Exchange Rate Impact of Bond-Financed Fiscal Deficit in Nigeria

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Abstract

The debate on the macroeconomic impact of financing government deficit through debts procured from the bond market has been topical but still unresolved. Theoretical analysis have failed to consistently yield an accepted doctrine on the exchange rate effects of bond financing of deficit while empirical analysis have yielded conflicting results. Hence, this study investigates the relationship between government financing of deficit through the bond market and its effects on the exchange rate in Nigeria over the period 1986 – 2016. The study makes use of secondary annual time series data to examine the relationship between bond financing and the exchange rate. In this regard, empirical models were formulated to explain the relationship between bond financing and the exchange rate, and the formulated models were estimated using the ARDL bounds test and the Johansen cointegration approaches. The result shows that bond financing has a weak positive relationship with the exchange rate in Nigeria. With regard to the components of bond financing, bond financing through the banking system depreciates the exchange rate while financing by the non-bank public leads to exchange rate appreciation. It was thus recommended that effort should be made by the government to further develop the bond market and encourage greater non-banking public participation in the market.

Keywords: *deficit financing; bond financing; exchange rate; Nigeria*

JEL Classification: *E44; E62; H61; H62*

Introduction

Various methods are available to the government for financing a budget deficit. These include borrowing from domestic sources, borrowing from external sources, depletion of the foreign reserve and sale of public assets among others (Ojo, 2014; Fatima, Ahmed, & Rehman, 2012). With regard to the financing of deficits from domestic sources, a significant proportion had traditionally been by the Central Bank of Nigeria through the ways and means mechanism. But given the probable inflationary effect of monetary financing, there has been a shift over time towards alternative methods of deficit financing and in this regard greater attention has been placed on the use of private sector credit through the participation of banks and the non-bank public in the bond market.

The bond market is a market where debt securities are issued and traded. It comprises both the primary market where new debts are issued to participants, and secondary markets-where participants can buy and sell existing debt securities. A deep and well-functioning domestic debt market play an important role in financing government budgets as well as facilitating the flow of long-term financing from investors to private enterprises (Peterside, 2012). Although the bond market covers both corporate debt securities and government-issued securities, in Nigeria, the market has largely been dominated by government securities.

The operation of the bonds market provides a platform for long term funding of public (and private) expenditures. Thus, the bond market holds a lot of positive prospect for the economy through its alternative financing role, diversification of risks, stimulation of capital investments, mitigation of bank's financial crises through its alternative financing function and stimulating infrastructural development amongst others. Akinsokeji, Adegboye and Edafe (2016) asserted that a well-functioning and developed bond market provides a secure and flexible investment outlet for investors as well as stimulates economic activities through provision of appropriate long-term finance for both government and non-governmental borrowers. Witherel (2003) argues that bond markets reduce the over reliance on bank term lending for financing of projects.

Bond markets as market for transferable debt securities have increased substantially in the last decades in Nigeria. Available statistics indicates that bond market development in Nigeria reached $1.2 trillion in 2011, $1.8 trillion in 2012, and was projected to reach $3.0 trillion in 2016 (CBN 2013). Bond market development in Nigeria has surpassed other debt instruments like bank credit and equities market both in absolute terms and as a percentage of GDP (Ogboi, Njoko and Nwakwo, 2016).

Conventional macroeconomic theory suggests that financing of deficits through increased debt puts upward pressure on real interest rates. High interest rates attract foreign capital inflows and consequently push up the currency value. Thus, deficit financing through debt causes exchange rate appreciation (Su and Su, 2003). However, Hakkio (1996) asserts that financing of deficit through the bond market hold significant implications for the exchange rate. According to him, a reduction in government deficit financing, for example, will reduce the demand for loanable funds, which lowers interest rates and makes foreign portfolio assets more attractive. Hence, demand for foreign currency rises, leading to the depreciation of the domestic currency. Similarly, economists of the Ricardian equivalence persuasion argue that deficit financed through debt has no real effect on economic variables such as the exchange rate. Thus, theoretical analysis have failed to consistently support a particular position on the exchange rate effects of financing government deficit through debts procured from the bond market (Su and Su, 2003). Empirical studies on the issue have also yielded conflicting results on the issue.

Therefore, the broad objective of this study is to investigate the effect of deficit financing through the bond market on the exchange rate of Nigeria over the period 1986 - 2016. The study seeks to answer the question "how does bond (i.e. debt) financing of fiscal deficit affect the exchange rate in Nigeria?" Consequently, the basic hypothesis tested in the study is: deficit financing through the sale of government instruments in the bond market has no significant relationship with the exchange rate in Nigeria. The study is divided into five sections with this introduction as section 1. In section 2, a review of the theoretical and empirical literature on the issue is carried out while section 3 presents the empirical model. Section 4 shows the results and discussion of findings while the paper concludes in section 5 along with relevant recommendations.

Theoretical and Empirical Literature

Theoretical Literature

Theoretically, the relationship between budget deficits and the exchange rate is considered ambiguous (Saleh, 2003). On the one hand, it is argued that a deficit can lead to a weaker or stronger exchange rate depending on the borrowing activities of the government in the financial market (Hakkio, 1996). As deficits fall and hence government borrows less, the demand for funds and by consequence, domestic interest rates decline which causes the exchange rate to depreciate. On the other hand, it is also postulated that a decline in the budget deficit can also lead to a stronger exchange rate if the resultant lower interest rate indirectly leads to an increase in the demand for funds by private investors. The increase in the demand for funds may bring about one of three effects namely a lower expected inflation, a lower foreign exchange risk premium, and a greater expected rate of return on domestic securities. These indirect effects induce private investors to increase their demand for domestic securities relative to foreign securities and as investors switch from foreign to domestic securities, the exchange rate would tend to appreciate (Hakkio, 1996).

Thus, three theoretical positions exist on the impact of budget deficit on the exchange rate. The conventional macroeconomic theory of fiscal deficit, which is based on the loanable funds framework, argues that interest rate is determined by the demand for and supply of loanable funds. The theory purports that an increase in budget deficit results in a rightward shift of the demand for loanable funds which, in turn, leads to an upward pressure on the interest rate and currency value. On the other hand, the Ricardian Equivalence hypothesis suggests that an increase in budget deficit will not only push the demand for loanable funds rightwards but it will have a similar effect on the supply of loanable funds. This simultaneous rise in demand and supply of loanable funds offsets each other and leaves the interest rate unchanged. Subsequently, there will be no impact on the currency value. A third approach is the Balance of Payment crisis model introduced by Krugman (1979) which is anchored on economic fundamentals. The BOP crisis model, predicts a negative relationship between budget deficit and future exchange rates. Empirical investigations to ascertain the propriety of these various theoretical positions have returned conflicting results.

Empirical Literature

Stoker (1999) examined the long-term and short-term effects of government deficit spending on the exchange rate, using a two-country cash-in-advance model, simulation and the OLS. He found that increases in deficit spending result in a short-term appreciation of the currency. In the long term however, it leads to a temporary or permanent depreciation of the currency depending on the method used to finance the deficit. If it is financed by taxation, the depreciation of the currency is temporary but if it is financed by money growth, the decline in the value of the currency is permanent.

Khan, Akhtar and Rana (2002) examined the relationship between exchange rate and budgetary deficit in Pakistan for the period 1982 - 1998 under the managed floating exchange system. The multiple regression model ordinary least squares method was used for analysis. The result shows that budget deficit has both direct and indirect effects on the real exchange rate; the exchange rate changes depend on whether the fiscal deficit is reduced by increasing taxes or by lowering government expenditures with the devaluation being lower if the cut in government expenditure falls on traded rather than non-traded goods.

Su and Su (2003) re-examined the relationship between budget deficits and exchange rates by applying Hakkio's (1996) model to seven Asian countries and eight Euro-currency countries over the years from 1951 to 2001. Applying the Time-Series Cross-Section Regression with the Seemingly Unrelated Regression approach to data from 15 countries, the results indicate that

because of the indirect effect of the expected inflation rate, the risk premium, and the expected return rate, currency values are inversely related to budget deficits. However, the empirical results also present evidence supporting the Ricardian Equivalence Proposition that there is no direct effect of budget deficits on exchange rates.

Vuyyuri and Seshaiah (2004) studied the interaction of budget deficit of India with other macroeconomic variables including the nominal effective exchange rate, using Cointegration approach and Variance Error Correction Models (VECM) for the period 1970-2002. The results reveal that the variables under study are co-integrated and there is a bi-directional causality between budget deficit and nominal effective exchange rates.

Kim and Roubini (2008) examined the effect of government deficits on the current account and the real exchange rate in the US for the post Bretton Wood period of flexible exchange rate covering 1973:1-2004:1 using a VAR. The variables include government deficits expressed as a percentage of the GDP, the current account deficits expressed as a percentage of GDP, the real interest rate and the real exchange rate. They also include the log of real gross domestic product to control for the cyclical component of the fiscal deficits. Contrary to Keynesian theory, their results suggest that an expansionary government budget deficit shock improves the current account and depreciates the real exchange rate.

Sayombath and Kyophilavong (2013) investigate the dynamic relation between budget deficit and the real exchange rate in the Lao PDR from 1980 to 2010. The empirical analysis applies ARDL Cointegration methodology in conjunction with the VAR as well as the structural VAR (SVAR) analysis to provide evidence for both the long and short run dynamics between the variables. They found that there is no long run relationship between budget deficit and real exchange rate.

Wuyah and Amwe (2015) adopted Vector Auto-regression method in analyzing the impact of fiscal deficits on macroeconomic variables in Nigeria for the period of 1970 to 2013. The empirical results show that fiscal deficits have positive impact on inflation, and negative impact on money supply and exchange rate. It was therefore concluded that fiscal deficits have significant impact in Nigeria.

Dissanayake (2016) examines the relationship between budget deficit and selected macroeconomic variables including the exchange rate in Sri Lanka. Data consisted of annual time series data for the post-liberalization period, 1980-2014. The ARDL bounds test was used to determine whether there is a relationship between budget deficit and the selected variables. Granger Causality test was carried out to determine the nature of causality between the selected variables and budget deficit. The results revealed that there is a long-run relationship between budget deficit and the exchange rate in Sri Lanka.

Nwaeze (2017) examined the relationship between fiscal deficits, modes of financing it and macroeconomic stability in Nigeria from 1970 to 2016. The study used inflation rate and exchange rate as proxies for macroeconomic stability whereas overall fiscal deficits, fiscal deficit financed by domestic borrowing, fiscal deficit financed by external borrowing, interest rate, money supply, foreign direct investment, and external reserve balance were used as the endogenous variables. The study employed co-integration and VAR estimation methods to analyze the data. The results of the variance decomposition reveal that interest rate, overall fiscal deficits and the size of fiscal deficits financed by domestic borrowing are the main shocks causing the variation in inflation, while overall fiscal deficits, the size of fiscal deficits financed by external borrowing and the size of fiscal deficits financed by domestic borrowing are the main shocks causing the variation in exchange rate in Nigeria. The study concluded that fiscal deficits have significant negative impact on macroeconomic stability (proxied by inflation and exchange rates) in Nigeria.

Model Specification and Estimation Techniques

Research Design and Data

The descriptive research design was adopted for the study using secondary time series data relating to the relevant variables of the research while the scope covered 1986 - 2016, which is the post-regulation period in Nigeria. The data were obtained mainly from various issues of the Central Bank of Nigeria Statistical Bulletin.

The Empirical Model

The structural form of the relationship between bond financing and the exchange rate can be written in functional form as:

$$Y_{it} = f(\alpha_i X_{it}) \tag{1}$$

Where Y_{it} represents the exchange rate, X_{it} represents the bond financing variable and α_i are the parameters of interest. In econometric form this can be written as:

$$Y_{it} = \alpha_0 + \alpha_i X_{it} + \mu_t \tag{2}$$

where Y_{it} and X_{it} are as defined earlier, μ represents the random/disturbance term and t represents the time dimension of the variables.

Following the general representation of the model (2) above, two empirical models were specified. In the first model, the exchange rate was modelled as a function of bond financing (i.e. the total amount of finance raised by the government from the bond market and money supply. That is:

$$ER_t = \alpha_0 + \alpha_1 BF_t + \alpha_2 MS_t + \mu_t \tag{3}$$

In the second model, bond financing was disaggregated into its two components namely, bank financing and non-bank public financing. Thus, model 1 was re-specified as:

$$ER_t = \alpha_0 + \alpha_1 BK_t + \alpha_2 NB_t + \alpha_3 MS_t + \mu_t \tag{4}$$

The formulated model was analysed using E-view statistical package. The Augmented Dickey-Fuller (ADF) was employed to examine the stationarity properties of the data. Due to the order of integration of the variables involved, model 3 was re-formulated in the ARDL form shown below (equation 5) in order to determine the relationship between bond financing and the exchange rate.

$$\Delta ER_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta ER_{t-1} + \sum_{i=1}^{n} \beta_{2i} \Delta BF_{t-1} + \sum_{i=1}^{n} \beta_{3i} \Delta MS_{t-1}$$
$$+ \beta_1 ER_{t-1} + \beta_2 BF_{t-1} + \beta_3 MS_{t-1} + \mu_t \tag{5}$$

Thus, the ARDL bounds test approach was used to determine the long run relationship between bond financing and the exchange rate while the Johansen co-integration methodology was used to examine the long run relationship between the two components of bond financing (bank and non-bank public) and the exchange rates. The short-run adjustment mechanism of the long-run relationship was determined using the Error Correction Mechanism (ECM).

As noted in the literature review, bond financing can have either a positive or negative relationship with exchange rate. Thus, the a priori expectations are:

$$\frac{\partial BR}{\partial BF} \lessgtr 0, \quad \frac{\partial BR}{\partial BH} \gtrless 0, \quad \frac{\partial BR}{\partial NB} \lessgtr 0 \tag{6}$$

Results and Discussion

Trend Analysis

The trend of bond financing in Nigeria over the study period is captured in Figure 1 below.
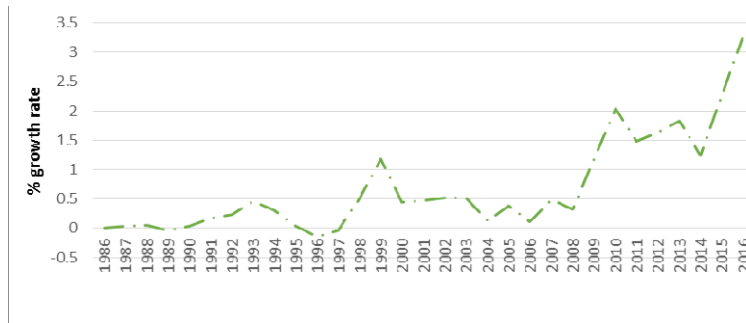

Fig. 1. Trend of Bond Financing in Nigeria, 1986 – 2016

Source: Authors, 2019.

Figure 1 shows that little change was observable in the growth of bond financing in Nigeria until 1996 when a significant decline was observed before significant positive change in 1999. However, an increasing rate of growth in the use of bond financing in Nigeria became noticeable around 2008, thus confirming that the government has been paying more attention to the use of the bond market in financing its expenditure. However, between 2010 and 2014 there was a reduction in the rate of growth of bond financing before a return to positive growth in 2014. Since 2014 however, the usage of bond financing has maintained an upward value indicating the increased important of this source of financing government deficit.
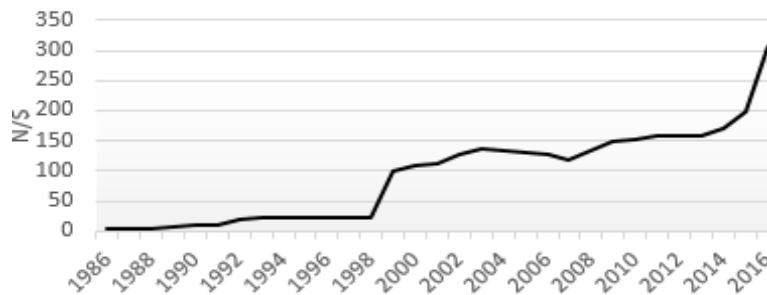

Fig. 2. Trend of the Exchange Rate in Nigeria (#/$), 1986 – 2016

Source: Authors, 2019.

Figure 2 shows the trend of exchange rate for the study period. Exchange rate policy in Nigeria has undergone a good number of changes which spans between two major regimes, namely, the fixed and flexible exchange rate regimes. The fixed exchange rate system was adopted between 1960 and 1985, while the flexible system has remained in use from 1986 to date albeit with series of modification. Figure 2 shows that the exchange rate in Nigeria depreciated throughout the study period. This is despite the various efforts by the government to maintain a stable exchange rate.

Stationarity Test

The test for the stationarity of the variables employed was done using the Augmented Dickey Fuller (ADF) test with automatic lag length selection based on Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC). The result is presented in Table 1 below.

Table 1. Augmented Dickey Fuller (ADF) Unit Root Test

Variables	Level	First Diff	Order of Integration @ 5%
BF	3.23	-4.36	I(0)
MS	-1.67	-3.63	I(1)
BK	-2.77	-7.15	I(1)
NB	-1.01	-5.02	I(1)
ER	-1.69	-5.06	I(1)
Critical Value			
1%	-3.67	-3.67	
5%	-2.96	-2.96	
10%	-2.62	-2.62	

Source: Authors' Computation, 2019.

Table 1 above shows that all the variables except bond financing were stationary at first difference i.e. they are I (1) series. Bond financing was stationary at levels.

Table 2. Bounds Test Result of Bond Financing on the Exchange Rates

Test Statistic	Value	k	Critical Value		
F-statistic	4.7657	3	Significance	I0 Bound	I1 Bound
			10%	2.45	3.52
			5%	2.86	4.01
			2.5%	3.25	4.49
			1%	3.74	5.06

Source: Authors' Computation, 2019.

The result of the Bound Test presented in Table 2 revealed that the 5% lower and upper bound critical values are 2.86 and 4.01 respectively. The calculated F-value suggests the existence of long-run relationship among the variables since the test statistics of 4.7657 is above the upper bound critical value at 5% level of significance.

Table 3 below presents the result of the estimation of the long-run relationship between bond financing and exchange rate in Nigeria.

Table 3. Long Run Result of Bond Financing on the Exchange Rate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BF	-0.006060	0.002997	-2.021866	0.0897
LOG(MS)	0.687077	0.106991	6.421848	0.0007
C	1.434528	1.412924	1.015290	0.3491
R^2	0.9882	F- Statistic	25.0704	
Adjusted R^2	0.9488	DW	2.57	

Source: Authors' Computation, 2019.

The result shows that in the long-run, the coefficient of bond financing was negative and statistically insignificant at 5% level of significance but significant at 10% level. This suggests a weak. The short run adjustment of the variables was determined using the error correction mechanism (ECM). The result (Table 4) shows that the coefficient of the ECM was negative and statistically significant at 1% and that it takes the variables approximately 2 years to converge in the long run.

Table 4. Short-Run Result of Bond Financing on the Exchange Rate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(ER(-1))	-0.336483	0.255902	-1.314890	0.2366
D(BF)	0.000447	0.000592	0.754947	0.4789
D(BF(-1))	-0.000471	0.000826	-0.570025	0.5894
D(BF(-2))	0.002538	0.000882	2.876840	0.0282
D(BF(-3))	0.002583	0.001283	2.013165	0.0908
DLOG(MS)	-1.149085	1.093005	-1.051308	0.3336
DLOG(MS(-1))	-1.234896	0.772707	-1.598144	0.1611
CointEq(-1)	-0.489537	0.123615	-3.960175	0.0011
R^2	0.9882	**F- Statistic**	25.0704	
Adjusted R^2	0.9488	**DW**	2.57	

Source: Authors' Computation, 2019.

The result of the post estimation diagnostic tests performed (Jarque-Bera Normality test, Serial Correlation LM Test and Breusch-Pagan-Godfrey Heteroskedasticity test) is presented in Table 5 below.

Table 5. Diagnostic Tests of Bond Financing on the Exchange Rate

Tests	Value	Prob.
Jarque – Bera	0.7793	0.6773
Serial Correlation LM Test	6.4487	0.0560
Breusch – Pagan – Godfrey (Heteroskedasticity)	1.2913	0.4008

Source: Authors' Computation, 2019.

From Table 5, the Jarque-Bera statistics of the Normality test was insignificant suggesting that the residual of the regression estimate is normally distributed. Also the F-statistics of both the Serial Correlation LM test and the Heteroskedasticity test were insignificant confirming the absence of serial correlation and heteroskedasticity problems in the residual of the regression estimate. The implication of this is that the regression estimate was appropriately estimated.

In addition to the above analysis, attempt was also made to examine the relationship between the components of bond financing and the exchange rate. The Johansen method was used to determine whether the variables cointegrate or not. The result is presented in Table 6 below.

Table 6. Johansen Cointegration Result of Components of Bond Financing on the   Exchange Rate

Hypothesized	Trace	0.05	Max-Eigen	0.05
No. of CE(s)	Statistic	Critical Value	Statistic	Critical Value
r = 0	57.33729	47.85613	27.76023	27.58434
r ≤ 1	29.57705	29.79707	18.21366	21.13162
r ≤ 2	11.36340	15.49471	6.212266	14.26460
r ≤ 3	5.151132	3.841466	5.151132	3.841466
Trace test and Max-eigenvalue test indicate 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors' Computation, 2019.

The result of the Johansen co-integration test revealed that there is one co-integrating vector based on Trace statistic and Eigen values since the hypothesis of no co-integration was rejected at 5% level for both test using Mackinnon-Haug-Michelis (1999) p-values as shown in Table 7.

Table 7. Long – Run Result of Components of Bond Financing on the Exchange Rate

LOG(ER)	BK	NB	LOG(MS)
	-0.008387*	0.019472*	-0.723974*
	(0.00184)	(0.00314)	(0.13621)

Note: Standard Error is in parentheses

Source: Authors' Computation, 2019.

The result revealed that banking system financing is negatively signed and statistically significant at 5% level. The negative sign exhibited by the coefficient of banking system financing implies that a unit increase in banking system financing would trigger a decrease in exchange rate by 0.008 percent. However, the coefficients of non-bank public financing and money supply were positively signed and statistically significant at 5% significant level. This indicates that a unit increase in non-bank public financing and money supply would cause a rise in exchange rate by approximately 0.02 and 0.72 percent respectively. The implication of this is that while banking system financing depreciates the exchange rate, both non-bank public financing and money supply causes exchange rate appreciation in the long run in Nigeria.

Table 8. Error Correction Mechanism Result of Components of Bond Financing on the Exchange Rate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.364597	0.179595	-2.030104	0.0516
D(BK)	-0.000187	0.000274	-0.684938	0.5005
DLOG(MS)	0.838929	0.479809	1.748463	0.0943
DLOG(ER(-2))	0.132096	0.232826	0.567361	0.5762
DLOG(MS(-1))	-0.292226	0.517308	-0.564897	0.5779
D(BK(-2))	0.000240	0.000422	0.568557	0.5754
D(NB)	0.201760	0.310082	0.664531	0.1753
D(NB(-1))	0.401242	0.150622	0.718259	0.5028
R-squared	0.188449	**Durbin-Watson stat**		1.8123
Adjusted R-squared	0.004006			

Source: Authors' Computation, 2019.

Table 8 describes the short-run relationship between sources of bond financing and the exchange rate in Nigeria. The value of the Durbin-Watson statistic can be approximated to 2 implying that the model has no serial correlation problem. The results indicate that the coefficients of banking system financing, and non-banking public financing, were not significant indicating that these variables have no effect on exchange rate in the short run in Nigeria. The coefficient of the ECM was negative and statistically significant at 5% and this suggests the possible convergence of the variables to long run equilibrium level at a speed of 0.365. Hence, it takes the variables approximately 2.7 years to converge in the long run.

The usual post estimation diagnostic tests were carried out in order to confirm the validity of the results obtained. These tests include Jarque-Bera Normality test, Serial Correlation LM Test and Breusch-Pagan-Godfrey Heteroskedasticity test. The result is presented in Table 9.

Table 9. Diagnostic Tests of Components of Bond Financing on the Exchange Rate

Tests	Value	Prob.
Jarque – Bera	0.4692	0.6741
Serial Correlation LM Test	0.4640	0.5646
Breusch – Pagan – Godfrey (Heteroskedasticity)	0.1468	0.6880

Source: Authors' Computation, 2019.

From Table 9, the Jarque-Bera statistics of the Normality test was insignificant suggesting that the residual of the regression estimate is normally distributed. Also, the F-statistics of both the Serial Correlation LM test and the Heteroskedasticity test were insignificant confirming the absence of serial correlation and heteroskedasticity problems in the residual of the regression estimate. The implication of this is that the regression estimate was appropriately estimated.

Conclusion and Recommendations

Fiscal deficit has become a common feature of the Nigerian government budgeting. Traditionally, the tendency has been on financing of the deficit through the Central Bank.

However, following the liberalization policies of the late 1980s there was a greater push for the financing of deficit through the bond market, especially as monetary financing through the Central Bank was then considered inflationary. The operation of the bonds market provides a reliable outlet for long-term finance of government projects, although it has been argued that it has the possibility of constraining the space for private investment and affecting the exchange rate.

This study therefore sets out to find out the relationship between bond financing of fiscal deficit and the exchange rate in Nigeria. The findings of this study indicate that bond financing has a weak long run relationship with the exchange rate. With regard to the components of bond financing, it could be concluded that bond financing through the banking system leads to exchange rate depreciation while financing through the non-bank public sources causes an appreciation of the exchange rate.

Based on the findings, it is recommended that concerted efforts be made to further develop the bond market in Nigeria with a view to increasing the size and depth of the market while greater involvement of the non-banking public (especially the institutional investors such as pension fund administrators) in the market should be encouraged.

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