Budget Deficit and Inflation in Nigeria: A Causal Relationship

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Abstract
The study investigates the nature and direction of causality among the two variables. This is with a view to providing empirical evidence on budget deficit operation in stimulating economic growth through inflation in Nigeria. Secondary data were used in this study. Data on inflation rate, exchange rate, Gross Domestic Product (GDP) and budget deficit were collected from statistical Bulletin and Annual Report and Statement of Account published by the Central Bank of Nigeria (CBN) and the International Financial Statistics (IFS) published by International Monetary Fund (IMF). Granger Causality pair wise test was conducted in determining the causal relationship among the variables. The result showed that there was no causal relationship from inflation to budget deficit ($F = 0.9$, $P > 0.005$), while the causal relationship from budget deficit to inflation was significant ($F = 3.6$, $P < 0.05$). This implies that a uni-directional causality from budget deficit to inflation exist in Nigeria. Furthermore, the result showed that budget deficit affects inflation directly and indirectly through fluctuations in exchange rate in the Nigerian economy.

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INTRODUCTION

Persistent government budget deficits and computing government debt have become major concerns in both developed and developing countries. Extensive theoretical and empirical literatures have been developed to examine the relationship between budget deficits and macroeconomic variables. The monetarists share the view that fiscal deficits are harmful to an economy. While some of the increases in the deficits have been associated with declining tax revenue resulting from the recession, others relate to the increase in debt service payments on public debt.

The development of a budget deficit is often traced to the Keynesian inspired expenditure-led growth theory of the 1970s. Most countries of the world adopted this theory that government has to motivate the aggregate demand side of the economy in order to stimulate economic growth. However, its Consequences on macroeconomic variables cannot be underestimated in most countries of the world, Nigeria inclusive (Olomola and Olagunju, 2004). Monetary policy has over the years in Nigeria been largely expansionary with direct implications for price inflation (including food prices) and exchange rates. Over the years, there has been a persistent rise in private consumption expenditures and developments in the external sector have also impacted strongly on the budget deficit.

Government's narrow revenue base, vis-a-vis its expenditure, is likely to have serious consequences for the government's budget balance (Cebula, 2000). Most analysts therefore argued that deficit reduction

is crucial to the future growth of an economy, although, economists are divided over its impacts. It is expected that lower budget deficits will lower real interest rates, increase investment, and thereby increase productivity, growth and real income. A country experience deficit in her budgetary system when its expenditure exceed its revenue while budget deficit financing reflect the means of operating budget deficit of the country. However, the source of finance has varying impact of a budget deficit on inflation.The major outcomes of empirical studies examining the relationship between budget deficits and inflation showed strong evidence that the budget deficits financed through monetization and a rising money suPply could lead to inflation.

The Nigerian government has greater influence on the nations economic activities through the use of fiscal instruments amongst which are budget deficit operation. However, this has effect on macroeconomic variables such as interest rate, exchange rate, inflation, consumption, investment, etc which serve as media through which budget deficit affects economic development. In Nigeria, for example, high incidence of projected budget deficit persists and the risk of severe adverse consequences must be taken very seriously, although it is impossible to predict when such consequences may occur. For instance, Oyejide (1972) established, that Nigeria started experiencing budget deficit in her budgetary system since 1957 and became persistent in the 1970s prior to the civil war of 1967 to 1970, and up till date, Nigeria only has seven years of

budget surplus CBN (2005). The budget deficit recorded for the remaining years were as a result of many factors that made the proposed expenditure to exceed the expected revenue. Some of these factors are: mismanagement of available resources, fall in the price of oil in the world market, corruption, social and religious crises, creation of more states and local governments, Egwaikhide (1996a). Inflation is one of the variables affected by budget deficit operation over the years in Nigeria. Government has continuously pursued an expansionary fiscal policy with the exception of the years 1970, 1971, 1973, 1974, 1979, 1980 and 1996 (CBN, 2005). This was in a view to improve economic growth and economic development. However, the major impact of the increase in budget deficit was felt in 1993, with high rate of inflation which shows an evidence of a positive relationship between budget deficit and inflation in Nigeria, although other macroeconomic factors could have accounted for this.

There exist controversies in the literature as to whether budget deficit is inflationary or not. Oyejide (1972) argues that in a less developed country, sustained growth of deficit financing could hardly take place without some amount of inflation. It should be noted that inflation is persistent increase in price and not high price. Thus, it is against this backdrop that this study intends to empirically investigate the relationship that exists between budget deficit and inflation in Nigeria. Budget deficit-inflation nexus has been an issue in both developing and developed countries of the world. Several studies have empirically investigated the relationship between budget deficit and inflation in developed countries (See, Hamburger and Zwick 1981; Dwyer 1982; Ahking and Miller 1985; Dogas 1992; Sowa 1994 Metin 1995; Ali 2003 and Hondroyiannis and Papapetrou 1994, 1997). These studies did not yield conclusive results on the causal relationship between budget deficit and inflation, either in the short run or in the long run.

In developing countries, the evidence that there exists a positive relationship between budget deficit and inflation has also been established (See Siddiqui, 1989; Choudhary and Parai, 1991; Buiter and Patel, 1992; Dogas, 1992; Sowa, 1994; Hondroyiannis and Papapetrou, 1994; and Metin, 1995; 1998; Darrat, 2000; Oyejide, 1972; Abiola, 1995; Egwaikhide et al, 1996, 1996b; Abiodun and James, 2000). However, several issues have been raised about the deficit-inflation nexus. In this respect, two related questions have remained central. The first question is whether budget deficit and inflation have causal relationship. The second is whether the causality is direct or indirect. Interestingly, while empirical research has examined the first question extensively; for example, Crozier, 1976; Hondroyinnis and Papapetrou, 1997; little work has been done on the issue of causality

between budget deficit and inflation in Nigeria. This study intends to fill this gap. In this sense, we investigate the direction of causality between inflation and fiscal deficit in Nigeria, using annual data from the Nigeria economy for the period 1970 to 2005. Although the direction of the causation is generally accepted from deficits to inflation empirical evidence on this unidirectional causation is inconclusive (Abizadeh and Yousefi, 1986; Ahking and Miller, 1985; Barnhart and Darrat, 1988; Dwyer, 1982; Hamburger and Zwick, 1981; Hondroyiannis and Papapetrou, 1997). While some studies provide results to suPport the idea that inflation is caused by deficits, in many studies there is no significant evidence. On the other hand, Aghevli and Khan, 1978; Ahking and Miller, 1985; Barnhart and Darrat, 1988; Hondroyiannis and Papapetrous, 1997; find a bi-directional causation between deficits and inflation. Most of the empirical studies have adopted ad hoc aPproaches using econometric techniques. The relationship has been generally examined through the relationship between money growth and inflation. The monetarist assumption, which suggests that inflation is mainly a result of an increase in the money suPply, is explicitly or implicitly held in many studies. Even some studies questioning the relevance of the unidirectional relationship between deficits and inflation presume a direct relationship between money growth and inflation (De Haan and Zelhorst, 1990; Honroyiannis and Papapetrou, 1997; Hamburger and Zwick, 1981; McMillin and Beard, 1982). Therefore, there is a need to know which of these variables causes the other and the direction of causality in Nigeria. This paper therefore employs the use of Pairwise Granger Causality test

While section 2 examines the background theory and the model, the empirical results are presented in section 3. Section 4 concludes and makes policy recommendations.

BACKGROUND THEORY/MODEL
The model adopted in this study, has its backing from the Neo classical school of thought. From the literature reviewed, Friedman (1968) argued that the monetary authorities could control inflation rate, especially in the long run, through the control of the money suPply. Deficits can lead to inflation, if and only if the economy output is at full employment level. Thus, money-financed deficits are inflationary; bond-financed deficits need not be. Whether bond-financed deficits are inflationary or not depends upon the current aPproach to policy of the monetary authorities. If interest rates are pegged or stable, then bond-financed deficits are inflationary, because this calls for an expansion in the money suPply that ultimately leads to rising prices. In addition, the Monetarists have argued that there is a positive link between government deficits and monetary growth, asserting that higher bond-financed deficits will put

upward pressure on interest rates and non-government bonds.

Sargent and Wallace (1981) have suPported the proposition that the Central Bank will be obliged to monetize the deficit either now or in later periods. Such monetization results in an increase in the money suPply and the rate of inflation, at least in the long run period. An alternative view, expounded by Miller (1983), argues that government deficits are necessarily inflationary irrespective of whether the deficits are monetized or not. According to Miller, deficit policy leads to inflation through different channels. The Central Bank might be forced into monetary accommodation of the deficits as argued by Sargent and Wallace (1981). But, even if the Central Bank does not monetize the deficit, deficits are still inflationary through crowding out. That is, non-monetized deficits lead to higher interest rates, higher interest rates crowd out private investment, and hence reduce the rate of growth of real output. Premchand, (1984) asserts that financing the budget deficit by borrowing from the public implies an increase in the suPply of government bonds. In order to improve the attractiveness of these bonds the government offers them at a lower price, which leads to higher interest rates. The increases in interest rates discourage the issue of private bonds, private investment and private spending. In turn, this contributes to the financial crowding out of the private sector.

Furthermore, Sargent and Wallace (1981) showed that if the time paths of government spending and taxes are exogenous, bond-financed deficits are non-sustainable because it will push interest rate excessively high and the Central bank would eventually have to monetize the deficit. This will increase the money suPply and inflation in the long run. The monetarist argued that the only cause of inflation is an increase in money suPply and they established, that budget deficit is a contribution factor to rise in money suPply .The origin of this submission is found in the classical Economist who formulated the quantity theory of money. In the basic formulation of Irvin Fishers, the circulation of money is related to the amount of money expended in the economy during a given period of time. SuPpose there are n- commodities in the economy and given that the price of the commodity is Pi for ith commodity then the quantity sold of the commodity is Q, then we can write that

$$P_1Q_1+P_2Q_2+P_3Q_3 \quad \ldots \quad P_nQ_n = \sum P_iQ_i = PQ \ldots \ldots \ldots \ldots (1)$$

P and Q are indices for prices and the quantity of goods, and the total monetary expenditure of the goods is given by PQ. The average turnover rate for money in the process of exchanging these goods will be given by

$$V=PQ/M \qquad (2),$$

Where; V = velocity of money in the circulation

M = money stock (i.e money suPply by government)

P = Prices level

Q = the quantity of goods.

Therefore, equation (2) can be re-written as

$$MV=PQ \qquad (3),$$

Equation (3) is the standard form of fishers' equation of exchange. The theory is based on certain assumptions. One, the velocity of circulation of money is constant in the short run and second, the economy is operating at full employment level, therefore output can not be changed and hence Q is constant i.e.

$$\overline{MV}=\overline{PQ} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4),$$

Therefore, M is directly related to P, if M changes P will also change by the same proportion. The policy implication of this is that if government increases money suPply, price will also increase the real money balances held by individuals, money will be devalued as it can buy less now, from equation (4);

$$P=MV/Q=(V/Q)M, P=KM \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (5)$$

Since (V/Q) are constant therefore V/Q =K.

A change in money suPply will result into the same change in the demand for money. It is concluded that an increase in the suPply of money (M) will generally not affect the velocity of money in the circulation and the volume of output at the full employment level. Hence, money suPply is therefore seen as the main cause of inflation. The proportion relationship between M and P can be illustrated. The elasticity of a price with respect to money suPply can be written as

$$Epm = \delta p/\delta m(m/p) \qquad (6)$$

Total differentiation gives, $M\delta V+V\delta m = P\delta Q+Q\delta p$ since V and Q are constant $\delta V=\delta Q = 0$, $V\delta M = Q\delta p$, therefore $\delta P/\delta M = Q/V \qquad (7)$

Substitute equation (6) into (7)

$$Epm =V/Q(M/P) \qquad (8)$$

Recall that V = PQ/M, Epm = (PQ/M)Q(M/P) = PQ/MQ(M/P) =1.

The above equation means that percentage change in money will lead to proportionate change in price. Therefore, these prove the proportionality between money suPply and price when velocity of circulation and quantity of output remains constant. The economists mostly associated with this quantity of theory of money are known as "Monetarist". Monetary Phenomenon is that the current inflation rate is expected to vary positively in relation to the rate of change in income. The monetary theory no doubt provides useful exposition that there is a relationship, and in fact a direct relationship between money suPply and price level. The most common empirical method to examine the deficit-inflation relationship has been to employ a single equation model for money growth or inflation, treating deficits as an exogenous variable among other (Abizadeh and Yousefi, 1998; Ahking and Miller, 1985; Hamburger and Zwick, 1981; McMillin and Beard, 1982). In this

study, a four variable single equation model is employed. Budget deficit, GDP and exchange rate are treated as exogenous variables

For the estimation of the relationship between budget deficit and inflation, starting from the long run government budget constraint specified thus:

$$\frac{B_{t-1}}{P_t} = \sum \frac{1}{r_j}\left[r_{t+j} - g_{t+j} + \left(M_{t+j} - \frac{M_{t-1-j}}{P_{t+j}}\right)\right] \quad (9)$$

Where $\underline{B_{t-1}}$ = Government debt
$\quad\quad P_t$

r_j = The discount rate

r_{t+j} = Total tax revenue

g_{t+j} = Total government expenditure

M_t = Broad money suPply

Considering the particular case where the public debt cannot grow, assuming that the entire budget deficit is ultimately financed through seigniorage. Imposing this restriction on the public debt, the short run budget constraint is obtained as

$$\frac{B_{t-1}(t)}{P_t} = r_t - g_t + \left[\frac{M_t - M_{t-1}}{P_t}\right] \quad (10)$$

Where B(t) is the debt with the maturity in period t that has to be paid and is not rolled-over. This can be rewritten as

$$\frac{B_{t-1}(t)}{P_t} - r_t + g_t = \left[\frac{M_t - M_{t-1}}{P_t}\right] \quad (11)$$

The terms on the left hand side is the budget deficit formed from the fiscal deficit and repayment of public debt with the maturity in period t and the term on the right hand side is seigniorage.

Seigniorage revenue (S) can be written as a function of the inflation rate and real money suPply:

$$S = f(\Pi_t)\frac{M_t}{p_t} \quad (12)$$

Where $f(\Pi_t)$ is a reduced form of money demand equation. Considering that seigniorage is increasing with the inflation rate and combining equations 3 and 4, the equation that explains inflation via the budget deficit and money suPply is obtained as.

$$\Pi_t = \beta d_t p_t / M^s_t \quad (13)$$

Where β is the inverse linear multiplier.

d_t is the budget deficit which is

$$d_t = g_t - T_t - B_{t-1}$$

M/P is the real money suPply

Dividing equation 5 by the nominal GDP(Y), an equation that relates the size of budget deficit (D) in GDP and the level of inflation is specified thus.

$$\Pi = D_t / Y_t / M_t / Y_t \quad (14)$$

The long run equation developed in this study includes the ratio of the budget deficit to GDP and the exchange rate as exogenous variables and the consumer price index, as the endogenous variable.

The influence of the budget deficit on inflation is positive. The higher the budget deficit, the greater will be the rate of inflation. The budget deficit affects inflation only if it is monetized to increase the monetary base of the economy. From Friedman's theory of money, inflation is a monetary phenomenon. Accordingly, if the budget deficit is monetized it increases the money suPply thereby increasing the price level. When the budget deficit is monetized, an extremely high correlation exists between the budget deficit and money suPply. The problem of multicollinearity and reducibility precludes one from using both money suPply and the budget deficit as explanatory variables in the regression analysis. Therefore, in order to estimate the effect of the budget deficit on inflation, the budget deficit is used as explanatory variable instead of the money suPply. The exchange rate has a deterministic effect on the level of prices in developing economies, Nigeria inclusive. It is included as a control variable in this work that can explain inflation. In countries like Nigeria, an exchange rate depreciation (aPpreciation) could increase (decrease) the price of imported commodities. Nigeria's market is highly based on imported commodities, which implies that, depreciation of the exchange rate could be immediately reflected by an increase on the price of the consumer's basket of commodities. The third important explanatory variable is the level of GDP, which is negatively related with the level of inflation. The functional form of the model is:

CPI = f (bdef, exch, gdp) (15)

Where: Cpi is the consumer price index (1995 = 100)
Bdf is the consolidated budget deficit (before grants)
Gdp is the level of gross domestic product a constant price. Exch is the exchange rate of Nigerian's naria against U.S. dollar

The Granger Causality Test was carried out as specified by the Granger Representation Theorem (GRT) (Khalid and Guan, 1999; Arinze and Malindretos, 2008). The question of which one causes the other, using the test is embedded in the time series data of the variables. The test involved estimating of the following pair of regressions:

For simplicity, taken (CPI, Bdf, Exch, Gdp) to be c, b, x and y respectively

$$Ct = \sum_{i-1}^{n}\alpha i Q_{-i} + \sum_{i=1}^{n}\beta_i C_{t-i} + U_{it} \dots\dots\dots\dots (16)$$

$$Qt = \sum_{i=1}^{n}\lambda i Q_{-i} + \sum_{i=1}^{n}\delta i C_{t-i} + U_{2t} \dots\dots\dots\dots (17)$$

Where it assumed that the disturbance U_{1t} and U_{2t} are uncorrelated and Q (b, x, y)

This work uses essentially data sourced from Central Bank of Nigeria (CBN), Statistical Bulletin (2006), Annual Report and Statement of Accounts (various issues), for the period 1970 and 2005.

EMPIRICAL RESULTS

Time Series Properties of the Data

Table 3.1 below presents the estimates of the Augmented Dickey Fuller (ADF) test. Evidence from the results shown in the table, confirmed that, all the variables (consumer price index, budget deficit, exchange rate and gross domestic product) were not stationary at level. However they became stationary after first difference since the series were integrated of order one i.e. I (1) at five percent level of significance. Consequently, the presence of significant co-integration relationship among the variables could be determined. It should be noted, that all the variables are in log form.

Table 3.1: ADF Statistics for Testing Unit Roots in the Variables

Variables	Series	At Levels	At First differences
Fiscal deficit	FCDT	-2.55	-7.33
Gross domestic product	GDP	-1.44	-3.90
Inflation rate	CPI	-2.69	-4.18
Exchange rate	EXRT	0.15	-3.53
Critical Value	1%	-3.63	-3.64
	5%	-2.95	-2.95

Sources: (Authors Survey, 2008)

Johansen's Maximum Likelihood Co-Integration Test

The results of the unit root test shows that all the variables were random walk processes. It does not however imply that in the long-run the variables could not express long-run convergence i.e. long run equilibrium. Hence the need to subject the residuals generated from their long run static regression to Dickey – Fuller test or Augmented Dickey – Fuller test to see if they are stationary. The stationarity of the residuals is potent evidence that there is evidence of convergence to long-run equilibrium among the integrated variables. To be able to ascertain whether there is cointegration among variable of interest, it is important to first determine the optimal lag length of variables to be used.

From Table 3.2.1, below the Akaike Criteria (AC) and Schwarz Bayesian Criteria (SBC) indicated that the optimal lag structure for the VAR upon which the cointegration analysis is based is two.

Table 3.2.1: Determination of Optimal Lag Length

Information Criteria(IC) ρ	Akaike Criteria (AC)	Schwarz Bayesian Criteria (SBC)
1	41.99	42.88
2	42.38	44.02
3	46.11	47.44
ρ =	1	1

Note: ρ indicates the lag length to use for Cointegration test
Source: (Authors survey, 2008)

Having determined the optimal lag structure, the cointegration test was carried out using Johansen cointegration test which is a superior test that lies on asymptotic property (like this study) and therefore sensitive to error in small sample. It is also robust to many departures from normality as it gives room for the normalization with respect to any variable in the model that automatically becomes a dependent variable. It also allows cointegration test to be carried out when the variables are of different orders of integration. The result of the Johansen cointegration is presented in Table 3.2.2.

Table 3.2.2: Co-Integration Tests
Series: GCPI FCDT GEXRT GGDP
Lags interval: 1 to 1

Eigen value	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.833332	61.32338	47.21	54.46	None **
0.558643	23.69654	29.68	35.65	At most 1
0.196367	6.520596	15.41	20.04	At most 2
0.087796	1.929722	3.76	6.65	At most 3

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 1 cointegrating equation(s) at 5% significance level

Sources: (Authors Survey, 2008)

The results of the co-integration in Table 3.2.2 confirmed that there is at most one co-integration relationship among the macro economic variables included in the model. Specifically, the result of the co-integration test suggests that inflation has equilibrium condition with budget deficit, GDP and exchange rate, which keep them in proportion to each other in the long run. This evidence of co-integration among the variables rules out spurious correlations and aPplies that one direction of influence can be established among the variables. It is important to note that the existence of co-integration vectors among a group of variables may not imply that there is causal influence between pairs of variables in the model of co-integration test.

Bi-Variate Causality

Although regression analysis deals with the dependence of one variable on the other variable, it does not necessarily imply causality. In other words, the existence of a relationship between variables does not prove causality or direction of influence. But in regression including time series data, the situation may be somewhat different. Because, time does not run backward, that is, if event A haPpens before event B, then it is possible that A is causing B. However, it is possible that B is causing A. in other words; events in the past can cause events to haPpen today. Future events cannot. This is roughly the idea behind the so-called Granger Causality test, but it should be noted clearly that the question of causality is deeply philosophical with all kinds of controversies. At one extreme are people who believe

that "everything causes everything". And at the other extreme are people who deny the existence of causality whatsoever. The econometrician Edward

Learner prefers the term precedence to causality. Francis Diebold prefers the term predictive causality. This is presented in table 3.3.1

Table 3.3.1: The Estimates of Causality Test
Pairwise Granger Causality Tests
Date: 02/13/08   Time: 17:25
Sample: 1970- 2005
Lag: 1

Null Hypothesis:	Obs	F-Statistic	Probability
FCDT does not Granger Cause GCPI	33	3.64899	0.03906
GCPI does not Granger Cause FCDT		0.92743	0.40738
GEXRT does not Granger Cause GCPI	33	3.24015	0.05423
GCPI does not Granger Cause GEXRT		1.84051	0.17743
GGDP does not Granger Cause GCPI	33	2.76817	0.07998
GCPI does not Granger Cause GGDP		0.08689	0.91703
GEXRT does not Granger Cause FCDT	33	1.24736	0.30274
FCDT does not Granger Cause GEXRT		6.53083	0.00470
GGDP does not Granger Cause FCDT	33	2.83586	0.07560
FCDT does not Granger Cause GGDP		0.00273	0.99727
GGDP does not Granger Cause GEXRT	33	0.14987	0.86150
GEXRT does not Granger Cause GGDP		0.04738	0.95380

Source: (Authors survey, 2008)

In Table 3.3 above, fiscal deficit, GDP and exchange rate have causal effect on inflation. However a strong unidirectional causality was found between fiscal deficits and inflation with the causality running from fiscal deficit to inflation at 5 percent level of significant. Also exchange rate was found to granger cause inflation at a very weak rate at 5 percent significant level, while fiscal and exchange rate has a unidirectional causality that is very strong running from fiscal deficit to exchange rate at 5 percent significant level. From the result, it was reported that there exists a unidirectional causality between GDP and fiscal deficit; this runs from GDP to fiscal deficit at 10% significant level. Also a unidirectional causality was found between GDP and inflation rate, which runs from GDP to inflation at 10 percent significant level. The monetarist's causal argument for inflation was confirmed by the Granger test result at 5 percent level of significant.

CONCLUSION/POLICY REMARKS
 The study examined the relative causal relationship between budget deficit and inflation as well as the economic implication of fiscal deficit financing in Nigeria. The review showed that while vast growing volumes of research were being carried out in the developed counties, little attention has been paid to the issue of causality and direction of causality between budget deficit and inflation in Nigeria.
Our result confirmed a unidirectional causality between inflation and budget deficit in Nigeria. Based on this empirical analysis, aPpropriate policies can then be drawn given insight to how budget deficit

can perform its roles without necessarily leading to inflation. In order to achieve high and sustained long-run economic growth when budget deficit is used as fiscal policy instrument, then, monetary policy, industrial policy and commercial policy must be strengthened to act as checks and balances in Nigeria.

Relevant measures to enhance policy coordination among various arms of government should be put in place. Most especially, monetary policy should be made to complement fiscal policy measures. Also fiscal discipline should be strongly adhered to at every level of government. Since inflation has been established as monetary phenomenon in Nigeria, for budget deficit to be effective, some fundamental changes in the productive base of the economy need be made.

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