DO FISCAL DEFICITS RAISE INTEREST RATES IN NIGERIA? A VECTOR AUTOREGRESSION APPROACH

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Abstract: *The paper examines the effects of fiscal deficits and government debt on interest rates in Nigeria, by applying the Vector Auto-regression approach. The results confirm a positive interest rates effect of fiscal deficits and debt. It is recommended that government revenue base should be increased, while unnecessary spending should be discouraged. Moreover, where deficit financing is inevitable, it should be put into productive activities in order to create more employment opportunities, raise national output, and increase the living standard of the people. This should check interest rates from rising*

Key words: *Fiscal deficits; government debt; interest rates; vector auto-regression*

Introduction

The controversies surrounding the exact relationship between public sector deficits (and government debt) and interest rates motivated this study. Easterly and Schmidt-Hebbel (1993) argued that the relationship between fiscal deficits and interest rates is a complex one because countries finance their deficits in different ways. On the one hand, under a repressed financial sector, taxes on financial assets are a major source of revenue for the government. On the other hand, in a liberalized financial system, where the government finances its deficits via domestic borrowing, public sector will compete with the private sector for loans. This puts upward pressure on interest rates. The World Bank (1993) opined that in economies where financial markets are not repressed, higher deficits financed by domestic debt increase domestic real interest rates when external borrowing is not possible. However,

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if financial markets are integrated with world capital markets, higher domestic borrowing results in international capital inflows and higher foreign debt. Thus the impact on domestic real interest rates will not be much. Moreover, in countries where the financial markets are repressed (that is, interest rate control, compulsory public debt placements, and controls on external capital flows), given a fixed nominal interest rate fiscal deficits raise inflation, resulting in a repressed (even negative) real interest rates (World Bank, 1993).

In Nigeria and many countries of the world, government deficits can be financed by borrowing from the Central Bank (deficit financing or money creation), borrowing from the domestic money market (mainly from the banks) or borrowing from abroad. One of the most important objectives of Nigeria's fiscal policy is to reduce national debt and to check the interest payments on such debt from rising, and prevent it from leading to higher deficits in the future.

Unfortunately, in Nigeria, government fiscal deficits increased continuously in the past two decades. For instance, deficits increased from N3,902.10 million in 1981 to N8,254.30 million in 1986 and further to N15,134.70 million in 1989. The rising trend of deficits continued except in the year 1995 when it was registered a surplus (that is N1,000 million). By the year 1998, overall deficits had jumped to N133,389.30 million and further to N301,401.60 million in 2002. Beginning from 2003, government fiscal deficits declined moderately from N202,724.70 million to N172,601.30 million, N161,406.30 million, and N101,397.50 million in 2004, 2005 and 2006; respectively (see appendix 1). Similarly, fiscal deficits as a percentage of GDP (at 1990 factor cost), deteriorated from -3.8 percent in 1981 to -5.7 percent in 1986 and further to -9.5 percent in 1993. However, the value of deficits as a percentage of GDP declined to -0.1 percent in 1997 only to rise to -5.9 percent in 1999. The share of deficits in total GDP has been declining, from -2.0 percent in 2003 to -1.1 percent and -0.6 percent in 2005 and 2006, respectively (appendix 1).

Government debt (domestic debt and external debt) increased continuously, from N13,526.70 million in 1981 to N69,892.60 million in 1986 and further to N960,994.10 million in 1996, before falling to N954,961.10 million in 1996. Total debt assumed a rising trend, moving from N1,170,507.90 million in 1998 to N3,995,637.80 million and N6,260,594.70 million in 2000 and 2004, respectively. However, the value of government debt dropped to N4,220,978.80 million in 2005 and further to N2,204,720.70 million in 2006. In the same vein, government debt as a percentage of GDP (at 1990 factor cost) also worsened during the period under review. For example, the share of government debt in total GDP increased from 5.4 percent in 1981 to 27.1 in 1986 and further to 261.1 percent in 1993. Even though the value of debt declined to 252.7 percent in 1997, it soon rose sharply to 857.8 percent in 1999. Government debt as a percentage of GDP continued to increase, jumping to 1128.6 percent in 2002 and 1186.7 percent in 2004, but again declined to 751.2 percent and 370.0 percent in 2005 and 2006, respectively (appendix 1).

The interest rate (lending rate) also showed a rising trend during the period under review. For example, interest rate increased from 7.75 percent in 1981 to 10.50 percent in 1986 percent and to a record high of 26.80 percent in 1989. In 1995, interest rate dropped to 20.18 percent only to rise again to 21.32 percent in 1999 and 24.40 percent in 2002. The value of interest rate has being falling, moving from 20.48 percent in 2003 to 19.15 percent, 17.85 percent and 17.30 percent, in 2004, 2005 and 2006; respectively (see appendix 1).

Large fiscal deficit has adverse effects the economy because it tends to reduce national savings, which in turn reduces domestic investment and increases borrowing from abroad. Besides, a low level of national savings raises inflation and domestic interest rates, and crowds out private (sector) investment. The reduction in investment in turn affects employment as firms/businesses reduce their demand for labour and other factor inputs. All of these reduce national output, which in turn lead to trade deficits and balance of payments problems, and reduction in the overall wellbeing of the people.

Given that the priorities of this administration include amongst others: making Nigeria one of the largest twenty (20) economies in the world by the year 2020 and improving the standard of living of the people; sustenance of the declining debt and attainment of stability of real interest rates in order to promote production activities in the economy, it is important to investigate the effect of government deficits on interest rate.

The paper is organized as follows: section one is the introduction while section two is the literature review and theoretical framework. Section three contains model specification and estimation, while section four discusses results. Section five is for recommendations and conclusion.

Literature review and theoretical framework

This section reviews past relevant studies on the relationship between government fiscal deficits (and government debt) and interest rates. Many studies have shown that large deficits lead to increase in interest rates. For instance, Wachtel and Young (1987) discovered that a 1 percentage increase in the projected deficit-GDP ratio raises interest rates on the order of 6 to 16 basis points. Similarly, study by Cohen and Garnier (1991) indicated a significant positive effect of deficit-GDP ratio on interest rates. A 1 percentage increase in deficit-GDP ratio is projected to raise interest rates on the order of 40 to 55 basis points. Laubach (2003) discovered that fiscal deficit has a significant effect on interest rate. A one percentage increase in the projected deficit-to-GDP ratio is estimated to raise long term interest rates by approximately 25 basis points. Similarly, interest rate rises by about 4 basis points in response to a percentage point in the projected debt-GDP ratio. Similarly, Stephen Miller and Frank Russek (1990) Elmendorf (1993) and Canzoneri et al (2002) and Shapiro (2004) suggested that rising interest rates are associated with federal deficits.

Moreover, Gale and Orszag (2003) indicated that a projected rise in the budget deficits-GDP ratio of 1 percentage result in an increase in the long term interest rates by 0.4 to 0.6 percentage points. In the same manner, Qiang Dai and Thomas Phillipon (2004) findings indicated that a 1 percentage point increase in the deficits increases 10 year (interest) rate by 41 basis points. Furthermore, Kimberly (2008) indicated that expected future fiscal deficits increases current long term interest rates. Patnaik (2000 and 2001) reported that, given money supply, fiscal deficits may raise interest rate by increasing the demand for money. He argued further that the link would be effective only if bank credit had supply-constrained. In India, Deepak Lal et al (2001) observed that the financing of large fiscal deficits (sales of bonds) has led to higher real interest rates and crowding out of private investment. Surprisingly, Bhalla (1995) argued that, because of the floor on interest rates, causation does not run from high fiscal deficits to high interest rates in India. The author

concluded that, causation runs from high interest rates to high fiscal deficits, and that to reduce deficits, interests should be reduced.

As reported by Gosselin and Lalonde (2005), real interest rates rise by 3 basis points for every 1 percentage point increase in the government debt-to-GDP ratio. According to Dellas et al (2005) the effect of deficits on interest rates increases with financial openness. Ari Aisen and David Hauner (2007) discovered overall highly significant positive impact of budget deficits on interest rates, but the impact depends on interaction term and is only significant when deficits are high, mostly domestically financed or interact with high domestic debt, when financial openness is low, interest rate liberalized or financial depth is low.

Some studies did not support the view that large deficits and debt raise interest rates (Elmendorf and Mankiw, 1999). They include Evans (1987), Plosser (1987), and Chakraborty (2002) who found no link between budget deficits and interest rates, and David et al (2003) who reported that the yield (interest rate) on 10 year bonds declined through out the 1980s, even as the fiscal deficits moved above 4% of GDP. The study of James Barth et al (1991) is consistent with the ones reported above. The report of the Reserve Bank of New Zealand (1986) and Stephen Kirchner (2007) are also in line with the ones mentioned above. In Namibia, Hoster Bebi (2000) discovered a statistically insignificant effect of domestic debt-GDP ratio on lending rate, and significant fiscal deficits effect on interest rate. Elsewhere, Goyal (2004) asserted that there is a feedback relationship between fiscal deficits and interest rates. Anyanwu (1998) applied regression analysis to pooled cross-section and time series data for Nigeria, Ghana and the Gambia. The results did not reveal a significant positive association between overall fiscal deficits (and its foreign financing) and domestic nominal deposit interest rates. However, the author reported a significant positive relation between domestic financing of the fiscal deficits and domestic nominal deposit rates. He concluded that the concern of economists in the Sub-region should shift from the deficits itself to the manner of financing the deficit.

This study is very important because past studies have focused more on the effects of deficits (Anyanwu, 1998). In addition, is the importance of interest rate on investment, savings, and all intertemporal decisions (Anyanwu, 1998). Moreover, our paper attempts to examine the effects of both fiscal deficits and government debt on interest rates in Nigeria.

Model Specification and Estimation

This study uses a vector autoregression model to examine the effects of fiscal deficits and government budget, on the interest rates. The interest rates would be captured by the lending rate. As argued by Bhalla (1995) and Deepak Lal et al (2002), given that most interest rates are highly correlated the (domestic) lending rate is used as a statistical proxy for the nominal interest rates. Thus, our econometric model expresses interest rates (INT) as a function of fiscal deficits (FDEF) and government debt (GOV). Thus, the model is specified as:

$$INT = (FDEF, GOV, U_t) \qquad\qquad\qquad (1)$$

Inflation is also expected to have a lasting effect on interest rates. Thus, we shall include inflation rate (INFL) as an important explanatory variable in the model. Moreover,

international interest rate, USINT (proxied by the United States interest rate) is expected to influence the domestic rate, therefore it would be included in our interest rate model. Thus, the model above would be transformed into the new model presented below:

INT=f(FDEF, GOV, INFL, USIN, Ut)   (2)
     [+]   [+] [+]   [+]

INT   refers to interest rates, and it is proxied by the domestic lending rate. The data is obtained from the Central Bank of Nigeria bulletin 2006.

FDEF is the ratio of overall fiscal deficits to GDP. The data is obtained from the Central Bank of Nigeria bulletin 2006.

GOV refers to government total debt to GDP ratio. The data for the two variables is obtained from the Central Bank of Nigeria bulletin 2006.

USIN refers to the international interest rate, and it is proxied by the United States interest rate. The data is obtained from the International Financial Statistics various issues.

INFL   refers to inflation rate. The data is obtained from the Central Bank of Nigeria bulletin 2006.

Ut   is the error term.

Before the regression analysis, we perform a stationarity test on the variables. Economic theory requires that variables be stationary before application of standard econometric techniques. This is to avoid misleading results. In performing the stationarity test we used a maximum lag of 4, and excluded both intercept and trend. The result of the stationarity test is presented below.

Table 1. ADF-Fuller (Stationarity) test for variables

Variable	ADF-statistic	Critical value	Decision rule
INT	-7.857560 (0.0000)	1%=-2.664853 5%=-1.955681 10%=-1.608793	Stationary at 1st difference
INFL	-4.771706 (0.0000)	1%=-2.664853 5%=-1.955681 10%=-1.608793	Stationary at 1st difference
FDEF	-5.445570 (0.0000)	1%=-2.664853 5%=-1.955681 10%=-1.608793	Stationary at 1st difference
GOV	-2.460505 (0.0163)	5%=-1.955681 10%=-1.608793	Stationary at 1st difference
USIN	-4.099371 (0.0003)	1%=-2.664853 5%=-1.955681 10%=-1.608793	Stationary at 1st difference

The stationarity test reveals that all the variables are stationary at first difference. Next, we perform the Granger-causality test on fiscal deficits and government debt, and interest rate (variables of interest). The decision rule requires that, for a high F-Statistic value and low probability value we reject null hypothesis and accept the alternative hypothesis. However, given a low F-Statistic and high probability value, we accept the null and reject the alternative hypothesis. The outcome of the causality test is presented below.

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Pairwise Granger Causality Tests
Date: 02/11/09   Time: 17:16
Sample: 1981 2006
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
FDEF does not Granger Cause INT	24	0.73612	0.49214
INT does not Granger Cause FDEF		0.03527	0.96541
GOV does not Granger Cause INT	24	0.06202	0.94005
INT does not Granger Cause GOV		0.11682	0.89038

As indicated by the results, while causality runs from fiscal deficits to interest rates, the same cannot be said of government debt because of the low F-Statistic and high probability value. This implies that, government deficits predict interest rates, but government debt does not predict interest rate in Nigeria. Lastly, we estimate the quantitative effect of fiscal deficits and government debt on interest rate, using the vector auto-regression (VAR) approach. The result of the estimation is presented below:

$$INT = 3.9162 + 0.4917 LEND(-2) - 0.1412 INFL(-2) - 1.4976 USIN + 2.4705 GOV + 19.9528 FDEF$$

S. E.   (10.5545)   (0.2541)   (0.9710)   (0.9710)   (1.2154)   (11.9684)

t   [0.3710]   [1.9352]   [-1.9634]   [-1.5423]   [2.0326]   [1.6671]

R^2 0.7361

F-Statistic 1.7932

Discussion of Results

The results of the estimation show that the explanatory variables account for approximately 73.6 percent variation in interest rate in Nigeria. The estimation also shows that fiscal deficits and government debt (our variables of interest) are statistically and economically significant. For instance, a 1 percentage increase in government debt-GDP ratio raises interest rate by approximately 2.47 percentages. This is consistent with the work of Wachtel and Young (1987), Cohen and Garnier (1991), Laubach (2003), Gale and Orszag (2003), Qiang Dai and Thomas Phollipon (2004) who discovered that higher deficits lead to higher interest rates. Moreover, A 1 percentage increase in fiscal deficits-GDP ratio in the previous two years is found to raise interest rates by approximately 19.95 percent. These findings are in line with Laubach (2003), Gosselin and Lalonde (2005) who indicated that rising debt raises interest rates. The results also indicate that inflation is statistically significant but it is negatively signed. A 1 percentage increase in inflation in the previous two years leads to approximately 0.14 percentage decrease in interest rate. Furthermore, the estimation revealed that international interest rate is statistically significant. A 1 percentage increase in international interest rate in the previous two years causes the Nigerian interest rate to fall by approximately 1.50 percentage. Finally, it is shown that the lagged value of interest rate has a significant positive influence on current interest rate. A 1 percentage increase in interest rate in the previous two years leads to an increase in the interest rate by approximately 0.49 percentage.

Recommendations and Conclusion

This paper investigates the effect of fiscal deficits and government debt on interest rates in Nigeria. The authors used VAR approach to estimate the effects of fiscal deficits and government debt (including inflation and international interest rate) on interest rates. The results indicate that fiscal deficits and government debt have positive impact on interest rates, but inflation and international rate were found to have negative effect on interest rates. Some policy implications can be drawn from our findings. For instance, deficits financing leads to huge debt stock and tends to crowd-out private sector investment, by reducing the access of investors to adequate funds, thereby raising interest (and/or lending) rates. The rise in interest rate reduces investment demand and output of goods and services. These inturn reduce national income as well as employment rate, and the overall welfare of the people would decline. Thus, government should make efforts to reduce unnecessary spending, because experience has shown that a large proportion of government expenditures have been channeled to unproductive ventures.

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Appendix 1.

Macroeconomic indicators

Year	Lending rate (%)	Inflation rate (%)	Government debt (Nm)	Overall fiscal deficits (Nm)	United States. Interest rate (%)	Gross domestic product, at 1990 factor cost (Nm)	Government debt-GDP ratio	Overall fiscal deficits-GDP ratio
1981	7.75	20.9	13526.7	-3,902.10	16.38	251,052.30	0.05388	-0.01554
1982	10.25	7.7	23829.9	-6,104.10	12.26	246,726.60	0.096584	-0.02474
1983	10	23.2	32802	-3,364.50	9.09	230,380.80	0.142382	-0.0146
1984	12.5	39.6	40483.7	-2,660.40	10.23	227,254.70	0.178142	-0.01171
1985	9.25	5.5	45252.6	-3,039.70	8.1	253,013.30	0.178855	-0.01201
1986	10.5	5.4	69892.6	-8,254.30	6.81	257,784.50	0.271128	-0.03202
1987	17.5	10.2	137579.7	-5,889.70	6.66	255,997.00	0.537427	-0.02301
1988	16.5	38.3	180987.4	-12,160.90	7.61	275,409.60	0.657157	-0.04416
1989	26.8	40.9	287444.8	-15,134.70	9.22	295,090.80	0.974089	-0.05129
1990	25.5	7.5	382707.5	-22,116.10	8.1	328,606.10	1.164639	-0.0673
1991	20.01	13	444653.9	-35,755.20	5.7	328,644.50	1.352994	-0.1088
1992	29.8	44.5	706164.3	-39,532.50	3.52	337,288.60	2.09365	-0.11721
1993	18.32	57.2	894238	-107,735.30	3.02	342,540.50	2.610605	-0.31452
1994	21	57	908173.9	-70,270.60	4.2	345,228.50	2.630646	-0.20355
1995	20.18	72.8	965640.1	1,000.00	5.84	352,646.20	2.738269	0.002836
1996	19.74	29.3	960994.1	32,049.40	5.3	367,218.10	2.616957	0.087276
1997	13.54	8.5	954961.1	-5,000.00	5.46	377,830.80	2.527483	-0.01323
1998	18.29	10	1170508	-133,389.30	5.35	388,468.10	3.013138	-0.34337
1999	21.32	6.6	3372181	-285,104.70	4.97	393,107.20	8.578273	-0.72526
2000	17.98	6.9	3995638	-103,777.30	6.24	412,332.00	9.690341	-0.25168
2001	18.29	18.9	4193267	-221,048.90	3.89	431,783.20	9.71151	-0.51194
2002	24.4	12.9	5098886	-301,401.60	1.67	451,785.70	11.28607	-0.66713
2003	20.48	14	5808009	-202,724.70	1.13	495,007.20	11.73318	-0.40954
2004	19.15	15	6260595	-172,601.30	1.35	527,576.00	11.86672	-0.32716
2005	17.85	17.9	4220979	-161,406.30	3.21	561,931.40	7.511555	-0.28723
2006	17.3	8.2	2204721	-101,397.50	4.96	595,821.61	3.700303	-0.17018

Source: Central Bank of Nigeria (2006), International Financial Statistics (Various issues)

Appendix 2.

Variables considered for regression analysis

Year	Lending rate (%)	Inflation (%)	United States interest rate (%)	Government debt-GDP ratio	Overall fiscal deficits-GDP ratio
1981	7.75	20.9	16.38	0.05388	-0.01554
1982	10.25	7.7	12.26	0.096584	-0.02474
1983	10	23.2	9.09	0.142382	-0.0146
1984	12.5	39.6	10.23	0.178142	-0.01171
1985	9.25	5.5	8.1	0.178855	-0.01201
1986	10.5	5.4	6.81	0.271128	-0.03202
1987	17.5	10.2	6.66	0.537427	-0.02301

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1988	16.5	38.3	7.61	0.657157	-0.04416
1989	26.8	40.9	9.22	0.974089	-0.05129
1990	25.5	7.5	8.1	1.164639	-0.0673
1991	20.01	13	5.7	1.352994	-0.1088
1992	29.8	44.5	3.52	2.09365	-0.11721
1993	18.32	57.2	3.02	2.610605	-0.31452
1994	21	57	4.2	2.630646	-0.20355
1995	20.18	72.8	5.84	2.738269	0.002836
1996	19.74	29.3	5.3	2.616957	0.087276
1997	13.54	8.5	5.46	2.527483	-0.01323
1998	18.29	10	5.35	3.013138	-0.34337
1999	21.32	6.6	4.97	8.578273	-0.72526
2000	17.98	6.9	6.24	9.690341	-0.25168
2001	18.29	18.9	3.89	9.71151	-0.51194
2002	24.4	12.9	1.67	11.28607	-0.66713
2003	20.48	14	1.13	11.73318	-0.40954
2004	19.15	15	1.35	11.86672	-0.32716
2005	17.85	17.9	3.21	7.511555	-0.28723
2006	17.3	8.2	4.96	3.700303	-0.17018

Appendix 3.

Results of Vector Auto-Regression

Vector Autoregression Estimates
Date: 02/13/09   Time: 13:48
Sample(adjusted): 1983 2006
Included observations: 24 after
    adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

	INT
LEND(-1)	0.265403
	(0.23173)
	[1.14532]
LEND(-2)	0.491731
	(0.25410)
	[1.93520]
C	3.916286
	(10.5545)
	[0.37105]
INFL	0.152815
	(0.10664)
	[1.43297]
INFL(-1)	-0.044504
	(0.08776)
	[-0.50709]
INFL(-2)	-0.141213
	(0.07192)
	[-1.96346]
USIN	-0.738223
	(1.17159)
	[-0.63010]
USIN(-1)	2.630592

	(1.76277)
	[1.49231]
USIN(-2)	-1.497698
	(0.97106)
	[-1.54233]
GOV	2.470595
	(1.21544)
	[2.03267]
GOV(-1)	-1.591884
	(1.48342)
	[-1.07311]
GOV(-2)	1.183558
	(0.89317)
	[1.32512]
FDEF	19.95280
	(11.9684)
	[1.66712]
FDEF(-1)	-2.136733
	(9.41300)
	[-0.22700]
FDEF(-2)	25.87123
	(14.0554)
	[1.84066]
R-squared	0.736118
Adj. R-squared	0.325634
Sum sq. resids	157.0208
S.E. equation	4.176932
F-statistic	1.793294
Log likelihood	-56.59442
Akaike AIC	5.966202
Schwarz SC	6.702485
Mean dependent	18.59167
S.D. dependent	5.086390

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