' - P_n') - \left[\eta_{dd} \left\{ i' - \delta P_n' - (1-\delta)E' \right\} \right] + \left[\eta_n G_n' + \eta_t G_t' \right] \qquad (4)$$

where, η_t, η_n, η_{exd} and η_{add} represent the expenditure share of traded goods, non-traded goods, interest payments on external and domestic debts, respectively.

As shown in Eq. 4, exchange rate depreciation affect government expenditure through its effect on real exchange rate, real interest payment on domestic public debt and on discretionary fiscal policy action represented by the items in the three square brackets on the right hand side of Eq. 4.

A change in real exchange rate affects government expenditure in many ways. Firstly, if we assume no substitution in consumption in favour of non-traded goods, government expenditure on traded goods ($\eta_t>0$) increases following real depreciation. Secondly, if we assume a given external debt, a real depreciation will lead to an increase in government expenditure because the cost of servicing this debt will increase in local currency units.

This channel is emphasised in the literature as the major determinant of fiscal deficit for countries with large public debt. Thirdly, a real depreciation tends to reduce fiscal expenditure by reducing expenditure on non-traded goods in units of aggregate price index, this is captured by $-1 (1 - \delta)\eta_n$. The net effect of devaluation through changes in real exchange rate thus depends on the initial shares of traded goods and interest payment on foreign debt in fiscal spending (η_t and η_{exd}) and also on the share of non-traded goods in aggregate expenditure (δ).

The link between depreciation and government spending is further strengthened by the presence of domestic public debt. This effect is operative where interest rate and or price index are sensitive to changes in exchange rate. In as much as depreciation causes a rise in the aggregate price index and given the nominal interest rate and value of debt, depreciation lowers real interest payment on the debt by eroding its real value. The larger the share of interest payment on domestic debt in total government expenditure (η_{add}), the larger the spending-reducing effect of an inflationary depreciation (Ize and Ortiz, 1987). Even where there is an increase in nominal interest rate following depreciation, the real cost of serving the debt will still decrease so long as interest rate rises less proportionately than the inflation rate.

Another channel through which depreciation can affect government spending is when it engenders a change in discretionary policy with respect to G_n and G_t. For instance, where the government raise the salaries of public sector employees to protect their real earnings from a devaluation-induced rise in the price of consumption goods, a policy which can be reflected by an increase in G_n. Government may also subsidise the private sector's purchase of traded goods whose local currency prices have risen as a result of devaluation (Tanzi, 1982). Moreover, the need to meet external debt-service obligation may necessitate a reduction in government spending on G_n and G_t.

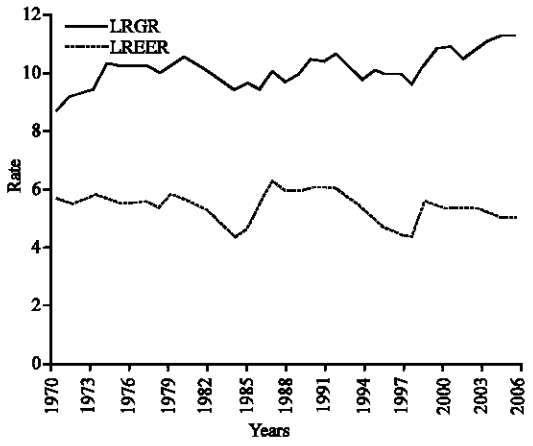

Fig. 1: Trends in Real Exchange Rate (LREER) and Real GovernmentRevenue (LRGR)

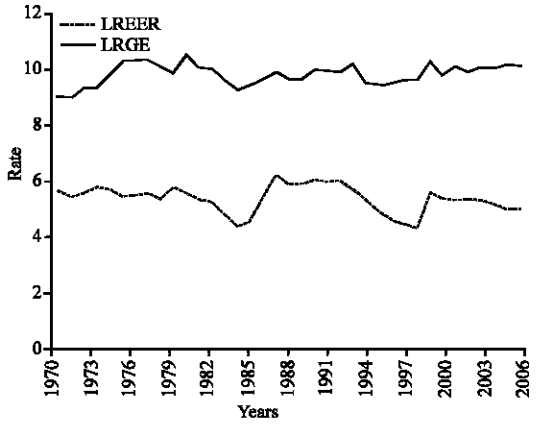

Fig. 2: Trends in Real Exchange Rate (LREER) and Real GovernmentRevenue (LRGR)

From the discussion, it is clear that the revenue and expenditure effects of depreciation are ambiguous a priori. The magnitude and direction of the effects has been shown to depend on the size of the real depreciation, the share of traded goods in government and aggregate expenditure and on the output effect of depreciation. Thus the fiscal effect of depreciation remains largely an empirical question.

Trend in real exchange rate and fiscal variables in Nigeria: In this, the trend in real effective exchange rate, real government revenue and expenditure is examined between 1970 and 2007. The time profiles of these variables are shown in Fig. 1 and 2. Figure 1 depicts the logarithms of the Real Effective Exchange Rate (REER) and real government revenue in Nigeria. The Fig. 1 shows that there is co-movement between the two variables except between 2003 and 2006 where divergence is observed.

Between 1970 and 1978, the REER exhibited some stability but it appreciated from 1980-1985. The appreciation during this period can be linked with the deliberate policy of appreciation pursued during this period by the government. The increased earning from crude oil exports during this time enhanced the policy of progressive appreciation. The policy of deliberate appreciation of the naira enabled the government to source imports cheaply to implement development projects but it also encouraged heavy reliance on imports thus leading to depletion of external reserves. Apart from this, this policy also altered the international competitiveness of Nigerian goods.

The REER depreciated between 1985 and 1988 while it appreciated between 1993 and 1998 before depreciating till 2000. However, from 2001 onwards, the REER appreciated persistently, the persistent appreciation can be linked with the relative stability that occurred in respect of the nominal exchange rate. Figure 1 shows that real government revenue exhibited consistent rise in the early 1970s due to boom experienced in the international oil market which led to huge inflow of revenue to the government. One striking feature of the trend is that real government revenue increases with appreciation of the real effective exchange rate especially between 1989 and 1993. This same trend is observed between 2000 and 2007 when appreciation of real exchange rate is accompanied by increase in government revenue.

The co-movement exhibited in Fig. 2 is more revealing as appreciation of REER is associated with decline in real government expenditure, while depreciation is associated with increase in government expenditure. One striking observation is that the observed response of government expenditure occurred with a lag. However, from 2001 onwards, this trend in relationship ceases to occur.

The model: After describing the behaviour of the variables of interest, an attempt is made in this study to gain an empirical insight into the nature of the relationship among the three variables of interest. To do this, a three equation model is specified with the three variables as endogenous variables. The model is described as follows.

Government expenditure: The level of real government expenditure is hypothesised to respond to REER as described in the theoretical analysis. Apart from REER, real Government expenditure (G) is also assumed to be

related to the level of real GDP per capita (GDPC), Balance-of-Payment constraints (BP_{-1}) and the level of pre-existing external debt as a percentage of GDP (XD_{-1}). In linear form, the real expenditure equation is specified as:

$$\ln G = \alpha_0 + \alpha_1 \ln REER + \alpha_2 \ln GDPC + \alpha_3 BP_{-1} + \alpha_4 \ln XD_{-1} + \beta_5 OILREV + \mu_1 \quad (5)$$

The level of per capita GDP is included in the equation in order to proxy for the level of economic development. This variable is expected to be positively related to the level of government expenditure because government expenditure tends to increase with the size of the economy through the demand and supply factors. The Wagner's law of increasing state activities also argues that government expenditure grows as the economy grows (Rosen, 1999). Balance-of-Payments restraint variable is included because the position of the Balance-of-Payment (BOP) account is expected to affect fiscal decision of the government. For instance, an improvement in the BOP would relax the government budget constraints and thereby has positive effect on fiscal expenditure, while an adverse position would require a fiscal restraint.

The BOP constraint is represented by the stock of external reserves as a percentage of GDP. The external debt burden is included in the equation in recognition of the expenditure implications of interest payments on public debt (Yiheyis, 2000). Oil revenue is included in the model as the Nigeria economy is highly dependent on oil. Oil revenue accounts for over 90% of foreign exchange earning in Nigeria and it affects government budgeting since budget is always based on a given level of oil price. The higher the oil revenue, the higher the government revenue and the higher the ability of government to spend, ceteris paribus

Government revenue: Real government revenue (R) is expressed as a function of REER, real GDP per capita (GDPC) and the level of government expenditure in the previous year as well as the terms of trade. In linear form the revenue equation is expressed as Eq. 6.

$$\ln R = \beta_0 + \beta_1 \ln REER + \beta_2 GDPC + \beta_3 \ln G_{-1} + \beta_4 \ln TT + \beta_5 OILREV + \mu_2 \quad (6)$$

The level of GDP per capita is included in the equation as a measure of the tax base and for administrative capacity (Yiheyis, 2000). It is assumed that a higher GDP per capita would imply wider tax base and yield higher tax revenue, *ceteris paribus*. Higher GDP per capita can also be used to proxy for the level of economic development, which positively correlates with efficiency in tax collection and tax revenue. According to Tanzi (1989), tax revenue does not only depend on the size of the tax base but also on the extent to which it is exploited. The hypothesis implied in this is that the greater the need for revenue the higher will be the tax level that the government would strive to generate from a given taxable capacity.

This is obvious in recent time in Nigeria where state governments now begin to exploit the tax bases more efficiently because of dwindling revenue from oil and unchanging or increasing revenue need. Revenue need in this analysis is represented by government expenditure in the previous period. Oil revenue is included in the model as the Nigeria economy is highly dependent on oil. Oil revenue accounts for over 90% of foreign exchange earning in Nigeria and it affects government budgeting since budget is always based on a given level of oil price. The higher the oil revenue, the higher the government revenue, *ceteris paribus*.

The real exchange rate: The real exchange rate equation is specified as a function of the Budget Deficit (BD), aggregate net capital flows as a percentage of GDP (NETCAP), the Terms of Trade (TT), the degree of Openness of the Economy (OPEN) and the rate of nominal depreciation ($NEER/NEER_{-1}$). The real exchange rate equation is expressed in linear form as shown in Eq. 7.

$$\ln REER = \gamma_0 + \gamma_1 \ln BD + \gamma_2 \ln NETCAP + \gamma_3 \ln OPEN + \gamma_4 \ln TT + \gamma_5 \ln\left(NEER / NEER_{-1}\right) + \mu_3 \quad (7)$$

A deterioration of the budget is expected to lead to an appreciation of the real exchange rate through its impact on domestic price index, especially when the deficit is financed through creation of money which is common in many developing countries (Yiheyis, 2000). The Terms of Trade (TT) are defined as the ratio of the price of a country's exports to the world price of imports. The effect of the TT on real exchange rate operates through import and export price variations, thus making its impact on real exchange rate theoretically ambiguous, depending on the relative strength of the income and substitution effects, which emerge from changes in the prices of both imports and exports.

If the income effect dominates, the real exchange rate will appreciate but if the converse holds then there will be real exchange rate depreciation (Montiel, 1999). An

increase in net capital flows permits an expansion of absorption and consequently an appreciation of real exchange rate. An alternative route through which capital flows affect real exchange rate is through an appreciation of nominal exchange rate. Under a flexible exchange rate regime, an increase in net capital flows produces an excess supply of foreign exchange which, in turn leads to an appreciation of both the nominal and real exchange rates, assuming that prices are slow to adjust.

The degree of openness in an economy is captured by commercial policy in form of import tariff or export subsidies. An economy with fewer trade restrictions in form of tariffs and subsidies is likely to be more associated with a more depreciated real exchange rate. A change in nominal exchange rate can affect the real exchange rate if prices are slow to adjust (Joyce and Kamas, 2003). In Edwards' model (1989, 1990), nominal exchange rate is included to capture short term fluctuations in the real exchange rate. It is expected that there is a positive relationship between nominal and real exchange rate.

Sources and description of data: The data used in this study is obtained mainly from the Central Bank of Nigeria (CBN), Statistical Bulletin, 2006 and CBN annual reports and accounts, 2007; as well as Annual Abstract of Statistics (various issues) published by the Federal Office of Statistics (FOS) now National Bureau of Statistics (NBS). Data on trade with Nigeria's trading partners used to compute the Real Effective Exchange Rate (REER) were collected from International Monetary Fund (IMF) direction of Trade Statistics (various issues). The real effective exchange rate is constructed as a weighted average of the real value of the Nigerian currency in terms of those of its major trading partners. The weights adopted in this study represent the relative share of each trading partner in total trade (exports and imports) with Nigeria. All the variables, except those with negative values were transformed into natural logarithms so that their coefficients can be explained as elasticities. To obtain the real values of the variables, the data were deflated using the consumer price index.

Estimation technique: The model was estimated using time series data on Nigeria from 1970-2007. The time series characteristics of the variables were examined by carrying out unit root tests using the Augmented Dickey-Fuller method. The results of the test revealed that some of the variables are stationary at level, while some only became stationary after being differenced once. The result of the unit root test is presented in Appendix 1. The unit root test is necessary to avoid the problem of spurious regression (Gujarati, 2003). Cointegration test was also carried out, using the Engel-Granger-Two-Stage (EGTS) procedures, in order to know if there is long run relationship among the variables in the equations. This was done by carrying out unit root tests on the residual of each of the equation.

The result of this test indicates that there is long run relationship among the variables in all the equations. The result of the co-integration test in contained in Appendix 2. Based on the result of the cointegration test, the equations were casted in an error correction format. The use of the error correction mechanism format adds richness, flexibility and versatility to the econometric modelling and it integrates short run dynamics with long-run equilibrium. In order words, it establishes the existence of long-run equilibrium relationships among variables, while at the same time correcting for short-run disequilibrium, thus enhancing the accuracy of prediction that could be made from the economic relationships among variables.

RESULTS AND DISCUSSION

In this study, we present and analyse the empirical result of the fiscal adjustment to exchange rate movements. As, after verifying whether the variables are stationary or otherwise by carrying out the unit root test and discovering that some of them are stationary at level, while others are stationary after differencing them once, we also established that there is long run relationship among the variables in each equation through the cointegration test. We therefore specified out equations in error correction mechanism format and estimated the model using the e-views software. The results are shown in Table 1-3.

Real government revenue: The estimated result for government revenue is shown in Table 1. The government revenue equation was initially estimated without the autoregressive term but the results obtained showed the presence of the problem of serial correlation, the equation was then reestimated with the AR term and the result is reported in Table 1. From Table 1, the majority of the slope coefficients are statistically significant at the 5% conventional level. This shows that real per capita income has positive and significant effect on government revenue; this is in line with a priori expectation. Per capita income indicates the tax base of the economy as it reflects the administrative capacity of the economy. The result

Table 1: Regression result for real government revenue (Dependenr variable: Real Government Revenue [D (LRGR)])

Regressor	Coefficient	SE	t-value	Prob.
Constant	0.67	0.78	0.85	0.40
D (LGDPC)	1.17*	0.24	4.94	0.00
LRGE (-1)	-0.22**	0.08	-2.75	0.01
LTOT	0.05	0.04	1.28	0.21
LREER	0.11***	0.06	1.91	0.07
LOILREV	0.13*	0.03	4.11	0.00
ECM (-1)	-0.26**	0.09	-2.81	0.01
AR (1)	-0.32***	0.19	-1.71	0.09

Diagnostic tests R^2 = 0.77, Adj. R^2 = 0.71, D.W = 2.09, Jarque-Bera Statistics = 0.47 (0.79), Breusch-Godfrey Stats = 0.71 (0.50), White Heteroskedasticity test stats = 0.99 (0.49); NB*, ** and *** indicate variable is significant at 1, 5 and 10%, respectively, Values in parentheses under diagnostic tests are probabilities

Table 2: Real government expenditure (Dependent varianle: Real Government Expenditure (LRGE))

Regressors	Coefficient	SE	t-value	Prob.
Constant	-1.71	1.11	-1.54	0.13
LREER	-0.01	0.07	-0.15	0.88
D (LCRGDP)	0.65*	0.24	2.73	0.01
D (LEXTRESV)-1	0.16*	0.05	3.49	0.00
D (EXTDEBT)-1	0.26*	0.07	3.99	0.00
LOILREV	-0.01	0.03	-0.39	0.69
LRGE (-1)	1.23*	0.14	8.79	0.00
ECM (-1)	-1.20*	0.22	-5.34	0.00

Diagnostic Tests: R^2 = 0.81, Adjusted R^2= 0.76, D.W = 2.07, Jarque-Bera Statistics = 2.81 (0.25), Breusch-Godfrey LM test stats = 0.30 (0.74), White Heteroskedasticity test stats = 0.98 (0.50);NB*, ** and *** indicate variable is significant at 1, 5 and 10%, respectively. Values in parentheses under diagnostic tests are probabilities

Table 3: Real exchange rate (Dependent variable: Real Effective Exchange Rate (REER))

Regressor	Coefficient	SE	t-value	Prob.
Constant	-6.33	4.16	-1.52	0.13
LDEFICIT	0.65*	0.18	3.71	0.00
D (LOPEN)-1	0.49**	0.19	2.52	0.02
LTOT (-1)	-0.08	0.08	-1.06	0.29
LDEVRATE (-1)	0.05	0.06	0.85	0.40
LREER (-1)	1.96**	0.76	2.56	0.02
ECM (-1)	-1.08	0.77	-1.40	0.17

Diagnostic Tests: R^2 = 0.75, Adjusted R^2 = 0.69, D.W = 2.17, Jarque-Bera Stats = 1.46(0.48), Breusch-Godfrey LM test stats = 0.19 (0.83), White Heteroskedascity test stats = 1.11 (0.40); NB*, ** and *** indicate variable is significant at 1, 5 and 10%, respectively. Values in parentheses under diagnostic tests are probabilities

shows that higher per capita income would lead to higher government revenue even if the tax rate is not altered. Specifically, 1% increase in per capita income will lead to 1.17% increase in government revenue, ceteris paribus. Terms of trade is found to be positively related to the real government revenue, although this variable is insignificant.

Real exchange rate is positively and significantly related to government revenue indicating that depreciation of real exchange rate would promote government revenue in Nigeria. This finding supports the view that real fiscal revenue responds positively to depreciation of real exchange rate. About 10% real exchange rate depreciation will lead to 1% increase in real government revenue. The Tanzi effect, which is represented by the impact of previous government expenditure is not supported by this result as the effect of previous government expenditure on revenue is negative. Oil revenue is found to have positive and significant relationship with government revenue in Nigeria. This is in line with a priori expectation.

The error correction mechanism term is correctly signed and significant at the 5% level indicating that the model will act to correct any deviation from equilibrium. The value of the ECM coefficient shows that 26% of deviation from equilibrium position in the previous year is restored within the next one year. As revealed by the coefficient of determination, R^2, over 70% of variation in real government revenue can be explained by the variables in the model. The Jarque-Bera test statistics shows that the residual of the equation is normally distributed hence the results obtained is appropriate for inferencespurposes. The LM test does not indicate that there is problem of serial autocorrelation. In the same manner; the White Heteroskedasticity test statistics does not indicate the existence of the problem of heteroskedasticity.

Expenditure equation: Table 2 shows the estimated result for government expenditure. Real effective exchange rate has negative but insignificant effect on government expenditure as revealed by the result in Table 2. About 100% depreciation would reduce government expenditure by 1%. This result is in contradiction with the finding of Yiheyis (2000), who found that depreciation of real exchange rate promoted government expenditure. Per capita income has positive and significant effect on real government expenditure in Nigeria. The Table 2 shows that 10% increase in per capita income will lead to 6.5% increase in government expenditure. This is an indication that government participation in the economy in form of provision of goods and services is increasing with the size of the economy. This result conforms to the finding Yiheyis (2000). Oil revenue has a negative but insignificant relationship with government expenditure. External reserves and external debt are shown to have positive and significant effects on government expenditure; it is however, the lag of these variables that are related to government expenditure.

The coefficients of both variables are less than unity indicating less than proportional response of government expenditure to changes in these variables. Both variables are significant at 1%, while per capita income is significant at 5%. Past government expenditure has positive and significant effect on current expenditure level, implying

the importance of habit persistence in government expenditure in Nigeria. The error correction term carries the correct sign; it is significant at 1 but the size of the coefficient is abnormal. The result of the normality test as indicated by the Jarque-Bera test shows that the residual of the expenditure equation is normally distributed. The LM test statistics also indicates that there is no problem of serial correlation. Both ARCH test and the White Heteroskedasticity test do not indicate problem of heteroskedasticity. This implies that the errors are homoskedastic and independent of the regressors, hence correct inferences can be made from the estimated parameters. Moreover, it indicates that the linear specification of the model is correct. The value of the coefficient of determination R^2, which is 0.81 shows that the variables included in the model are capable of explaining over 80% of variation in government expenditure.

Real exchange rate equation: The variables in the real exchange rate equation are correctly signed except the coefficient of fiscal deficit, which shows positive relationship, contrary to a priori expectation. From the result in Table 3, a more open an economy is at a current period, the more it is associated with depreciated real exchange rate in the next period. Deterioration of terms of trade is found to promote depreciation of real exchange rate, although the relationship is not significant. There is positive relationship between nominal and real exchange rate suggesting that nominal depreciation would translate to real depreciation, all things being equal. Past real exchange depreciation is also found to promote real depreciation in the current period. The error correction term is rightly signed and significant but the size of the coefficient is abnormal. The Jarque-Bera statistics shows that the errors are normally distributed, while the Breusch-Godfrey LM and the White Heteroskedasticity test results indicates that there is no problem of serial autocorrelation and heteroskedasticity, respectively. The coefficient of determination implies that the independent variables are capable of explaining about 70% of variation in real exchange rate. Overall, the results suggest that real exchange rate depreciation promotes government revenue but it reduces government expenditure indicating the possibility of real exchange rate depreciation leading to improvement in fiscal balance. The findings of this study seem to suggest that the fiscal effects of depreciation would reinforce the current account effects so long as the latter were favourable in the first place.

CONCLUSION

The primary objective of this study is to investigate the fiscal outcome of exchange rate depreciation in Nigeria. The study identified the channels through which depreciation can influence fiscal variables. To gain empirical insight into the relationship between real exchange rate and fiscal variables, a simple model was formulated and estimated. The findings of the study suggest that nominal depreciation resulted in real depreciation and that real depreciation has augmented real fiscal revenue. The expenditure effect is however, insignificant. Budget deficit and increased openness are found to promote depreciation of real exchange rate. Where the current account is favourable, real depreciation by its fiscal consequences is found to reinforce, rather than dampen the position of the current account.

Appendix 1: Results for unit root test

Variables	N/T/C/CT	Level	1st diff	Critical value for ADF (95%)	Order of intr
LGDPC	C	-2.016229	-5.370348	-2.948404	I (1)
LDEFICIT	CT	-4.230561			-3.540328
	I (0)				
LDEVRATE	CT	-5.538032		-3.544284	I (0)
LEXDEBT	N	-0.764700	-3.217189	-1.950687	I (1)
LEXTREV	C	-2.355729	-6.601289	-2.948404	I (1)
LOPEN	CT	-8.914089		-3.544284	I (1)
LREER	C	-2.975456		-2.948404	I (0)
LRGE	C	-3.110258		-2.945842	I (0)
LRGR	C	-2.282127	-6.391175	-2.948404	I (1)
LTOT	N	-3.537582		-1.950394	I (0)
NETCAP	CT	-5.042475		-3.540328	I (0)
LOILREV	C	-3.904788		-3.540328	I (0)

C, T, CT and N indicate that regression is done with intercept, trend, intercept and trend and no intercept or trend, respectively

Appendix 2: Cointegration test result (engel-granger-two-stage procedure)

Equations	Critical value of 5%	ADF test statistics	Order of integration	Implication for cointegration
Residual of government expenditure equation 2	-1.95	-4.53	I(0)	Cointegrated
Residual of government revenue equation 1	-1.95	-2.60	I(0)	Cointegrated
Residual of real exchange rate equation	-1.95	-3.38	I(0)	Cointegrated

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