

The Nexus between Budget Deficit and Inflation in the Nigerian Economy (1980 – 2009)

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Abstract

This study examined whether budget deficit is inflationary or not in Nigeria within the period of 1980-2009. The study made use of time series data and employed vector Error correction Mechanism (VECM) to determine the correlation that existed between the two macroeconomic variables. The study also investigated the existence of long run relationship between budget deficit and inflation. The result showed a significant causal relationship from budget deficit to inflation while the causal relationship from inflation to budget deficit was insignificant. This implies that a uni-directional causality from budget deficit to inflation exist in Nigeria. This result shows that budgets deficit affect inflation directly and indirectly through increase in money supply in the Nigerian economy. Adequate monetary policy should be geared towards balancing the role money supply performs to both budget deficit and inflation, noting that there was uni-directional relationship between budget deficit and inflation.

Keywords: Budget Deficit, Inflation, Causality, Nexus

1. Introduction

The persistent growth of budget deficit in developing countries in recent time has brought the issue of fiscal deficit into focus. While by definition, inflation is a persistence and appreciable rise in the general price level, however, not every increase in price level is termed inflation.

Therefore, for an increase in general price level to be considered inflation, such a rise must be constant, enduring and sustained. For inflation to occur, the price level should affect almost every commodity and should not be temporal. In inflationary economy, it is difficult for money to act as a medium of exchange and store of value without adverse effects on output, employment and real income.

The development of a budget deficit is often traced to the Keynesian inspired expenditure-led growth theory of the 1930s. 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.

In Nigeria, government expenditure has consistently exceeded its revenue for most of the years beginning from 1980 except in 1995 and 1996 when surplus budget were recorded. 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. While budget deficits are nothing new in Nigeria's history, the recent size of the deficit has been a cause of concern to many people including academics, policy makers and investors.

The persistent government budget deficits and government debt have become major concern in both developed and developing countries. According to Olomola and Olagunju (2004), the consequences of budget deficit on macroeconomic variables cannot be underestimated in most countries of the world, Nigeria inclusive.

Over the years, there has been a persistent rise in private consumption. Government expenditures and developments in the external sector have also impacted strongly on the budget deficit.

However, this has effects on macroeconomic variables such as interest rate, exchange rate, inflation, consumption, investment, and so on which serve as medium through which budget deficit affects economic growth. 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 (Cebula, 2000).

The issue of deficits and deficit financing, therefore, has been of primary concern to the government because deficit are perceived as negative traits in the economy. Contrarily, budget deficits can sometimes be good for an economy because real structural deficits can usher in great growth in output, consumption, encourages savings and investment as well as enhanced productivity and purchasing power in an economy, thereby stimulate economic activities.

Deficit reduction/financing is done via borrowing mainly and taxation sometimes, which are both inflationary. Inflation is one of the numerous problems of developing nations which needs to be regulated. The rate of inflation has been on increase with its damaging effect on the economy through the movement of price of consumer's goods and services.

In the literature, there are controversies on whether budget deficit is inflationary or not. Some researchers argued that budget deficit is inflationary and these researchers include Fakiyesi (1996), Iyoha (2000), Vieira (2000), Obadan (2001), Ghartey (2001), Arikawe (2002), Nechega (2005), Lozano (2008), Oladipo and Akinbobola (2011), Imimole and Enoma (2011). While some other researchers such as Karras (1994), DeHaan and Zelhorst (2001), Aliyu and Englame (2009), WAMA (2009), Vansteenkiste (2009), and so on, were of the opinion that budget deficit is not inflationary.

Ogunmuyiwa (2008) argued that, there is unidirectional causality between budget deficit and inflation in Nigeria. The result of his study shows that, the causality runs from inflation to budget deficit in Nigeria. This implies that, inflation causes budget deficit in Nigeria.

Chimobi and Igwe (2002) established that, there is bilateral/feedback causality between budget deficit and inflation in Nigeria. They argued that, changes in inflation could be explained by previous inflation and the value of past budget deficit. Also, changes that occur in budget deficit could be explained by the past budget deficit and the value of past inflation.

However, the views of Ogunmuyiwa (2008), Aliyu and Englame (2009), WAMA (2009) were in sharp contrast to the monetarists like Iyoha (2000), Obadan (2001), Oladipo and Akinbobola (2011) among others who were of the opinion that budget deficit is inflationary in Nigeria.

Considering these views, it is obvious that some scholars believe budget deficit causes inflation while some viewed otherwise.

Consequently, this study focuses on analyzing empirically the nexus between budget deficit and inflation. It provides an avenue for more critical appraisal of the direction of causality by the inclusion of government debt variable which was missing in all the past studies.

2. Literature Review

It is generally believed that budget deficit is one of the core instruments in the hand of government for the attainment of sustainable economic growth target. The issues on the nexus between budget deficit and inflation and their impacts on the economy have been explored by many researchers across different regions in the world while some of these researches dwell basically on Nigeria.

The inflationary effects of a budget deficit have been the object of extensive empirical evaluation at international level with mixed results. There are some studies that found significant relationship between budget deficit, money growth and inflation while some found no significant relationship among the variables.

Karras (1994) investigated the impact of budget deficit on money growth, inflation investment and real output for a wider sample of 32 countries, including developed and developing economies. He used annual data between 1950 and 1989, to estimate reduced-form equations and found among other things that (i) deficits are generally not monetised and therefore do not produce inflation via monetary expansion; and (ii) deficits are not inflationary, even by virtue of their aggregate demand deficits. Tekin-Koru and Ozmen (2003) used a vector error correction model. The result of their research shows, in the long-run that inflation is positively related to the money supply and exchange rate but inflation was found to be negatively related to the real income in Turkey. For the same country, Ozatay (2000) found the price level has been adjusted to the monetary imbalances caused by the Turkish government's fiscal imbalances.

Ghartey (2001) found fiscal deficit to be inflationary in Ghana between the periods of 1972 to 1992, because substantial amount of financing budget deficit came from printing money. He concluded that budget deficit monetisation generated inflationary pressures, which created, in turn, an adverse environment for economic growth.

Nechega (2005) assessed the Fiscal Dominance (*FD*) hypothesis in Democratic Republic of Congo between the periods 1981 to 2003, using a co-integration analysis. His empirical findings reveal a strong and statistically significant long-term relationship between fiscal deficit and money growth and between money creation and inflation. This supports the assumption that the fiscal dominance hypothesis applies throughout the period.

Lozano (2008) using Johansen co-integration and vector error correction (VEC) model in Colombia for the period of 25 years (1982 – 2007). He noted that, a causal long term relationship between budget deficit, money growth and inflation could vary depending on the degree of independence of the Central bank and the type of monetary policy regime.

Vansteekiste (2009) employed pooled probit analysis to estimate the contribution of the key factors to inflation start in 91 countries of which 63 were developing countries and 28 are advanced economies. The empirical results suggest that, for all cases considered, a more fixed exchange rate regime and lower real policy rates increase the probability of an inflation start. For developing countries, other relevant factors included food price inflation, the degree of trade openness, the level of past inflation, the ratio of external debt to GDP and the durability of the political regime.

The effect of budget deficit on inflation in Nigeria and its impact on the Nigerian economy cannot be overemphasized according to the studies carried out by the early researchers which include Onwioduokit (1999), Chimobi and Igwe (2010), Imimole and Enoma (2011) and Oladipo and Akinbobola (2011).

Onwioduokit (1999) in his study attempted to ascertain the impact of fiscal deficits on inflation as well as the impact of inflation on fiscal deficits. In essence, the study sought to answer the question, 'Do fiscal deficit cause inflation or is it inflation that cause fiscal deficits? Using Granger-causality test, the study confirmed that fiscal deficit as well as fiscal deficit-Gross Domestic Product (GDP) ratio caused inflation in Nigeria. However, the empirical results did not confirm a feedback effect between inflation and deficit in absolute terms. In the same vain, Patillo, Poirson and Ricci (2004) confirmed this by arguing that, low deficit levels are essential in order for developing countries to finance infrastructural development and education. In a study carried out in some developing countries (including Nigeria), there was an evidence that there exists a positive relationship between budget deficit and inflation.

Nyong and Odubekun (2002) examine the effects of monetary financing of budget deficit on macroeconomic instability in Nigeria, using the following variables in their methodology, inflation, gross domestic product, money supply and exchange rate. They found that monetary financing of fiscal deficit is one of the contributing factors to macroeconomic instability in Nigeria. Specifically, the result of the empirical study reveal that 10 percent increase in monetary financing of the deficit may lead to 5.5 percent increase in inflation. They quantified the cost to the economy, the monetary financing of fiscal deficit in terms of inflation, economic growth, capital flight, exchange rate depreciation, and balance of payment deficit; these were found to be high. According to Nyong and Odubekun (2002), the continuous financing of bulging fiscal deficit in Nigeria by the CBN is partly responsible for liquidity in the money market and inflation in the goods market.

However, West Africa Monetary Agency (WAMA) (2009) analyzed the relationship between money supply growth and inflation in each of the member countries. The results indicate that the relationship between money supply growth and inflation depends on the peculiar circumstances of the countries concerned. Inflation exhibited a positive relationship with money supply in Benin, Guinea-Bissau, Mali, Gambia, Ghana, Guinea, Cape Verde and Liberia. Thus, in these countries, monetary policy contributed to movements in the general price level. On the other hand, the relationship was negative in Senegal, Togo, Nigeria, Burkina-Faso, Cote d'voire, Niger and Sierea-Leone. The negative correlations observed in certain countries confirm the existence of other determinants of inflation which may be structural in nature or attributed to supply-side-factors. Aliyu and Englama (2009) confirm this by employing Vector Autoregressive (VAR) model and Granger causality test on selected monetary policy and other macroeconomic variables to explore the various channels. The results from the model show that inflation in Nigeria shows no sign of effect to monetary transmission. Specifically, weak relationship between price, credit and interest rate channels were established. However, evidence of strong inverse link between exchange rate and price was found in the model. This suggests that exchange rate pass-through the level of price in economy.

Oladipo and Akinbobola (2011) used Granger causality pair-wise test in determining the causal relationship between budget deficit and inflation. The results showed that there was no causal relationship from inflation to budget deficit, while the causal relationship from budget deficit to inflation exists in Nigeria. Furthermore, the result showed that budget deficit affects inflation directly and indirectly through fluctuations in exchange rate in the Nigerian economy. Also, Chimobi and Igwe (2010) in one of their works, investigate the causality among budget deficit, money supply growth and inflation, using Vector Error Correction (VEC) model and Pair wise Granger causality test. The result shows that inflation and budget deficit have bilateral/feedback causality. This proved that the change that occurred in inflation could be explained by its lag and also lagged value of budget deficit. In the same vain, changes that occur in budget deficit is explained by its lagged values and the lagged values of inflation.

The present study investigates the nexus between budget deficit and inflation, and the direction of causality in Nigerian economy. To achieve this, Vector Error Correction Mechanism (VECM) will be used to examine the relationship between budget deficits and inflation in Nigeria. While Granger causality test will be employed to establish the direction of causality between budget deficit and inflation in Nigeria.

3. Analytical Technique

Most common empirical method to examine the budget deficit-inflation nexus has been to employ a single equation model for money growth or inflation, treating deficits as independent variable. In this study, the model specification of inflation mirrors the work of Imimole and Enoma (2011) and Oladipo and Akinbobola (2011) with little modification. The specification of the model considers the following variables, Rate of Inflation (INF) as dependent variable; while

Government Debt (GD), Budget Deficit (BD), money supply (narrow money supply, M1), (MS), will be used as independent variables.

The model is specified thus:

$$INF = f(GD, BD, MS) \quad \dots i$$

$$BD = f(GD, INF, MS) \quad \dots ii$$

Explicitly

$$INF = \alpha_0 + \alpha_1 GD + \alpha_2 BD + \alpha_3 MS + U_i \quad \dots iii$$

$$BD = \beta_0 + \beta_1 GD + \beta_2 INF + \beta_3 MS + U_i \quad \dots iv$$

where: INF is the rate of inflation

GD is Government Debt

BD is Budget Deficit

MS is Money Supply (M1)

α_0 is constant intercept

α_1, α_2 and α_3 are parameter coefficient of GD, BD and MS respectively.

3.1 Sources of Data

For the purpose of estimating the empirical nexus between budget deficit and inflation in Nigerian economy, annual data on Inflation rate (INF), Government Debt (GD), Budget Deficit (BD) and Money Supply (MS) are collected from *Statistical Bulletin* and *Annual Report and Statement of Account* published by Central Bank of Nigeria (CBN) between the period of 1980 to 2009.

3.2 Estimating Techniques

A multi-stage VAR (Vector Auto-Regressive) modelling approach involving unit root tests, co-integration examination, and the Vector Error Correction Mechanism (VECM) were employed in this study. This enables us to test for the effect of budget deficit on the inflationary rate in an economy. The Vector Error Correction Mechanism (VECM) is employed to establish the relationship between variables and to know which of these variables causes the other. Also, Granger causality test was used to test for the direction of causality between budget deficit and inflation in Nigeria.

4. Results and Discussion

This section includes the review budgetary provisions in Nigeria between 1980 to 2009. Also it presents the analysis and interpretation of the empirical results. It begins with the descriptive analysis of the data and followed by the results of various empirical test conducted in the study. The study includes the Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) statistical test to determine the time series characteristics of each variable, Granger causality test to determine the short-run relationship between inflation and budget deficit, and cointegration tests in VECM, to determine the long-run relationship between inflation and budget deficit.

After establishing the direction of causality between inflation and budget deficit, the study shift focus on the inflation equation and proceed to report other test conducted on it. The chapter concludes by discussing some policy implication of the findings.

4.1 Budgetary Provisions in Nigeria from 1980 to 2009

Table 1 shows the budget deficit/surplus, the percentage changes in budget deficit/surplus and the corresponding rate of inflation for each year from 1980 to 2009 in Nigeria. In most of the years under review, government expenditure in Nigeria has consistently exceeded revenue beginning from 1980 to 2009 except in 1995 and 1996 when surplus were recorded.

Table 1: Budget Deficit and Inflation in Nigeria from 1980 to 2009

| Year | Budget Deficit/Budget Surplus (#Million) | Percentage of Changes in Budget Deficit/Budget Surplus (%) | Inflation rate (%) |
|------|--|--|--------------------|
| 1980 | -1,975.20 | 35.1 | 9.9 |
| 1981 | -3,902.10 | 97.6 | 20.9 |
| 1982 | -6,104.10 | 56.6 | 7.7 |
| 1983 | -3,364.50 | 44.9 | 23.2 |
| 1984 | -2,660.40 | 20.9 | 39.6 |
| 1985 | -3,039.70 | 14.3 | 5.5 |
| 1986 | -8,254.30 | 171.6 | 5.4 |
| 1987 | -5,889.70 | 28.7 | 10.2 |
| 1988 | -12,160.90 | 106.5 | 38.3 |
| 1989 | -15,134.70 | 24.5 | 40.9 |
| 1990 | -22,134.70 | 46.3 | 7.5 |
| 1991 | -35,755.20 | 61.5 | 13.0 |
| 1992 | -39,532.50 | 10.6 | 44.5 |
| 1993 | -65,157.70 | 64.8 | 57.2 |
| 1994 | -70,270.60 | 7.8 | 57.0 |
| 1995 | 1,000.0 | 98.6 | 72.8 |
| 1996 | 32,049.40 | 310.5 | 29.3 |
| 1997 | -5,000.00 | 84.4 | 8.5 |
| 1998 | -133,389.30 | 2,569.8 | 10.0 |
| 1999 | -285,104.70 | 113.7 | 6.6 |
| 2000 | -103,777.30 | 63.6 | 6.9 |
| 2001 | -221,048.90 | 113.0 | 18.9 |
| 2002 | -301,401.60 | 36.4 | 12.9 |
| 2003 | -202,724.70 | 32.7 | 14.0 |
| 2004 | -172,601.30 | 14.8 | 15.0 |
| 2005 | -161,406.30 | 6.4 | 17.9 |
| 2006 | -101,397.50 | 37.2 | 8.2 |
| 2007 | -117,237.10 | 15.6 | 5.4 |
| 2008 | -47,378.50 | 59.6 | 11.6 |
| 2009 | -810,020.70 | 1,590.7 | 27.8 |

Source: CBN statistical Bulletin 2009.

(-): Budget Deficit.

(+): Budget Surplus.

From Table 1, budget deficit stood at #1,975.20 million in 1980 while the rate of inflation during the same period was 9.9%. Inflation rose from 9.9% in 1980 to 20.9% in 1981 when budget deficit increased by 97.6% from #1,975.20 million in 1980 to #3,902.10 million in 1981. But there was a decline in the rate of inflation from 20.9% in 1981 to 7.7% in 1982 when budget deficit further increased from #3,902.10 million in 1981 to #6,104.10 in 1982, representing 56.63% during the period.

However, budget deficit declined from #6,104.10 in 1982 to #3,364.50 in 1983 which represented 44.9% reduction in budget deficit and it further declined by 20.9% when the deficit reduced to #2,660.40 in 1984. But inflation increased from 7.7% in 1982 to 23.2% in 1983 and increased further to 39.6% in 1984.

Again, Budget deficit started increasing from 1985 up till 1994, while rate of inflation was fluctuating with the highest inflationary rate of 57.2% was recorded in 1993 and the lowest rate of inflation of 5.4% occurred in 1986. However, Nigeria recorded budget surplus in 1995 and

1996. It was in 1995 when budget surplus in Nigeria stood at #1billion that the highest rate of inflation of 72.8% was recorded in Nigeria. But inflationary rate falls from 72.8% in 1995 to 8.5% in 1997 when Nigeria recorded budget deficit of #5billion in 1997. Between 1997 to 2009 Nigeria maintained her budget deficit, while rate of inflation was fluctuating between the same periods.

4.2 Descriptive Statistics of Data from 1980 – 2009

Table 2 Descriptive Statistics Data of the Variables

| Variable | Observation | Mean | Std. Deviation |
|----------|-------------|---------|----------------|
| INF | 30 | 20.73 | 18.28 |
| BD | 30 | - 97459 | 161679.7 |
| GD | 30 | 1776905 | 1955603 |
| MS | 30 | 1473640 | 26880101 |

Source: Computed from Data

- The variables have relatively high variability
- The mean of budget deficit is negative which is expected because it is Budget Deficit (BD) which is – 97459
- The mean value of Inflation (INF) was 20.7, while that of Government Debt (GD) is 1776905 and the mean of Money of Supply (MS) is 1473640.
- The variability of the variables were high compared to the mean of the variables, except the variability of inflation which was a little bit lower compared with its means.
- The number of observations of the variable was 30.

Because of the high variability exhibited by the variables which is due to the fact that they are not measured by the same unit, the growth rate of each variable was used.

Table 3 Correlation Matrix of Selected Variables

| | INF | GD | BD | MS |
|-----|--------------------|-------------------|--------------------|--------|
| INF | 1.0000 | | | |
| GD | 0.2814 (0.1320) | 1.0000 | | |
| BD | 0.2458 (0.1905) | 0.62 (0.0001)* | 1.0000 | |
| MS | 0.311 (0.09) | 0.51 (0.0042)* | 0.665 (0.0001)* | 1.0000 |

Source: Computed from Data

Note:

- (i) * significant at both 1% and 5% level.
- (ii) Probability of t-test for the correlation coefficients is in parenthesis.

The result in Table 4.2 shows that only three correlation coefficients among the variables are significant at both 1% and 5% level. Correlation between BD and GD was positive (0.62) and significant at both 1% and 5%. This indicates that there is a significant positive relationship between Government Debt and Budget Deficit. This same trend was witnessed between money supply and Budget Deficit ($r=0.67$).

It implies that Budget Deficit is positively correlated with money supply. On the contrary, there exist a positive correlation between money supply and government Debt. This suggests that an increase in government borrowing will lead to an increase in money supply.

The results in Table 4.3 are not conclusive on their own but give us a guide to the degree and nature of relationship among the selected variables.

Ho: unit root

Table 4a: Phillips-Perron Test at level.

| Variable | Phillips-Perron Test Statistic | Critical value 1% | Critical value 5% | Level of integration |
|----------|--------------------------------|-------------------|-------------------|----------------------|
| INF | -2.649923 | -3.679322 | -2.967767 | Non Stationary |
| GD | -5.961693 | -3.679322 | -2.967767 | I(0) |
| BD | -4.647353 | -3.679323 | -2.967767 | I(0) |
| MS | -5.369509 | -3.679322 | -2.967767 | I(0) |

Source: Computed from Data.

Ho: no unit root

Table 4b: KPSS Unit Root Test at Level

| Variable | LM Test Statistics | Critical Value 1% | Critical Value 5% | Level of integration |
|----------|--------------------|-------------------|-------------------|----------------------|
| INF | 0.1814 | 0.7390 | 0.4630 | I(0) |

Source: Computed from Data.

4.3 Time Series Properties of Variables in the Model

The Phillips-Perron and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test for unit root were conducted for the variable in the model. The results of the test at level are presented in Table 4a and 4b. Accordingly, the null hypothesis (Ho) for Philips-Perron unit root test was that, there was a unit root in each variable. That is, each variable was stationary at levels while the null hypothesis (Ho) for KPSS unit root test was that, there was no unit root.

As usual, the rule of thumb for PP test is that, the null hypothesis of unit root should be accepted if the Phillips –Perron statistic is less negative, that is greater than critical value while the rule of thumb for KPSS is that, the null hypothesis of no unit root be accepted if the LM (KPSS) statistics is less than the critical value as shown in Table 4b. The result in Table 4a indicates therefore that all variables are stationary at their level except INF. However, INF was found stationary using KPSS unit root test. This was confirmed by the value of Mackinon (1996) associated one-sided P-value in each variable. INF variable which was non-stationary at level was confirmed stationary at level using the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root as shown in Table 4b. The economic implication of stationary variable was that of absence of persistence shock. That is, if there is disturbance on the variables, the variable will move together at the same rate back to equilibrium level.

4.4 Johansen's Cointegration Test of the Nexus between Budget Deficit and Inflation in Nigeria

It appears that the series are integrated of the same order. There is need to test whether these variables are cointegrated or not. The cointegration results are reported in Table 5. We first conducted a bivariate cointegration test on budget deficit and inflation. The test result suggests that budget deficit and inflation in Nigeria are cointegrated. That is, these variables do move together in the long-run at the same rate.

Table 5: Johansen Bivariate Co-integration Rank Test.

| Ho | Ha | Statistic Trace | Critical value 0.05 | Max-Eigen statistic | Critical value 0.05 |
|-----|-----|-----------------|---------------------|---------------------|---------------------|
| r=0 | r=1 | 18.57190 | 15.49471 | 11.17146 | 14.26460 |
| r≤1 | r=2 | 7.4004334 | 3.841466 | 7.400434 | 3.841466 |

Source: computed from data.

$$BD = 14.46270INF \quad 1$$

(6.52294)

The result of Johansen Bivariate Co-integration rank test from the normalized cointegration coefficient shows the relationship between budget deficit and inflation. Equation 1 indicates that there is long-run relationship between budget deficit and inflation. It shows that inflation exhibits a positive relationship with budget in bivariate sense. The economic implication is that an increase in inflation will also lead to an increase in the level of budget deficit. This result can be justified by the fact that inflation at any level will lead to the reduction in the real income thereby reducing the value of revenue which will result in increasing the tendency of budget deficit since in this case expenditure will always be above income revenue.

A multivariate cointegration was conducted on inflation, budget deficit, government debt and money supply. The result is reported in Table 6

Table 6 Johansen Multivariate Cointegration Rank Test

| Ho | Ha | Trace Test | Critical Value 0.05 | Max.Eigen statistic | Critical value 0.05 |
|-----|-----|------------|---------------------|---------------------|---------------------|
| r=0 | r=1 | 73.77213 | 47.85613 | 38.57538 | 27.58434 |
| r≤1 | r=2 | 35.19675 | 29.79707 | 17.25526 | 21.13162 |
| r≤2 | r=3 | 17.94149 | 15.49471 | 9.468623 | 14.26460 |
| r≤3 | r=4 | 8.472865 | 3.841466 | 8.472865 | 3.841466 |

Source: computed from data

The trace test indicates four cointegrating equations at 0.05 level while the maximal Eigen value confirm one cointegrating equation.

$$INF = 0.0123BD + 0.1424GD + 0.0015MS \quad .2$$

(0.0160) (0.0068) (0.0170)

The result from normalized cointegration coefficients shows the long-run relationship between inflation as dependent variable and budget deficit, government debt and money supply as independent variables, as it is stated in estimated equation 2.

From estimated equation 2, there is existence of a direct relationship between inflation as dependent variable, budget deficit, government debt as well as money supply as independent variables, which agree with the a-priori expectation in this study. This implies that an increase in any of the following budget deficit, government debt or money supply, or an increase in both would lead to an increase in the level of inflation. That is, if budget deficit is increase by one, when other variables assume zero value, inflation will be increased by 0.0123. So also, an increase in government debt by one when all other variables assume zero value will result to an increasing in the level of inflation by 0.1424. Again, an increase in the value of money supply by one when other variables assume zero value, will lead to an increase in the level of inflation by 0.0015. This is also in agreement with the a priori expectation of this study.

4.5 The Result of Vector Error Correction Mechanism (VECM) and Granger Causality Test

When co-integration exists, the Engle Granger theorem establishes the encompassing power of ECM over other forms of dynamic specifications. The ECM is specified in over parametrised form though the parsimonious depicts the best fitted result for the dynamic specification, the difference between the two is the choice of the lag-length included. The result of vector error correction mechanism (VECM) and granger causality test is presented in Table 7

Table 7: Estimates of the Vector Error Correction Model (VECM)

| Variables | ΔINF Equation | Std. Error | ΔBD Equation | Std. Error. |
|-------------------|-----------------------|------------|----------------------|-------------|
| Constant | -0.017746 | 2.67181 | 49.67677 | 139.247 |
| $\Delta INF (-1)$ | 0.125655 | 0.16459 | -5.272699 | 8.57804 |
| $\Delta INF (-2)$ | -0.459843 | 0.16357 | -10.78773 | 8.52463 |
| $\Delta GD (-1)$ | -0.013748 | 0.02981 | -0.769411 | 1.55347 |
| $\Delta GD (-2)$ | 0.020917 | 0.01770 | -0.516687 | 0.92249 |
| $\Delta BD (-1)$ | -0.000221 | 0.00647 | -0.637959 | 0.33700 |
| $\Delta BD (-2)$ | -0.001649 | 0.00525 | -0.280836 | 0.27381 |
| $\Delta MS (-1)$ | 0.004899 | 0.01079 | -0.020210 | 0.56208 |
| $\Delta MS (-2)$ | -0.001319 | 0.01085 | 0.033949 | 0.56571 |
| ECM (-1) | -0.230920 | 0.21068 | -5.630635 | 10.9798 |
| R-Squared | 0.572290 | | 0.393451 | |
| Adj. R-Squared | 0.345855 | | 0.072337 | |
| F-Statistic | 2.527390 | | 1.225268 | |

Source: Computed from data.

The equation of error correction model is specified thus.

$$\begin{aligned} \Delta INF = & \underbrace{-0.0178}_{(2.6718)} + \underbrace{0.1257\Delta(INF(-1))}_{(0.1646)} - \underbrace{0.4598\Delta(INF(-2))}_{(0.1636)} - \underbrace{0.0138\Delta(GD(-1))}_{(0.0298)} + \\ & \underbrace{0.0209\Delta(GD(-2))}_{(0.0177)} - \underbrace{0.0002\Delta(BD(-1))}_{(0.0065)} - \underbrace{0.0017\Delta(BD(-2))}_{(0.0053)} + \underbrace{0.0049\Delta(MS(-1))}_{(0.0108)} + \\ & \underbrace{0.0013\Delta(MS(-2))}_{0.0109} - \underbrace{0.2309ECM(-1)}_{(0.2107)} \end{aligned}$$

$$\begin{aligned} \Delta BD = & 49.6768 - 5.2727\Delta(INF(-1)) - 10.7877\Delta(INF(-2)) - 0.7694\Delta(GD(-1)) - \\ & \quad (139.24) \quad (8.5780) \quad (8.5246) \quad (1.5535) \\ & 0.15167\Delta(GD(-2)) - 0.6380\Delta(BD(-1)) - 0.2808\Delta(BD(-2)) - 0.0202\Delta(MS(-1)) + \\ & \quad (0.9225) \quad (0.3370) \quad (0.2738) \quad (0.5621) \\ & 0.0340\Delta(MS(-2)) - 5.6306ECM(-1) \end{aligned}$$

4

Since the vector error correction representation can be used to test causality, the result in Table 7 is also the Granger –causality result.

From the result, it appears that the error correction term in both equations were well defined, that is, their associated coefficients are negative and statistically significant at 0.95 level, which indicate a feedback of approximately 23.1 per cent (from INF equation) of the previous year's disequilibrium and a feedback of approximately 563.1 percent (for BD equation) of previous year's disequilibrium. This means that, the speed of adjustment to equilibrium here was from behind (that is from previous years) and highly significant in INF equation considering the fact that F-statistic of 2.5274 is greater than F-tabulated which was 2.4642. This confirms the significance of relationship between budget deficit and inflation in INF equation (that is equation 3). However, the value of F-statistic of 1.2253 which was less than the value of F-tabulated of 2.4642 indicated that the relationship between inflation and budget deficit in BD equation (that is equation 4), was insignificant.

The speed with which the model converges to equilibrium was shown by ECM coefficients. The equation of interest in this study was the INF equation. The results show that, the coefficient of ECM (-1) is -0.2309, it was properly signed and highly significant, indicating that the adjustment is in the right direction to restore the long-run relationship. The magnitude of (ECM (-1)) was lower in the BD equation than that of INF equation.

The interpretation of the ECM is further explained as follows. If there was a change in the level of inflation, that is, $\Delta INF \neq 0$, also, if there was disequilibrium in last period ($ECM \neq 0$). In which case some changes in inflation was necessary to restore equilibrium, or there was a change in the independent variables in the current period which was caused by changes in equilibrium condition (as shown in cointegration equation), this implies that inflation (INF_t) should also change. The anticipated signs and magnitude of the coefficients are as follows. The coefficient of ECM is the error correction or disequilibrium correction – coefficient. If the ECM coefficient is greater than zero it means there is a “surplus” of the dependent variable, therefore a reduction is required to restore equilibrium. But if otherwise as in Table 4.7, an increase is required through the independent variable (Patterson, 2000).

The significance of the error correction model is that, about 23.1 per cent of short run inconsistencies were being corrected and incorporated into long-run relationship among the variables and their past value in INF equation. The non-zero value of the ECM shows that there was disequilibrium in the previous growth in inflation, some changes in budget deficit is therefore necessary to restore equilibrium because the ECM value is less than zero while the speed of adjustment is about 23.1 per cent. This significance of ECM also supports the conclusion of co-integration. The short-run dynamics are capture by the individual parameter except that of the ECM term. The F-statistic for inflation equation is significant at 0.95 levels and probability of F-statistics shows that we reject the null hypothesis therefore there is no bidirectional causality between budget deficit and inflation in the Nigerian economy. This suggests that the causality is from budget deficit to inflation and not from inflation to budget deficit.

The degree of causality between budget deficit and inflation was explained by the value of R-squared. The value of R-squared from budget deficit equation was 0.3953 while the value of R-square from inflation equation was 0.5723. This explained that the degree of causality from budget deficit to inflation was about 57 per cent according to the value of R-squared from inflation equation. On the other hand, the degree of causality from inflation to budget deficit was about 40 per cent according to the value of R-squared from budget deficit equation. This implies that there is bi-directional causality between budget deficit and inflation but the degree of causality from budget deficit to inflation was higher and significant while the degree of causality from inflation to budget deficit was low and insignificant.

The R^2 adjusted (0.3459) for the inflation equation indicates that 34.6 per cent of variations in INF growth have been explained by the joint variation of the variables in the model. Also the R^2 adjusted (0.0723) for budget deficit equation indicates that 7.2 per cent of variations in growth of fiscal deficits have been explained by the joint variation of the variables in the model.

Although the result was contrary to the report of Aliyu and Englame (2009); Ogunmuyiwa (2008); who were of the opinion that budget deficit was not inflationary in Nigeria, it agreed with the research works of Iyoha (2000); Obadan (2001); Fatukasi (2006); and Oladipo and Akinbobola (2011) whose results of their research work indicated that budget deficit was inflationary in Nigeria. The result of this research work defer a bit with the result of the research work of Chimobi and Igwe (2010) which established bi-directional causality between budget deficit and inflation in Nigeria. However, the result of this research confirmed the result of research work of Oladipo and Akinbobola (2011) which said that there was uni-directional causality (from budget deficit to inflation) between budget deficit and inflation in the Nigerian economy.

5. Conclusion

Empirical evidence from this research work has shown that there is a positive relationship between budget deficits and inflation in the Nigerian economy. Thus, whenever there is a change in budget deficit, the rate of inflation is adversely affected in line with the empirical finding of the research work.

The results of this study shown that, there was uni-directional causality between budget deficit and inflation in Nigeria. Although, the degree of causality from budget deficit to inflation was much higher and significant, however, the degree of causality from inflation to budget deficit was very low and insignificant. These results provide the basis to conclude that efforts targeted at inflationary control could be best achieved if it was aimed at fiscal deficit reduction. Therefore any efforts targeted at controlling inflation could be best achieved by formulating policies geared towards reducing fiscal (budget) deficit.

The direct causal relationship between budget deficit and inflation according to the results of this research work, indicate that an increase in budget deficit will also lead to a corresponding increase in the level of inflation. Hence, for the level of inflation to be reduced in Nigeria, government need to cut down the current level of her expenditure, in form of reducing the level of her budget deficit, in order to reduce the rate of inflation.

5.1 Policy Implication and Recommendations

Based on the findings of this study which shown that, there was causal relationship between budget deficit and inflation in Nigeria, government should display a high sense of transparency in the fiscal operations to bring about realistic fiscal deficits. Fiscal deficits, where recorded should be channeled to productive investments like road construction, electricity provision and so on, that would serve as incentives to productivity through the attraction of foreign direct investment, in other to reduce the incidence of inflation in Nigeria.

Also, the implication of these findings was that both budget deficit and inflation could be caused by money supply meaning that they were both monetary phenomenon. Inflation was also found to be dependent on performance of the budget (deficit). The increase in money supply could as well help to cushion the extent of budget deficit in an economy, whereas, the same increase in money supply might still lead to an increase in the rate of inflation. Hence, adequate monetary policy should be geared towards balancing the role money supply performs to both budget deficit and inflation, noting that there was uni-directional relationship between budget deficit and inflation.

Based on the causal relationship that exist between budget deficit and inflation, relevant measures has to be put in-place in order to enhance policy coordination among various arms of government, especially monetary policy should be made to complement fiscal policy. According to the result of this research work, inflation has been established as monetary phenomenon in Nigeria. Then, for inflation to be curtailed, government should strongly adhered to fiscal discipline at all levels for budget deficit to be effective.

In the quest of Nigeria to achieve high and sustained long-run economic growth, monetary policy has to be strengthened to act as checks and balances, that is, monetary policy should be used to complement fiscal policy, in order to curtail inflation when budget deficit is used as fiscal policy instrument.

From the research study, it was impossible for aggregate demand side of the economy be motivated without causing inflation in an economy. Hence government has to employ policy mix so as to put inflation under control if the gain that government intends to achieve through the promotion of economic growth is not to be eroded.

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