

Risk of Geometric Increase in Debt Servicing on Public Investments in Nigeria

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ABSTRACT

The study investigated the risk of geometric increase in debt service on public investments in Nigeria using a time series data from 1985 – 2021. The study employs ARDL model in analyzing the behavior of the variables. The findings show that there is a significant direct relationship between domestic debt stock and public investment. Similarly, it also shows same non-risky relationship between external debt and public investment in the past two years as shown from lagged values of last year and the year preceding it. External debt servicing has non-risky relationship with public investment in the current year as it avoid crowding out effect of private investment. But it shows a risk relationship in the two years before. The results also visualize that there is a direct relationship between FDI and public investment in the current year and indirect relationship in the preceding years. It can also be seen that a negative relationship exists between inflation and public investment, while a negative relationship exists between exchange rate and public investment in the current year, a positive relationship exists between exchange rate and public investment for Nigerian economy which suggests that exchange rate volatility matters as it affects debt servicing in the long run.

Keywords: Debt Servicing, Public Investments, Debt Stock, Exchange Rate, Inflation, Foreign Direct Investment

INTRODUCTION

Insufficient or inadequacy of financial resources led most of developing countries around the world borrow from internal or external sources to finance their various governmental projects in their respective economies [1]. Improvement of standard of living of citizens and provision of social and economic infrastructural facilities among others required availability of financial resources, good governance, political will, loan accessibility, interest rate on loanable fund and others [2]. Low revenue generation to weak economies led to the inability to meet their budgeted expenditure target and have to secure loans from International financial institutions or have to issue bonds and treasury bills to the domestic market. International Financial Institutions like World Bank, International Monetary Fund, Asian Development Bank and African Development Bank are the lending donor agencies. They give loan to debtor economy on soft and hard conditions depending upon the credit rating of the country [3]. External debt is an engine for financing capital accumulation by the government in any economy [4]. It is a medium used by countries to bridge their deficits and carry out economic projects that are able to increase the standard of living of the citizenry and promote sustainable growth and development⁵ stated that external borrowing ought to accelerate economic growth especially when domestic financing is inadequate. External debt also improves total factor productivity through an increase in output which in turn enhances Gross Domestic product (GDP) growth of nations.

Fig1. Nigeria’s Debt Profile



Source: Author’s Compilation

Nigeria’s indebtedness dates back to pre-independence era. The debts incurred before 1978 were relatively small and mainly long-term loans from multi-lateral and official sources such as the World Bank and Nigeria’s major trading partners. The loans were majorly obtained on soft terms and therefore did not constitute a burden to the economy. However, due to the fall in oil prices and oil receipts, the country in 1977/78 raised the first jumbo loan to the tune of US\$1.0 billion from the international capital market. The loan was used to finance various medium to long-term infrastructural projects. The past couple of decades have witnessed rising concern on the increase in Nigeria’s public debt. The first most significant rise in Nigeria’s public debt occurred in 1987 when the total debt rose by 96.9 per cent to N137.58 billion. From then, the rise in Nigeria’s public debt continued unabated such that as at 2004, total public debt stood at N4.264 billion. In 1986, total debt which was hitherto driven largely by the domestic debt witnessed a reversal and was being driven by the external debt [5]. Nigeria’s debt stock increased by 3% from the N21.68 trillion recorded in December 2017 to N22.4 trillion (\$73.21 billion) as at June 2018[6]. This motivates the need to carry out the empirical research on the impact of external debt on economic growth in Nigeria. Payments of principal and interest rate in currency, goods or services on short term debt and long term debt referred to debt servicing. This is the repayment by a debtor country that owes the principal and interest on a loan outstanding at maturity to the creditor country. Debt servicing has jeopardized the economic growth and development of Nigeria. This attributed to heavy economic consequences such as high inflation, unemployment, corruption, exchange rate parity and larger portion of the population living below poverty threshold [7].

Debt servicing is the regular payment of loan in installments made by debtor country to creditors from internal and external loans. An installment includes interest on debt and a part of the principal [8]. Higher global interest rates could divert a large chunk budget to debt servicing instead of critical growth enhancing infrastructure, economic and social services; placing low-income and emerging economies at great risk. Underlying growth estimates potential in most developing and emerging economies rising interest rates makes cost of servicing debt harder for debtor country to refinance bonds and contracted loans [9]. There was a swift shift of focus by both debtor and creditor countries from the build-up in public debt towards debt-servicing capacity towards the end of the 1980s by most of the sub-Sahara African (SSA) countries. During this period, most regional countries experienced; rampant inflation and an excessive diversion of foreign borrowings

from productive investment's and social services towards debt servicing, severe loss of credit worthiness, negligible net capital inflows [10].

Debt overhang in SSA caused considerable changes in economic institutions, domestic policies, monetary expansion, flourishing of parallel foreign exchange markets, rising fiscal deficits and substantial capital flight. Falling export earnings reverted foreign borrowing to sustain public expenditures by few African countries, such as Zimbabwe and Zambia [11]. Education, healthcare facilities, Roads, rail networks, bridges, energy generating plants, ports, telecommunications structures, water and sanitation networks, government buildings which can have a productive life of several decades are the basic public investment outlays. Such outlays range from small one off, limited infrastructural projects that can be implemented within a year to more complex projects that take place over decades so-called "mega projects". Governments may invest in machinery and equipment computers, laboratory equipment, even textbooks whose life span is much shorter [12]. Capital outlay of a government would be defined as "public investment" in normal budgetary classification terms, this approach sidesteps a number of important conceptual issues [13]. Emphasized the positive impact on trade flows from public infrastructural investments in transport, airports and port facilities. By reducing trade and transport margins and lowering the cost of market participation in a relatively nondiscriminatory manner, infrastructural investments can promote regional trade expansion [14]. When operating organization drafted annual budget estimation of future recurrent cost implications were not required when costing the investment project. Budgeting of expenses for the maintenance of completed investment projects, including expenses for current repairs and maintenance, was supposed to be carried out. The efforts of a Country to "invest in the investment process" can play a key role in raising the returns on public and private investment, and in ensuring that the scaled-up investment reaps the required growth dividends, while maintaining fiscal and debt sustainability [15].

EMPIRICAL LITERATURE REVIEW

Several empirical studies have been conducted on external debt and economic growth relationship, internal debt and economic growth nexus, debt service payment and economic growth connection, debt stock and social services association and debt service payment and social services provision. It must be stated that the literature on external debt, internal debt, debt servicing and economic services provision is very scanty. External debt on economic growth in Sub-Saharan African countries for the period 1970 to 1994. Time series data and simulation approach have been used in the study. The findings of the analysis shows that external debt has a negative effects and is significantly related to investment. The results also showed that debt stock reduction would significantly increase investment and economic growth. To them, debt forgiveness could provide a much needed stimulus to investment recovery and economic growth in Sub-Saharan African countries [16]. Impact of external debt on economic growth in Kenya was analyzed from 1970 to 1995. The study employed time series data and Ordinary Least Square Regression technique. Empirical findings from the study revealed that there is positive relationship between debt service payment and economic growth; however, the study confirmed some crowding-out effects on private investment [17].

[18] Examined both the short-run and long-run relationships between economic growth and external debt service of Turkey over the period 1956 to 1996. The study used a standard production function model analysis using multivariate co-integration techniques. The Vector Auto regression estimates showed that there is one co integration equation. The results of the study revealed that debt service payment has an adverse effect on economic growth in the long run. The causality test showed uni-directional causality between debt service payment and economic growth. [15] Examined the channels through which external debt affects growth in low income countries. Their results suggest that the substantial reduction in the stock of external debt projected for highly indebted poor countries would directly increase per capita income growth by about 1 percentage point per annum. Reductions in external could also provide an indirect boost

to growth through their effects on public investment. [18] analyzes the relationship between domestic investment and external debt ratio in the 13 countries using panel data analysis for the period 1971-1991 and reports a negative effect of debt on domestic investment. [19] Analyzed the African external debt problem with reference to Nigeria and Morocco. He concluded that external debt has affected investment severely. Other findings include the fact that fiscal expenditure, balance of payments, and global interest rates are major factors explaining debt accumulation in the studied countries. He, therefore, suggests measures that could alleviate the above problems (privatization, sustained export promotion program, and restructuring and development of capital markets, among others).

[20] Examined the impact analysis of external debt servicing on the aggregate investment of Pakistan. A simple and sophisticated technique of classical econometrics is used for the analysis. Empirical findings revealed that debt servicing practices to multilateral financial creditors and other private creditors has a negative impact on investment while the bilateral creditors, IBRD (non-concessional debt) and IDA have shown a positive contribution. [21] Investigated the impact of external debt on economic growth and public investment in Nigeria from 1970 to 2002. The study was conducted using the co integration test and error correction method. Empirical findings from the study revealed that debt servicing pressure in the country has had a significant adverse effect on the growth process and past debt accumulation negatively affect public investment. The study also, examined the relationship between external debt and economic growth in Sudan over the period 1978 and 2001. The study revealed that export earnings have a significant positive impact while external debt and inflation had negative impact on Sudan's economic growth [22].

[23] Used standard neo-classical growth model to explore the dynamics of capital accumulation, external debt and economic growth for Philippines over a period of 2000 to 2003. They used goal seek technique to estimate the steady state ratio of external debt to GDP, associated with doubling the capita income. He concluded that higher ratio of change in interest rate spread to change in debt-to-GDP lowers welfare in long run. [24] Analyzed the effects of external debt management on the economic growth of Nigeria for a period of 1962 to 2006 using time-series data of the various bilateral and multi-lateral arrangements. Their study concluded that accumulation of external debt adversely affected Nigeria's economic growth. [25] Examined the impact of external debt on economic growth in Nigeria and South Africa using neoclassical growth model. The study found a negative impact of debt and its servicing requirement on economic growth in the two countries while external debt contributes positively to growth up to a point after which its contribution becomes negative in Nigeria. [26] Investigated the effect of external debt service payment practices on sustainable economic growth and development in Nigerian from 1981 to 2004. The study used Ordinary Least Square estimating technique for the analysis. Empirical findings from the study revealed that debt service payment to foreign creditors exerted negative impact on sustainable economic growth and development. [27] Empirically investigated the effect of external debt service payment practices on the economic growth of Nigeria. Ordinary Least Square method of multiple regressions was used to examine how debt payment to multilateral financial creditors, Paris club creditors, London club creditors, Promissory notes holders and other creditors relates to gross domestic product (GDP) and gross fixed capital formation (GFCF) using data from 1981 to 2004. The study showed that debt payment to Paris club creditors and Promissory notes holders are positively related to GDP and GFCF while debt payment to London club creditors and other creditors show a negative significant relation to GDP and GFCF.

[28] Investigated the relationship between external debt and economic growth in Pakistan over the period 1972 to 2005 employing time series econometric technique. Their result reveals that external debt is negatively and significantly related to economic growth. The evidence suggests that increase in external debt would lead to decline in economic growth. [29] Examined the effect of different types of debts on the economic growth in Malaysia during the period 1970 to 2006. Using co integration test, the findings suggest that all components of debts have a negative effect on long run economic growth. The granger causality test reveals the existence of a short-run causality linkage between all debt measures and economic growth in the

short-run. [30] Examined the causal nexus between public debt and economic growth in Nigeria between 1970 and 2010 using a Vector Autoregressive (VAR). The variables used in the study were tested for stationarity using the Augmented Dickey Fuller and Phillip Perron test. Co integration test was also performed and the result revealed the presence of co integration between public debt and economic growth. The co integration results show that public debt and economic growth have long run relationship. Empirical findings from the study revealed that there is bidirectional causality between public debt and economic growth in Nigeria.

[31] Journal of Economics and Sustainable Development www.iiste.org ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online) Vol.9, No.6, 2018 91 empirically tested the linear or non-linear relationship of external debt and economic growth for 20 Latin American and Caribbean economies over the period 1970 and 2002. The study used a dynamic system Generalized Method of Moments (GMM) pane estimator. The results show that lower total external debt levels are associated with higher growth rates and there is an insignificant association between debt service ratios and growth rate of the economy. [32] Investigated the external debt effect on economic growth using a relatively small sample of 24 developing countries over the period 1976 to 2003. The study applied random effect and fixed effect estimation. She found that debt servicing to GDP does hamper economic growth and may leave less funds available to finance private investment in these countries leading to a crowding out effect. [33] Examined the impact of external debt on promotion of economic growth in developing countries using Nigeria as a case study. The study covers the period 1970 and 2007. Time series data were used with various econometric techniques such as Augmented Dickey Fuller test, Granger Causality test, Johansen Co integration test and Vector Error Correction Method (VECM). According to this study, external debt only helps to exploit the potentials of a country, it does not enhance it. Empirical results have shown clearly that causation between external debt and economic growth could not be established in the Nigerian context and external debt could thus not be used to forecast improvement or slowdown in economic growth of Nigeria. [28] Examined the impact of external debt on economic performance of Pakistan over the period 1972 to 2005. Time series data and various econometric techniques were used for the analysis. Empirical findings revealed that external debt is negatively and significantly related with economic growth while debt servicing has a statistically significant adverse relationship with economic growth. [5] Examined the effect of external debt on economic growth in Nigeria from 1970 to 2010. The study found short and long run relationship among the variables and concluded that external debt contributed positively to economic growth in Nigeria. [8] Conducted a study on the impact of external debt financing on economic development in Nigeria from 1969 to 2011. Empirical findings from the study revealed that external debt service payment contributed positively to economic development in Nigeria. [34] Investigated the causality between debt service payments and provision of social services in Nigeria from 1980 to 2010 employing Augmented Dickey Fuller (ADF) unit root test and Ordinary Least Square estimating technique. Empirical findings from the study revealed a positive relationship between internal debt, exchange rate and social services provision, while an inverse relationship exists between external debt and social service provision. The study suggested the need for more innovativeness in tax collection and administration and implementation of more public-private-partnership in infrastructural financing.

[35] Examined the relationship between external debt and economic growth in Nigeria for the period 1981 to 2014. The study employed both descriptive and econometric tools. The regression results showed a significant relationship between external debt and economic growth in Nigeria. However, external debt stock impacted positively while external debt service payment impacted negatively on the annual growth rate of the Nigerian economy both in the long run and the short run. Private investments necessary for productivity growth, and a reduction in capital accumulation [3] investigate the effect of external debt on growth for low-income countries using both fixed effects and system GMM methods. According to the empirical results, external debt to GDP has a negative effect on growth especially when it reaches around 30-37%. Also, the authors examine the relationship between public investment and external debt and find that

higher debt service crowds out public investment. The Validity of the Debt Overhang Theory in Developing Countries

[36] Argues the debt-growth nexus with institutions' and policies' efficiency for panel data of 114 developing countries "Between" (1980-2004). According to GMM estimation results debt overhang appears to be at work only in countries with well-established institutions. On the other hand, for countries with weak institutions, the impact of external debt on growth is insignificant. [37] Examine two main channels to show whether the level of indebtedness impact growth: investment channel and deterioration of the quality of investment and policies. The authors use OLS and system GMM methodology to investigate the relationship between the investment and the external debt with control variables terms of trade growth, openness and per capita GDP growth for unbalanced panel data of 79 developing countries over the period 1970-2002. They find that a rise in indebtedness negatively influences investment at low levels of debt and high government efficiency. [37] Using the fixed effect panel data and the system GMM approach with a nonlinear specification for 93 developing countries over the period 1969-1998 finds that debt seems to have a nonlinear effect on growth. The results show that the average influence of debt is negative for debt levels above 35-40% of GDP like [3].

[38] Analyzes the evidence of the debt overhang hypothesis at the firm level for emerging and developing countries by using a baseline estimating equation. The analysis finds that there is a nonlinear effect indicating that debt overhangs crowds out investment at high levels of indebtedness.

THEORETICAL LITERATURE REVIEW

The Dependency Theory

This theory is based on the assumption that resources flow from a "periphery" of poor and underdeveloped states to a "core" of wealthy states thereby enriching the latter at the expense of the former. Dependency theory states that the poverty of the countries in the periphery is not because they are not integrated or fully integrated into the world system as is often argued by free market economists, but because of how they are integrated into the system. From this standpoint, a common school of thought is the bourgeoisie scholars. [33]. To them, the state of underdevelopment and the constant dependence of less developed countries on developed countries are as a result of their domestic mishaps. They believe this issue can be explained by their lack of close integration, diffusion of capital, low level of technology, poor institutional framework, bad leadership, corruption, mismanagement, they see the under-development and dependency of the third world countries as being internally inflicted rather than externally afflicted. To this school of thought, a way out of the problem is for third world countries to seek foreign assistance in terms of aid, loan, investment etc. and allow uninterrupted operations of the Multinational [34] They are dependent on the developed nations for virtually everything ranging from technology, aid, technical assistance, to culture, etc. the dependent position of most underdeveloped countries has made them vulnerable to the products of the Western metropolitan countries and Bretton Woods institutions. The dependency theory gives a detailed account of the factors responsible for the position of the developing countries and their constant and continuous reliance on external aid for their economic growth and development [23].

The Dual Gap Theory

Underdeveloped economies face low and weak growth rates because of the inherent nature of under savings which is unable to provide financial support for investment in both private and public sectors of their economies. In other words savings and investment supports and sustains economic growth [39]. Economic growth cannot be sustained and maintained unless the level of capital reaches a certain threshold point. Growth in capital and investment enhanced with foreign loans will stimulate automatic economics growth resulting from an increase in savings over time. The foregoing illustrates the concept of the dual gap theory.

Thus, external borrowing becomes a necessity [40].

The most important consideration in contracting external debt is a simple and direct one; signing up for debt from abroad only when the funds can generate higher returns than the cost of funds when invested. It therefore follows that borrowing nations would be enhancing their productivity and national output through the investment facilitated by borrowed funds. The dual-gap concept refers to the function of foreign capital in the economic development process. The role of foreign capital here is that it permits developing countries to invest more than they can save domestically; which is a necessity resulting from deficits in internal savings [41]. In the same vein [42] observed that the capacity of the difference between consumption and income in under developed economies has not been high enough due to the inadequacy of income resulting into low savings. Capital in the circumstance therefore need to be augmented by external funds to enhance investment and hopefully raise the degree of growth in the economies. It should be born in mind that such funds must be efficiently invested and profitably utilized. This will lead to countries successes in boosting their rates of growth. The reason for incessant dearth of capital in developing countries mostly originates from inadequate inflow of foreign exchange from outside to supplement local savings [43]

Theory of Debt Laffer curve

External debt is an important resource to finance existing and planned investments. Although the growth-cum-debt is the preferred method to arrive sustainable growth rate, especially in developing countries, inherited debt in the future may be greater than the present value of the creditors' expected resource transfer [44]. In this case, external debt stock may exceed the value-added created by economic growth. The debt overhang theory states that if the countries' debt repayment ability decrease in the future, the expected debt ratio will be an increasing the function of the country's output level [45]. The terms, conditions and timing of both debt repayment and domestic taxation become uncertain in the case of high indebtedness. [37] Ultimately, this uncertainty causes domestic and foreign investments to decrease and the projected growth to be negatively affected. As suggested by the Debt Laffer Curve introduced by [46] high debt levels result in efficiency losses and the present value of expected debt repayments tend to decline when the value of nominal debt stock becomes too large due to these deadweight losses and inefficiencies 3 Similar to the previous empirical studies, we focus on external debt to analyze the debt overhang hypothesis. We do not include industrial countries in the dataset since external debt data are not available for them. The Validity of the Debt Overhang Theory in Developing Countries [47]

Fig.2 Debt Laffer curve



The Debt Laffer Curve is explained in the above Figure 1. In line with the Debt Laffer curve, [48] shows that investment increase with the external debt up to a certain threshold level. Beyond this threshold level of indebtedness, external debt is associated with lower investments. Investments have been suppressed

inefficiently with increasing external debt and expected taxation policies [48] the existence of distortionary taxation is the key factor that reduces the efficiency of investments [49] an uncertain environment leads investors to short-term investments with high returns instead of long-term investments which in turn, decreases the value-added of the investments. On the other hand, lenders' long-term balance strategy makes the growth of debt-dependent on the growth of the borrower country [46]. Increased uncertainty due to high external debt stock tends to decline investment, growth and the possibility of borrowing in the future. In short, sustainable external debt is a necessary condition for sustainable growth.

METHODOLOGY AND SOURCES OF THE DATA

The study extracted annual time series data on capital expenditure, inflation, exchange rate, external debt stock and domestic debt stock from the NBS & CBN Statistical Bulletin 2021. While external & internal debt services are sourced from Debt Management Office (DMO) and the World Development Indicator (WDI). The data on Foreign Direct Investments FDI were sourced from the WDI and CBN Statistical Bulletin, 2021 respectively. The analysis was conducted using the Autoregressive Distributed lags Technique (ARDL) following the test of stationary which warrants the use of ARDL model.

Unit Root Test

The study begins by examining the stationary status of time series data variables of the study, in order to determine whether the variables are stationary or non-stationary. The study used Augmented Dickey Fuller (ADF) test for stationary. Unit root equation is specified in below form:

$$\Delta Y_t = \beta_1 + \beta_2 + \sigma Y_{t-1} + \alpha \sum_{t=1}^n Y_{t-1} + \varepsilon_t \dots \dots \dots (1)$$

The null hypothesis to be tested is H0: p=1 indicates the presence of a unit root. If found that the variables are not integrated of the same order, we can then employ ARDL bound test, otherwise the study would undertake co-integration test based on Johansen/Juselius approach especially if all the variables are I (1).

Model Specification

The study employs ARDL bound approach to co-integration test to determine the long run relationship between the variables under study. The ECM model is used to capture the short run relationship between the variables. The model is based on approach of Engle and Granger (1987) and Johansen Juselius (1990) and Autoregressive Distributed Lag (ARDL) bounds testing approach by Pesaran et al. (2001) presented as follows:

$$\Delta CAPEX_t = \beta_0 + \sum_{t=1}^n \beta_1 EXTD_{t-1} + \sum_{t=1}^n \beta_2 DOMD_{t-1} + \sum_{t=1}^n \beta_3 EXTS_{t-1} + \sum_{t=1}^n \beta_4 DOMS_{t-1} + \sum_{t=1}^n \beta_5 EXCH_{t-1} + \sum_{t=1}^n \beta_6 INFL_{t-1} + \sum_{t=1}^n \beta_7 FDI_{t-1} + \gamma_1 ECM_{t-1} + \varepsilon_t \dots \dots \dots (2)$$

Where:

CAPEX = Capital Expenditure (Billion); EXTD= External Debt (Billion); DOMD= Domestic Debt (Billion); EXTS=Eternal Debt Service (Billion); DOMS = Domestic Debt Service (Billion); EXCH= Exchange Rate; Inflation Rate and FDI =Foreign Direct Investments (Billion). The ARDL model above seeks to test the long run relationship of the variables and the null hypothesis is tested by H0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$ to determine the presence of co-integration among the variables of interest. The critical bounds test of the F statistics with upper and lower bound limits I (1) and I (0) respectively is the criterion for rejection of the null hypothesis. Thus the ECM is model as follows:

$$\Delta CAPEX_t = \beta_0 + \sum_{t=1}^n \beta_1 EXTD_{t-1} + \sum_{t=1}^n \beta_2 DOMD_{t-1} + \sum_{t=1}^n \beta_3 EXTS_{t-1} + \sum_{t=1}^n \beta_4 DOMS_{t-1} + \sum_{t=1}^n \beta_5 EXCH_{t-1} + \sum_{t=1}^n \beta_6 INFL_{t-1} + \sum_{t=1}^n \beta_7 FDI_{t-1} + \gamma_1 ECM_{t-1} + \varepsilon_t \dots \dots \dots (3)$$

DATA ANALYSIS AND RESULTS

Descriptive Statistics of the Variables

The descriptive statistics on Table 1 showed that the average values of the public investments that used the capital expenditure as the proxy (CAPEX), Domestic Debt Stock, Domestic Debt Service (DOMDES), Exchange Rate (EXR), External Debt Service, External Debt Stock, Foreign Direct Investments and Inflation Rate (INFR), 2.38, 3.04, 2.11, 1.75, 3.01, 1.80, 0.22 & 1.15. The standard deviation shows that both variables aren't relatively deviated as none exceeds one (1). Furthermore, the table revealed that the skewness statistics of all the variables are negatively skewed except that of inflation with positive skewness of 0.910479. The Kurtosis statistics revealed of all the variables are leptokurtic except external debt and external debt service with 3.164924 and 3.485314 respectively, which implies that the distributions are peaked relative to normal distribution, Lastly, the probability of Jarque-Bera statistic rejected the null hypothesis of normal distribution for all the variables at 5% significant level as they are significant at 5% confidence level.

Table1: Descriptive Statistics

| | LNCAPEX | LNDOMDET | LNDOMDS | LNEXCH | LNEXTDDET | LNEXTERS | LNFDI | LNINFL |
|---------------------|---------|----------|---------|--------|-----------|----------|-------|--------|
| Mean | 2.38 | 3.04 | 2.10 | 1.75 | 3.01 | 1.8 | 0.22 | 1.15 |
| Std. Dev. | 0.8 | 0.86 | 0.85 | 0.69 | 0.66 | 0.65 | 0.46 | 0.31 |
| Skewness | -0.82 | -0.4 | -0.48 | -0.88 | -0.43 | -0.46 | -0.14 | 0.91 |
| Kurtosis | 2.47 | 2.08 | 2.52 | 2.79 | 3.16 | 3.48 | 1.98 | 2.91 |
| Jarque-Bera | 4.63 | 2.13 | 1.78 | 4.85 | 1.19 | 1.68 | 1.71 | 5.12 |
| Probability | 0.10 | 0.34 | 0.41 | 0.09 | 0.55 | 0.43 | 0.42 | 0.08 |
| Observations | 37 | 37 | 37 | 37 | 37 | 37 | 37 | 37 |

Source; Authors Compilation (2022)

Unit Root Tests

The study used Augmented Dickey-Fuller test to investigate the stationarity of the variables. The results of the unit root test presented in Table 2 showed that all the variables were stationary at the first difference except inflation rate and exchange rate which was stationary at level. Based on this being mix order of integration in the result, this study will use Auto-regressive Distributed Lag Bound co-integration technique because it is for it's the technique to use when there is a mixed order of integration in the variables.

Table 2: Results of Unit Root Test

| Variables | Order of Integration | ADF (5%) | Critical Value | P-value |
|-----------------|----------------------|----------|----------------|---------|
| LNCAPEX | I(1) | -2.95 | -6.9 | 0 |
| LNDOMDET | I(1) | -4.61 | -2.95 | 0.0007 |

| | | | | |
|-----------------|------|-------|-------|--------|
| LNDOMDS | I(1) | -4.62 | -2.95 | 0.0008 |
| LNEXTDET | I(1) | -4.12 | -2.94 | 0.0028 |
| LNEXTERS | I(1) | -4.84 | -2.95 | 0.0008 |
| LNFDI | I(1) | -3.3 | -2.95 | 0.0231 |
| EXCH | I(0) | -3.43 | -2.94 | 0.0163 |
| INFL | I(0) | -2.98 | -2.94 | 0.0463 |

Source: Author’s computation (2022)

Co-integration Test

Table 3 below shows the Bound test for Co-integration and used the value of the F-statistics to determine the degree of co integration of the variables under analysis. The outcome revealed that F-statistics is 3.97 which greater than both lower bound of 2.17 and upper bound of 3.21 being a critical value of 5%, which shows the presence of Co integration among the variables under study. Therefore, going by bound test decision criterion of the Co integration there is presence of long run convergence among the variables under analysis.

Table 3: ARDL Bound Co-integration Test

| Co-integration Bound test | Diagnostic test | | | |
|---|-----------------|-----------------|-----------------|----|
| | Model | F-Statistics | Lag | R2 |
| capex=fdomdet, domdes, exterdet, exters, infl, excr, fdi) | 3.969771** | 1,3,3,3,3,3,3 | 0.94624 | |
| Significance level | | Lower bounds(0) | Upper bounds(1) | |
| 1% | | 2.73 | 3.9 | |
| 5% | | 2.17 | 3.21 | |
| 10% | | 1.92 | 2.89 | |

The critical value according to Narayan (2005) (Case III Unrestricted constant and no trend) K=7, (***), (**), (*) donates Significance at 1%,5% and 10% respectively.

Table 4: ARDL Test for Short Run

| Dependent Variable: CAPEX | | | | |
|---------------------------|---------------|----------------|--------------|--------|
| Variables | Coefficient’s | Standard Error | T-statistics | Prob |
| D(LNDOMDET(-1)) | -1.28 | 0.24 | -5.3 | 0.0061 |
| D(LNDOMDET(-2)) | -1.18 | 0.3 | -3.89 | 0.0177 |
| D(LNDOMDET) | 2.26 | 0.28 | 8.01 | 0.0013 |
| D(LNDOMDS) | -0.36 | 0.08 | -4.37 | 0.012 |
| D(LNDOMDS(-1)) | 0.49 | 0.08 | 6.08 | 0.0037 |
| D(LNDOMDS(-2)) | 0.42 | 0.08 | 5.19 | 0.0065 |
| D(LNEXTDDET) | 0.32 | 0.09 | 3.4 | 0.0273 |
| D(LNEXTDDET(-1)) | 0.78 | 0.12 | 6.67 | 0.0026 |

| | | | | |
|-----------------|--------|-------|--------|--------|
| D(LNEXTDET(-2)) | 0.58 | 0.11 | 5.17 | 0.0066 |
| D(LNEXTERS) | 0.29 | 0.04 | 6.33 | 0.0032 |
| D(LNEXTERS(-1)) | -0.68 | 0.09 | -7.7 | 0.0015 |
| D(LNEXTERS(-2)) | -0.33 | 0.06 | -5.49 | 0.0054 |
| D(LNFDI) | 0.1 | 0.05 | 2.01 | 0.1152 |
| D(LNFDI(-1)) | -0.002 | 0.07 | -0.03 | 0.9742 |
| D(LNFDI(-2)) | 0.12 | 0.06 | 2.17 | 0.0954 |
| D(INFL) | -0.005 | 0.001 | -4.86 | 0.0083 |
| D(INFL(-1)) | -0.005 | 0.001 | -5.48 | 0.0054 |
| D(INFL(-2)) | -0.09 | 0.001 | -7.57 | 0.0016 |
| D(EXCH) | -0.002 | 0.001 | -3.56 | 0.0235 |
| D(EXCH(-1)) | 0.001 | 0.001 | 1.15 | 0.3123 |
| D(EXCH(-2)) | 0.002 | 0.001 | 2.12 | 0.1014 |
| CointEq(-1) | -1.37 | 0.13 | -10.35 | 0.0005 |

Source: Author’s computation (2022)

Table 4 above shows the short run ARDL estimates for co integration, the findings shows that most of the variables are statistically significance except FDI of the current year of analysis, and its lag one and two. Also, exchange rate of previous two lags is statistically not significance while they are positively related with public investments (CAPEX). Domestic debt is positively related with public investments with 2.27 and it’s statistically significance while domestic debt of previous two years adversely affects public investment in Nigeria. Domestic debt servicing on the other hand negatively affects public investment in the current year and does positively affects public investment in the last two years.

The results also shows a positive relationship between external debt and public investment in the current, it also shows that same positive relationship exists between external debt and public investment in the past two years as shown from lagged values of last year and the year preceding it. External debt servicing has a positive relationship with public investment in the current year while a negative relationship exists between external debt servicing and public investment in the two years before. The results also visualize that there is a direct relationship between FDI and public investment in the current year and indirect relationship in the year before but exhibit direct relationship in the year before last year. It can also be seen that a negative relationship exists between inflation and public investment in all years, while a negative relationship exists between exchange rate and public investment in the current year, a positive relationship exists between exchange rate and public investment in the two lagged years before. From the table there is co integration since the coefficient of the error correction terms is also negative and statistically significant for the observed models of the study. ECM coefficient is – 1.37, which shows that the speed of adjustment from long run is almost 137%.

Table 4: ARDL Test for Long run

| Dependent Variable: CAPEX | | | | |
|----------------------------------|--------------------|-----------------------|---------------------|-------------|
| Variables | Coefficient | Standard Error | T-statistics | Prob |
| LNDOMDET | 1.66 | 0.18 | 9.198 | 0.0008 |
| LNDOMDS | -0.97 | 0.36 | -2.70 | 0.0539 |
| LNEXTDET | -0.44 | 0.15 | -2.93 | 0.0426 |
| LNEXTERS | 0.84 | 0.20 | 4.30 | 0.0126 |
| LNFDI | 0.03 | 0.34 | 0.08 | 0.9356 |

| | | | | |
|------|----------|-------|-------|--------|
| INFL | 0.007 | 0.01 | 0.93 | 0.4042 |
| EXCH | -0.00009 | 0.001 | -0.12 | 0.9097 |
| C | -0.97 | 0.34 | -2.86 | 0.0459 |

Source: Author’s computation (2022)

Table 4 represents the long run ARDL based on the Akaike Information Criterion (AIC). The findings shows positive and significant relationship between domestic debt stock and public investments in Nigeria in the long run at 5% level of significance. The results shows that a negative relationship exists between domestic debt service and public investment. While, external debt stock is found to have an indirect relationship with public investment in Nigeria for years under review. On the other hand, external debt servicing exhibit a positive relation with public investment though both external debt and external debt servicing are found to be statistically insignificant. The study also shows that FDI and inflation has a positive relationship with public investment in Nigeria in the years under the study. Even in the long run exchange rate exhibits negative relationship with public investment.

Coefficient Diagnostics Test

Table 5: Breusch-Godfrey Serial Correlation LM Test

| | | | |
|-------------|--------|---------------------|--------|
| F-statistic | 188.24 | Prob. F(2,2) | 0.0053 |
| | | Prob. Chi-Square(2) | 0.0000 |

Table 6: Heteroskedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|-------------|------|----------------------|--------|
| F-statistic | 2.24 | Prob. F(29,4) | 0.2256 |
| | | Prob. Chi-Square(29) | 0.3186 |

Source: Author’s computation (2022)

From the diagnostics test in the table 5 and 6 respectively, the result shows that there is presence of autocorrelation in the model adopted for the study which nullify the use of OLS. On the other hand, it indicates the absence of Heteroskedasticity considering the probability of F-statistic in the Breusch and Godfrey test for serial correlation and that of Breusch, Pagan and Godfrey test at 5% level of significance. The probability value is less than 0.05 for the serial correlation and greater than 0.05 for heteroscedasticity respectively which warrants a rejection of null hypothesis that there is serial correlation in the model and a clear acceptance of null hypothesis for heteroscedasticity.

Fig.3 Normality test.

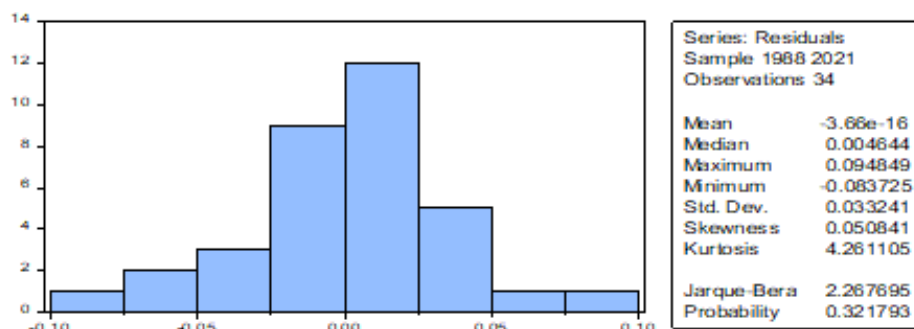


Figure3. Represents the test of normality of the model which is measured by the probability of Jarque-Bera. The results shows that the model is normally distributed with probability values greater than 5%

Fig.4 Stability test

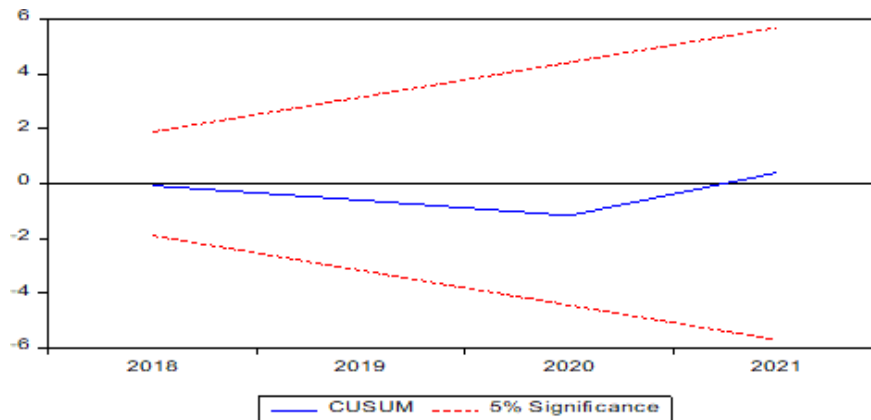
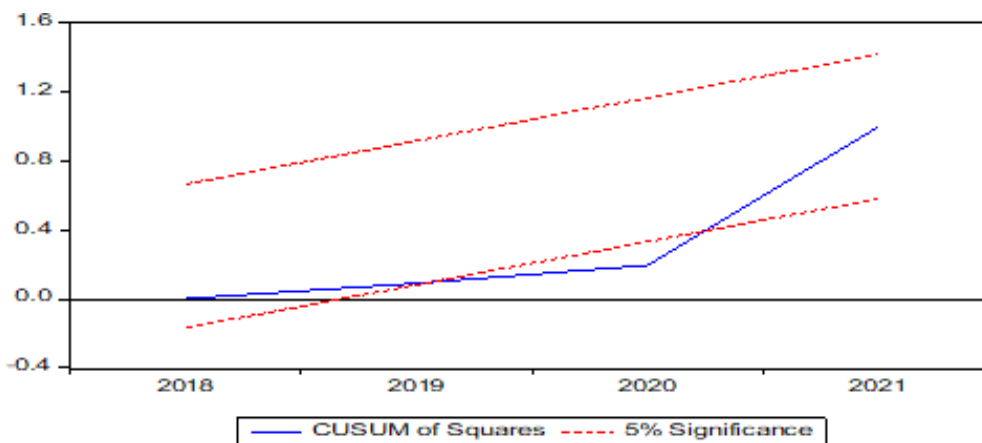


Fig.5 CUSUM Square of Stability Test



From the cumulative sum graph above, the results show that the data is stable over the period under the study meaning that there is consistency of the trends of the data in the time frame which is captured by the study. Though cumulative sum squares do not harmonized with cumulative sum to the full extent, it still shows and confirmed the stability of the data trends as was illustrated by the cumulative sum graph.

DISCUSSION OF THE FINDINGS

From the results of the ARDL short run analysis obtained above, one and all could see that an increase in domestic debt stock will increase public investment (CAPEX) by 2.27 meaning that any percentage any percentage increase in domestic debt stock will raise public investment by 2.27%. external debt stock is found to be non-risky to public investment with figure 0.32 meaning that as external debt stock increases, public investment also increases by that stated rate, Domestic debt servicing on the other hand is found to have risky to public investment by -0.36 which stands to mean that any incremental debt servicing will decrease public investment by -0.36. External debt servicing will increase public investment by 0.29 meaning that any incremental external debt servicing will increase public investment by 0.29. The magnitude of the elasticity of inflation to public investment as was found from the analysis is -0.005 which implies that the rate of inflation erodes the amount supposed to be allocated to public investments in Nigeria. Furthermore, exchange rate plays a vital role in reducing the amount supposed to invest in to public investment, which means exchange rate differential is diverting huge amount that could be invested.

Hence, the result shows convergence in the long run though all the variables are not statistically significance

except domestic debt, with positive coefficient which implies even in long run government loan to domestic investors are impacting public investment positively. Though, the outcomes is contrary to [38] which shows the evidence of the debt overhang hypothesis at the firm level for emerging and developing countries by using a baseline estimating equation. Who finds that there are nonlinear effects indicating that debt overhang crowds out investment at high levels of indebtedness

Rising debt especially the one owes to domestic investors could have a significant impact on public investments in Nigeria, in both short run and long run. It contradict the assertion of crowding out effect but servicing domestic left government copper with insufficient amount to carryout public investment that's why it indicated negative relation with CAPEX. On the other hand, any incremental external debt servicing will increase public investment. Also, the magnitude of the elasticity of inflation to public investment as was found from the analysis implies that the rate of inflation erodes the amount supposed to be allocated to public investments in Nigeria. The study also shows that FDI has a positive relationship with public investment in Nigeria in the years under the study which signify an inflow in the foreign direct investment is impacting public investment directly. In the long run exchange rate exhibits negative relationship with public investment. Having carried out an in-depth analysis, the study recommends that government needs to plan strategically and to negotiate well with international financial institutions say world bank, international monetary fund, Paris club etc. on the modes of the repayment of loan and also consider the current situation of the economy for a clue on what will likely happen in the future so that the economy will not fall into debt trap and that will be able to maintain public yield future investment so as to run away from non-absorbable risk or unmitigated risk

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