INFLATION, BUDGET DEFICIT AND MONEY SUPPLY IN NIGERIA: A NEW OUTLOOK

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Abstract

Nigeria, a developing country habitually, employs money supply as a way of augment government revenue. This study employed time series dataset, over the period 1980-2010, to investigate the nexus among money supply, budget deficit, interest rate, exchange rate and inflation in Nigeria. Empirical findings of the study showed that the relationship between inflation, budget deficit, interest rate and the lag one of inflation is negative while the relationship between inflation and exchange rate was positive. Also, inflation rate in the preceding period did have significant impact in the succeeding period. The policy implication of these was that since all the estimated variables are monetary phenomena, adequate monetary policy should be employed to balance the role that money supply plays in budget deficit, interest rate and consequently moderate inflation in stabilizing the economy

JEL Classifications: E40, E51, E52.

Keywords: Money supply, laffer curve, budget deficit, inflation, interest rate.

1. Introduction and Background

Nigerian economy has experienced consistent acute fiscal (budget) deficit and relatively high inflation since 1980s. Various governments/regimes had increased public expenditures without corresponding increases in taxes, which equivocally had led to 'double digit' rate of inflation. Inflation adversely affects ability to make optimal decisions; and consequently, exerts negative effects on the growth rate of the economy. Fiscal deficit was at the forefront of macroeconomic

adjustment in the 1980s; in both developing and industrial countries. It was blamed in large part for the assortment of ills that beset developing countries during the decade: over indebtedness, leading to the debt crisis that began in 1982; high inflations and poor investment and growth performance (Easterly, William R., Paolo Mauro and Klaus Schmidt-Hebbel 2005). Deficit finance has been on the increase for sometimes in Nigeria and seigniorage[1] has always been used by successive administrations to monetise it. Theoretically, three major ways of financing government expenditures are taxes, debts and money supply. Countries make different choices to finance their deficits, partly because they differ in the extent to which other means of finance are available (Ibid).

The nexus among deficit finance, money supply, interest rate and inflation is a global issue. Various studies indicate a strong correlation between budget deficit and inflation; a few others found no evidence to confirm that budget finance is a major catalyst of inflation (Chimobi and Igwe, 2010).

Literature on inflationary finance such as Friedman (1971), Sergeant and Wallace (1981) among others gave rise to a laffer curve[2]. The Laffer curve shows that in general, there are two steady-state equilibria. There are essentially three alternative explanations of high inflation within this approach. A first explanation considers that the economy is on the "efficient" part of the Laffer curve and therefore inflationary trend is associated with larger seigniorage (this is clear in the analysis presented in Sergent and Wallace (1981). The second argues that the economy might be stuck at an equilibrium that lies on the "wrong" side of the Laffer curve (Fischer and Modigliani, 1978), budget deficits in this case are not the main explanation for inflation.

From a fiscal stance, the government can increase the revenue from seigniorage by reducing the rate on inflation. The common feature of these two views is that they consider high inflation as a stable long-run equilibrium. The third explanation sees high inflation as an unstable phenomenon (Kiguel 1985), whose main cause is the attempt to raise seignoirage in excess of the maximum warranted by the demand for money. According to this approach, once the economy reaches this point, inflation jump or accelerates and eventually reaches hyperinflation levels (Kiguel, 1985).

[1] Seigniorage can be described as revenue generated from increasing the stock of money in an economy.

[2] describes the relationship between inflation and seigniorage.

To determine which of these approaches is the most relevant to explain the actual behaviour of a particular economy depends on whether the long-run fiscal deficit is greater or smaller than the maximum long-run revenue from money creation.

Traditional economic analysis takes the behaviour of policy makers, in particular the behaviour of monetary authorities as exogenous, but most economists agree with the view that inflation is a monetary phenomenon in the sense that there would be no inflation in the long run without sustained increases in money supply. This leads to the obvious policy statement that long-run price stability can be achieved by limiting the rate of monetary growth to the long-run real rate of growth of the economy.

Although, some works have been on inflation, budget deficit, hyper-inflation and money supply etcetera; this study is an extension as it includes many variables as regressors of inflation.

This paper assesses the relationship between inflation (explained variable); fiscal deficit, interest rate, budget deficit, exchange rate and money supply (explanatory variables) between1980-2010. The choice for that period is due to the fact that Nigeria's debt crisis and austerity measures suggested by International Monetary Fund (IMF) took their woes on the economy.

Apart from the introduction and background, the paper is organized as follows: the next section offers a review of related studies; empirical model and data are described in section three. Section four presents and discusses the results while the final section features conclusion.

2. RELATED LITERATURE

Lack of a strong positive correlation between the size of budget deficit, money supply and the rate of inflation is a commonplace in the literature. Meridor (1998) shows in the case of Israel in 1980 that the rate of inflation increased from about 130% to about 400% in 1984, government budget deficit to GNP ratio shows a small increase from 17% to 19%. Likewise, money supply to GNP ratio rose only from 2.9% to 2.9%. Sergeant and Wallace (1981) also lent credence to it in the European hyper-inflation of the 1920s.

Eckstein and Leiderman (1992) results show that the ratio of money supply to GNP is an increasing function of the rate of inflation. This is in contrast with the notion that inflation rates in Israel in the mid-eighties exceeded the revenue-maximizing rate. The reason for the differential seems to be difference in econometric approaches. Eckstein and Leiderman (1992), using estimated and observed parameters found that money supply rises with the rate of inflation. The simulated relation between money supply and the rate of inflation appears to be more closely than the Laffer curve that arises from a model based on Cagan-type money demand. The difference was due to the fact that they assume different rates of inflation.

Money supply seems to be a less attractive method of government financing in industrial countries but averagely, it is five times higher in developing countries than in the industrial economies. In the 1990s, average seigniorage revenue represented 14.85% of total government revenues for developing countries compared to only 1.64% for industrial countries. (Aisen and Verga, 2007).

Confirming previous results by Cukierman (1992); Aisen ang Verga (2007) found that greater political instability leads to higher money supply. On the other hand, Easterly and Pfutze (2005), in their empirical analysis on the relationship between fiscal deficit and inflation found a positive relationship between fiscal deficit and money supply.

Egwaikhide (1991) examined the determinants of fiscal deficits. He finds that inflation, revenue instability (or slow growth of revenue) and increased government participation in the economy has been important determinants of budget deficits. Ojo and Okunrounmu (1992) investigated the role of fiscal policy in developing countries with specific reference to Nigeria and observed that the narrow revenue base of Nigeria that could not withstand the weight of public expenditure and investment led to more money supply. They found that as fiscal deficit financed by borrowing from the banking system increased, macroeconomic instability and the public debt burden escalated.

Lack of correlation across countries between deficits and inflation and between deficits and interest rates is primarily attributable to the different ways in which countries finance their public deficits. Any notion that fiscal deficits and inflation display a simple relationship fails for two reasons. The first is that countries make different choices about seigniorage to finance their

deficits because they differ in the extent to which other means of finance are available. The second reason is that money creation and inflation are nonlinearly related (Easterly and Pfutze, 2005).

According to Easterly, William R., Paolo Mauro and Klaus Schmidt-Hebbel (1995), studying inflation is different from studying money supply, especially for developing and high inflation countries, Aisen and Verga (2007) corroborated Easterly *et al* (1995), the correlation between inflation and money supply in their study fluctuates significantly depending on the rate of inflation. While it is positive most of the time and for most of the countries, it declines with the level of inflation and becomes negative for inflation rates above 400% per year. Thus, it is misleading to assume that the determinants of inflation are necessarily the same as those of money supply.

Cukierman (1992) used a probit model to show evidence that higher political instability and ideological polarization lead to higher money supply. Similarly, Aisen and Verga (2007) employed more direct measures of political instability such as number of cabinet changes, executive changes or government crises taking place in a year in about 100 countries. They used a dummy variable for democratic regimes as a proxy for ideological polarization. Their result also shows that money supply is an increasing function of political instability.

Ignacio (2008) analyzed the evidence of the causal long-term relationship between budget deficit, money growth and inflation in Colombia considering the standard money (M1), the narrowest money (MO-base) and the broadest money (M2) definitions of money supply. Using a vector error correction (VEC) model with quarterly data over the last 25 years, the study found a close relationship between inflation and money growth on the one hand, and between growth and fiscal deficit, on the other. (Chimobi and Igwe, 2010).

Tekin-Koru and Ozmen (2003) investigated the long-run relationships between budget deficit, inflation and monetary growth in Turkey considering two alternative trivariate systems corresponding to the narrowest and the broadest monetary aggregate. They found that while the joint endogeneity of money and inflation rejects the validity of the monetarist view, lack of a direct relationship between inflation and budget deficits makes the pure fiscal theory explanation illegitimate for the Turkish case. Consistent with the policy regime of financing domestic debt

through commercial banking system, budget deficits led to a growth not of currency but of broad money in Turkey. This mode of deficit financing, leading to a creation of near money and restricting the scope for an effective monetary policy, may not be sustainable, as the government securities/broad money ratio cannot grow without limit (Ibid).

In addition, Chaudhary and Parai (1991) used a rational expectations macro model of inflation to find out the effect of the anticipated budget deficit on inflation rates for the Peruvian economy. They concluded that the country's huge budget deficit as well as high rates of growth of money did have a significant impact on the inflation rate (Ibid).

Mohammad and Naved (1995) studied money supply, deficit and inflation in Pakistan based on the monetarist and quantity theory approaches to inflation and came out with the findings that suggested that the domestic financing of budget deficit particularly from the banking system, is inflationary in the long run. The results provided support for a positive relationship between budget deficit and inflation during acute inflationary period, i.e. 1970s. They also found that money supply is not exogenous rather it depends on the position of international reserves and fiscal deficits.

Chimobi and Igwe (2010) posited that there was a long-term relationship between inflation and money supply. It also indicated that money supply in the Nigerian economy determined the extent of budget deficit.

Poterba and Rotemberg (1990) provided some cross- country evidence on the joint movements of inflation and other tax revenue. In general, their result is not favourable to the hypothesis that money supply has been set on the basis of optimal finance considerations. Although, they found that there exists a positive relationship between tax rates and inflation for the United States and Japan, while it is a negative relationship for France, Germany and the United Kingdom (Ibid).

Omoke and Oruta (2010) analyzed the causal long term relationship between budget deficit, money growth and inflation in Nigeria. The results point to a close long–term relationship between inflation and money supply. With regard to the role of the fiscal deficit, the VEC estimates provide evidence that a one percentage increase in the fiscal deficit (as a share of GDP)

leads to an increase of almost 0.94 percent in the money supply (M2) growth rate. The results from the test indicated that Money supply causes fiscal deficit which means that the level of money supply in the Nigerian economy determines whether there has been or there will be fiscal deficit. Inflation and budget deficit revealed a bilateral/feedback causality proving that the changes that occur in inflation could be explained by its lag and also the lag values of budget deficit; in the same vein changes that occur in budget deficit is explained by its lagged values and the lagged values of inflation.

Cevdet, Emre and Suleyman (1996) used annual Turkish data to analyse the existence of a stable long-run relationship between budget deficits, money growth and inflation; and the results according to them was affirmative but concluded that a significant impact of budget deficits on inflation could not be refuted under the assumption of long-run monetary neutrality. However, utilizing an unrestricted VAR model using quarterly data corresponding to the post-bond financing period, the results were suggestive of a weakened link from the other variables to inflation. A further check using an ARIMA approach validated the same result and it is shown that the inertia in the inflation process was increasing over time.

De Haan and Zelhorst (1990) analysed the relationship between government budget deficit and money growth in the developing countries. The overall conclusion of their study did not provide much support that government budget deficit influences monetary expansion and, therefore, create inflation.

3 **THE EMPIRICAL MODEL**

The model of this paper is different from previous studies (Buiter, 2007; Easterly and Pfutze, 2005); because their studies were based on cross country data; but modifies Chimobi and Igwe (2010) model that based its analysis on the Nigerian economy. In analysing the relationship among money supply, fiscal deficit and inflation, ordinary least square (OLS) method was employed. Data covering 1980 – 2010 were sourced from Central Bank of Nigeria Statistical Bulletin (2010).

The model is specified as:

$$\mathbf{Inf_t = a_0 + a_1 Inf(-1) + a_2 \log M2_t + a_3 \log Bd_t + a_4 int.rate_t + a_5 exc.rate_t + e_t} \quad \mathbf{(1)}$$

Where:
Inf_t is inflation at time t
Inf(-1) is lagged inflation
$M2_t$ is money supplyat time t
Bd_t is growth rate of budget deficit at time t
Int.rate represents interest rate at time t
exc.rate is echange rate at time t
a_0 is the constant term
e_t is the random error term.

4. RESULTS AND DISCUSSION

TABLE 1: STATIONARITY TEST RESULTS (AUGMENTED DICKEY FULLER)

Variables	t statistic (5%)*	t statistic (10%)**	Order of Integration
M2	-2.967767	-2.622989	1(1)
Bd	-2.967767	-2.622989	1(1)
Int.rate	-2.967767	-2.622989	1(1)
Exc.rate	-2.967767	-2.622989	1(1)
Inf.	-2.981038	-2.629906	1(1)

Note: (a) All the variables are stationary at first difference. The asymptotic critical values of the Augumented Dickey Fuller unit root tests are in their respective level of significance.
(b)* and ** denote the rejection of the null hypothesis at 5% and 10% levels of significance respectively.
Sources: Author's Computation with E-vies 7

It is common to test the stability of time series data in economic analysis before the main estimation. Most economic variables are not stationary at levels hence, they have to be differenced (Gujarati, 2003). From the unit root test on U_t the MacKinnon approximate p-values show that the variables are stationary at first difference. Therefore, it is inferred that they all have a short-run relationship at both 5% level of significance using the tau-statistic. It is therefore, necessary to estimate the short run dynamism of the model.

A formal test that shows the functional relationship of equation (1) was estimated and the results are presented in Table 2:

TABLE 2: EMPIRICAL RESULTS

Variable	Coefficient
Inflation(-1)	-129795.8 (-0.801330)
Money supply	-0.337895 (2.061594)
Budget deficit	-36.58165 (-5.358582)
Interest rate	-129795.8 (-0.801330)
Exchange rate	25186.53 (0.782477)
R^2	0.6486
F statistic	3.9
D-Watson statistic	1.2

NOTE: Standard errors are in parentheses.
SOURCE: Author's Computation with E-vies 7, 2013.

The results presented in Table 2 are the OLS estimates of the relationship among inflation, deficit budget, interest rate, exchange rate and money supply. Standard error is used in deciding if the estimates are significantly different from zero or statistically reliable.

The rule of thumb of standard error asserts that the significance of coefficient must be less than half of the coefficient of the regressor, that is, S.E (b0) < bo/2 etc. From the estimated results above, it is observed that lagged inflation value, budget deficit, interest rate and exchange rate are statistically significant while (M2), money supply is not significant at 5%. By implication, changes in all the regressors affect inflation while a change in M2 leaves it unaffected.

The adjusted - R^2 of 60% shows that the model has a good fit, with 60% of inflation rate being explained by budget deficit, interest rate, exchange rate, money supply and previous year inflation rate while the remaining percentage (40%) is explained by factors not captured in the model. The F-statistic reveals the overall significance of the explanatory variables at 5% level of significance. The Durbin Watson statistic shows that there is no evidence of the error term being serially correlated.

CONCLUSION

Past empirical studies of the association between inflation and its regressors in Nigeria are negative with a close short term relationship, but the findings of this study show that despite high reliance on money supply in Nigeria, the relationship between money supply, interest rate, lagged inflation, budget deficit and inflation is highly negative, implying that there is no strong support for a positive association between inflation and its explanatory variables. In addition, the results depict that lagged inflation, interest rate; budget deficit and exchange rate are the drivers of inflation in Nigeria. The policy implication of these is that since all the estimated variables are monetary phenomena, adequate monetary policy should be employed to balance the role money supply plays in enhancing budget deficit, interest rate and consequently moderate inflation in stabilizing the economy.

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APPENDICES

Null Hypothesis: D(LNM2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.012208	0.0003
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNM2,2)
Method: Least Squares
Date: 06/27/13 Time: 15:06
Sample (adjusted): 1982 2010
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNM2(-1))	-0.958895	0.191312	-5.012208	0.0000
C	0.262067	0.077832	3.367107	0.0023

R-squared	0.481987	Mean dependent var	0.002884
Adjusted R-squared	0.462801	S.D. dependent var	0.427398
S.E. of regression	0.313256	Akaike info criterion	0.582883
Sum squared resid	2.649499	Schwarz criterion	0.677179
Log likelihood	-6.451803	Hannan-Quinn criter.	0.612415
F-statistic	25.12223	Durbin-Watson stat	2.011656
Prob(F-statistic)	0.000029		

Null Hypothesis: D(BD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.141238	0.0032
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BD,2)
Method: Least Squares
Date: 06/27/13 Time: 15:07

Sample (adjusted): 1982 2010
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BD(-1))	-0.824127	0.199005	-4.141238	0.0003
C	-31811.02	31156.20	-1.021017	0.3163

R-squared	0.388446	Mean dependent var	-8559.366
Adjusted R-squared	0.365796	S.D. dependent var	207233.5
S.E. of regression	165034.4	Akaike info criterion	26.93217
Sum squared resid	7.35E+11	Schwarz criterion	27.02646
Log likelihood	-388.5164	Hannan-Quinn criter.	26.96170
F-statistic	17.14985	Durbin-Watson stat	1.953360
Prob(F-statistic)	0.000304		

Null Hypothesis: D(EXC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.756475	0.0007
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXC,2)
Method: Least Squares
Date: 06/27/13 Time: 15:08
Sample (adjusted): 1982 2010
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXC(-1))	-0.913930	0.192144	-4.756475	0.0001
C	3.988914	2.659106	1.500096	0.1452

R-squared	0.455909	Mean dependent var	-0.068621
Adjusted R-squared	0.435758	S.D. dependent var	18.05587
S.E. of regression	13.56286	Akaike info criterion	8.119020
Sum squared resid	4966.682	Schwarz criterion	8.213316
Log likelihood	-115.7258	Hannan-Quinn criter.	8.148552
F-statistic	22.62406	Durbin-Watson stat	2.005961
Prob(F-statistic)	0.000059		

Null Hypothesis: D(INT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.539328	0.0000
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INT,2)
Method: Least Squares
Date: 06/27/13 Time: 15:09
Sample (adjusted): 1982 2010
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INT(-1))	-1.460512	0.171034	-8.539328	0.0000
C	0.519704	0.783722	0.663123	0.5129

R-squared	0.729784	Mean dependent var	-0.052414
Adjusted R-squared	0.719776	S.D. dependent var	7.943566
S.E. of regression	4.205020	Akaike info criterion	5.776907
Sum squared resid	477.4191	Schwarz criterion	5.871203
Log likelihood	-81.76515	Hannan-Quinn criter.	5.806439
F-statistic	72.92012	Durbin-Watson stat	2.166743
Prob(F-statistic)	0.000000		

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.995583	0.0004
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF,2)
Method: Least Squares
Date: 06/27/13 Time: 15:09
Sample (adjusted): 1985 2010
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	-2.235740	0.447543	-4.995583	0.0001
D(INF(-1),2)	1.112587	0.360663	3.084839	0.0056

D(INF(-2),2)	0.635045	0.263102	2.413680	0.0250
D(INF(-3),2)	0.456286	0.175192	2.604484	0.0166
C	-0.265541	3.334946	-0.079624	0.9373

R-squared	0.682648	Mean dependent var	0.846154
Adjusted R-squared	0.622200	S.D. dependent var	27.59523
S.E. of regression	16.96154	Akaike info criterion	8.670815
Sum squared resid	6041.567	Schwarz criterion	8.912756
Log likelihood	-107.7206	Hannan-Quinn criter.	8.740485
F-statistic	11.29314	Durbin-Watson stat	1.734477
Prob(F-statistic)	0.000048		

Dependent Variable: M2
Method: Least Squares
Date: 06/27/13 Time: 15:11
Sample: 1980 2010
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INT	-129795.8	161975.4	-0.801330	0.4299
INF	13589.01	75486.94	0.180018	0.8585
EXC	25186.53	32188.22	0.782477	0.4407
BD	-36.58165	6.826741	-5.358582	0.0000

R-squared	0.648658	Mean dependent var	4556875.
Adjusted R-squared	0.609621	S.D. dependent var	11620438
S.E. of regression	7260491.	Akaike info criterion	34.55371
Sum squared resid	1.42E+15	Schwarz criterion	34.73874
Log likelihood	-531.5825	Hannan-Quinn criter.	34.61402
Durbin-Watson stat	1.211819		