PUBLIC DEBT AND DOMESTIC INVESTMENT IN NIGERIA: A VECTOR ERROR CORRECTION MECHANISM APPROACH

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Abstract

The puzzling reality that Nigeria's debt obligation has been soaring within the past four decades coupled with the need for more investment in the domestic economy prompted this study to examine the impact of public debt on domestic investment in the country in the period 1981-2021. The work is set within the framework of the Keynesian and the debt overhang theories. Time series data were obtained from the Central Bank of Nigeria Statistical Bulletin and analysed using the Johansen cointegration and vector error correction methods owing to the result of the stationarity tests from the Augmented Dickey-Fuller and Phillips-Perron tests. The study finds that domestic public debt stock has a significant negative impact, but external public debt stock has a significant positive impact, on domestic investment in Nigeria both in the short and long runs; and that Nigeria's external public debt service payment is significantly crowding out domestic investment. The study therefore concludes that growth of public debt is inimical to that of domestic investment in Nigeria. As such, the Nigerian government should curtail its domestic borrowing excesses because of the negative influence it exerts on domestic investment over time. second, the government should channel some externally borrowed funds into growing the country's capital formation which is the result of domestic investment owing to the positive relationship between both variables. The government should also cut down on more external borrowing because the resulting debt service payment stifles the growth of domestic investment in the domestic economy.

Keywords: Public debt, domestic public debt, external public debt, domestic investment.

Introduction

Following the Keynesian theory that favours increasing government outlay in a country popularized since the mid-1930s, the government of Nigeria needs all the funds it can get to finance its usually expansive expenditure. The result has been deficit budgeting that has created huge fiscal imbalances which must be financed with additional funds outside of what the government entity can generate. This has given rise to borrowing from both within and outside the country. But whether such borrowings have helped to stimulate the overall level of domestic investment in the country remains a curiosity.

This study concentrates on the forty-one-year period from 1981 to 2021 for the reason that Nigeria's debt obligation started to increase during that period (Babalola, 2015). In the 1970s, Nigeria obtained huge revenue from sell of crude oil due to oil boom at that time. The country would therefore establish conspicuous consumption pattern which would later be threatened. This was because revenue from sell of crude oil started faltering more and more from 1981 following global economic crises of the 1980s. The government would then resort to borrowing in order to augment the meagre oil revenue and to keep expenditure from falling. Huge debt has therefore become a notable feature of the Nigerian economy.

For example, Nigeria's domestic debt stock annual growth rate stands at about 21.7% per annum for the period 1981-2021, considering data published by Central Bank of Nigeria (CBN, 2021). When broken down into decades, the period 1981-1990 saw annual average growth rate of 27.1%, the period 1991-2000 had 28.5% growth, the third decade 2001-2010 had 18.2%, and the last decade 14.2%. This means that the rate of growth of domestic debt stock has been decreasing in more recent decades since 1981; however, that year's domestic debt stock is only but 0.06% of that of 2021 which is a clear indication that government's internal borrowing has really shot up over the years.

Nigeria's external public debt stock has also been growing. Overall, it averaged 38.4% yearly in growth between 1981 and 2021. On decades basis, the first decade of note (1981-1990) had the highest average growth rate (86%) while the next two had 42.1% and -3.3%. The latter was for the period 2001-2010 which witnessed debt forgiveness from some external creditors, notably Paris Club, between 2005 and 2007 (Okonjo-Iweala, 2009). However, it did not take long to rise again as the last decade had annual average growth rate of 34.9% in external debt stock, and the 1981 value is only but 0.015% of the 2021 as the country's external debt stock rose from N2.33 billion to N15.9 trillion within the two periods. Unsurprisingly, about 4 trillion Naira has been spent to service those debts within the period under focus, which amounts to annual average growth rate of 39.3% (CBN, 2021). On the other hand, annual average growth rate of domestic investment over the review period is 17.93%, according to data from the aforementioned source, which is smaller compared to those of the public debt variables, implying that capital formation, which is the result of domestic investment, may not have been spurred by the rising public of Nigeria.

The need for growth of domestic investment in a developing economy like Nigeria cannot be overemphasised. But whether the expected growth in this variable is adversely affected by those of the public debt variables is the big question. For instance, going by trend analysis over the last four decades based on data published by Central Bank of Nigeria (CBN, 2021), growth of domestic investment in the country averaged 10.6 per cent per annum between 1981-1990; whereas that of public domestic debt stock was 27.1 per cent, the external counterpart stood at 86.1 per cent, and external debt service payment averaged 57.8 per cent per annum in the same period.

Two decades later, 2001-2010, domestic investment averaged 15.3 per cent in annual growth compared to 18.2 per cent for public domestic debt stock, 3.5 per cent for the external counterpart, or 48.8 per cent average growth rate in external debt service payment. Similarly, in the last decade 2011-2020, domestic investment averaged 17 per cent per annum in growth compared to 14 per cent for public domestic debt stock, 35 per cent for the external counterpart, or 34.4 per cent average growth rate in external debt service payment in the same period.

Although it appears that domestic investment increased marginally in growth, decade-on-decade, over the period 1981-201, the underlying data appears to suggest that the seeming increase is easily dwarfed by those of the debt variables, especially, the external debt service payment counterpart. It may be argued that government tries to inject more funds into the economy through external borrowing for infrastructural development that is intended to drive more domestic investment, but this comes at a great cost which is the burden of debt service payment. This implies that rising external debt obligation may not have been stimulating domestic investment in Nigeria as expected.

In the light of the aforementioned disproportionate growth between domestic investment and the public debt variables, the main worry necessitating this study is whether the debt obligations of the federal government of Nigeria is hampering the growth of domestic investment in the country thereby limiting the potential of the investment factor to create employment and generate inclusive and sustainable growth

in Nigeria. These worries therefore motivated this study which is aimed at analysing the impact of the aforementioned public debt components on domestic investment in Nigeria within the period 1981-2021.Specifically, the drive is to (i)determine the impact of domestic public debton domestic investment, (ii) ascertain the impact of external public debt on domestic investment in Nigeria, and (iii) determine whether Nigeria's external public debt service payment is crowding out domestic investment in the country.

The paper is structured into five sections. Following the introduction are four sections, namely, literature, methodology, results and discussion, and conclusion and recommendation.

Conceptual Literature Review

Domestic public debt

Public debt refers to borrowing by a government entity (Umaru, Hamidu & Musa, 2013). This study adopts a macroeconomic perspective, so public debts in this study is borrowings by the federal government of Nigeria. With this in mind, one institutional definition of domestic debt is by The Commonwealth Secretariat, as cited in Ndung'u (2001), that public domestic debt is "the debt a government incurs through borrowing in its own currency from residents of its own country" (King'wara, 2014, p. 90). This definition points out two important ingredients of domestic debt: one, it is issued in the borrowing country's currency, and two, its source is the residents of the borrowing country. Sources of domestic debt include bank and non-bank financial institutions such as central bank, discount house, deposit money banks, and may even include corporate bodies and individuals and instruments used for domestic debt include treasury bills, bonds, treasury certificates and others.

Abu and Usman (2010) share the same view that domestic debt consists of government borrowing from within the domestic economy. They contrasted domestic from foreign or external debt, saying that it does not increase the total resources available to the country, as does external debt, because domestic debt is merely a transfer of resources from one segment of the economy to the other to serve public interest. The same applies to the interest payment on domestic debt as it only reallocates financial resources to the bondholders from the tax payers. Their definition implies that domestic debt only brings about a transfer of purchasing power among the citizenry of the country, which means there is no giving up of real output to another country. From all definitions considered, this study therefore regards domestic debt as that part of a country's public debt obtained internally or from within its territory.

External public debt

There is little or no controversy as to the meaning of external public debt. One idea is that it is one owed to non-residents by a government entity repayable in terms of foreign currency, food or service (World Bank, 2004). The fulcrum of this definition is the origin of external debt which is non-residents and that the repayment is in foreign currency. Similarly, Arnone, Bandiera, and Presbitero (2005) are of the view that external debt is that part of a country's debt that was obtained from foreign lenders which may be international financial institutions, government, or commercial banks. The same view is held by Nwannebuike, Ike, & Onuka (2016) that external debt refers to fund sourced from outside a country's border, usually in foreign currency, for which interest is paid. Of these submissions, the definition by Arnone, Bandiera, and Presbitero (2005) best describes the meaning of external public debt intended in this study.

Domestic investment

As used in this study, domestic investment comprises those by the private and public sectors. In the view of Levacic and Rebmann (2001), private investment refers to the accumulation overtime by firms of real capital goods - those that will yield a future flow of services. It is domestic because it is undertaken by economic agents operating within the shores of the country. According to World Bank (2019), domestic investment can also be called capital formation, and it comprises outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. This latter view is favoured by this study.

Theoretical review

The theoretical connection between domestic investment and public debt can be viewed from three perspectives: the classical (crowding-out) theory, the Keynesian (crowding-in) theory, and the debt overhang theory.

Classical (crowding-out) theory of public debt

The classical economists were known to oppose government borrowing because they argued that it had negative effect on the economy (Friedman, 1978). The classical school opined that if government participated actively in the economy – say through expansionary fiscal policy – this would lead to higher interest rates, reduced after-tax income and increased wages all of which dampen firms' profitability and by implication business investment. This carries a negative implication which manifests in businesses being unable to expand as well as loss of increase in potential output (Sineviciene & Vasiliauskaite, 2012).

Modern authors have lent their voice in support of the classical theory. For example, Majumder (2007), as cited in Abubakar and Mamman (2021), state that a rise in public debt accumulation leads to competition for loanable funds between the private and public sectors causing the interest rate to rise, thereby leading to a fall in the private component of domestic investment. The latter also pointed out another channel through which public debt negatively affects domestic investment under the classical theory to be through tax burden. For instance, when the government borrows to finance its deficits, tax burdens are shifted to upcoming generations which means current consumption will increase leading to a retardation in savings. Lower savings means lower loanable fund. Competition for the meagre fund will induce a rise in interest rate, which ultimately results in slack in private investment (Khan & Gill, 2009).

The classical schools' argument that public debt crowds out domestic investment assumes an economy in the long run, operating at full employment equilibrium level with no excess capacity; hence, investment and savings are highly interest rate elastic (Sineviciene & Vasiliauskaite, 2012). From what has been said, the theory stresses that government intervention in the economy, such as financing fiscal deficit through borrowing, causes distortions. Also, that in the long-run, the negative side effect of such actions, such as crowding out private domestic investment, does more harm than good to the economy, therefore, rendering fiscal policy ineffective and self-defeating (Osuoha, Udenwa, & Nwala, 2021).

Keynesian (crowding-in) theory of public debt

John Maynard Keynes, a British economist, was the earliest to vehemently oppose the postulations of the classical school on how the economy should run. Keynes advocated for active government involvement in the economy through increased public spending to stimulate the economy. He therefore recommended

financing fiscal deficit through borrowing. He postulated that such fiscal expansion will spur domestic investment which will further lead to the creation of more income in the economy (Keynes, 1936). He opined that fiscal expansion had the tendency to expand the market for private sector products through the fiscal multiplier, which has been labelled the crowding-in argument (Sineviciene & Vasiliauskaite, 2012).

The Keynesian view postulates that public debt produces a positive effect on domestic investment. The theory argues that government borrows because of a decline in investment, therefore when the borrowing is channelled into capital expenditure, this increases public infrastructure. The increase in public infrastructure is associated with an increase in economic growth (Musgrave, 1997), and economic growth improves the business expectations of investors, eventually leading to higher private investment (Baddeley, 2003). Moreover, public debt-financed capital projects help attract private investment via the provision of investment-inducing infrastructure (Musolesi, 2011; Christ & Green, 2004).

In summary, the Keynesian theory argue that public borrowing can increase a country's capacity to raise its capital formation level which leads to increase in the country's productive capacity. This creates increase in aggregate demand the drive to satisfy the increasing demand will lead to increase in domestic private investment (Makin, 2015). It is this scenario that is described as the crowding-in effect of public debt. Thus, the Keynesian argument is that of a positive relationship between domestic investment and public debt. However, it is silent on the effect of debt service payment which is forms part of the total debt obligation.

Debt overhang theory

The debt overhang theory of investment is associated with the scholarly works of Krugman (1988) and Sachs (1989). The theory argues that public debt does not have the same overall effect on domestic investment. At first, the effect may be positive, however, after a certain point it wanes and begins to pull the investment component downwards. Calvo (1998) and Deshpande (1997) note that public debt beyond a certain turning point leads to a drag on investment as a result of unpleasant expectation by investors that gains from their investment would be "taxed" away by the government to finance the public debt obligation. Hence, the resultant fall in investors' confidence would hinder investment.

The implication of the debt overhang theory is that the relationship between domestic investment and public debt components is rather non-linear. But its relevance to the present study lies in the fact that it factors in the issue of debt service payment in explaining the effect of public debt on domestic investment. While this study does not employ a non-linear approach in the investigation, the theory is certainly important in evaluating the research objectives of the study which assumes that the variables are linearly related. To conclude this sub-section, the author would like to point out that the empirical investigations of this study are based on the propositions of the Keynesian and the debt overhang theories so reviewed.

Impact of domestic public debt on domestic investment

At the international level, the study by Eric, Ndayizeye and Barthélémy (2021) reviewed the effect of domestic public debt on domestic private investment in Burundi over the period 1980-2020 using the least squares method of analysis. Findings are that, in the long run, increase in domestic public borrowing did not lead to a reduction in private sector investment, refuting the crowding out hypothesis in that country within the said period. Thilanka and Ranjith (2020) has similar conclusion for Sri Lanka involving annual data for the period 1978-2015; whereas in Tanzania, Mabula and Mutasa (2019) find

evidence of crowding-out effect of domestic investment.

At the domestic level, the study by Abubakar and Mamman (2021) focused on the period 1981-2018 using the linear and non-linear autoregressive distributed lag (ARDL) models and find that that domestic public debt has asymmetric effect on private domestic investment, meaning that increasing or reducing domestic public debt would still increase domestic private investment which is somewhat puzzling. In contrast, the present study limits itself to investigating the linear relationship between both variables.

The study by Anoke, Odo, and Nnabu (2021) investigated the relationship between public debt and domestic private investment in Nigeria for the period 1980 - 2018. The authors used cointegration, VECM and VEC Granger causality methods to analyze the study data and found that domestic debt has negative significant effect on domestic private investment. However, the study focused on one aspect of domestic investment, namely, the private component alone.

The study by Olaolu and Ibrahim (2021) focused on the 20-year period 2000-2019 in Nigeria. The researchers used the least squares method with result justifying the crowding-out hypothesis. However, the study limited itself to private sector investment and even excludes the effect of external public debt or its servicing, and the time scope of the study is rather small. The present study makes up for these perceived lapses.

The study by Osuoha, Udenwa, and Nwala (2021) empirically analyzed the effect of public debt on private-sector investment in Nigeria over the period 1986-2017 using error correction model (ECM) as method of data analysis. Results show that public domestic debt has significant negative effect on domestic private-sector investment in the country in the short run but the long-run relationship is not significant. Just as in the study by Anoke, Odo, and Nnabu (2021), this study under review focused on private-sector investment alone which is rather narrow.

The study by Penzin and Oladipo (2021) used quarterly data to investigate the relationship between domestic debt and private investment in Nigeria over the period 2000Q1-2019Q2. The data were analyzed using the ARDL method with finding that domestic debt has a significant negative long-run effect on private investment in Nigeria. However, the study used gross fixed capital formation to proxy domestic private investment which is wrong because the variable includes public investment component. Add to it the fact that the authors in the article did not incorporate the case of external public debt nor that of debt service into their study.

The study by Ogunjimi (2019) investigated the impact of the components of public debts on two kinds of domestic investment in Nigeria: private and public, over the period 1981-2016. The author used the ARDL framework and the results showed that domestic debt improves (crowds in) both private and public investment in the short and long runs. However, the study did not include the case of debt service payment which the present study does. Chinanuife, Eze and Nwodo (2018) is another study in Nigeria, that unlike many others, used quarterly time series data over the period 1981-2016. The ARDL method was used in the study with no significant relationship found between the key variables. The study is however limited to public investment whereas the present study is more expanded by using total domestic investment.

On the other hand, Ogbaga and Udude (2018) used the same ARDL method with sample 1986-2016 and find that the suspicion of crowding-out effect is invalid, rather the crowding-in effect is reinforced. But then, the study focuses on private investment only and excluded foreign debt. The study by Nwaeze (2017) in Nigeria focused on the period 1981-2015. The growth rate of domestic credit to the private

sector is used as proxy for private domestic investment, alongside domestic debt stock, external debt stock, and interest rate. Unlike several other studies, the author used the vector auto-regression technique for the analysis and reported a positive relationship between private investment and domestic debt implying a crowding-in (not out) effect; whereas Akomolafe, Bosede, Oni, and Achukwu (2015), using VECM method, reported that the effect is insignificant within the period 1980-2010.

Impact of external public debt on domestic investment

On the foreign scene, Magumisi (2021) examined the impact of public debt on private investment in Zimbabwe using quarterly data for the period 2009-2017. Variables of interest to the study include external debt, interest rates, political risk, trade openness and household consumption. Method of analysis employed is the VECM and finding is that external debt has a significant negative impact on private domestic investment in the long run which supports the crowding out hypothesis. But the study excluded domestic debt or debt service payment.

On the domestic scene, the study by Abubakar and Mamman (2021) mentioned earlier, also found that that external public debt has symmetric effect on private domestic investment with the former having adverse effect on the latter, the present study uses a different methodology though. Likewise, Anoke, Odo, and Nnabu (2021), mentioned earlier, also found that external debt has negative significant impact on domestic private investment; and Osuoha, Udenwa, and Nwala (2021) also found that public external debt has no significant effect on the dependent variable whether in the short run or long run, as did Akomolafe, Bosede, Oni, and Achukwu (2015) whose study covered the 31-year period 1980-2010 in Nigeria.

Similarly, the study by Akpan, Awujola, and Impalure (2023) found no significant long-run impact of external debt on private domestic investment whereas the short run impact is negative and significant in the current period, with the first lag of the variable having significant positive impact on the dependent variable. Clearly, all three studies featured in this paragraph differ in their findings from that of Anoke, Odo, and Nnabu (2021) mentioned earlier. However, most of them ignored the effect of debt service payment in their analysis.

Ogunjimi (2019) examined the impact of the components of public debts on two kinds of domestic investment in Nigeria: private and public, over the period 1981 to 2016. The author used the ARDL framework and the results showed that external debt crowds-in private investment both in the short-run and the long run whereas there is no significant effect on the public component of domestic debt. However, debt service was not included in the study.

Impact of external public debt service payment on domestic investment

In the study by Abubakar and Mamman (2021) mentioned earlier, the authors reported that an increase in debt service payment produces adverse effects on private domestic investment and that the relationship is symmetric. In the case of Anoke, Odo, and Nnabu (2021), the authors find that debt service payment has no significant impact on domestic private investment, as well as no significant causal relationship between the variables. In a similar fashion, the study by Osuoha, Udenwa, and Nwala (2021) investigated the effect of public debt on private-sector investment in Nigeria over the period 1986-2017 using error correction model (ECM) as method of data analysis with the finding that public debt service payment has no significant effect on private investment, just as in the study by Anoke, Odo, and Nnabu (2021). But then

the authors used total public debt service whereas the present study favours external debt service only, for the reason already given.

Thus, on the one hand, most of the studies dwelt on domestic private investment, on the other, most focused on only one aspect of public debt at a time. Also, the case of external debt service is often ignored but this is necessary to investigate whether public debt is crowding out domestic investment. To close these gaps, the present study uses expanded measures such as total domestic investment, domestic and foreign public debt stocks, and external debt service payments, in a bid to extend the empirical literature.

Methodology

The study is quantitative and involves secondary data which are analysed using statistical and econometrics methods. Specifically, we used multiple regression analysis conducted using EViews 9.

Model specification

The Keynesian and the debt overhang theories provide the theoretical backing for the empirical model of the study in explaining the relationship between domestic investment and public debt. The main tenet of the former is that deficit financing, through government borrowing, stimulates the economy by raising the level of investment in the economy. Thus,

Domestic investment = f (Public debt) 1

In our study,

Public debt = domestic debt stock + external debt stock 2

Hence, we rewrite Equation 1 as follows,

Domestic investment = f (domestic debt stock, external debt stock) 3

In addition, the debt overhang theory argues that a country's debt repayment obligation may be so heavy that it stands in the way of investment due to fear of heavy tax demand aimed to raise revenue to service the debt burden. To investigate this, we incorporate debt service payment into the model as follows,

Domestic investment = f (domestic debt stock, external debt stock, external debt service) 4

Lastly, we incorporate an important control variable, interest rate, which is believed to affect the level of investment in an economy, as used in Magumisi (2021), Caspah (2018), Ogbaga and Udude (2018), and Nwaeze (2017), among others. Hence,

Domestic investment = f (domestic debt stock, external debt stock, external debt service, interest rate) 5

The explicit form of the model is as follows,

$$DIV_t = \alpha_0 + \alpha_1 DMDS_t + \alpha_2 EXDS_t + \alpha_3 EDSV_t + \alpha_4 INT_t + e_t \quad 6$$

In Equation 6, DIV is domestic investment proxy by gross fixed capital formation, DMDS is domestic debt stock, EXDS is external debt stock, EDSV is external debt service, and INT is interest rate (prime lending rate), *e* is residual, and *t* is time. Differences in units of measurement of data often necessitates expressing data in log, rather than the absolute, values; as such,

$$\log DIV_t = \alpha_0 + \alpha_1 \log DMDS_t + \alpha_2 \log EXDS_t + \alpha_3 \log EDSV_t + \alpha_4 INT_t + e_t \quad 7$$

Following the supporting theories, the following expectations follow the parameters of the study model: $\alpha_0 > 0$, $\alpha_1 > 0$, $\alpha_2 > 0$, $\alpha_3 < 0$, and $\alpha_4 < 0$.

Data discussion

The data on domestic investment is actually gross fixed capital formation which comprises outlays on fixed assets in the economy by both private sector and public sector investors. The original data are in billions of Naira. Domestic debt stock, external debt stock, and external debt service payment are as previously defined and are in billions of Naira too. Interest rate is actually prime lending rate (in per cent) charged by commercial banks. The data were transformed by log.

Sources of data

The study employed annual time series data covering the 41-year period 1981-2021 in Nigeria. The data were obtained from Central Bank of Nigeria (CBN) Statistical Bulletin of year 2021 available at: https://www.cbn.gov.ng/publication/statistical_bulletin. The raw data is available in Appendix I.

Estimation procedure

The procedure used to estimate the model is summarized into three: pre-testing, estimation, and post-testing. Pre-testing involves stationarity test to determine the orders of integration of the time series data employed. Based on the results, cointegration and vector error correction method were used to estimate the model. The estimated model was thereafter subjected to post-testing for evaluation. Tests such as autocorrelation, normality, and heteroskedasticity were thus administered to determine whether the estimated model conforms with the assumptions of the classical regression model. The essence is to produce a robust and reliable result.

RESULTS AND DISCUSSION

Preliminary results

Descriptive statistics of the original data

Table 1: Descriptive statistics

Statistics	DIV	DMDS	EXDS	EDSV	INT
Mean	7957.668	3594.826	2311.985	97.28220	17.30987
Median	2473.473	1016.974	648.8130	39.86000	17.50000
Maximum	58293.95	19242.56	15855.23	946.2880	29.80000
Minimum	87.14485	11.19000	2.331200	0.300000	7.750000
Std. Dev.	12320.02	5162.039	3497.686	179.5990	4.637785
Skewness	2.491260	1.536557	2.342756	3.253895	0.269227
Kurtosis	9.346954	4.246979	8.358839	14.30761	3.517521
Jarque-Bera	111.2284	18.78994	86.56325	290.7810	0.952843
Probability	0.000000	0.000083	0.000000	0.000000	0.621002
Sum	326264.4	147387.9	94791.37	3988.570	709.7048
Sum Sq. Dev.	6.07E+09	1.07E+09	4.89E+08	1290232.	860.3621
Observations	41	41	41	41	41

Source: Author's computation from EViews 9, 2023

The result in Table 1 shows vital statistics which describe the data for each variable employed in the study. The mean is the average value of the variable over the 41-sample period 1981-2021. The minimum and maximum give the range of the data. The standard deviation is a measure average dispersion from the arithmetic mean whereas the Skewness, Kurtosis, and Jarque-Bera statistics are all measures of distribution of the data. Considering that probability values less than 0.05 means non-normal distribution, we can say that domestic investment (DIV), domestic debt stock (DMDS), external debt stock (EXDS), and external debt service payment (EDSV) are each non-normally distributed in their level form, whereas interest rate (INT) is. To correct this, we transformed the data into growth rates using the logarithm function.

Unit root test results

Stationarity test was conducted with the Augmented Dickey-Fuller (ADF) test and then using the Phillips-Perron (PP) test to confirm the result. Both results are presented in Tables 2 and 3.

Table 2: Summary of Augmented Dickey Fuller (ADF) unit root test results

Variable	ADF Test Statistic @ Level	5% critical value	P-value	ADF Test Statistic @ 1st Difference	5% critical value	P-value	Order of Integration
lnDIV	-3.0346	-3.5366	0.137	-3.9286	-3.5298	0.02	I(1)
lnDMDS	-1.5643	-3.5331	0.788	-4.9005	-3.5298	0.002	I(1)
lnEXDS	-1.9671	-3.5298	0.600	-4.7719	-3.5298	0.002	I(1)
lnEDSV	-1.9650	-3.5266	0.602	-7.4897	-3.5298	0.000	I(1)
INT	-3.0334	-3.5266	0.136	-5.9129	-3.5331	0.000	I(1)

Source: Author's computation from EViews 9, 2023

The result in Table 2 shows that all the variables stationary at first difference, which means they are integrated of order one, with constant only, going by the ADF method.

Table 3: Summary of Phillips-Perron (PP) unit root test results

Variable	Adj. t-Statistic @ Level	5% critical value	P-value	Adj. t-Statistic @ 1st Difference	5% critical value	P-value	Order of Integration
lnDIV	-2.2050	-3.5266	0.474	-3.9279	-3.5298	0.0201	I(1)
lnDMDS	-1.4802	-3.5266	0.8199	-4.8901	-3.5298	0.0020	I(1)
lnEXDS	-2.5744	-3.5266	0.293	-4.7719	-3.5298	0.0020	I(1)
lnEDSV	-2.0508	-3.5266	0.557	-7.3766	-3.5298	0.0000	I(1)
INT	-2.9136	-3.5266	0.169	-9.5617	-3.5298	0.0000	I(1)

Source: Author's computation from EViews 9, 2023

The Phillips-Perron unit root test result in Table 3 confirms the results from the ADF method that all the series employed are integrated of order one. Consequently, the researcher checked for long-run relationship among them using the Johansen cointegration test.

Results of model analysis

Result of Johansen cointegration test

The result of the cointegration test is presents in Table 4.

Table 4: Unrestricted cointegration rank tests (Trace and Max-Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical value	Prob.**
None *	0.770280	103.2487	69.81889	0.0000	57.36488	33.87687	0.0000
At most 1 *	0.477332	45.88384	47.85613	0.0757	25.30356	27.58434	0.0952
At most 2	0.278711	20.58027	29.79707	0.3843	12.74191	21.13162	0.4763
At most 3	0.133419	7.838369	15.49471	0.4828	5.584801	14.26460	0.6669
At most 4 *	0.056146	2.253568	3.841466	0.1333	2.253568	3.841466	0.1333
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level					Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level		

Source: Own computations from EViews 9, 2023

As presented in Table 4, either of the Trace and Max-Eigenvalue test results states that there is at least 1 cointegrating equation among the series of the study at the 5% level of significance. The vector error correction mechanism (VECM) was therefore employed to estimate the long run and short-run relationships.

Long-run results from the Vector error correction mechanism (VECM)

The estimated long-run relationship is presented in Table 5.

Table 5: Long-run estimates

Vector Error Correction Estimates
Dependent variable: D(LDIV)
Sample (adjusted): 1983-2021

Independent variable	**Coefficient**	**Std. Error**	**t-Statistic**
LDMDS(-1)	-0.593703	0.02440	-24.3321
LEXDS(-1)	0.113662	0.03672	3.09544
LEDSV(-1)	-0.470698	0.04086	-11.5198
INT(-1)	-0.463823	0.12641	-3.66921
C	-4.279179		

Source: Own computations from EViews 9, 2023

The result in Table 5 shows that growth of domestic debt stock (LDMDS) has significant negative impact on that of domestic investment (LDIV) in the long run such that DIV would decline by about -0.59% in response to 1% rise in LDMDS. However, positive relationship is observed between growth rate of external debt stock (LEXDS) and LDIV such that the latter would rise by 0.11% in response to 1% rise in LEXDS in the long run. In the other results, same negative relationship is observed between LDIV and growth of external debt service payment (LEDSV) where a 1% rise in the latter results in -0.47% decline in the dependent variable. Lastly, a 1% rise (fall) in the growth rate of lending interest rate (INT) leads to -0.46% fall (rise) in the growth of LDIV in the long-run implying negative relationship. The regression coefficients are statistically significant at the 5% level considering that their T-statistics are each greater than 2.0.

Short-run results from the VECM

The short-run system result of the model is presented in Table 6.

Table 6: Short-run system result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq1	-0.663364	0.067238	-9.865970	0.0000
D(LDIV(-1))	0.269976	0.082094	3.288627	0.0025
D(LDMDS(-1))	-0.233450	0.087250	-2.675664	0.0117
D(LEXDS(-1))	0.182904	0.029667	6.165193	0.0000
D(LEDSV(-1))	-0.147301	0.029487	-4.995461	0.0000
D(INT(-1))	0.088881	0.064804	1.371532	0.1798
C	0.146079	0.025274	5.779791	0.0000
R-squared	0.815716	Durbin-Watson stat	2.435120	
Adjusted R-squared	0.781163	F-statistic	23.60748	
		Prob(F-statistic)	0.000000	

Source: Own computations from EViews 9, 2023

The result of the short-run relationship presented in Table 6 shows that the error correction coefficient of the short-run model is -0.66 which means that about 66% of error due to disequilibrium in the past period is corrected per annum. The speed is very high and this implies that the model would return to equilibrium within two years. The other results show that:

(i) growth of domestic public debt stock (LDMDS) has significant negative impact on that of domestic investment (LDIV) in the short run;

(ii) growth rate of external public debt stock (LEXDS) has significant positive impact on LDIV;

(iii) Growth rate of external debt service payment (LEDSV) is negatively related to LDIV;

(iv) But growth rate of lending interest rate (INT) has no significant effect on that of domestic investment (LDIV) in the short run.

In terms of the robustness of the results, the short-run model has a strong explanatory power considering that the R-squared statistic of 0.82 implies that changes in the predictors explained about 82% of the variations in the response variable. Also, the Durbin-Watson statistic of 2.4 means that there is no positive serial correlation (autocorrelation) problem in the estimated model; and the F-statistic of 23.6 (with p-value = 0.000) implies that the independent variables jointly have significant impact on the dependent variable at the 5% level of significance.

Post estimation test results

Post estimation or diagnostic tests conducted on the residuals of the estimated results include the serial correlation, heteroscedasticity, normality, and stability tests.

Test for autocorrelation

We conducted the vector error correction (VEC) residual serial correlation test with this result:

Table 7: VEC Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at		
Lags	LM-Stat	Prob
1	**34.52621**	**0.0971**
2	27.89443	0.3127
3	41.15267	0.0221
4	25.36130	0.4423
5	18.93532	0.8002

Probs from chi-square with 25 df.
Source: Own computations from EViews 9, 2023

The result in Table 7 clearly shows that the null hypothesis of no serial correlation is accepted at the 5% level for lags, 1, 2, 4, and 5 only. The study used just one lag; hence we have good reason to conclude that the regression residuals of the model are serially uncorrelated.

Test for heteroskedasticity

The heteroskedasticity test is used to check the assumption of constant variance in the residuals of the estimated model. The VEC residual heteroskedasticity test was employed in this study and the result is presented in Table 8.

Table 8: Result of heteroskedasticity test

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 07/23/23 Time: 05:47
Sample: 1981 2021
Included observations: 39

Joint test:		
Chi-sq	df	Prob.
159.5776	180	0.8609

Source: Own computations from EViews 9, 2023

The result in Table 8 shows that the null hypothesis of 'no heteroskedasticity' is accepted at the 5% level of significance, considering that the p-values of the Chi-Square statistic is greater than 0.05. This implies that the distribution of the regression residuals is characterised by constant variance (homoskedasticity) as expected.

Test for normality of distribution of the residuals

To determine whether the regression residuals follow a normal distribution, the histogram normality test was employed and the output is presented below.

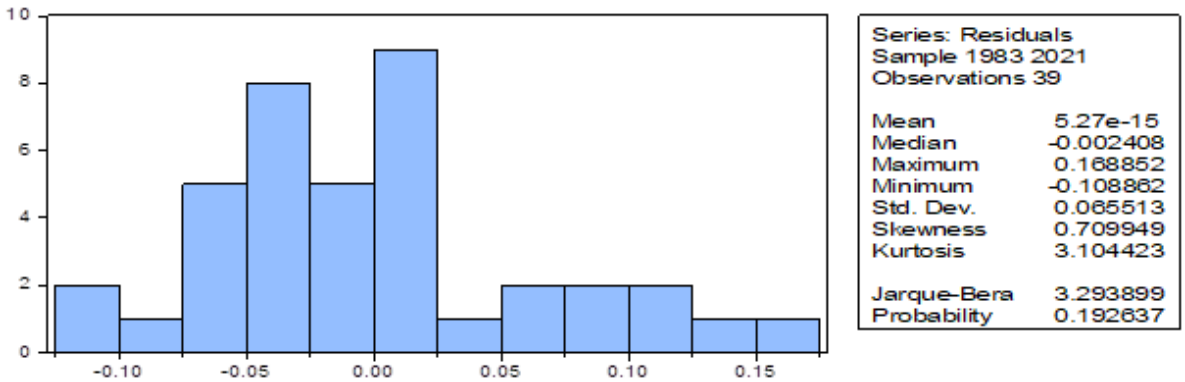

Fig. 1: Histogram normality test result

Going by the Jarque-Bera (J-B) statistic (3.29) and its probability (0.193) in Fig. 1, we conclude, at the 5% level of significance, that the residuals are normally distributed which meets our expectations.

Test for model stability

We employed the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUM^2) tests to evaluate the stability of the estimated VECM model.

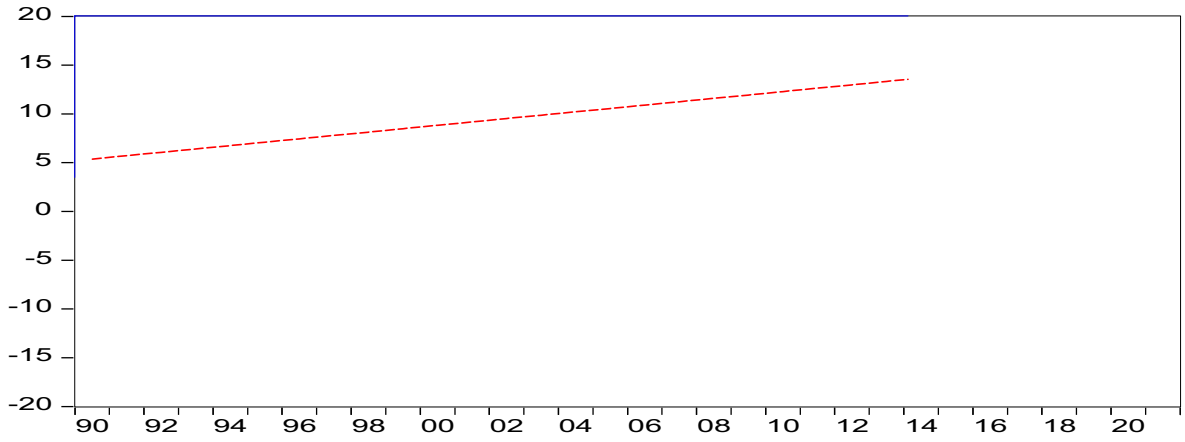

Fig. 2: CUSUM graph

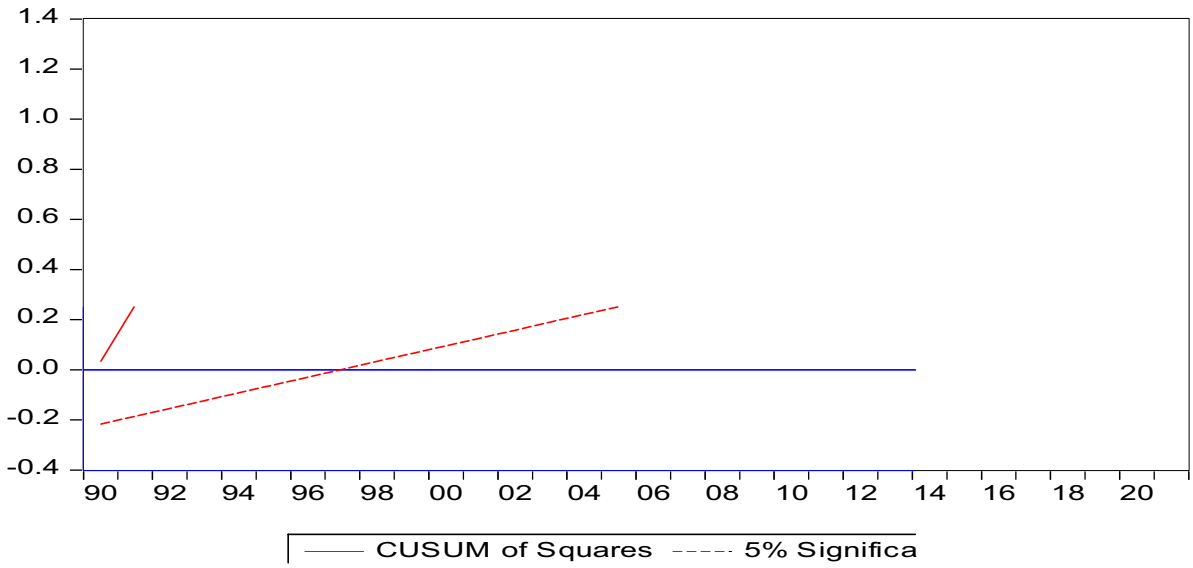

Fig. 3: CUSUM of squares graph

Since the solid curves in both graphs are within the upper and lower bounds, we conclude, at the 5% level of significance, that the estimated model is stable going by the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUM of Squares) results.

Test of research hypotheses

Test of research hypothesis one

H_{01}: Domestic public debt has no significant impact on domestic investment in Nigeria.

Decision rule: Reject H_0 if the estimated t-Statistic of the domestic public debt variable (LDMDS) is significant at 0.05 level; otherwise, do not reject H_0.

Result and conclusion: The estimated long-run coefficient of LDMDS is -0.5937 with t-Statistic of -24.33 as in Table 5. Similarly, the short-run result in Table 6 shows that the coefficient of the variable is -0.233 with t-Statistic -2.676 and p-value 0.01. Since the T-statistics are each greater than the 2.0 benchmark, the null hypothesis stands rejected. Therefore, domestic public debt stock has significant negative impact on domestic investment in Nigeria in the short and long runs.

Test of research hypothesis two

H_{02}: External public debt does not have significant impact on domestic investment in Nigeria.

Decision rule: Reject H_0 if the estimated t-Statistic of the external public debt variable (LEXDS) is significant at 0.05 level; otherwise, do not reject H_0.

Result and conclusion: The estimated long-run coefficient of LEXDS is 0.114 with t-Statistic of 3.095 as in Table 5. Similarly, the short-run result in Table 6 shows that the coefficient of the variable is 0.183 with t-Statistic 6.165 and p-value 0.00. Since the T-statistics are each greater than the 2.0 benchmark, the null hypothesis stands rejected. This implies that external public debt stock has significant positive impact on domestic investment in Nigeria in both the short and long runs.

Test of research hypothesis three

H_{03}: Nigeria's external public debt service payment is not crowding out domestic investment in the country.

Decision rule: Reject H_0 if the estimated t-Statistic of the external public debt service variable (LEDSV) is significant at 0.05 level; otherwise, do not reject H_0.

Result and conclusion: The estimated long-run coefficient of LEDSV is -0.471 with t-Statistic of -11.52 in Table 5. Similarly, the short-run result in Table 6 shows that the coefficient of the variable is -0.147 with t-Statistic -4.995 and p-value 0.00. Since the T-statistics are each greater than the 2.0 benchmark, we reject the null hypothesis and conclude that Nigeria's external public debt service payment is seriously crowding out her domestic investment in both the short and long runs.

Discussion of findings

Effect of domestic public debt on domestic investment in Nigeria

The study finds that domestic public debt stock has significant negative impact on domestic investment in Nigeria in the short and long runs. This finding is at variance with the Keynesian theory that supports financing fiscal deficit through government borrowing, in this case, internally. The finding is similar to those of the studies by Olaolu and Ibrahim (2021), Osuoha, Udenwa, and Nwala (2021), and Penzin and Oladipo (2021). However, it differs from those of Ogunjimi (2019), Ogbaga and Udude (2018) which reported positive significant impact.

Effect of external public debt on domestic investment in Nigeria

The study finds that external public debt stock has significant positive impact on domestic investment in Nigeria in both the short and long runs. The finding is in tandem with the Keynesian theory of deficit financing through government borrowing. While it does not encourage needlessly growing the external debt stock of the country, the results suggests that externally borrowed funds can be spent to improve the country's capital formation due to the observed positive relationship. The findings agree with those of Ogunjimi (2019); but not with those of Anoke, Odo, and Nnabu (2021) who found negative relationship between the variables.

Effect of external public debt service payment on domestic investment in Nigeria

This study finds that Nigeria's external public debt service payment is definitely crowding out her domestic investment in both the short and long runs. This gives credence to the debt overhang theory in Nigeria that huge debt repayment obligation eventually scares domestic investment. In other words, increase in debt service payment retards the growth of domestic investment in the country. The findings agree with those of Abubakar and Mamman (2021). However, it is an improvement over those of Anoke, Odo, and Nnabu (2021), and Osuoha, Udenwa, and Nwala (2021) both of which reported that public debt service payment has no significant impact on domestic investment in Nigeria in separate periods.

Conclusion and Recommendations

Based on the shreds of evidence presented and discussed, the study concludes that growth of public debt is inimical to the growth of domestic investment in Nigeria. The study recommends as follows:

1. The Nigerian government should curtail its domestic borrowing excesses because of the negative influence it exerts on domestic investment over time.
2. The government should channel some externally borrowed fund into growing the country's capital formation which is the result of domestic investment owing to the positive relationship between both variables.
3. The government should strongly cut down on more external borrowing because the resulting debt service payment stifles the growth of domestic investment in the domestic economy.

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