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Reference: Chinanuife, Emmanuel/Eze, Paul et. al. (2018). Public debt spiral and domestic investment in Nigeria. In: Academic journal of economic studies 4 (1), S. 153 - 161.

This Version is available at:

<http://hdl.handle.net/11159/1876>

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Public Debt Spiral and Domestic Investment in Nigeria

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Abstract *The nature of Nigeria economy is such that borrowing has become the business of every government in power. Most often, in order to finance the deficit in the budget, the government would resolve to borrowing. However, there is growing concern on how long it would take Nigeria government to reduce the rate of borrowing. Some theorist argued that borrowing is not bad if borrowed fund is used productively. It is to this assertion that this study sorts to investigate public debt spiral and the level of public investment in Nigeria. Using quarterly time series data ranging from 1981 to 2016 and the ARDL methodology. The result showed that public debt has negative and statistical significant impact on public investment in Nigeria. That is, public debt crowds out public investment in Nigeria. The study therefore recommends among others that greater percent of public borrowing should be invested in order to reduce future borrowing in Nigeria. Also, the government should embark on internal borrowing instead of external to overcome exchange rate fluctuation problem.*

Key words Public debt, debt servicing, investment, domestic

JEL Codes: C22, E62, H63, N17

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1. Introduction

In recent time, there has been growing concern on the amount of debt incurred by Nigeria government and the state of the economy at large. Government often borrows to finance future projects thereby shifting the debt repayment to future date. However, as debt burden is shifted to future date, taxpayers therefore stand to bear greater burden for substantial amount of their future earnings would be required (given-up) for debt servicing and repayment.

Government or public debt in Nigeria constitutes external and domestic debt incurred by both the federal and the state government. According to the Central Bank of Nigeria (CBN) Annual Report (2014), the stock of federal government domestic debt as at December 2014 stood as high as seven thousand, nine hundred and four billion naira, representing an increase of 11.0 percent over the level in 2013. The report showed that the banking system remained the dominant holder of the outstanding debt instruments with 68.7 percent while the remaining 31.3 percent was for non-bank public. In similar manner, while domestic debt was soaring high, external debt was also on the increase. Nigeria external debt grew by 10.1 per cent over the level obtained in 2013, (CBN Annual Report, 2014). The rise reflected the drawdown on additional multilateral loans, particularly International Development Assistance (IDA) loans, amounting to six hundred million American dollars. The rise reflected the drawdown on additional multilateral loans, particularly International Development Assistance (IDA) loans, amounting to six hundred million American dollars. According to the debt Management Office (DMO report, 2014), Nigeria debt profile stands at \$64 billion. It is as if this is not high enough, the president Mohamed Buhari has proposed N1.67 trillion (US \$ 30 billion) external debt to fund N2.36 trillion deficits in 2017 budget. this was far more than 600 million dollars borrowed in 2016. This increasing debt profile has created bad impression in the economy. Most investors and citizens are casting doubt on the future state of the economy.

In a country where the ratio of public debt to Gross Domestic Product (GDP) was highest, government's hands would be effectively tied as the interest burden absorbed the lion's share of the budget, and just maintaining the level of indebtedness resulted in budget deficits. Having a significant amount of outstanding government debt to roll over also meant that public finances were continually vulnerable to the risk of higher interest rates, (Alfred and Pedro, 2001). For those countries, whose sovereign debt was dominated in foreign currency, there was also the risk of depreciation.

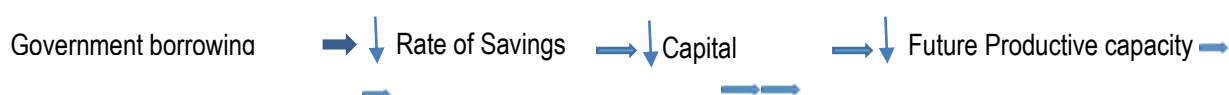
2. Literature review

Public debt is a liability on the part of the government and it requires servicing and repayment. It is a financial liability of institutions owned by the public that relates to the loans and advances taken, (Owsiak, 2005). Misiag (1996) on the other hand claimed that public debt encompasses all the liabilities incurred by the Treasury, national earmarked funds having legal personality and by municipalities. The definition of public debt *sensu largo* is contained in the supplementary

documents to the Treatise of Maastricht. In line with the afore-mentioned definition, Chimielewski (1997) argued that public debt is the sum of liabilities of the Treasury to national and foreign entities related to loans taken in financial institutions and directly from the governments of member countries of Paris Club or these which were guaranteed or insured by the governments or their agendas as well as treasury securities remaining to be purchased issued onto the foreign and national market and other registered liabilities of the Treasury. Debt requires servicing and public debt is not an exception. In line with this, Buchanan (1958) argues that when government debt is serviced there is a burden in the form of claim on the taxpayer's income. That is when the debt is repaid; the future generation has to pay tax. This will reduce either their consumption or saving.

In Nigeria, the cost of debt servicing is such that the entire economy is being affected. According to CBN report (2008), the total debt service payments in 2008 stood at N336.2 billion naira and it comprised N14.0 billion for external debt and N322.2 for domestic debt. This increased the ratio of debt service payments/ GDP from 1.4 per cent in 2007 to 1.6 percent in 2008. However, from 2008 to 2014 the total debt service payments witnessed tremendous increase for both external debt and domestic debt. The report of the central bank of Nigeria (CBN report, 2014) showed that the total debt service stood at N290.8 billion, or 1.0 percent of GDP, comprised of N55.0 billion for external debt and N865.8 for domestic debt. However, the total debt servicing increased from N1.48trillion in 2016 to N1.66trillion in 2017 suggesting more borrowings for the Federal Government.

Debt has burden and what the burden of debt is remained a controversy over the years following the work of James Buchanan "public principles of public debt" in 1958. There have been arguments on what public debt burden is all about. The traditionalists or classists argued that public debt imposes a real burden on the community. They maintained that if the government expenditure is financed through public borrowing, the present generation gets relieved at the expense of the future generation. In this case, the burden of public debt is shifted to the next generation. The mechanism through which debt endangers the future generation could be viewed following the flow chart below:



Note: Where the arrow denotes the direction of flow.

It is pertinent to know however that Continuous fall in future productive capacity is a bad signal to any country. It has the effect of creating untold hardship in future. More so, financing public expenditure such as war sometimes produces dual effect in the country. First, it would lead to decline in savings or consumption which would in turn lead to reduced inherited capital for the future generation. On the other hand, if savings and consumption failed to decline, burden of tax would be shifted to the future generation. The classists further argued that public debt necessitates a transfer of resources from the private sector to the government in the form of additional taxation. This view is supported by David Hume, Adam Smith and David Ricardo. Also, the classists maintained that public debt is costlier method of financing public expenditure than taxation.

Researchers have attempted to unveil the effect on debt on economic growth of a country. Among them include Adofu and Abula (2010) on the link between economic growth and domestic debt. Using OLS on a time series data from 1986 to 2005 in Nigeria, the result of their study revealed that domestic debt has negative effect on the growth of Nigeria economy. They added that government plans towards increasing the revenue base through tax should be encouraged and that government should decline to borrowing for the health of the economy. On the area of optimal debt level in low-countries, Abbas and Christensen (2007) investigated 40 Sub-Saharan African countries using data from 1975 to 2004 and discovered a medium level of competitive debt as a percentage of GDP domestically which has a significantly positive effect on growth. Their study also established a thresh hold level of 35 percent. They added that debt level exceeding 35 percent of the total bank deposits has negative effect on economic growth.

Okwu *et al.*, (2016) investigated the effects of domestic debt on economic growth. The study utilized evidence based data from 1980 to 2015. The result of their analysis revealed that domestic debt has significant short and long run relationship with economic growth. They however recommended adequate deployment of domestic debt to key sectors in order to ensure sustainable short term growth which might translate to long run growth. Again, Tajudeen (2012) investigated public debt and economic growth in Nigeria employing the Granger causality approach from 1970 to 2010 and revealed that there exist a bi-directional causality between economic growth and public debt in Nigeria. The study further noted that public debt and economic growth are positively related and that under *ceteris paribus* assumption, an increase in public debt would lead to corresponding increase in economic growth. On the contrary, Classens *et al.*, (1997) argued that debt has the effect of increasing output and export partially. However, a fraction of that increase would be used in servicing such debt. They

further added that debt reduction would increase investment and debt servicing would be easier and healthier for an economy.

Obademi (2012) appraised the impact of public debt on economic growth using augmented Cobb Douglas model. The result of the long run association shows that public debt has negative and long run relationship with economic growth. Based on the findings of the study, the adjustment to the long run is relatively slow, hence, debt in the long-run depressed economic growth as a result of incompetent debt management. Izedonmi and Ilaboya (2012) examined debt – growth dynamics in Nigeria using time series data from 1980 – 2010. The study adopted co-integration and error correction setting in estimating the relationship between economic growth and a set of economic fundamentals. The findings revealed a negative significant link between economic growth and public debt burden in Nigeria. Also, it found negative and significant relationship between the ratio of debt servicing to export and economic growth.

Remhert and Rogolf (2010) investigated economic growth in time of debt. The study applied simple correlation analysis on a sample of 20 countries from 1990 to 2009 and found a weak link between economic growth and government debt since the debt/ GDP ratio in Nigeria below the 90% threshold, the median growth rate decreased by 1% and the average by considerably more. Adopting similar method of analysis with Remhert and Rogolf (2010), Ugo and Presbitero (2012) examined the relationship between public debt and economic growth. The study focused on OECD countries and utilized instrumental variables approach. The result of the study was consistent with the existing negative relationship in empirical literature. The study further reported that the relationship broke down when the instrument debt with a variable that captures valuable effects caused by the interrelationship between exchange rate volatility and foreign currency debt. However, the works of Asogwa (2005) employed a more robust methodology in examining the effects domestic debt has on Nigeria's economic growth. The study argued that domestic government debt in Nigeria has continued to suffer form of confidence crisis as market participants have consistently shown greater lack of trust in the system.

El-Mahdy and Torayeh (2009) studied public debt – growth changes in Egypt using co-integration and algebraic analytical framework and revealed a robust and negative influence of debt on economic growth in Egypt. However, the result of algebraic analysis showed some levels of sustainability. The result of El-Mahdy and Torayeh (2009) conforms to the findings of Adegboté, Ayadi and Ayadi (2008) who examined the impact of external debt on economic development in Nigeria. Essen *et al.* (2016) investigated the impact of public sector borrowings on prices, interest rates, and output in Nigeria. The result of the study revealed that shock to external debt stock increases prime lending rate with a lag.

In a similar manner, Saifuddin (2016) examined public debt and economic growth in Bangladesh using time series data from 1974 to 2014. The study formulated two models; investment model and growth model. Investment model was used to investigate the potential indirect effect of public debt on economic growth through its impact on investment employing the 2 Stage Least Square methodologies and found that public debt is positively and significantly related to investment and economic growth. Debt has both positive and negative effect in an economy. However, the burden of debt on economic growth has been viewed differently by different authors. Cunningham (1993) while investigating the relationship between economic growth and debt burden in a panel of sixteen economies argued that the growth of a nation's debt burden had a negative effect on economic growth during 1971 to 1979. In addition to the effect of debt burden on economic growth, Cunningham (*ibid*) observed that countries with culture of debt servicing tend to experience growth in GDP compared to others without the culture of debt servicing. In a similar study, Amoateng and Audu (1996) investigated the relationship between external debt servicing and economic growth and exports for 35 African countries. Granger causality was used to analyze the interrelationship between exports, GDP growth and foreign debt servicing during the period 1971 to 1990. There exists a unidirectional link from debt service to GDP.

However, the impact of external debt on per capita growth was examined by Schlareek (2004). The study adopted a panel data approach on 59 developing countries from 1972 to 2002. The result of the study showed the existence of linear negative impact of external debt on per capita growth. In another study on Turkish economy, Karagol (2002) investigated the long and short run relationship between economic growth and external debt service from 1956 to 1996. The study utilized multivariable co-integration technique alongside a standard production function model. The vector auto-regression estimates of the system showed the presence of long run association between external debt and economic growth. The study further revealed the existence of unidirectional causality running from debt service to economic growth.

Debt required servicing and long stayed debt has negative impact on a nation's economy. In an attempt to study the impact of debt overhang problem on economic growth of Kenya, In another study of Turkish economy, Kozali (2007) utilized data from 1970 to 2005 to investigate the impact of external debt, debt service, public and private investment. The study applied cointegration test that include structural break on the time series data. The result of the study showed that both external and debt services have negative impact on economic growth. The study further revealed that foreign debt used by Turkish

government is not allocated efficiently. He therefore suggests that economic policies that enhance savings should be formulated and adopted in the country. The effect of public debt on economic growth has remained a controversial phenomenon and different authors have presented their views on it. In his own contribution, James (2006) opined that public debt has no significant effect on the growth of the Nigeria economy because the fund borrowed were not channeled into productive ventures, but diverted into private purse. He suggested further, that, for the gains of the debt forgiveness to be realized the War against Corruption should be fought to the highest. It is in reaction to this menace of corruption on Nigeria economy that prompted the current President Buhari’s administration into action on corruption.

In view of the forgoing, it could be seen that the interests of researchers have been on either public debt and economic growth or the burden of public debt on economic growth. However, this study deemed it necessary to consider the impact of public debt spiral on public investment in Nigeria. This study argued that should public investment increase as a result of increase in public debt; the resultant effect in the economy would not be bad as most researchers claim.

3. Methodology of research

The theoretical framework of this model is anchored on modern theory of public debt whose pioneers include Buchanan, Harris, Musgrave, Modigliani and Keynes. Buchanan regards the modern theory as “the new Orthodoxy”. This theory opposed the traditional theory which sees debt as evil rather than good and thus should not be tempered. The proponents of the modern theory argued that public debt is an asset rather than liability to the indebted country. During recession as it is the case with Nigeria, the theory argued that the techniques of deficit budget financed through borrowing can be fruitfully utilized to improve the employment situation and generating effective demand thereby raising the level of economic activities. This was however supported by Professor Hansen A.H who argued that public debt is an essential means of increasing employment and has it as an essential tool of modern economic policy of a nation.

In order to determine the impact of public debt on public investment in Nigeria, the study specifies the functional form of the model as;

$$PUBINV = f(PDT, RIR, FD, DEBS, INF) \tag{1}$$

In an estimable form, the ARDL cointegrating and long run form is specified thus;

$$\begin{aligned} \Delta PUBINV_t = & \beta_0 + \beta_1 \sum_{i=0}^q \Delta PDT_{t-i} + \beta_2 \sum_{i=0}^q \Delta RIR_{t-i} + \beta_3 \sum_{i=0}^q \Delta FD_{t-i} + \beta_4 \sum_{i=0}^q \Delta DEBS_{t-i} \\ & + \beta_5 \sum_{i=0}^q \Delta INF_{t-i} + \phi ECM_{t-1} + \beta_1 PDT_t + \beta_2 RIR_t + \beta_3 FD_t + \beta_4 DEBS_t + \beta_5 INF_t + \mu_t \end{aligned} \tag{2}$$

The study recognized that most time series are not stationary in their level form and using them without minding their stationarity status would produce spurious result. As a result, the study conducts pretest to ensure that the data is fit for use. Other posttest would be conducted as well to ensure that estimated model is robust.

4. Results

Table 1. Descriptive Statistic of Variables

	PUBINV	PDT	RIR	FD	DEBS	INF
Mean	44.43413	3249.830	0.299991	13.36721	20527.64	19.41884
Median	20.12049	2294.343	2.218750	11.10000	66.96250	13.01863
Maximum	154.7000	12188.90	25.28000	36.90000	2306756.	72.72900
Minimum	0.237600	13.52380	-43.57000	5.900000	1.007078	3.226000
Std. Dev.	51.95024	3361.906	13.73974	6.160483	196369.1	15.93442
Skewness	0.975846	0.984448	-0.867880	1.505437	11.17099	1.644461
Kurtosis	2.499041	2.952726	3.690442	5.375916	129.6174	4.683706
Jarque-Bera	24.36039	23.27270	20.93744	88.26206	99186.80	81.91126
Probability	0.000005	0.000009	0.000028	0.000000	0.000000	0.000000
Sum	6398.515	467975.6	43.19865	1924.878	2955980.	2796.313
Sum Sq. Dev.	385932.3	1.62E+09	26995.61	5427.073	5.51E+12	36308.50
Observations	144	144	144	144	144	144

Table 1 shows the result of the descriptive statistics of the variables in the model. It could be observed that public debt has the highest mean value followed by debt serving, public investment, inflation, financial development and real interest rate. The standard deviation shows that debt servicing and public debt deviate more from their mean value than financial development, real interest rate, and inflation.

4.2. Unit Root test

Table 2a. Phillip Peron Unit Root Test (with intercept) Result

Variable	Level Form	5%critical value	First Difference	5%critical value	Order of Integration
INF	-2.709313	-3.442474	-4.222138**	-3.442712	I (1)
FD	-2.473263	-3.442474	-4.552888**	-3.442712	I (1)
PDT	1.038478	-3.442474	-4.032042**	-3.442712	I (1)
PUBINV	-1.355986	-2.881685	-4.482140**	-2.881830	I (1)
RIR	-3.762163**	-3.442474			I (0)

**denotes significant at 5%

Table 2b. Dicky-Fuller-Min-t Break Point Unit Root Test (with intercept) Result

Variable	Level Form	Critical value		First Difference	Critical value		Order of Integration
		1%	5%		1%	5%	
DEBS	-2.527029	1%	-4.949133	-6.821134	1%	-4.949133	1(1)
		5%	-4.443649		5%	-4.443649	
		10%	-4.193627		10%	-4.193627	

Source: Authors compilation from the result of unit root test

The result of the unit root test conducted shows that inflation (INF), financial development (FD), public debt and (PUBDEBT) were stationary at first difference while real interest rate (RIR) in the economy was stationary in level. With this, all the variables except real interest rate are integrated of order one. Real interest rate is thus the only variable that is integrated of order zero.

However, the study observed that debt servicing was not stationary using the normal unit root testing. With this, the study adopted Dicky-Fuller-Min-t break point unit root test and the result shows the presence of structural break and the variable became stationary after first difference. The type of break point identified was that of additive outlier. This was however attributed to the type of data generating process. The lag length for the break point test was selected following Schwarz information Criterion. It is pertinent to know that with mixture of I (0) and I (1) variables, bound test cointegration approach becomes necessary for the test of long run association among the variables of the model.

Model Selection

Schwarz Criteria (top 20 models)

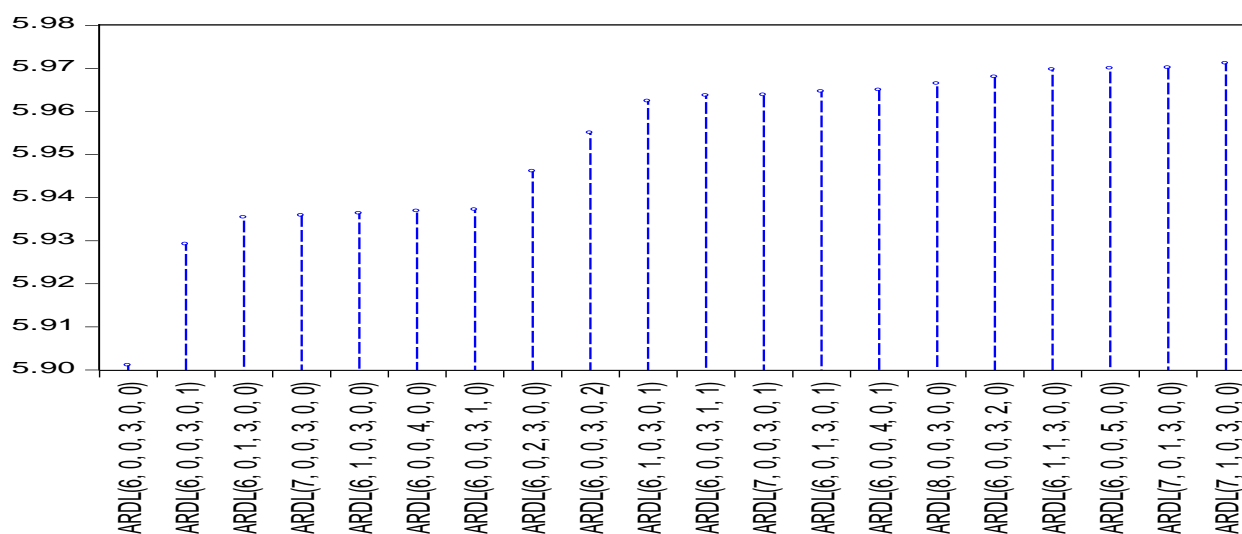


Figure 1. Graph of ARDL model selection

Since there is possibility of the lag value of public investment explaining the current value, the study estimated the model using Autoregressive Distributed Lag (ARDL) model with the aid of E-views 9. The lag length selection criteria used was Schwarz information. This is because Schwarz gave a robust model. The graph of the lag length selection is depicted in figure 1. It could be seen from figure 1 that out of 20 top models evaluated, Schwarz Criteria considered ARDL (6,0,0,0,3,0) the best. Unlike in figure one above where Akaike information criteria gave the best information, in this case, Schwarz criteria proved to be the best. This is because, the model produced by Schwarz does not suffer serial correlation, it was found to be cointegrated and there was absence of heteroscedasticity in it. The study therefore examines the existence of cointegration or existence of long run association among the variables.

4.3. Cointegration Test

In order to test for the existence of long run association among the variables, the study used Bound test approach. This is because some of the variables in the model are order one while some or at least one of the variables is order zero. This result is presented in table 3. The null hypothesis for this test is that no long run relationship exists and the decision is to reject the null hypothesis if the value of F-statistic from the bound test conducted is greater than the upper bound value of Paseran test statistic.

Table 3. Result of bound test (cointegration of the variables)

Null hypothesis: No long run relationship exists

Test Statistic	Value	K	Bound Test	
			Lower bound	upper bound
F-statistic	4.001826	5	2.62	3.79

The result of bound test presented in table 3 shows that the value of F-statistic lays above the upper bound value of Paseran test statistic. This is an indication that the null hypothesis is to be rejected. Therefore, there exists long run association among the variables in model for objective one.

Table 4. Long run Result of impact of public debt on public investment in Nigeria

Dependent Variable: PUBINV

Variable	Coefficient	Standard error	t-statistic	Probability
LOG(PDT)	-23.555208	12.428354	-1.895280	0.0604
LOG(FD)	56.174172	18.988318	2.958354	0.0037
LOG(DEBS)	31.395928	11.173470	2.809864	0.0058
INF	-0.354282	0.406446	-0.871659	0.3851
RIR	-0.562088	0.433355	-1.297062	0.1970
C	-40.857410	80.874750	-0.505194	0.6143
R-Squared	0.995574			
Adjusted R-Squared	0.994959			
F-Statistic	1932.507			
Prob(F-statistic)	0.000000			
Durbin Watson	1.958340			

Figure 4 shows the result of long run estimation of the impact public debt on public investment in Nigeria. It could be observed that public debt, financial development and debt servicing were found to be statistically significant at 10%, 5% and 5% respectively while real interest rate and inflation rate were found to be statistically insignificant. The result of the study also shows that holding other variables in the model constant, a change in public debt (increase) by one percent would lead to about 0.23 percent change (decrease) in public investment in Nigeria. Although, this was found to be statistically significant at 10 percent, the a priori sign was contradicting. Under ceteris paribus assumption, it is expected that increasing public debt should bring about increase in public investment as most researchers claimed. The case is different in Nigeria. It could mean that huge amount of money borrowed were not invested into public ventures.

The real cost of borrowing (RIR) was observed to exerts negative but statistically insignificant impact on public investment. The idea behind this is that most of the long run public investment does not necessary relies on interest rate especially when such investment is paramount sine qua non for the growth and development of the country.

However, financial development was observed to experts' positive and statistically significant impact on public investment in Nigeria. The result shows that holding other variables in the model constant, one percent change (increase) in the level of

financial development in Nigeria would lead to about 0.56 percent change (increase) in public investment in Nigeria. This result is not surprising because ordinarily, with favourable investment climate, one would expect financial development to bring about improvement in public investment.

Similarly, debt servicing was found to experts' positive and statistically significant impact on public investment in Nigeria. The study observed that holding other variables in the model constant, one percent change (increase) in the amount of debt servicing would bring about 0.31percent change (increase) in public investment in the long run. This is however surprising because one would expect increase in the percentage of debt servicing to bring about decrease in the percentage of public investment in Nigeria. Lastly, on the basis of the general model, the result of the study shows the explanatory variables explained about 99 percent of the variation in public investment. Also, the result shows that with the Durbin Watson of 1.958, the model is free from autocorrelation (positive or negative). The probability F-statistic value of 0.0000 shows that the model is robust and suits the estimation test.

Table 5. Result of Short Run Dynamics as depicted in cointegration form

Dependent variable: D(PUBINV)

Variable	Coefficient	Standard error	t-statistic	Probability
D(PUBINV(-1))	0.724838	0.076374	9.490622	0.0000
D(PUBINV(-2))	0.203574	0.092847	2.192585	0.0302
D(PUBINV(-3))	-0.068545	0.089846	-0.762915	0.4470
D(PUBINV(-4))	-0.470463	0.090663	-5.189113	0.0000
D(PUBINV(-5))	0.301533	0.076320	3.950891	0.0001
DLOG(PDT)	-1.540836	0.615165	-2.504750	0.0136
DLOG(FD)	3.674566	1.913656	1.920181	0.0572
DLOG(DEBS)	1.853573	1.436932	1.289952	0.1995
DLOG(DEBS(-1))	9.414103	2.804659	3.356595	0.0011
DLOG(DEBS(-2))	-9.902255	1.716090	-5.770241	0.0000
D(INF)	-0.023175	0.026398	-0.877907	0.3817
D(RIR)	-0.036768	0.029672	-1.239162	0.2176
CointEq(-1)	-0.065414	0.017819	-3.671004	0.0004
R-Squared	0.995574			
Adjusted R-Squared	0.994959			
F-Statistic	1932.507			
Prob(F-statistic)	.0000000			
Durbin Watson	1.958340			

$$\text{Cointeq} = \text{PUBINV} - (-23.5552 * \text{LOG(PDT)} + 56.1742 * \text{LOG(FD)} + 31.3959 * \text{LOG(DEBS)} - 0.3543 * \text{INF} - 0.5621 * \text{RIR} - 40.8574)$$

Table 5 shows the result of the short run dynamics of the impact of public debt on public investment in Nigeria. It could be seen that most of the variables were statistically significant except real interest rate, debt servicing and inflation. Also, most of the variables assumed their a priori sign. The result further shows that the past value of public investment has statistically significant impact on the current value. This is not by anyway surprising because of spillover effect.

On the basis of the ceteris paribus impact of individual variables, the study found that holding other variables in the model constant, one-naira change (increase) in public domestic debt would lead to about one-naira fifty kobo decrease in the amount of public investment in Nigeria. Although this was found to be statistically significant, the result shows that public borrowing does not contribute significantly to investment outlay in Nigeria. Similarly, as table 5 shows, public investment does not rely on the cost of borrowing. This is due to the insignificant impact of real cost of borrowing on public investment. Just like the long run shows, the government does not consider real cost of borrowing especially when it has to do with investment that is capable of bringing about economic growth and development.

Also, financial development was observed to exerts positive and statistically significant (at 10 percent) impact on public investment in Nigeria. The result shows that holding other variables in the model constant, a change in financial development would bring about 0.04 (3.674566/100) percent change in public investment in Nigeria. It is not surprising to see that financial development impact more to public investment in the long run than in the short run. It takes time lag for the effect of financial development to be felt in the economy. Other variables such as debt servicing and inflation in the economy were found to be statistically insignificant in explaining public investment in Nigeria.

However, on the basis of the general model, the result shows that about (R-square = 0.995574) 96 percent of the variation that occurs in economic growth is explained by the explanatory variables in the model. Also, the probability value of F-statistic (prob. F-stat.= 0.00000) shows that the model is dynamically stable. Lastly, the Durbin Watson statistic (1.958340) shows that the model does not suffer autocorrelation problem.

4.4. Serial Correlation LM

Following similar steps as in objective one, the study examined the presence of serial correlation in the residual of the estimated model using Breusch-Godfrey LM test. The null hypothesis for this test is that there is no serial correlation in the residual. The decision rule is to reject the null hypothesis if the probability Chi-square of the observed residual squared is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level. The result of this test is presented in table 6.

Table 6. Result of Breusch-Godfrey Serial Correlation LM Test

<i>F-statistic</i>	0.782039	<i>Prob. F(2,121)</i>	0.4598
<i>Obs*R-squared</i>	1.761061	<i>Prob. Chi-Square(2)</i>	0.4146

Table 6 shows the result of Breusch-Godfrey serial correlation LM test. It could be observed that the Prob. Chi-Square (2) of Obs*R-squared (0.4146) is greater than 0.05. This implies that the null hypothesis cannot be rejected. Therefore, not rejecting the null hypothesis is an indication that the residual of the model presented in table 4.5 does not suffer serial correlation.

4.5. Heteroscedasticity Test

In order to test for heteroscedasticity in the residual, the study conducted Breusch-Pagan-Godfrey heteroscedasticity test. The null hypothesis for this test is that the variance of the residual is homoscedastic. The decision is to reject the null hypothesis if the probability Chi-square of the observed residual squared is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level. The result of this test is presented in table 4.7.

Table 7. Result of Breusch-Pagan-Godfrey heteroscedasticity Test

<i>F-statistic</i>	1.777365	<i>Prob. F(14,123)</i>	0.0493
<i>Obs*R-squared</i>	23.22016	<i>Prob. Chi-Square(14)</i>	0.0568
<i>Scaled explained SS</i>	75.39113	<i>Prob. Chi-Square(14)</i>	0.0000

Table 7 shows the result of Breusch-Pagan-Godfrey heteroscedasticity test. It could be observed that the Prob. Chi-Square (0.0568) of Obs*R-squared is more than 0.05. This implies that the null hypothesis that the variance of the residual is homoscedastic cannot be rejected at 5 percent.

5. Conclusions

The study investigated the impact of public debt spiral on public investment in Nigeria. The variables used include public investment, public debt, debt servicing, financial development, inflation rate and real interest rate. Some of the model was found to be integrated of order one while some are of order two. This informed the use of bound test approach to cointegration. The cointegration result proved the existence of long run relationship among the variables. The study therefore estimated the long run and the short run dynamics of the impact of public debt on public investment in Nigeria. The result of the analysis shows that public debt has negatively and statistically significant impact on public investment. In that, public debt crowds out public investment in Nigeria. The study therefore recommends that about 60 percent of public borrowing should be invested in order to reduce future borrowing in Nigeria. It also recommends that the government should embark on internal borrowing instead of external to overcome exchange rate fluctuation problem.

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