IMPACT OF EXTERNAL DEBT BURDEN ON INFRASTRUCTURAL GROWTH IN NIGERIA

BY

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BEING A PROJECT SUBMITTED TO THE DEPARTMENT OF ECONOMICS, FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF BENIN. IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE (B.Sc) DEGREE IN ECONOMICS

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CERTIFICATION

This is to certify that this project titled "Impact of External Debt Burden on Infrastructural Growth in Nigeria" was carried out by **Ifeoma Helen** UKOR with matriculation number **SSC1608125** from the department of Economics.

It is found worthy of acceptance in partial fulfilment of the award of Bachelor of Science (BSc) Degree in Economics.

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DEDICATION

This project is solely dedicated to God Almighty my creator, my strong pillar, my source of inspiration for the grace of determination, consistency, wisdom, knowledge and understanding bestowed upon me throughout my years of academic pursuits in the great University of Benin.

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ABSTRACT

This study empirically examined the impact of external debt burden on infrastructural growth in Nigeria from 1981-2018. Being a time series data, and to avoid spurious regression result in our model, a test for stationary of the data using Augmented Dickey-Fuller unit root test was carried out. The variables; infrastructural growth, domestic debt, external debt, exchange rate, and interest rate were found to be stationary at their first differences. Then, an ARDL Bound Co-integration technique was used to establish if the stationary variables are co-integrated in the long-run. The finding indicates that the variables were found to be co-integrated in the long run. Further, an ARDL was employed to obtain long run coefficients of the respective regressors. The ARDL result revealed that Domestic Debt (negative impact), Exchange Rate (negative impact), and Interest Rate (positive impact) exerts a significant influence on infrastructural growth while External Debt (positive impact) was found to be insignificantly related to the growth of infrastructures in Nigeria. It recommends amongst others, that the government should as a matter of priority create more favourable institutional policy and regulatory framework to meet up these challenges. On the whole, there is need for the policymakers to adopt policy framework consistent with availability of external finance that is credibly maintained. Conclusively, infrastructure growth is one of major elements of structural reforms in developing economy like Nigeria because of its expected large economic and social impact.

CHAPTER ONE

INTRODUCTION

1.3 Background of the Study

Governments around the world are continually looking for new strategies to increase the ability of their economies to produce goods and services. In this light, over the last two and half decades attention has shifted to infrastructure development as a veritable tool for raising the productive capacity of the economy. Infrastructure plays a very important role in the growth process of an economy. In fact, development economists have considered infrastructure to be a precondition for industrialization and economic development (Sawada, 2015). Hence, infrastructural development has been on the top of priority list for governments all over the world. According to World Bank (2014), improving infrastructure in the world is key to reducing poverty, increasing growth and achieving the Millennium Development Goals (MDGs). The need for infrastructure development is indeed crucial for developing countries, especially Africa. The lack of modern infrastructure has been regarded as an impediment to economic development and a major constraint not only on poverty reduction, but also on the attainment of the Millennium Development Goals (MDGs) in SSA countries (Habitat, 2011).

Infrastructure contributes to economic development by increasing productivity and providing services, which enhance the quality of life (Babatunde, 2018). Over time and in most countries governments have been involved in the introduction of

construction and maintenance of infrastructure systems. This involvement has led governments to take on a large number of roles in the infrastructural sector such as; regulator, financer, owner with responsibility for construction and maintenance and also in many cases with heavy involvement in the organizations carrying out services (Hasselgren, 2012). The services generated as a result of an adequate infrastructure base will translate to an increase in aggregate output such as increased electrical generation, transmission and distribution, water and irrigation projects, increase quality of life and urbanization of different areas improved roads, creation of a sea ports, rail links (Akinyosoye, 2010).

External debt burden as experienced by many developing countries of the world had become global concern, following the fall in oil prices, variation on exchange rate etc. which has brought adverse effect to some developing nations of the world such as Nigeria. Also in reflecting on the economic implication of the country's growing debt record, it is a very important policy issue which needs broad public debate (Obademi, 2012). Nigeria economy has been characterized with tremendous debt accumulation without any significant impact on the economy (Amakom, 2013). This was due to corruption, ineptitude, unethical behaviours and poor planning policy formulation and implementation. The continuing stay in power of the so-called military juntas and the political instability experienced in the post-independence era have worsening matters as debt burden continues to grow without any meaningful impact on growth (Amassoma, 2012).

Nigeria's external debt had its origin in 1958 when a loan of USD28 Million was obtained from the World Bank to construct a railway and other developmental projects (Ndekwe, 2008). In 1985, the problem of debt servicing began as the total foreign debt of Nigeria rose to USD19 billion, but the government was able to repay the foreign creditors (Paris Club) more than USD35 billion while the borrowed money was then less than USD15 billion (Rieffel, 2005). Following the apparent debt overhang in Nigeria, the Obasanjo's led government in 2003-2007 intensely pursued debt revocation which consequently resulted to a reduction of the foreign debt up to USD3.4 billion in 2007 (Adedoyin, Babalola, Otekunri & Adeoti, 2016) and if translated into the local currency it amounted to N438.89 Billion (CBN Statistical Bulletin, 2018). The succeeding administrations after President Obasanjo's tenure swiftly resumed the borrowing to such a level that Nigeria's debt profile (comprising loans from Multilateral, Bilateral, Euro Bond, Diasporal Bond, and others) started rising again from N438.89 Billion in 2007; N523.25 Billion in 2008; N590.44 Billion in 2009; N689.84 Billion in 2010; N896.85 Billion in 2011; N1,026.90 Billion in 2012; N1,387.33 Billion in 2013; N1,631.50 Billion in 2014; N2,111.51 Billion in 2015; N3,478.91 Billion in 2016; N5,787.51 in 2017 to N7,759.20 in 2018 (CBN, 2018).

1.2 Statement of the Problem

Nigeria is the largest debtor nation in sub Saharan Africa. When compared with other sub Saharan nations such as South Africa, Nigeria's external debt stock follows an upward pattern over the years while the former is relatively stabilized (Ayad and

Ayadi, 2008). As of December 31, 2015 the report by the Nigeria institution in charge of Debt Management Office (DMO) stated that the total debt of the country stood at N12.6 trillion ($65.4 billion). The present debt record represents 11.5 percent of Nigeria's GDP of $569 billion (2014). Nigeria's public debt rose by N1.3 trillion from N11.24 trillion recorded on December 31, 2014, to the latest figure. An investigation by Financial Nigeria newspaper regarding the country's debt stock proved that between January and June 30 2015, the government raised its debt record by N825 billion (CBN, 2016).

DMO reported that Nigeria's foreign borrowing stood at N2.11 trillion ($10.7 billion) as of December 31, 2015, while the domestic debt reserve of the state and federal government was N10.6 trillion ($54.7 billion). The borrowing of the federal government within the country was N8.8 trillion ($44.9 billion). Precisely the available record from the Debt Management Office as at 2015 showed that Nigeria borrows more domestically than external debt, this can been seen by the volume of external debt being 2,113,230.59 against domestic debt of 10,651,163.19. (CBN, 2016). National Bureau Statistics (2017) reports that Nigeria’s debt to foreign creditors in 2016 stood at 15.05 billion US dollar and N14.06 trillion to domestic creditors. The usage of heavy inflow of cash via external debt to double up economic growth and development of Nigeria is rightly in accordance with Keynesian Theory of capital accumulation as a catalyst for economic growth.

Despite the huge amount of debts which the country has continued to incur over the years, with the aim of achieving economic growth, is still prevalent in the country, as observed by Aiyedogbon and Ohwojasa (2012) and Nwagwu (2014). The inability of Nigeria to effectively meet her debt obligations has adverse effect on the economy, as interests arrears accumulate over the years, thereby creating a much greater debt burden on the nation resulting in a greater percent of her revenue being spent on debt service arrears. Debt servicing remains a huge resource leakage in Nigeria. It occupies a significant portion in the country's recurrent expenditure profile. Meeting debt obligations continues to pose a threat to growth and development of Nigeria since paying it means sacrificing welfare and capital projects for social and economic development.

The impact of external debt on infrastructural growth of many nations remains a controversial issue in both academic and policy making fora (Cashell, 2007). Empirical and theoretical studies try to analyse the question of whether the rising of domestic debt shows positive or negative effects on the growth rate of an economy. Thus, the available empirical studies on the effect of debt on economic growth in various countries produced mixed findings and inconclusive results (Cerra et al., 2008; Malone, 2010; Reinhart and Rogoff, 2010a; Sefdari and Mehrizi, 2011). This necessitates the need for further studies on the topic in order to provide more explanations on the relationship between the macroeconomic variables. Hence, this

study seeks to examine the impact of external debt burden on infrastructural growth in Nigeria.

1.3 Research Questions

Based on the above stated problem, the following research questions will be answered;

1. Does external debt has influence on infrastructural growth in Nigeria?
2. Does domestic debt has effect on infrastructural growth in Nigeria?
3. What is the causality between external debt and infrastructural growth in Nigeria?

1.4 Objectives of the Study

The main objectives of this study focuses on the impact of external debt burden on infrastructural growth in Nigeria. The specific objectives include the following;

1. To assess the effect of external debt on infrastructural growth in Nigeria.
2. To ascertain the effect of domestic debt on infrastructural growth in Nigeria.
3. To examine the causality between external debt and infrastructural growth in Nigeria.

1.5 Hypotheses of the Study

For meaningful assessment, conclusions and recommendations, a set of testable hypotheses based on available data will be necessary. In the course of this research, the following hypotheses would be tested.

1. H_0: external debt has no significant effect on infrastructural growth in Nigeria.

   H_1: external debt has significant effect on infrastructural growth in Nigeria.
2. H_0: domestic debt has no significant effect on infrastructural growth in Nigeria.

H_1: domestic debt has significant effect on infrastructural growth in Nigeria.

3. H_0: there is no causal relationship between external debt and infrastructural growth in Nigeria.

   H_1: there is causal relationship between external debt and infrastructural growth in Nigeria.

1.6 Significance of the Study

External debt burden has been a matter of great concern to the government of the country and the nation as a whole which has resulted in embarking upon drastic actions like dividing the nation's scarce resources in servicing of debts annually. This action has thus led to disinvestment in the economy, and as a result a fall in the domestic savings and the overall rate of growth. This study provides empirical evidence on the effect of external debt burden on infrastructural growth in Nigeria.

The findings of this research transcend beyond academic paradigm, thus, the study tends to provide immense benefit to federal agencies and policymakers who occasionally prescribe and suggest policy options to the government on debt servicing matters. This research will provide up to date knowledge which was also helpful to the academic field by providing them extensive knowledge regarding the issues surrounding external debt burden and infrastructural growth in Nigeria. Finally, this piece will also act as basis for reference for further studies on the effect of external debt burden and infrastructural growth in Nigeria.

1.7 Scope of the Study

This study seeks to study the impact of external debt burden on infrastructural growth in Nigeria. In order to fully capture its effect on the economy, a thorough empirical investigation will be conducted with data covering a period of 39 years i.e. 1981-2018. This period was chosen to cover the period after the oil collapse and also the post debt-relief era. The study focused mainly on the external debt burden and infrastructural growth in Nigeria. i.e. the aggregate external debt of all tiers of government in Nigeria; infrastructural growth which measured from the supply side. This study used time series secondary data sourced from Central Bank of Nigeria Statistical Bulletin (CBN) and National Bureau of Statistics (NBS). The dependent variable for this study is infrastructural growth while the independent variables include the external debt and domestic debt.

1.8 Limitations of the Study

This study like every other study is faced with certain limitations. A major limitation of this research is the inconsistency and discrepancy of data. The data as reported in the statistical bulletin by the Central Bank of Nigeria is not consistent with that of the World Development Indicators of the World Bank. Also, there was difficulty in obtaining empirical data for adequate data analysis, difficulties in obtaining finance for this study and inadequate research materials.

1.9 Structure of the Study

The paper is structured as follows; Chapter one is the Introduction. Literature review is the focus of chapter two. The third chapter is on theoretical framework, model specification and methodology. Chapter four looks at the presentation and analysis of results while the final chapter focuses on summary of findings, recommendations and conclusion.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In order to give answers to the research questions, necessary literatures will be reviewed in order to help us arrive at a solid base for answering the research questions relating to this concepts and help in taking a better decision as it bothers these concepts.

2.2 Conceptual Literature

2.2.1 External debt

The external debt burden is a well-known phenomenon for the developing countries and can be called as a common characteristic of the fiscal sector of the economies. According to the World Bank (2015) description of external debt "debt owed toward non-resident repayable in provisions of the foreign currency, goods and services, external debt might be in the longer run debt (public and publicly guaranteed debt also private non-guaranteed debts) and may be short term debts (commercial debts and International Monetary Fund (IMF) loans)".

External debt involves a country, for example Nigeria borrowing money from foreign countries or issuing a Euro bond to finance capital projects. Due to the scarcity of resources and the law of comparative advantage, countries depend on each other to foster economic growth and achieve sustainable economic development (Adepoju et al., 2007). The funds can be borrowed either from the foreign government or

businessmen and private citizens of the foreign country. External debt is widely believed to enhance economic growth and development (Osinubi et al., 2006; Hirschman, 1958). That is the basic reason why the debt is usually borrowed in the first place the necessity for governments to borrow in order to finance a deficit budget has led to the development of external debt (Osinubi et al., 2006).

External debt increases a country's total available resources in the future because of the future obligation of repaying the debt and meeting interest commitment. This type of debt is vital for a developing economy that has need of additional imports of capital good for economic development. Nigeria has been utilizing the external debt to the extent that the debt becomes, so, huge to water down substantial part of the country's revenue. Despite the increasing nature of the debt stock, until the recent decline due to debt cancellation and relief, the economic development of Nigeria is not encouraging, especially, looking at the economic development in terms of its basic components such as employment creation and poverty reduction (Ayadi & Ayadi, 2008).

The Nigeria external debt is composed of the Federal government debt, the state government debt, government parastatals debt, etc. while the major source of her external debt include the Paris Club of creditors, the London Club of creditors, the African Development Bank, the World Bank, the European Investment Bank International Development Association, etc. The debt including interest, must usually be paid in the currency in which the loan was made. This study, thus, not only made

use of current external debt but also lagged external debt to also show the impact past external debt has had on the economy.

2.2.2 Domestic Debt

This consists of government borrowing from within her domestic economy. This type of debt, unlike the external borrowing does not increase the total resources available to that country. There is simply a transfer of resources from one end to the other for public services purpose (Nurudeen and Usman, 2010). Also the interest payment only transfers resources from the fiscal indiscipline.

Internal debt only effect a transfer of purchasing power among the citizens of the country, thus there is no giving up of real output to another country. Instruments used for internal debt include treasury bills, treasury polity, certificates, treasury bonds, development stock and Federal Government of Nigeria bonds.

The oppressive burden of internal debt has service has fostered the initiative to borrow externally at cheaper rates of interest. According to the Debt Management office, the internal debt burden now exceeds N6 trillion with $6 billion as external debts due to financing of budget deficit, capital projects, bonds.

Crowding In Hypothesis

Crowding In effect can be viewed as an attempt by Government to increase private sector investment through undertaking of capital projects such as roads infrastructure, hydropower, education or health care facilities which ultimately reduce the marginal cost of producing one unit of output for the private sector (Piana, 2001). This entails

that huge Government spending directed towards production of capital goods can potentially increase the stock of public capital investment and thus crowd in private sector participation. Undertaking such projects would require government to issue debt instrument (domestic or/and foreign) or raise taxes.

Crowding Out Hypothesis

According to Elmendorf and Mankiw (1999), public debt contracted to finance the budget deficit is a primary source of crowding out private investments. The implication of huge borrowings by the Government is an increase in interest rates. The increase in interest rates may reduce or crowd out private-sector investments in plants and equipment. This decline in investment means that the overall economy has a smaller capital stock with which to work, which then decreases future growth rates.

A further argument advanced by Elmendorf and Mankiw (1999) is the effect of a budget deficit on savings accumulation. An increased flow of Government borrowing can result in distortionary tax measures which can incite dissaving behaviour among consumers and consequently raise interest rates. By implication, this reduces investible funds and raises the cost of capital through high interest rates. The result is a decline in private sector investments. Aschauer (1989) provides empirical evidence pointing out to budget deficit as the primary source for crowding-out private investments as advanced above by the two scholars.

2.2.3 Nigerian External Debt Profile

Nigeria's external debt had its origin in 1958 when a loan of USD28 Million was obtained from the World Bank to construct a railway and other developmental projects (Ndekwe, 2008). External debts dated back to pre-independence era when it acquired its first loan of twenty eight (28) million US dollars from World Bank, to finance the construction of railway. Ayadi and Ayadi (2016) reported that by 1960, the Nigeria's external debt profile had risen to 150 million US dollar. The quest for developmental plans and the need to finance the flamboyant lifestyle of government leaders in Nigeria surged up the country's external debt to 1 billion US dollar by 1971 (Olasode & Babatunde, 2016). The increase in external debt alarmingly continued which was however due to fall in oil price in 1978 and sharp decline in the balance of payment. Debt Management Office (2000) noted that Nigeria obtained her first jumbo loan of 1 billion US dollar from International Capital Market (ICM) in 1978 summing the external debt to 2.2 billion US dollars.

Fosu (2009) observed that high debt service payments shifts spending away from health, educational and social sectors. This obscures the motive behind external borrowing which is to boost growth and development rather than get drowned in a pool of debt service payments which eats up most of the nation's resources and hinders growth due to high interest payments on external debt. Nigeria as a developing nation has adopted a number of policies such as the Structural Adjustment Programme (SAP) of 1986 to liberalize her economy and boost Gross Domestic product (GDP)

growth. In a bid to ensure the implementation of these policies the government embarked upon massive borrowings from multilateral sources which resulted in a high external debt service burden and by 1992 Nigeria was classified among the heavily indebted poor countries (HIPC) by the World Bank. According to (Omotoye, Sharma, Ngassam and Eseonu, 2006)

In 1985, the problem of debt servicing began as the total foreign debt of Nigeria rose to USD19 billion, but the government was able to repay the foreign creditors (Paris Club) more than USD35 billion while the borrowed money was then less than USD15 billion (Rieffel, 2005). The states in the country joined in contracting loans from foreign creditors which gave rise to Nigeria external loan of about N17.3 billion in 1986, a situation that compelled the nation to adopt the Structural Adjustment Programme (SAP) in 1986, which was packaged by International Monetary Fund (IMF) as a means to revamping the nation's economy (Ayadi & Ayadi, 2008).

Following the apparent debt overhang in Nigeria, the Obasanjo's led government in 2003-2007 intensely pursued debt revocation which consequently resulted to a reduction of the foreign debt up to USD3.4 billion in 2007 (Adedoyin, Babalola, Otekunri & Adeoti, 2016) and if translated into the local currency it amounted to N438.89 Billion (CBN Statistical Bulletin, 2018). The succeeding administrations after President Obasanjo's tenure swiftly resumed the borrowing to such a level that Nigeria's debt profile (comprising loans from Multilateral, Bilateral, Euro Bond, Diasporal Bond, and others) started rising again from N438.89 Billion in 2007;

N523.25 Billion in 2008; N590.44 Billion in 2009; N689.84 Billion in 2010; N896.85 Billion in 2011; N1,026.90 Billion in 2012; N1,387.33 Billion in 2013; N1,631.50 Billion in 2014; N2,111.51 Billion in 2015; N3,478.91 Billion in 2016; N5,787.51 in 2017 to N7,759.20 in 2018 (CBN Statistical Bulletin, 2018).

2.2.4 Infrastructure Growth

Infrastructure is basic physical and organizational structures needed for the operation of a society or enterprise, it is the services and facilities necessary for an economy to function. Infrastructure can be generally defined as the set of interconnected structural elements that provide framework supporting an entire structure of development (Wikipedia, 2013). It is an important term for judging a country or region's development. According to Mody (1997), infrastructure can be defined as activities that provide society with the services necessary to conduct daily life and to engage in productive activities.

Infrastructure can be defined as the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions. The term typically refers to the technical structures that support a society, such as roads, bridges, water supply, sewers, electrical grids, telecommunications, and so forth. There are two basic types of infrastructure, that is hard and soft infrastructure. Fung, Garcia-Herrero, Lizaka and Siu (2006) noted that hard infrastructure is in the form of highways and railroads while soft infrastructure take the form of market-oriented institutions through deeper structural reform. Urban

or municipal infrastructure refers to hard infrastructure systems generally owned and operated by municipalities, such as streets, water distribution, and sewers (Kingombe, 2011). It may also include some of the facilities associated with soft infrastructure, such as parks, public pools and libraries.

Another important term in infrastructure is Green infrastructure. It is a concept that highlights the importance of the natural environment in decisions about land use planning (Hammontree, 2012). In particular there is an emphasis on the "life support" functions provided by a network of natural ecosystems, with an emphasis on interconnectivity to support long-term sustainability. Examples include clean water and healthy soils, as well as the more anthropocentric functions such as recreation and providing shade and shelter in and around towns and cities. The concept can be extended to apply to the management of storm water runoff at the local level through the use of natural systems, or engineered systems that mimic natural systems, to treat polluted runoff.

2.2.5 Infrastructural Development in Nigeria

The adequacy of infrastructure helps determine one country's success and another's failure in diversifying production, expanding trade, coping with population growth, reducing poverty, or improving environmental conditions (World Development Report, 1994; Ihedigbo, 2012). The Oxford Dictionary of Economics defines infrastructure as the capital equipment used to produce publicly available services, including transportation and telecommunications, gas, electricity, and water supplies. The

dictionary further states that 'these infrastructures provide an essential background for other economic activities in modern economics; the fact that they are not available or reliable is characteristic of less developed countries, and handicaps their development.'

From the above assertion, Adamson (2012) concluded that it is evident that the foundation upon which a sustainable economic progress can be built, among other things, is the provision of sound infrastructural platform. Incidentally, the above-stated definition hit the nail on the head concerning the state of infrastructure in developing states, among which is this 'potentially' great nation, Nigeria! The state of infrastructure that supports economic progress in any modern economy, as pointed out by the definition, rightly categorises the state of infrastructure in Nigeria as either 'not available' or 'not reliable'. This is also supported by Akinwale (2010) and Tsokar (2012). Not available in the sense that most basic infrastructural facilities needed to oil the economic machine of the most populous country in sub-Saharan Africa still remain a pipe dream; not reliable in that the needed infrastructural facilities, which the system seems to have expended its scare resources on, can only be best described as less than sufficient. The list ranges from activities such as power, telecommunications, water supply, sanitation and sewage, solid waste collection and disposal, and piped gas.

According to Foster and Pushak, (2011), it also includes road and major dam and canal works for irrigation and drainage; transport facilities such as urban and inter-urban railways, urban transport, port and waterways, and airports. If Nigeria's dream

and aspirations to be among the 20 leading economies of the world by 2020 is anything to go by, the issue of infrastructural development must not be taken with a pinch of salt. Akinyosoye (2010) and Eniola (2010) both concluded that infrastructure development should be a key priority in the country's journey towards development. Lamido Sanusi Lamido, governor of the Central Bank of Nigeria (CBN), largely buttressed this fact when he categorically stated recently that the current level of infrastructure deficit in the country is perhaps the major constraint towards achieving that national Vision 20:2020. The World Bank's investment climate survey report also emphasises the fact that infrastructural problem was ranked far worse than the problem of access to finance.

2.2.6 Indices of Hard Infrastructure

The following list of hard infrastructure according to Redmond (2012) is limited to capital assets that serve the function of conveyance or channelling of people, vehicles, fluids, energy, or information, and which take the form either of a network or of a critical node used by vehicles, or used for the transmission of electro-magnetic waves. Infrastructure systems include both the fixed assets, and the control systems and software required to operate, manage and monitor the systems, as well as any accessory buildings, plants, or vehicles that are an essential part of the system. Also included are fleets of vehicles operating according to schedules such as public transit buses and garbage collection, as well as basic energy or communications facilities that

are not usually part of a physical network, such as oil refineries, radio, and television broadcasting facilities.

2.2.6.1 Transport Infrastructure

The importance of good roads and transport networks in accelerating the pace of economic development of a state cannot be belittled (Adamson, 2012). It is pertinent to note that currently, the total road network in Nigeria stands at 194,800km, of which a large chunk is in a very bad state. According to the CBN, N300 billion would be required to bring the roads to a satisfactory condition. Foster and Pushak (2011) observed that Nigeria has developed an extensive national road network. Both paved and unpaved road network densities are more than twice as high as those for the peer group of resource-rich African countries, although still only half of the levels found in Africa's middle-income countries. Traffic volumes on Nigeria's paved and unpaved networks are also relatively high compared with those of similar countries, and indicate that networks are being utilized.

For airport and seaport, Foster and Pushak (2011) noted that Nigeria's port system has traditionally put a brake on economic development, due to poor performance and high costs. In rail system, Nigeria has one of the most extensive national rail networks in Africa, second only to South Africa in length, but it has since fallen into neglect.

Transport Infrastructure Entails:

a) Road and highway networks, including structures (bridges, tunnels, culverts, retaining walls), signage and markings, electrical systems (street lighting and

traffic lights), edge treatments (curbs, sidewalks, landscaping), and specialized facilities such as road maintenance depots and rest areas.

b) Mass transit systems (Commuter rail systems, subways, tramways, trolleys, City Bicycle Sharing system, City Car Sharing system and bus transportation).

c) Railways, including structures, terminal facilities (rail yards, railway stations), level crossings, signalling and communications systems (Kao, Yung-Cheng and Shih 2010).

d) Canals and navigable waterways requiring continuous maintenance.

e) Seaports and lighthouses.

f) Airports, including air navigational systems.

g) Bicycle paths and pedestrian walkways, including pedestrian bridges, pedestrian underpasses and other specialized structures for cyclists and pedestrians.

h) Ferries.

2.2.6.2 Energy Infrastructure

Adamson (2012) observed that modern economic development is closely interrelated with the development of the energy infrastructure. It is further observed that current electricity generation capacity in the country is put at about 6,000 megawatt (mw), which is far below the total national demand of 10,000mw. Foster and Pushak (2011) noted that despite the high levels of electrification, Nigeria's power sector has struggled to provide an adequate supply of reliable power. Energy infrastructure may include the following:

a) Electrical power network, including generation plants, electrical grid, substations, and local distribution.
b) Natural gas pipelines, storage and distribution terminals, as well as the local distribution network. Some definitions may include the gas wells, as well as the fleets of ships and trucks transporting liquefied gas. Petroleum pipelines, including associated storage and distribution terminals.

Some definitions may include the oil wells, refineries, as well as the fleets of tanker ships and trucks.

a) Specialized coal handling facilities for washing, storing, and transporting coal. Some definitions may include Coal mines.
b) Steam or hot water production and distribution networks for district heating systems.
c) Electric vehicle networks for charging electric vehicles.

2.2.6.3 Water Management Infrastructure

Nigeria has made some progress toward developing an institutional framework suitable for irrigation development. The country has adopted a water policy, together with an irrigation strategy and action plan. There are specialized agencies for basin-level management, and water-user associations have been empowered. Foster and Pushak (2011) noted that compared to its African peers, Nigeria's water storage capacity is low. It stands at 339 m3 per capita, compared with 838 m3 per capita for Sub-Saharan Africa as a whole.

The following are various forms of water management infrastructure:

a) Drinking water supply, including the system of pipes, storage reservoirs, pumps, valves, filtration and treatment equipment and meters, including buildings and structures to house the equipment, used for the collection, treatment and distribution of drinking water.

b) Sewage collection, and disposal of waste water. Drainage systems (storm sewers, ditches, etc.).

c) Major irrigation systems (reservoirs, irrigation canals).

d) Major flood control systems (dikes, levees, major pumping stations and floodgates).

e) Large-scale snow removal, including fleets of salt spreaders, snow plows, snowblowers, dedicated dump trucks, sidewalk plows, the dispatching and routing systems for these fleets, as well as fixed assets such as snow dumps, snow chutes, snow melters.

f) Coastal management, including structures such as seawalls, breakwaters, groynes, floodgates, as well as the use of soft engineering techniques such as beach nourishment, sand dune stabilization and the protection of mangrove forests and coastal wetlands.

2.2.6.4 Communications Infrastructure

Nigeria has made good progress in expanding GSM signal coverage. However, Foster and Pushak (2011) observfed that the price of internet access remains high, but can be expected to fall with the arrival of new submarine cables.

The following are various forms of communication infrastructure:

a) Postal service, including sorting facilities.
b) Telephone networks (land lines) including telephone exchange systems.
c) Mobile phone networks.
d) Television and radio transmission stations, including the regulations and standards governing broadcasting.
e) Cable television physical networks including receiving stations and cable distribution networks (does not include content providers or "networks" when used in the sense of a specialized channel such as CNN or MTV).
f) The Internet, including the internet backbone, core routers and server farms, local internet service providers as well as the protocols and other basic software required for the system to function (does not include specific websites, although may include some widely-used web-based services, such as social network services and web search engines).
g) Communications satellites.
h) Undersea cables.

i) Major private, government or dedicated telecommunications networks, such as those used for internal communication and monitoring by major infrastructure companies, by governments, by the military or by emergency services, as well as national research and education networks.

j) Pneumatic tube mail distribution networks.

2.2.7 Indices of Soft Infrastructure

Soft infrastructure includes both physical assets such as highly specialized buildings and equipment, as well as non-physical assets such as the body of rules and regulations governing the various systems, the financing of these systems (Wikipedia, 2013). It also include the systems and organizations by which highly skilled and specialized professionals are trained, advance in their careers by acquiring experience, and are disciplined if required by professional associations (professional training, accreditation and discipline).

Unlike hard infrastructure, the essence of soft infrastructure is the delivery of specialized services to people. Unlike much of the service sector of the economy, the delivery of those services depend on highly developed systems and large specialised facilities or institutions that share many of the characteristics of hard infrastructure.

2.2.7.1 Governance Infrastructure

a) The system of government and law enforcement, including the political, legislative, law enforcement, justice and penal systems, as well as specialized facilities

(government offices, courthouses, prisons, etc.), and specialized systems for collecting, storing and disseminating data, laws and regulation.

b) Emergency services, such as police, fire protection, and ambulances, including specialized vehicles, buildings, communications and dispatching systems.

c) Military infrastructure, including military bases, arms depots, training facilities, command centres, communication facilities, major weapons systems, fortifications, specialised arms manufacturing, strategic reserves.

2.2.7.2 Economic Infrastructure

a) The financial system, including the banking system, financial institutions, the payment system, exchanges, the money supply, financial regulations, as well as accounting standards and regulations.

b) Major business logistics facilities and systems, including warehouses as well as warehousing and shipping management systems.

c) Manufacturing infrastructure, including industrial parks and special economic zones, mines and processing plants for basic materials used as inputs in industry, specialized energy, transportation and water infrastructure used by industry, plus the public safety, zoning and environmental laws and regulations that govern and limit industrial activity, and standards organizations.

d) Agricultural, forestry and fisheries infrastructure, including specialized food and livestock transportation and storage facilities, major feedlots, agricultural price support systems (including agricultural insurance), agricultural health standards,

food inspection, experimental farms and agricultural research centres and schools, the system of licensing and quota management, enforcement systems against poaching, forest wardens, and fire fighting.

2.2.7.3 Social Infrastructure

Health care system is one of the essential social infrastructure of a country. Akinwale (2010) noted that the poor condition of health and health care in Nigeria is one of the factors responsible for low life expectancy of less than 50 years. The basic social infrastructure includes:

a) The health care system, including hospitals, the financing of health care, including health insurance, the systems for regulation and testing of medications and medical procedures, the system for training, inspection and professional discipline of doctors and other medical professionals, public health monitoring and regulations, as well as coordination of measures taken during public health emergencies such as epidemics.
b) The educational and research system, including elementary and secondary schools, universities, specialised colleges, research institutions, the systems for financing and accrediting educational institutions.
c) Social welfare systems, including both government support and private charity for the poor, for people in distress or victims of abuse.

2.2.7.4 Cultural, sports and recreational infrastructure

a) Sports and recreational infrastructure, such as parks, sports facilities, the system of sports leagues and associations.

b) Cultural infrastructure, such as concert halls, museums, libraries, theatres, studios, and specialized training facilities.

c) Business travel and tourism infrastructure, including both man-made and natural attractions, convention centres, hotels, restaurants and other services that cater mainly to tourists and business travellers, as well as the systems for informing and attracting tourists, and travel insurance.

2.3 Theoretical Review

2.3.1 Theoretical Approaches to Modelling the Impact of external debt on Growth

The Two gap or Dual gap model

Scholars have taken so many positions in an attempt to explain the subject of external debt. The dual gap model by Chenery (1996) is generally used in order to analyse the requirements of foreign aid to bridge the two gaps that prevail in developed and developing countries vis savings gap and trade gap. In most of these economies, they start off their development process with low savings. However, it has change gaps binding for achieving a desired rate of growth in order to engage in high level investment. If the gap is reduced, it becomes easier for economies to reach the stage of take-off as postulated by Rostow. The question now is how the gap will be filled.

Chenery sees foreign aid as a way of filling these two gaps in order to achieve the target rate of the economy (M.L. Jhingan 2007).

Given the assumption of full employment, if the savings gap is dominant, this would imply that the economy is operating at full employment and are not using all of its foreign exchange earnings. It may have enough foreign exchange to purchase additional capital goods from abroad but there is not enough excess domestic resources to carry out additional investment projects. As a result, excess foreign exchange may be spent on importing luxury goods. Such a country can be said to have a shortage in productive resources which can be viewed as shortage in savings. On the other hand, the saving-gap countries, the countries facing foreign exchange gap cannot overcome it by using excess domestic saving. The foreign exchange gap is binding for the purpose of achieving a desired rate of economic growth.

This is the basis of dual gap analysis. Assume that there is a country that requires saving and investment good import to achieve a particular rate of growth. If the available saving at the domestic font falls short of the level necessary to achieve the targeted growth rate, a savings-investment gap is said to be present. On a similar note, if the maximum import requirement needed to achieve the growth target is greater than the maximum possible level of export, then this is an export-import of foreign exchange gap.

Foreign exchange gap occurs due to the difference in the total value of exports and imports (especially when imports exceed export). The depreciation that arises

therefrom alters the gap between the local and foreign currency on the other hand, savings gap is the difference between amount of money held by individuals and the required level of investment in the economy.

The dual gap analysis is built on the works of Dormar (1939), Harrod (1946, 1947), and Chenery and Strout (1966) which hinges development on investment. Such investment requires savings. Theoretically, savings is expected to equal investment but in reality, it is insufficient to stimulate development. The model further assumed that most developing countries experience scarcity of domestic savings needed to augment scarce investment and foreign exchange needed to finance intermediate and capital goods. (Emmanuel and Ola-David, 2010) The two gap model is explained using the national income identity:

$$Y = C + I + G + X - M = C + S + T \quad - - - - - \quad (1)$$

Where Y is total output produced in a given year (GDP); C is private consumption; I represents Investment and G is government consumption. X explains export while M denotes imports. S and T are savings and total government tax revenue respectively.The premise on the analysis is that domestic investment can be financed by domestic saving as well as through inflows of capital. Therefore by rearranging equation (1), the resource gap is highlighted with the savings gap (constraint) on the left hand side constraints to financing growth and foreign exchange (external finance gap) constraint on the right hand side of equation (2):

$$I - S = (X-M) + (G-T) \quad - - - - - - -- \quad (2)$$

By representing (M – X) with F, and with the assumption that government plans its expenditure, to be equal to its tax revenue, equation (2) is modified to be:

$$I - S = T \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad (3)$$

There are several possible scenarios that may play out: where savings (S) is too small to permit the amount required for investment (I) for the country to undertake, a savings gap would exist. On the other hand, if export (X) is too small to permit the importation (M) and ensure full utilization of the resources of the economy, a foreign exchange (or trade) gap would exist. The deduction from equation (3) is that domestic investment can be financed by domestic savings and/or external debt in which case external debt can augment investment, which in turn stimulates economic growth by filling either the savings gap or foreign exchange gap. This model is relevant for this study considering the level of development of Nigeria economy and its domestic realities. Presented in the next sections are evidence gathered from Nigeria and some other developing countries.

The Dependency Theory

The dependency theory seeks to outline the factors that have contributed to the development of the underdeveloped countries. 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. The phenomenon associated with the dependency theory is that poor states are impoverished while rich ones are enriched by the way poor states are integrated into

the world system (Todaro, 2003; Amin, 1976). 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. To them the state of underdevelopment and the constant dependence of less developed countries on developed countries is 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, etc. (Momoh & Hundeyin, 1999). 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 undisrupted operations of the Multinational Corporations (MNCs). Due to the underdeveloped nature of most LDC's, 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 Breton Woods institutions (Ajayi, 2000). 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 for their economic growth and development.

2.3.2 Theoretical Approaches to Modelling the Impact of Infrastructure on Growth

Following Dissou and Didic (2013), we can distinguish between two theoretical approaches to modelling the impact of infrastructure on growth. The first treats infrastructure expenditures as a flow variable which directly enters the production function. The second treats infrastructure as accumulated capital, rather than as current flows, and thereby represents infrastructure as a stock variable in the aggregate production function.

Modelling Infrastructure as a Flow Variable

Barro (1990) models infrastructure in the context of a simple AK endogenous growth model. The two building blocks of his model are a production function that incorporates public services (an expenditure flows variable) as an input to private production, and a Ramsey equation that captures the representative consumer's optimization behaviour. The main advantage of modelling infrastructure as a flow variable is that it produces highly manageable models (Fisher and Turnovsky 2013). Agenor (2007) observes that the flow specification generates results that are not qualitatively very different from studies employing the stock specification of infrastructure. However, it has been argued that as long as one is interested in modelling the impact of infrastructure on growth, the stock variable specification may be more appropriate or acceptable (Dissou & Didic, 2013).

Another criticism of the flow specification approach captures the idea that it may not be realistic to describe government expenditures on infrastructure examine the relationship between infrastructure and economic growth. For example, Imobighe and Awogbemi (2006) regressed private capital stock, non-military, net investment, time to capture the effects of the technical changes in economic growth, one year lag GDP and electricity supplied against Gross Domestic Product to assess the impact of capital stock in Nigeria's economic growth from 1980-1998. They found gross domestic product to be positively related to private capital stock by one year lag, while electricity supply was found to be negatively related to recurrent and capital expenditure, except expenditure on defence and technical change.

Nurudeen and Usman (2010) use co integration and error correction methods to analyse the relationship between government expenditure and economic growth in Nigeria over the period 1970-2008. Their results reveal that government total capital expenditure, total recurrent expenditures, and government expenditure on education have negative effect on economic growth. On the contrary, rising government expenditure on transport and communication results to an increase in economic growth. Using Ordinary Least Squares and Granger Causality econometric techniques, Owolabi-Merus (2015) investigates the infrastructural development economic growth nexus in Nigeria over the period 1983 to 2013. His empirical results reveal that infrastructure (measured by Gross Fixed Capital Formation) has a positive and statistically significant impact on Nigeria's economic growth. However, the Granger

Causality test connotes that there is no mutual correlation between both variables in Nigeria in the period under review.

Using both primary and secondary data, Siyan, Eremionkhale and Makwe (2015) examined the impact of road transportation on economic growth in Nigeria. Probit model was used to analyse the primary data while multivariate model was used for analysing the secondary data to determine the long run relationship between growth and road transportation. Their results show that the transport sector has a positive impact on the economic growth in Nigeria.In an empirical analysis of the relationship between infrastructural development and economic growth in Nigeria between 1981 and 2013, Michael (2016) collapsed two models, one of which is a CobbDouglas production function, into one which he as a non-rival good like aggregate knowledge. Public infrastructural expenditures may not always be complementary to private capital in the aggregate production function, and instead may be rival at the level of the aggregate economy through crowding out effects.

Modelling Infrastructure as a Stock Variable

Futagami et al. (2013) combine Barro's (1990) model with the assumption that government spending does not influence the aggregate production function directly, but only indirectly via the stock of public capital. By including two stock variables, Futagami et al. (2013) bring transitional dynamics into the model in contrast to the endogenous growth models employing the flow specification. The main finding of the Futagami et al. (2013) study is that Barro's (1990) result about optimal fiscal policy

remains valid in the steady-state equilibrium even if government services are proportional to the stock of public capital (rather than capital expenditure flows), but not in the development transition phase.

Futagami et al.'s (2013) modelling strategy of incorporating public infrastructure into an endogenous growth model differs from that of Barro (1990) in that government services are now accumulated like physical capital. In this framework, the steady-state per capita capital equation implies that consumption growth is positively related to infrastructure accumulation and is negatively related to the tax rate, the capital depreciation rate and the time preference rate.

2.4 Empirical Review

Ajayi and Oke (2012) investigated the effect of external debt on economic growth and development of Nigeria. They used national income as an endogenous variable and debt service payment, external reserve and interest rate as exogenous variables they found that external debt burden had a positive effect on the nation’s income and per capital income. Also external reserve and interest rate have positive relationship with national income. They conclude that high level of external debt led to devaluation of the nation’s currency, increase in retirement of workers, continuous industrial strike and poor educational system.

Ekperiware and Oladeji (2012) examined the effect of external debt relief on economic growth in Nigeria using regression technique on quarterly time series of external debt, external debt service and real gross domestic product. Applying Chow-

test to the regression result they found that there was a structural break in the relationship between economic growth and external debt in Nigeria during the period 1975 to 2005. The study concluded that the external debt relief made more resources available for economic growth in Nigeria and recommended a shift towards discretional concessional borrowing. It also identified external debt relief as a good option for poor unsustainable indebted countries as a way of making resources available for economic growth with the real sector being the focal point where value is created rather than impeding it with mismanagement and servicing debt.

Obademi (2012) used the ordinary least squares (OLS) technique in an augmented Cobb Douglas model in analyzing the impact of public debt on economic growth in Nigeria. The variables used were the external debt, domestic debt, total debt and budget deficit. He found that the impact of debt on economic growth was negative and quite significant in the long-run though in the short-run the impact was useful. He concluded that though the impact of borrowed funds on the Nigerian economy was positive in the short-run, its impact in the long-run depressed the economy as a result of inefficient debt management.

Oke and Sulaiman (2012) investigated the relationships among external debt, economic growth and investment in Nigeria between the periods of 1980-2008. They employed debt-cum-growth model regression in their analysis and found that reserve to external debt, private investments and debt service ratio have negative relationships with GDP, whereas exchange rate and interest rate have positive relationship with

GDP. They recommend that appropriate measure be put in place to aim at optimal use of borrowed fund so that servicing such funds will not invoke economic crises.

Rabia and Kamran (2012) examined the impact of domestic and external debt on the economic growth of Pakistan. They examined the determinants of economic growth for Pakistan, the impact of domestic debt and external debt on the economic growth of Pakistan separately over period of 1980 to 2010, using Ordinary Least Square (OLS) approach to Co integration, Unit Root Testing, Serial Correlation Testing, test for checking Heteroscedasticity and CUSUM test of stability. The findings suggested an inverse relationship between domestic debt and economic growth and also the relationship between external debt and economic growth was found to be inverse. These relationships were found to be significant as well. The results also concluded that external debt amount slows down economic growth more as compared to domestic debt amount.

Rifaqat and Usman (2012) assessed the impact of external debt on the economic growth of Pakistan using both the long and short term approach for a period covering 1970 – 2010. The study employed Gross National Product as a function of external debt in conjunction with other control variables which include expenditure on education, capital and labor force. The findings revealed among others that external debt had a significant negative influence on economic growth, thereby confirming that a high foreign debt burden impedes economic growth.

Sulaiman and Azeez (2012) examined the effect of external debt on the economic growth of Nigeria. Gathering annual time series data from 1970-2010, they proxy gross domestic product for economic growth and internal debt, ratio of external debt to exports and exchange as independent variables. Employing econometric techniques of Ordinary Least Square (OLS), Augmented Dickey Fuller (ADF) unit root test, Johansen Co-integration test and Error Correction Model. The result of ADF shows that all the variables were stationary at first difference with the exception of inflation rate. Johansen co-integration depicts that all the exogenous variables except external debt has a positive long run relationship with GDP. The result of Error correction model shows that external debt has positive but insignificance relationship with GDP, external debt to export and inflation rate have negative and significant effect on GDP while exchange rate has a significant positive relationship with GDP.

Udoka and Ogege (2012) examined the extent of public debt crisis and its consequences on economic development using data on the Nigerian economy for the period 1970 to 2010. They employed the error correction modeling framework with co-integration techniques to test the relationship between percapita GDP and other macroeconomic variables (foreign reserve, debt stock, investment, debt service payment). The test revealed that political instability may reduce the rate of development and other independent variables were responsible for the underdevelopment of the country. Hence, they recommended that, to avoid the crisis of economic development in Nigeria, public debt should be reduced to minimal level.

Kasidi and Said (2013) applied the ordinary least squares (OLS) method to evaluate the impact of external debt on the economic growth of Tanzania from 1990 to 2010. The results showed that external debt stock had a significant positive impact on GDP, while external debt servicing exerted a significant negative influence on GDP. Both results were significant, implying that external debt gives economic progress and also takes it with excessive debt servicing. Debt servicing is so demanding that most developing countries go into fresh borrowing in order to have funds to service old foreign debts to avoid the compounding interest penalties and to remain credit worthy before their foreign lenders.

Mukui (2013) did a study by trying to answer the questions whether external debt and debt servicing payment actually had a significant influence on the economic growth of Kenya. The study employed the linear model to analyze the impact of external debt on the economic growth of Kenya from 1980 to 2011 while including in the model some control variables such as capital formation, domestic saving, inflation, labor force, and foreign direct investment. The results indicated that external debt and debt servicing had negative impacts on economic growth.

Zaman and Arslan (2014) empirically sought to determine the role of external debt on the economic growth of Pakistan. Employing distributive statistics and Ordinary Least Square regression estimation technique on a time series data of 39 years (1972-2010), they revealed that gross capital formation and external debt stock have significant positive effect on Pakistan GDP while gross domestic savings does not have

significant impact on GDP of Pakistan. Tarek and Tarek (2013) argued that external debt is not an obstacle to development on North African countries especially when it's contained within reasonable limit and disclosed that it can help countries in North Africa strengthen their growth economically.

Siddique, Selvanathan, and Selvanathan (2015) employed a panel data of 40 highly indebted poor countries from 1970 to 2007 to examine the impact of foreign debt on economic growth. The study made use of panel data estimation of an ARDL model. The results revealed that the external debt of these poor countries had a negative impact on economic growth both in the long run and in the short run. Saxena and Shaner (2015) examined the relationship between economic growth and external debt in India using ordinary least squares technique and a secondary form of data spanning from 1991 – 2015. The study found the existence of a negative relationship between the Gross Domestic Product (GDP) and India's external debt stock.

Bolanle, Fapetu and Olufemi (2015) analyse the impact of external debt and foreign direct investment on economic growth in Nigeria using error correction model with data spanning 1990 to 2013. Augmented Dickey Fuller test indicates that all the variables are first differenced stationary while Johansen co integration test indicate the presence of at least one co integrating equation among the variables. The short run estimation shows that external debt has a negative impact on economic growth in the short run but statistically insignificant while foreign direct investment has a negative but significant impact on economic growth in Nigeria.

Ibi and Aganyi (2015) tested the same in Nigeria using a Vector Auto Regression model. Secondary data which covers 1970 to 2011 were used in the model and five variables were regressed on gross domestic product which proxy economic growth. The variance decomposition shows that at horizon 5, shock arising from external debt was 0.7% thereby aligning with studies that found a weak and insignificant causation between external debt and economic growth in Nigeria. Similar study by Utomi (2014) using the same method over the period of 1980 to 2012 established a long run relationship among external debt, debt servicing, exchange rate and real gross domestic product but a positive relationship between external debt and economic growth in the short run.

Korsi (2015) investigated the effect of external debt on economic growth in sub-Saharan Africa. The study used the sample of 39 sub-Saharan African countries from 1990 to 2013. The study used the Generalized Method of Moments for examining the robust estimates effect of external debt and economic growth. After checking all biases that might be characterized by the panel data, the result proved that external debt is negatively affects economic growth in sub-Saharan African countries. Furthermore, the external debt and economic growth relationship in this region is not influenced by the classification of the per capita income level.

Akram (2016) examined the effect of public debt on economic growth and poverty reduction in selected South Asian Countries (which included Bangladesh, India, Pakistan, and Sri Lanka) for a period covering 1975 to 2010. The study used a model

that incorporated the role of public debt in effecting economic growth which was turned into an equation that was also used to assess the same effect of public debt on poverty. Standard panel data estimation methodologies were applied to estimate the model and the results showed that public debt had a negative impact on economic growth while both the public external debt and the external debt servicing had no significant relationship with poverty reduction which suggested that public external debt has the same effect (whether good or bad) on both the poor and the rich.

Bakare, Ogunlana, Adeyeye and Mudasiru (2016) empirically analyzed the effects of domestic debt on Nigerian economic growth. The study adopted the quantitative research method. Secondary time series data spanning thirty-two years (1980-2012) were collated from the Central Bank of Nigeria Statistical Bulletins and Annual Reports, the Debt Management Office [DMO], the National Bureau of Statistics [NBS], and other cognate publications. Data gathered in the study was analyzed using Ordinary Least Square Regression (OLS) technique. Findings gathered from the study revealed that a positive relationship between domestic debt and economic growth. The study recommended that mechanisms should be put in place to monitor the impact of new borrowing on overall debt sustainability based on the evolution of the debt indicators and provide prompt fiscal rectification.

Ijirshar, Fefa and Godoo (2016) investigated the relationship between external debt and economic growth in Nigeria for the period of 1981-2014. They used both descriptive and econometric tools in empirically analyzing the time series data

generated. The findings show a significant relationship between external debt and economic growth in Nigeria in a long run, while external debt servicing had both long run and short run negative effect on Nigeria economic growth. They recommend that external loan stock borrowed be effectively managed since it increases growth rate.

Ideniyi, Ogonna and Ifeyinwa (2016) examined public debt and public expenditure in Nigeria. The qualitative research method was used as secondary time series data spanning thirty-five years (1980-2015) was gathered in the study. The econometrics estimation techniques such as co integration, vector error correction model and Wald test were employed in analyzing the study's data. Findings from the study revealed that there is no long run relationship between public debt and public expenditure in Nigeria, the study also discovered that government capital and recurrent expenditure has significant positive relationship with public debt in the Nigerian economy. Based on these findings, the study advocated for the introduction of planning-programming budgeting systems (PPBS) and Zero based budgeting (ZBB) in preference to the current practice of incremental budgeting (IB) in our public finance at both federal and state level.

Mbah, Umunna and Agu (2016) looked at the impact external debt has on economic growth in Nigeria. Time series data were used which spanned from 1970 to 2013. The study adopted ARDL bound testing approach, Johansen co-integration and error correction model of econometric were also employed in analyzing the data. The result of Granger Causality indicates a unidirectional causality between debt and economic

growth. In the same vein, it is depicted that a long run relationships existed among the variables. At the same time external debt is found to have significant negative impact on GDP. They conclude that Nigeria has not benefited from the dividend accrued to external borrowing which is ought to bridge the savings- investment gap.

Udeh, Ugwu and Onwuka (2016) x-rayed the relationship between external debt and economic growth from the experience garnered by Nigeria. Using GDP as endogenous variable to economic growth and external debt stock, external debt service payment and exchange rate as exogenous variable, they employed ex-post facto research design, a time series study that covered 1980 to 2013. Data were analysed using Ordinary Least Square technique, augmented Dickey Fuller (ADF) unit root test, co integration and error corrective model. The results show that external debt has positive significant relationship with gross domestic product growth at short run, but a negative relationship with economic growth at long run. They recommend that mechanisms be set in motion to ensure that loans are utilized for the purpose of acquisition.

Olasode and Babatunde (2016) modeled some economic theories that explain the causal relationship between external debt and economic growth in Nigerian economy. They empirically used autoregressive Distributed Lag model to analyze data from 1983-2012. They applied augmented Dickey Fuller and Phillips-Perron unit root test to control spurious data. Johansen Co-integration method was employed to test the relationship among variables. The result from the ordinary least square method show that there is dual behavior as lag one of external debt has positive effect while external

debt of the present year has a negative effect on the economic performance .they recommend that loans obtained should be channeled towards productive uses.

Saifuddin (2016) analyzed public debt and economic growth in Bangladesh. The study adopted the quantitative research approach as secondaary data for the period of 1974-2014 were collated in the study. Data gathered in the study were analyzed using the Augmented Dickey-Fuller test and the TSLS repression analysis. Findings stemming from the study revealed that that public debt is positively related to both investment and economic growth. This result reveals that financial resources pooled through government debt in Bangladesh is used for productive investment. Serrao (2016) assessed the impact of public debt on economic growth in advanced countries. the study employed the econometric research design as secondary time series data spanning sixty four years (1964-2009) was collated for twenty advanced countries including Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, the United Kingdom, and the United States. Inferential analysis was adopted and findings that resulted from the study revealed that there exists a negative connection between public debt and economic growth in advanced countries. Following this findings, the study advocated for new strategies for public debt management in advanced economies, taking into account their economic and financial performance.

Solomon (2016) investigated the impact of external debt on the Nigeria economy. Data was collected from secondary source while the regression analysis showed that external debt and external debt service have negative relationship with causality exists between external debt and GDP which runs from external debts to GDP. It recommended that external debt should be for largely be for economic reason rather than social or political reasons as this would increase the productivity of the nation.

Ugwuegbe, Okafor and Azino (2016) used annual time series data to investigate the effect of external borrowing and foreign aid on economic growth in Nigeria from 1980 to 2013. They used GDP as a parameter for economic growth and external debt, foreign aid, exchange rate regime and foreign reserve as the exogenous variables. Econometric techniques of Ordinary Least Square (OLS) multiple regression, Augmented Dickey Fuller (ADF), Johansen Cointegration, Error Correction Method (ECM) were applied. The results show that external debt has a positive and significant effect on economic growth, foreign aid has positive and insignificant effect on economic growth in Nigeria.

Ugwu and Nzewi (2016) evaluated the effect of external debt on economic growth parameters in Nigeria. They employed ex post facto research design and the result show that positive relationship exists among external debt and economic growth parameter (GDP, exchange rate, capital expenditure). They conclude that small external debt accumulation stimulates the economy while huge debt s negative impact on the economy. Adeniran, Azeez and Aremu (2016) empirically examined the impact

of external debt on economic growth in Nigeria with data from 1980 to 2014, while applying Vector Error Correction model found that external debt service payment do negatively impact significantly on Nigeria economic growth.

Udofia and Akpanah (2016) investigated the impact of external debt on economic growth of Nigeria. The issue was empirically examined using co-integration test and the error correction test for Nigeria over the period 1980- 2012. Finding from this study supported that traditional view between external debt and growth. It also found the non-existence of debt overhang problem for Nigeria. It is recommended from the study that development activities in Nigeria be financed through increased export earnings spearheaded by export led by growth strategy as well as investment in human capital as these can be the best alternative to external debt in the long run.

Afolabi et al. (2017) investigated the long and short term association between external debt and economic growth in Nigeria. The study covered a period from 1980 to 2014 and applied error correction model and granger causality test in order to empirically establish the relationship existing among the variables. Thus, the findings showed that external debt had a negative relationship with economic growth in Nigeria. The suggestion is that external debt should be judiciously used for the provision of infrastructures and projects that will result in economic development and growth. Onakoya and Ogunade (2017) used OLS technique to find evidence on the implication of external debt to Nigeria's economic growth. The study covered a period from 1981 to 2014 and found that external debt did not granger cause economic growth at 5%

level of significance. This finding implied that external borrowing in Nigeria is not used for developmental projects which is the major driver for foreign loans.

Ndubuisi (2017) extended the study on the impact of external debt on the economic growth of Nigeria from 1985 to 2015 using the ordinary least squares method and some other statistical tools. The control variables employed were the exchange rate and external reserve while the major independent variable includes external debt stock and external debt servicing. The study also employed the GDP as the dependent variable. Thus, the findings revealed that debt service payment had an insignificant negative impact on economic growth while the external debt stock had a significant positive impact on the economic growth of Nigeria. The control variable which include external reserve and exchange rate had significant impacts on GDP. Thus, the study recommended the use of external debt for infrastructural development.

Elwasila (2018) investigated the effect of external debt on the economic growth of Sudan from 1969 to 2015, using vector error correction method (VECM). The study also employed exchange rate and foreign direct investment as the controlling factors. The dependent variable was the GDP while the external debt to exports ratio was the proxy for the external debt which is the main explanatory variable. Thus, the findings revealed the Effect of Foreign Debt on the Economic Growth of Nigeria that external debt to export ratio had impacted positively on Sudan's economy while the control variables (the exchange rate and FDI) employed exerted a negative influence on GDP growth in Sudan. Matuka and Asafo (2018) examined the impact of external debt on

economic growth in Ghana using co-integration analysis and an error correction methodology. The study made use of annual time series data covering a period from 1970 to 2017. The findings indicated that external debt impacted positively on economic growth in Ghana, both in the long and short terms.

Matandare and Tito (2018) evaluated public debt and economic growth in Zimbabwe. The study employed quantitative research design. Secondary time series data spanning thirty six years (19862016) were gathered from the World Development Indicators database. Data gathered in the study were analyzed inferentially. Findings revealed in the study showed that there exists a negative significant relationship between external debt and economic growth in Zimbabwe. The study also ascertained that exchange rate and inflation were also found to have negative significant relationships with economic growth in Zimbabwe and external exerts a significant positive relationship with economic growth. Based on the findings, the authors advanced that the government should step up efforts to boost sources of domestic revenue to finance its growth plans as external debt accumulation weighs down economic growth and suggested the need to diversify the economy is crucial as government should develop new sectors which can generate revenue to contribute towards economic growth.

Rafindadi and Musa (2018) empirically analyzed the impact of public debt management strategies on Nigeria's debt profile. The study specifically assessed the impact of debt refinancing (DRF), and measured the impacts of debt forgiveness (DF) and debt conversion (DCV) scheme on the public debt profile of Nigeria. The study

employed the econometric research approach as secondary time series data spanning thirty-seven years (1981-2016) were gathered from the Central Bank of Nigeria annual statistical bulletin, Debt Management Office Records and World Development Index (WDI). Data gathered in the study were analyzed inferentially. Findings stemming from the study showed that debt refinancing has negative impact on total debt profile in Nigeria. Furthermore, the study ascertained that debt forgiveness was detected to have significant negative impact on the debt profile of the country while debt conversion on its part was found to be having significant effect on the Nigeria's debt profile. Following these findings, the study suggested that government should strengthen debt refinancing in order to reduce debt profile of the country, seek for debt forgiveness and provide more instruments for debt conversion with a view to drastically reduce the Nigeria's national debt profile.

Said and Yusuf (2018) examined public debt and economic growth in Tanzania. The quantitative research approach was adopted as secondary time series data spanning forty-five years was collated. Co-integration and Vector Error Correction Mechanism (VECM) Approach were used in analyzing data collated in the study. The VECM estimate showed that there is a negative relationship between public debt and economic growth in Tanzania over the study period. In addition, granger causality test revealed that there is no causal relationship between public debt and economic growth. Premise on these findings, the study suggested Government and policy makers should stop the accumulation of external debt stock overtime and prevent concealing of the

motive behind external debt; external debts should be used only for productive investment of highest priorities that would help in yielding returns for economic reasons (productive purposes) and not for social or political reasons.

Shkolnyk and Koilo (2019) empirically examined the relationship between external debt and economic growth in Ukraine from 2006 to 2016 using different econometric techniques. The study established that a high level of external debt and macroeconomic instability impede economic growth. The study further revealed that the debt burden on Ukraine as found in other emerging economies had denied them expected economic improvement. AL-Tamimi and Jaradat (2019) investigated the impact of external debt on economic growth in Jordan using annual time series data covering a period from 2010 to 2017. The empirical finding revealed that external debt had a significant negative impact on economic growth. Thus, the study suggested foreign direct investment as an alternative method of financing.

CHAPTER THREE

THEORETICAL FRAMEWORK, MODEL SPECIFICATION AND METHODOLOGY

3.1 Theoretical framework

The theoretical framework for the study is based on the Dual gap model. The dual gap model by Chenery (1996) is generally used in order to analyse the requirements of foreign aid to bridge the two gaps that prevail in developed and developing countries via savings gap and trade gap. Basically, the theory postulates that investment is a function of savings and investment that requires domestic savings is not sufficient to ensure economic development, thereby necessitating complementary external goods and services. According to Root (1978), the gross domestic product identity is of the form:

$GDP = C + S$ - - - - - - - (3.1)

Alternatively;

$GDP = C + I + (X - M)$ - - - - - (3.2)

Where,

C = Consumption

I = Investment

X = Exports

M = Imports

S = Saving In this model, investment includes both private sector investment and government investment expenditure. That is,

$I_p = I_g$ - - - - - - - - (3.3)

Where;

I_p = government expenditures

I_g = private sector investment

Since GDP equals domestic consumption plus the domestic saving, it follows from equations (1) and (2) that the demand for domestic investment equals the sum of domestic savings and the import balance on current accounts, which is financed by net borrowing from abroad.

$I = S + (M - X)$ - - - - - - - (3.4)

Where, (M - X) = net foreign borrowing

To answer the question of why external debt tends to increase rapidly, we recall the two-gap model described by Chenery and Strout (1966). In their model, net external borrowing is known as basic transfer (BT). Mathematically, it is measured as the difference between the net capital inflow (gross capital minus the amortization on past debt) and interest payments on remaining accumulated foreign debt.

$BT = Dd - rD$ - - - - - - - (3.5A)

where, D= total accumulated foreign debt d = percentage rate of increase in total debt r = average annual interest rate Dd = net capital inflow or the rate of increase in total external debt rD = total annual interest rate payments Equation (4b) shows losses or

gains in foreign exchange from international capital flows by a country in a given year. BT indicates gain if d > r and loss otherwise. Generally, if borrowing is linked with productive use when rates of return exceeds r and BT is positive, increasing the external debt will not hamper the economy of the recipient country in the long run.

Given that the aforementioned theory relates to inter-temporal budget constraint in a period-to-period flow, the following equation becomes applicable:

$(D_t - D_{t-1}) = Y_t - \mathrm{r}D_t - C_t - I_t - G_t$ - - - - (3.5B)

Where;

$(D_t - D_{t-1})$ = net change in debt from a period t to a period t+1

Y_t = GNP in period t (net remittance is included)

C_t = consumption in period t

I_t = domestic investment in time

G_t = government expenditure in time t

In Equation (3.5B), the debt size in a given period can be reduced by an increase in a country's output and a reduction in consumption, domestic investment, and government expenditure. The failure of a country to do a period-to-period flow analysis and to reach the level where the sum of output, consumption, domestic investment, and government expenditure is less than the basic transfer will lead to a debt crisis as shown below:

$C_t + I_t + G_t - Y_t < \mathrm{d}D_t - \mathrm{r}D_t$ - - - - - - (3.6)

Based on the above stated models, it can be deduced that output growth (which stand for infrastructural growth) is determined by domestic savings, debt burden, capital, and other macroeconomic variables such as exchange rate.

3.2 Model Specification

The specification of an appropriate econometric model borders on the prevailing economic circumstance(s) and the availability of economic data relating to the variable(s) being examined (Koutusoyiannis, 1997). Therefore, following the Dual gap model stated in the above equation(s), a suitable model would be specified in this study to harness the degree and direction of the impact of external debt burden on infrastructural growth in Nigeria.

Thus, the model for this study can be modified as;

$$INFR = f(EXD, DDT, EXR, INTR) \quad - \quad - \quad - \quad (3.5)$$

The econometric form of the model above is stated as;

$$INFR_t = \beta_0 + \beta_1 EXD_t + \beta_2 DDT_t + \beta_3 EXR_t + \beta_4 INTR_t + U_t \quad - \quad - \quad (3.6)$$

Where;

INFR = Infrastructural Growth

EXD = external debt

DDT = domestic debt

EXR = exchange rate

INTR = interest rate

U_t = stochastic error term

The error correction model for this study can be specified as;

$$\Delta INFR_t = \beta_0 + \beta_1 EXD_{t-i} + \beta_2 DDT_{t-i} + \beta_3 EXR_{t-i} + \beta_4 INTR_{t-i} + \varepsilon ECM_{t-I} + Ut \quad (3.7)$$

The coefficient of error correction term is expected to be negative ($\varepsilon<0$) and significant as this is require to ensuring the existence of long run relationship and adjusted disequilibrium in the model (Narayan, 2005). Similarly, the ECM_{t-1} denotes the one period lagged error correction term. It measures the effectiveness of the adjustment mechanism in stabilizing disequilibrium in the model. The value of its coefficient measures the speed of adjustment to equilibrium from the short run disequilibrium in the model.

A Priori Expectation: A priori expectation in this study will be evaluated based on the following criteria;

- **Economic criterion:**

The test is aimed at determining whether the signs and sizes of the results are in line with what economic theory postulates. In other words, it is concerned with determining the consistency of our parameter estimate with the signs and magnitude. As such it is our expectation that the parameter estimate of our study must be consistent with this signs and magnitude. Therefore, the variables under consideration, their parameter and a priori signs can be expressed as follows;

$\beta_0>0$, $\beta_1<0$, $\beta_2<0$, $\beta_3<0$, $\beta_4>0$

Where;

β_0 = constant term

β_1 = coefficient of external debt

β_2 = coefficient of domestic debt

β_3 = coefficient of exchange rate

β_4 = coefficient of interest rate

- **Statistical Criterion (First Order Test)**

These tests are set of statistically theory used in evaluating the reliability of the parameter estimates. According to Guajarati (2004), a test of significance is a procedure by which sample result is used to verify the truth or falsity of a null hypothesis. It has the following tests;

a) **Standard Error Test**: This test is important due to the fact that the estimates obtained from a given set of a simple observation are not free from sampling errors. It is therefore necessary to measure the size of the error and subsequently determine the degree of confidence in the validity of the obtained estimates (Kautsoyiannis, 1977). The test helps us to know if our estimates are statistically significant or whether the sample from which we made estimates might have come from a population whose true parameter value are zero (Kautsoyiannis, 1977-80).

b) **The T-Test**: This is used to test the significance of the individual parameters of the regression model. This will be used in testing the statistical significance of each regression coefficient at a given level of significance with N – K

degree of freedom and in this case, we will use 5% level of significance and it is given as; $+t_{\alpha/2\ (N-K)}$. Where; +t = t –critical, α = level of significance N = Sample size K = total number of estimated parameters. Decision Rule If $+t_{cal} < +t_{\alpha/2\ (N-K)}$ at a given level of significance, we accept H_0 and reject H_1 but if $t_{cal} > +t_{\alpha/2\ (N-K)}$ we reject H_0 and accept H_1. On the other hand, if $-t_{cal} < -t_{\alpha/2\ (N-K)}$ at a given level of significance, we reject H_0 and accept H_1 but if $-t_{cal} > -t_{\alpha/2\ (N-K)}$ we accept H_0 and reject H_1.

c) **F – Test**: This involves the overall significance of the regression result as against individual significance 0f the regressions. This test can be said to be a join hypothesis test employing the analysis of variance (ANOVA). Thus if the computed F – test is greater than the critical value of $F_{\alpha\ (K-1)\ (N-K)}$, then we say it is significant.

d) **R^2 and adjusted R^2 test**: The R^2 (multiple coefficient of determination) shall be carried out to the strength of the independent variables in explaining the changes in the dependent variables. Gujariti (2004:217) has noted that changes in the adjusted R^2 should be treated as another summary statistic. The R^2 is reported as the multiple coefficient of determination adjusted to take into account the degree of freedom associated with the sum of square.

- **Econometrics Criterion (Second Order Test)**

There are test set by the theory of econometrics and aimed at investigating whether the assumptions of econometric method employed are satisfied or not, for the purposed of this study, we will test only for Autocorrelation.

a) **Auto-Correlation Test:** This is used to test if the errors corresponding to different observation are uncorrelated; testing for the randomness of the error term. Thus, the Durbin-watson (DW) method was employed for this test.

3.3 Methodology

The study adopts an ARDL model as a statistical tool of analysis. The ARDL model has difficulties in identifying the relationships between the data variables which contain a unit root as issues of spurious correlation may occur. However, cointegration and modelling the variables in differences may be used to avoid problems relating to unit roots. If there is a random trend present in the data, the model may estimate the incorrect trend rather than modelling the real dynamics (Oxera, 2010).

3.3.1 Unit Root Test

The first step involves testing the stationarity of the variables, and then the order of integration of the individual series under consideration. Researchers have developed several procedures for the test of order of integration. The most popular ones are Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981). Augmented Dickey-Fuller test relies on rejecting a null hypothesis of unit root (the series are non-stationary) in favor of the alternative hypotheses of stationarity. The

tests are conducted with and without a deterministic trend (t) for each of the series. Basically, this test involves testing for the order of integration of each time series (variable). A series is said to be integrated of order I(1), if it needs to be differenced once to become stationary. The same holds for an I(2) series which will need to be differenced twice to become stationary. Similarly, a stationary series is integrated order of degree zero I(0) if no differencing is necessary.

3.3.2 The Bound Test

The second step is the testing of the presence or otherwise of co-integration between the series of the same order of integration. The basic idea behind co-integration is that if, in the long-run, two or more series move closely together, even though the series themselves are trended, the difference between them is constant. It is possible to regard these series as defining a long-run equilibrium relationship, as the between them is stationary. A lack of co-integration suggests that such variables have no long-run relationship: they can wander arbitrarily far away from each other (Dickey et.al., 1991). We employ the bound test cointegration test. The Bounds test approach was performed, which entailed testing the null hypothesis that the parameters were equal to zero. If parameters are equal to zero, it implies no long-run relationship. Ideally the null hypothesis should be rejected for the long-run relationship to exist. Assuming the results in the Bounds test indicates the present of cointegration then the next step will entail estimating the long-run equilibrium between the variables.

3.3.3 The ARDL model Estimate

The autoregressive distributed lag (ARDL) model is an ordinary least square (OLS) based model which is applicable for both non-stationary time series as well as for time series with mixed order of integration. Hence, in this study, the ARDL model is employed to ascertain long-run equilibrium between the variables.

CHAPTER FOUR

DATA ANALYSES AND PRESENTATIONS OF RESULTS

4.0 Introduction

This chapter presents the results from the analysis of data and its interpretation. The chapter is divided into four sections. The first section deals with the preliminary analysis using descriptive statistics and correlation analysis. The second section presents regression analysis while the final section focuses on discussion of findings.

4.1 Descriptive Statistics

Table 4.1: Descriptive Statistics

	INFR	EXT	DDT	EXR	INTR
Mean	3.874149	6.369416	6.19995	3.389487	2.837598
Median	5.127913	6.739276	6.450597	4.573729	2.8667
Maximum	6.226556	9.825056	8.495003	5.316282	3.454738
Minimum	-0.42114	2.415021	0.845868	-0.48174	2.187922
Std. Dev.	2.301751	2.177835	1.952042	1.945728	0.294543
Skewness	-0.60943	-0.244717	-1.0614	-0.80762	-0.70242
Kurtosis	1.675948	1.907855	3.450301	2.294002	3.249891
Jarque-Bera	5.127961	2.267847	7.455978	4.920076	3.723706
Probability	0.076998	0.321768	0.024041	0.085432	0.099518
Sum	147.2177	242.0378	235.5981	128.8005	107.8287
Sum Sq. Dev.	196.0282	175.4897	140.9873	140.0768	3.209961
Observations	38	38	38	38	38

Source: Authors' Computations using Eviews 10.0, 2021.

The table 4.1 shows the detail account of the descriptive statistics for the explained and explanatory variables respectively. The mean values of all the variables as shown in the table ranges from minimum of 2.837 for interest rate to a maximum of 6.369 for external debt. The average infrastructural growth is about 3.874 with standard

deviation of 2.302. In respect of external debt, the mean value is 6.369 with a standard deviation of 2.1778. The analysis of domestic debt shows a mean value of 6.1999 with the value of standard deviation of 1.952. This implies that domestic debt through the analysis of its standard deviation deviates from its mean value up to 1.952. The mean value of exchange rate is 3.389 and its standard deviation is 1.946. Finally, the mean value of interest rate is 2.837 and its standard deviation is 0.295.

Skewness is a measure of asymmetry of the distribution of the series around its mean. Furthermore, the skewness of a normal distribution is zero. Positive skewness implies that the distribution has a long right tail and negative skewness implies that the distribution has a long left tail. From the above table we observe that LNINFR, LNEXT, LNDDT, LNEXR and LNINTR all have negative skewness and as such they have long left tails. Similarly, kurtosis measures the peakedness or flatness of the distribution of the series. If the kurtosis is above three, the distribution is peaked or leptokurtic relative to the normal and if the kurtosis is less than three, the distribution is flat or platykurtic relative to normal. From table 4.1 above, it is observed that LNINFR, LNEXT, LNDDT and LNEXR are all below three therefore this suggest that these variables are platykurtic while LNDDT and LNLNINTR are above three therefore this suggest that these variables are leptokurtic. Finally, Jarque-Bera is a test statistic to test for normal distribution of the series. From the table 4.1 above, the Jarque-Bera for LNINFR, LNEXT, LNDDT LNEXR and LNINTR are 5.128, 2.268,

7.456, 4.920 and 3.724 respectively. These results show that all the variables except LNEXT is normally distributed.

4.2 Empirical Analysis

4.2.1 Unit Root Test

Table 4.2: Augmented Dickey Fuller Test Result at Level and First Difference

VARIABLES	ADF TEST STATISTICS	ADF CRITICAL VALUE			ORDER OF INTEGRATION	REMARKS
		1% Level	5% level	10% level		
LNINFR	-0.967011	-3.62102	-2.943427	-2.610263	I(0)	NOT STATIONARY
LNEXT	-1.217062	-3.62102	-2.943427	-2.610263	I(0)	NOT STATIONARY
LNDDT	-1.900128	-3.62678	-2.945842	-2.611531	I(0)	NOT STATIONARY
LNEXR	-2.251923	-3.62102	-2.943427	-2.610263	I(0)	NOT STATIONARY
LNINTR	-2.425285	-3.62102	-2.943427	-2.610263	I(0)	NOT STATIONARY

VARIABLES	ADF TEST STATISTICS	ADF CRITICAL VALUE			ORDER OF INTEGRATION	REMARKS
		1% Level	5% level	10% level		
D(LNINFR)	-6.352557	-3.626784	-2.945842	-2.611531	I(1)	STATIONARY
D(LNEXT)	-4.746905	-3.62678	-2.945842	-2.611531	I(1)	STATIONARY
D(LNDDT)	-4.723112	-3.626784	-2.945842	-2.611531	I(1)	STATIONARY
D(LNEXR)	-5.115698	-3.62678	-2.945842	-2.611531	I(1)	STATIONARY
D(LNINTR)	-4.470928	-3.632900	--2.948404	-2.612874	I(1)	STATIONARY

Source: Authors' Computations using Eviews 10.0, 2021.

Table 4.2 above shows the results of unit root test for ADF. it shows that in the process of comparing the test statistic value against the Mackinnon critical value at 1%, 5% and 10% level of significance, it was noticed that LNINFR, LNEXT, LNDDT, LNEXR and LNINTR were found to be stationary at first differenced. Hence, having tested for the stationarity of the variables, we proceed to test for the long run relationships of the variables which give us the co integration result in table 4.3 below;

4.2.2 Bound Test Approach to Cointegration

The cointegration test was conducted to determine the long run relationship among the variables used in the private investment model. The study employed the ARDL Bounds test to test whether there is a long run relationship among variables. The model has an unrestricted trend with no constant. The Bounds test results are reported in Table 4.3 below:

Table 4.3: Bounds test results

Significance	Lower bound value	Upper bound value	F-Statistic value	Null Hypothesis
10%	2.45	3.52	4.1365	No cointegration
5%	2.86	4.01		No cointegration
2.50%	3.25	4.49		No cointegration
1%	3.74	5.06		No cointegration

Source: Authors' Computations using Eviews 10.0, 2021.

The results for the Bounds test reveal that there is a long run relationship among the variables. This is because the F-statistics value (4.137) is greater than upper Bounds

critical values at 5% level of significant, and thus the null hypothesis of no cointegration is rejected.

4.2.3 Long-run ARDL Model Estimate

Though there is a presence of co-integration, it was necessary to estimate the long-run ARDL in order to calculate the elasticities. Thus, the long run ARDL was estimated or unrestricted ECM was estimated and the results are presented in Table 4.4 below.

Table 4.4: Unrestricted Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(LNDDT)	-0.122126	0.249018	-0.490430	0.6298
D(LNDDT(-1))	0.367652	0.301219	1.220549	0.2380
D(LNDDT(-2))	-0.413940	0.208245	-1.987757	0.0623
D(LNEXT)	-0.336316	0.615372	-0.546525	0.5914
D(LNEXT(-1))	-1.003053	0.629044	-1.594568	0.1282
D(LNEXR)	0.338307	0.371483	0.910692	0.3745
D(LNEXR(-1))	-1.415230	0.483471	-2.927226	0.0090
D(LNEXR(-2))	1.342760	0.356360	3.767981	0.0014
D(LNINTR)	0.741162	0.708365	1.046300	0.3093
D(LNINTR(-1))	1.581398	0.715135	2.211329	0.0402
D(LNINTR(-2))	-2.411593	0.626087	-3.851850	0.0012
CointEq(-1)	-0.299975	0.101075	-2.967838	0.0082
Cointeq = LNINFR - (-0.6080*LNDDT + 1.4382*LNEXT -0.4716*LNEXR + 5.8470*LNINTR -15.5665)				
Long Run Coefficients				
LNDDT	-0.608020	0.623964	-0.974447	0.3427
LNEXT	1.438196	0.835571	1.721215	0.1024
LNEXR	-0.471592	1.108791	-0.425321	0.6756
LNINTR	5.847016	3.016744	1.938188	0.0684
R-squared = 0.985548				
Adjusted R^2 = 0.972701			**Durbin-Watson stat**= 2.381095	
F-statistic= 76.71745				
Prob(F-statistic)= 0.00000				

Source: Authors' Computations using Eviews 10.0, 2021

From table 4.4 above, the estimation of the Unrestricted Error Correction Model (UECM), the coefficient of the ECM which is the speed of adjustment shows that about 30% of the discrepancy between the actual and the long run (equilibrium) value of DLNINFR is corrected or eliminated each year. Put differently, it tells us that about 30% of disequilibrium in the previous year is corrected in the current year. Notice that the coefficient of the ECM has a negative sign and is statistically significant at 5% level as expected. Thus, this justify our earlier position that the variables under study are indeed co-integrated. the coefficient of determination (R^2) is 0.98 which shows that about 98 percent variations in the infrastructural growth were explained by the independent variables. Also, its adjusted counterpart is 0.97 which shows that about 97 percent growth in infrastructural growth in Nigeria can be attributed to the explanatory variables.

In the long-run, a unit increase in the external debt will result to a decrease of 2.975-units in infrastructural growth in Nigeria. This suggests that there is a negative relationship between domestic debt and infrastructural growth. In the long-run, a 1% increase in external debt leads to about 1.4% increase in infrastructural growth. This suggests that there is a positive relationship between external debt and infrastructural growth. In the long-run, a 1% increase in exchange rate leads to about 0.5% decrease in infrastructural growth. This suggests that there is a negative relationship between exchange rate and infrastructural growth. In the long-run, a 1% increase in interest rate

leads to about a 5.8% increase in infrastructural growth in Nigeria. This suggests that there is a positive relationship between interest rate and infrastructural growth.

Furthermore, the p-value for the D(DDT), D(EXT), D(EXR) and D(INTR) were 0.0623, 0.3745, 0.0014, and 0.0012 respectively at lagged period 2. By implication, the finding shows that exchange rate and interest significantly influence infrastructural growth at 5% level; of significance. Domestic Debt was found to be significant at 10% while external debt was found to be insignificant. Similarly, the F-test is 76.717 shows that the overall test is significant. Thus this tells us that the explanatory variables are simultaneously significant in forecasting infrastructural growth in Nigeria. Also, the Durbin-Watson statistics value of 2.38 which is approximately 2, indicates that there is no autocorrelation in the model.

4.2.4 Parameter Stability Test (CUSUM/ CUSUM OF SQUARES))

In this segment, we look at the stability properties of the estimation model by utilizing the plots of the Cumulative Sum of Recursive Residual (CUSUM) and Cumulative Sum of Squares of Recursive Residual (CUSUMsq). It is worth noting that, while the CUSUM test is appropriate for identifying systematic variations in the regression coefficients, the CUSUMsq is used in situations where the deviation from the stability of the regression coefficients is sudden.

Hypothesis

There are two hypotheses governing the CUSUM and CUSUMsq tests and they are expressed below.

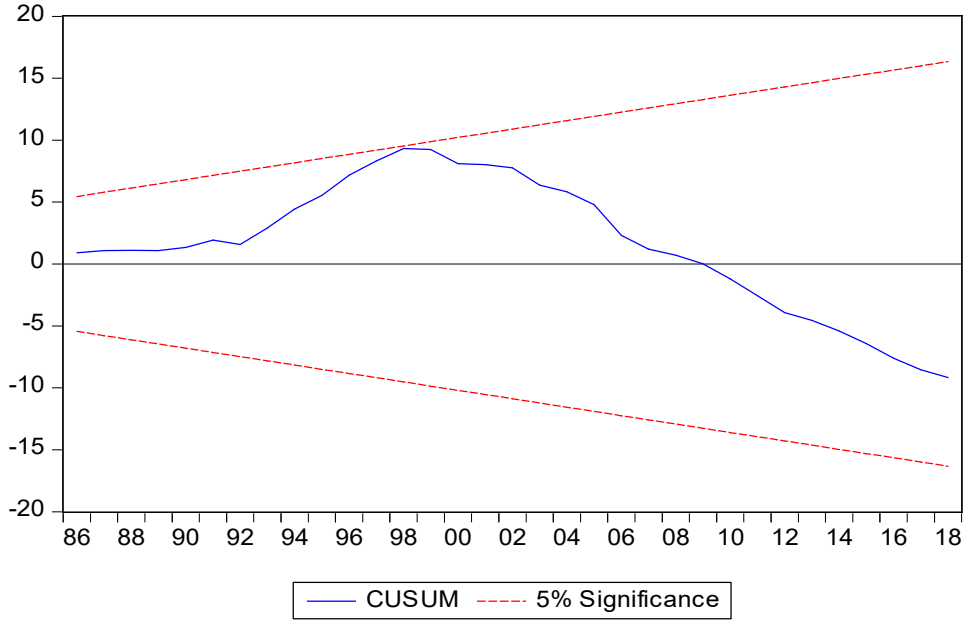
H_0: parameters are stable

H_1: parameters are not stable.

Decision Rule

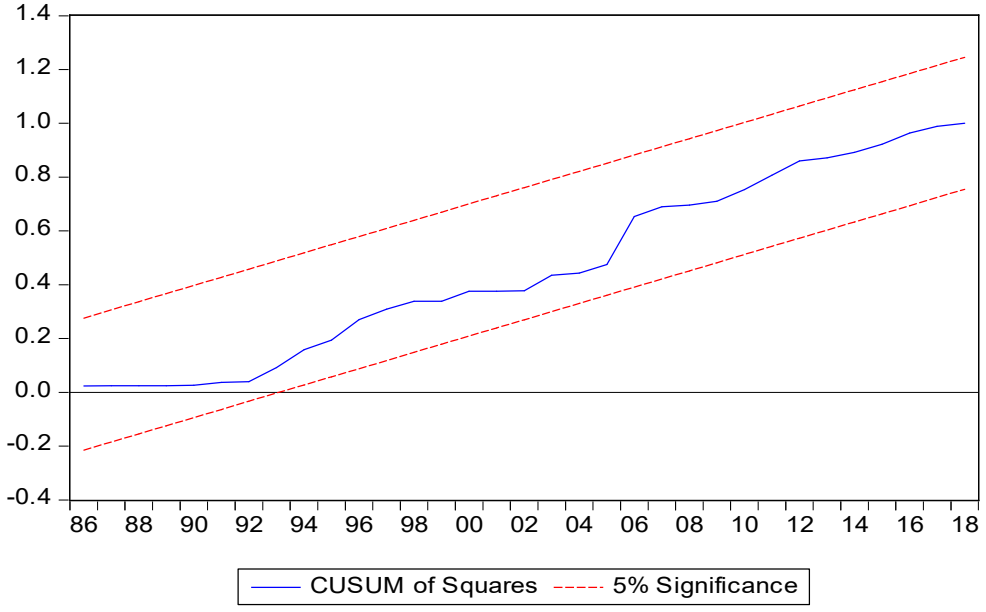
If the blue/dotted line is found between/within the two parallel red lines, we accept the null hypothesis (stable) and reject the alternative hypothesis (not stable). But if the blue line is found across/outside the red lines, we accept the alternative hypothesis (not stable) and reject the null hypothesis (stable). From the graph presented in figure 1A, the CUSUM remained within the 5percent critical lines throughout the whole period thus, signifying parameter stability during the course of assessment. Similarly in figure 1B, the CUSUM of Square test also remained within the 5percent critical lines throughout the whole period.

Figure 1A: CUSUM Test Result



Source: Authors' Computations using Eviews 10.0, 2021

Figure 1B CUSUM of Squares Test Result



Source: Authors' Computations using Eviews 10.0, 2021.

4.2.5 Diagnostic Test

Table 4.5: Serial Correlation and Heteroskedacity Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.668995	Prob. F(2,16)	0.5260
Obs*R-squared	2.700984	Prob. Chi-Square(2)	0.2591
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.522583	Prob. F(16,18)	0.1942
Obs*R-squared	20.12795	Prob. Chi-Square(16)	0.2145
Scaled explained SS	5.862996	Prob. Chi-Square(16)	0.9895

Source: Authors' Computations using Eviews 10.0, 2021.

Confirmation of the absence of Serial Correlation

H_0: The residuals are not serially correlated
H_1: The residuals are serially correlated

Decision Rule
Probabilities > 0.05 accept the null hypothesis
Probabilities < 0.05 reject the null hypothesis

From table 4.5 above, the probability of the chi-square (2) is 0.259 and this is greater than 0.05 at 5% significance level and therefore the null hypothesis is accepted. This implies and therefore confirms the absence of serial correlation.

Confirmation of the absence of Heteroskedasticity

H_0: Homoscedasticity

H_1: Heteroskedasticity

Decision Rule
Probabilities > 0.05 accept the null hypothesis
Probabilities < 0.05 reject the null hypothesis

From table 4.5 above, the probability of chi-square (4) is 0.215 and this is greater than 0.05 at 5% significant level and therefore the null hypothesis is accepted. This implies and therefore confirms the absence of heteroskedasticity in the model. i.e. the error terms are homoskedastic. In essence, they have constant variance in repeated sampling.

4.3 Hypotheses Testing

This section presents the result generated from the regression analysis in order to test the hypotheses of the study stated in chapter one. The hypotheses in this study were tested with the aid of regression (t-test) at 5% level of significance. Our decision in accepting a hypothesis is based on the p-value, we reject the null hypothesis when p-value < 0.05 and we do not reject the null hypothesis when the p-value is > 0.05 (that is, we accept the null hypothesis). The regression result used to test the hypotheses of the study is presented in table 4.3 below;

Table 4.3: Summary of ARDL Result at Lagged Period 2

Variables	P-values
External Debt	0.3745
Domestic Debt	0.0623
Exchange Rate	0.0014
Interest Rate	0.0012

Source: Researcher's Compilation, 2021.

Hypothesis One

H_0: External debt has no significant effect on infrastructural growth in Nigeria.

External debt was found to be positively insignificant at 5% level. This is affirmed by the p-value of 0.3745 which is greater than 5% conventional level of significance. This indicates that external debt does not significantly affect infrastructural growth in Nigeria. This provided grounds for accepting the null hypothesis one which stated that external debt has no significant effect on infrastructural growth in Nigeria.

Hypothesis Two

H_0: domestic debt has no significant effect on infrastructural growth in Nigeria.

Domestic debt was found to be negatively and significant at 5% level. This is affirmed by the p-value of 0.0623 which is greater than 5% but less than 10% level of significance. This indicates that domestic debt does significantly affect infrastructural growth in Nigeria. This provided grounds for accepting the null hypothesis two which stated that domestic debt has no significant effect on infrastructural growth in Nigeria.

Hypothesis Three

H_0: There is no significant effect between exchange rate and infrastructural growth in Nigeria

Exchange rate was found to be negatively significant at 5% level. This is affirmed by the p-value of 0.0014 which is less than 5% conventional level of significance. This indicates that exchange rate does significantly affect infrastructural growth in Nigeria. This provided grounds for rejecting the null hypothesis three which stated that there is no significant effect between exchange rate and infrastructural growth in Nigeria

Hypothesis Four

H_0: There is no significant effect between interest rate and infrastructural growth in Nigeria

Interest rate was found to be positively significant at 5% level. This is affirmed by the p-value of 0.0012 which is less than 5% conventional level of significance. This indicates that interest rate does significantly affect infrastructural growth in Nigeria. This provided grounds for rejecting the null hypothesis four which stated that there is no significant effect between interest rate and infrastructural growth in Nigeria.

4.4 Discussion of Findings

The study examines the impact of external debt burden on infrastructural growth in Nigeria. The study however utilized external debt, domestic debt, exchange rate and interest rate as the independent variables used for the study. The findings prove that there is a positive insignificant relationship between external debt and infrastructural

growth in Nigeria. This result is in agreement with the works Udeh, Ugwu and Onwuka (2016) and Ndubuisi (2017). However the result opposes the works of Olasode and Babatunde (2016) and Adeniran, Azeez and Aremu (2016) which found a negative relationship between external debt and growth.The findings also show that there exist a negative and insignificant relationship between domestic debt and infrastructural growth as validated by the works of Adofu and Abula (2010), Onyeiwu (2012) and Rabia and Kamran (2012). However the result opposes the works of Abbas and Christensen (2007), who found a positive relationship between domestic debt and growth. The empirical result also shows that exchange rate has a positive and significant effect on infrastructural growth in Nigeria. This result is in line with previous works of Aloba and Abogan (2013). Finally, the empirical result also shows that interest rate has a significant negative effect on infrastructural growth in Nigeria. This result is in line with previous works of Obamuyi and Olorunfemi (2011)

CHAPTER FIVE

SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1 Summary of Research Findings

The findings from the specific objectives of this study are as follows:

1. External debt has a positive and insignificant impact on infrastructural growth in Nigeria.
2. Domestic debt has a negative and significant impact on infrastructural growth in Nigeria.
3. Exchange rate has a negative and significant impact on infrastructural growth in Nigeria.
4. Interest rate has a positive and significant impact on infrastructural growth in Nigeria.

5.2 Recommendation

In line with the findings of this study, we recommend as follows;

1. Federal Government of the country should cut down on domestic borrowing and ensure that the existing ones are applied for purposes intended to ensure positive effect and growth.
2. There is need for the government of the country to ensure that funds that are borrowed from external sources are invested in projects that would eventually generate enough returns to defray the interest accruing and the principal amount borrowed. Borrowed funds from abroad should not be diverted into expenditures

on consumables, payment of workers' emoluments, refinancing of previous loans, and unproductive projects.

3. Exchange rate fluctuations impede great threat to the economic growth of Nigeria. The effectiveness of different exchange rate system in promoting competitiveness in international trade often depends on the appropriate choice of exchange rate regime for in countries. The exchange rate is one of the most important policy variables determinants of infrastructural growth in Nigeria. In the light of the above, there is need for monetary policy authorities in the country to ensure consistency in exchange rate policy as this has a way of ensuring improvement to the infrastructural growth in the country.
4. Policy formulators in Nigeria need to enact some investor-friendly policies. This can be done be ensuring a favourable interest rate so as to attract more capital inflows into the country.

Other Recommendations

1. The government should enhance the competition between the efficiency in infrastructure industries and thus the government can make an indirect contribution to economic development.
2. In the area of transportation, more roads should be constructed and the existing one adequately maintained.

3. There is need to stabilize the exchange rate through economic diversification. There is need for government to improve the competency of her administration. This can be done through accountability, prudency, fairness, and good governance.

5.3 Conclusion

This study examined empirically on the impact of external debt on infrastructural growth in Nigeria using data spanning between the periods 1981 to 2018 by employing the use of Augmented Dickey Fuller test, Co integration test and Error Correction technique. From the study, the findings revealed that external debt and domestic debt have an insignificant impact on infrastructural growth in Nigeria. From the findings, it is evident that infrastructure growth is one of major elements of structural reforms in developing economy like Nigeria because of its expected large economic and social impact. Demand for infrastructure is said to expand significantly in the decades ahead, driven by major factors such as global economic growth, technology progress, urbanization and growing congestion. The researchers propose that government should as a matter of priority create more favourable institutional policy and regulatory framework to meet up these challenges. On the whole, there is need for the policymakers to adopt policy framework consistent with availability of external finance that is credibly maintained. Ensuring macroeconomic stability, guaranteeing policy credibility and political stability, and the fight against the growing phenomenon of terrorism in the region would spur investor confidence to

attract both local and foreign investment in order to get rid of heavy reliance on external debt.

BIBLIOGRAPHY

Adedoyin, L.I., Babalola, B.M., Otekinri, A.O., & Adeoti, J.O. (2016). External debt and economic growth: Evidence from Nigeria. *Acta Universitatis Danubius Economica*, 12(6), 179-194.

Afolabi, B., Laoye, A., Kolade, A.R., & Enaholo, J. (2017). The nexus between external debt and economic growth in Nigeria. *British Journal of Economics, Finance and Management Sciences,* 14(1), 1-17.

Adeniran, A.O., Azeez, M.I., & Aremu, J.A. (2016).External debt and economic growth in Nigeria: A Vector Auto-Regression (VAR) Approach. *International Journal of Management and Commerce Innovations.* 4(1), 706 - 714.

Aminu, U., Ahmadu, A.H., & Salihu, M. (2013). External debt and domestic debt impact on the growth of the Nigerian economy. *International Journal of Educational Research*. 1(2), 70-85.

Ayadi, F.S., & Ayadi, F.O. (2008). The Impact of external debt on economic growth: A comparative study of Nigeria and South Africa. *Journal of Sustainable Development in Africa.* 10(3) 234 – 264.

Ajayi, L.B., & Oke, M.O. (2012). Effect of external debt on economic growth and development of Nigeria. *International Journal of Business and Social Science.* 3(12), 297-304.

Akram, N. (2016). Public debt and pro-poor economic growth: Evidence from South Asian Countries. *Economic Research Ekonomska Istrazivanja.* 29(1), 746-757.

Akinwale, A. A. (2010). The menace of inadequate infrastructure in Nigeria. *African Journal of Science, Technology, innovation and Development.* 2(3), 207-228

Akinyosoye, M. (2010). Infrastructure development in Nigeria; Roadmap to sustainable development. Retrieved from https://www.greenhills.com.

AL-Tamimi, K.A.M., & Jaradat, M.S. (2019). Impact of external debt on economic growth in Jordan for the period. *International Journal of Economics and Finance*. 11(4), 114-118.

Bakare, A.S. (2011). The macroeconomic impact of foreign aid in Sub-Saharan Africa: The case of Nigeria. *Business and Management Review*. 1(5), 24-32.

CBN (2014), Statistical Bulletin, Statistical Department, Central Bank of Nigeria, Garki, Abuja, Nigeria.

CBN Statistical Bulletin (2018). Annual Statistical Bulletin. Retrieved on March 1, 2019 from https://www.cbn.gov.ng/documents/Statbulletin.asp.

Chenery, H.B., & Strout, A. (1962).Foreign assistance & economic development. *American Economic Review*. 56(3), 679-733.

Ezeabasili, V.N., Isu, H.O., & Mojekwu, J.N. (2011). Nigeria's external debt and economic growth: An error correction approach. *International Journal of Business and Management*. 6(5), 156-170.

Elwasila, S.E.M. (2018). Effect of external debt on economic growth of Sudan: Empirical analysis (1969-2015). *Journal of Economic Cooperation and Development*. 39(1), 39-62.

Eniola, S.S. (2010). Infrastructure and Economic Growth: the Nigeria Experience. *Journal of Infrastructure Development.* 2(2), 121-133

Foster, V., & Pushak, N. (2011). *Nigeria's Infrastructure: A Continental Perspective*. Country report by Africa Infrastructure Country Diagnostic (AICD) supported by The International Bank for Reconstruction and Development / The World Bank.

Kao, T., Yung-Cheng, L., & Shih, M. (2010). Privatization versus public works for high speed rail projects. *Journal of the Transportation Research Board*. 21(6), 18-26.

Ijirshar, V.U., Joseph, F., & Godoo, M. (2016). The relationship between external debts and Economic growth in Nigeria. *International Journal of Economics & Management Sciences*. 6(1), 1-5.

Kasidi, F., & Said, M. (2013). Impact of external debt on economic growth: A case study of Tanzania. *Advances in Management & Applied Economics*. 3(4), 59-82.

Kothari, C. (2004). Research methodology: methods & techniques (2nd Ed.). New Delhi, India: *Newage International Publishers.*

Karagol, E. (2002). The causality analysis of external debt service and GNP: The case of Turkey. *Central Bank Revenue*. 2(1), 39 – 64.

Mbah, S.A., Agu, O.C. & Umunna, G. (2016). Impact of external debt on economic growth in Nigeria: An ARDL bound testing approach. *Journal of Economics and Sustainable Development*, 7 (10), 16-26.

Mehdi, S. & Masoud, A.M. (2011).External debt and economic growth in Iran. *Journal of Economics and International Finance*, 3(5), 322-327.

Monogbe, T.G. (2016). Intergenerational effect of external debt on performance of the Nigeria economy. *Journal of Social Development*. 5(2), 51-65.

Matuka, A., & Asafo, S.S. (2018). External debt and economic growth in Ghana: A cointegration and a vector error correction analysis. Retrieved from https://mpra.ub.uni_muenchen.de/904631.

Mbah, S.A., Agu, O.C., & Umunna, G. (2016). Impact of external debt on economic growth in Nigeria: An ARDL bound testing approach. *Journal of Economics and Sustainable Development.* 7(10), 16-26.

Merriam-Webster (2019). Definition of debt service. Retrieved on June 5, 2019 from https://www.merriam-webster.com/dictionary/debt%20service.

Monogbe, T.G. (2016). Intergenerational effect of external debt on performance of the Nigeria Economy. *Journal of Social Development*. 5(2), 51-65.

McCawley, P. (2010). Infrastructure policy in Developing countries, *Asian-Pacific Economic Literature.* 24(1), 21-32.

Naeem, M.Z., Akhlaque, S., & Ashiq, R. (2016). External debt and external rate of interest: An empirical analysis of Pakistan. *Bulletin of Business and Economics*. 5(3), 116-125.

Ndubuisi, P. (2017). Analysis of the impact of external debt on economic growth in an Emerging Economy: Evidence from Nigeria. *African Research Review*. 11(4), 156-173.

Obademi O.E. (2013). External debt and Nigeria's economic growth nexus: Matters arising. *Journal of Poverty, Investment and Development,* 1(4), 22-28

Obademi, O E (2012).An empirical analysis of the impact of public debt on economic growth: Evidence from Nigeria 1975-2005.*Canadian Social Science*, 8(4),154-161.

Ogunlana, O.F. (2016). Causal nexus between external debt and economic growth: The Nigerian case. *International Journal of Management and Commerce Innovations*. 4(1), 92 - 98.

Ogunmuyiwa, M.S. (2011). Does external debt promote economic growth in Nigeria? *Current Research Journal of Economic Theory.* 3(1), 29-35.

Onakoya, A.B., & Ogunade, A.O. (2017). External debt and Nigerian economic growth connection: Evidence from autoregressive distributed lag approach. *Journal of Economics and Development Studies*. 5(1), 66-78.

Olagide, F. (2019). Assessing efforts to revive Nigeria's textile industry. Retrieved from https://leadership.ng/2019/01/08/assessing-efforts-torevive-nigerias-textile-industry/.

Onakoya, A.B., & Ogunade, A.O. (2017). External debt and Nigerian economic growth connection: Evidence from autoregressive distributed lag approach. *Journal of Economics and Development Studies*. 5(1), 66-78.

Rifaqat, A., & Usman, M. (2012). External debt accumulation and its impact on economic growth In Pakistan. *The Pakistan Development Review*. 51(4), 79-96.

Rashid, Z., & Muhammad, A. (2014).The role of external debt on economic growth: Evidence from Pakistan economy. *Journal of Economics and Sustainable Development*. 5(24), 140-147.

Redmond, W. A. (2012). Infrastructure; Microsoft Encarta, Microsoft Corporation, 2011

Saxena, S.P., & Shanker, I. (2015). External debt and economic growth in India. *Social Science Asia.* 4(1), 15-25.

Shkolnyk, I., & Koilo, V. (2018). The relationship between external debt and economic growth: Empirical evidence from Ukraine and other emerging economies. *Investment Management and Financial Innovations*. 15(1), 387-400.

Sulaiman, L.A., & Azeez, B.A. (2012). Effect of external debt on economic growth of Nigeria. *Journal of Economics and Sustainable Development*. 3(8):71-79.

Shahnawaz, M., Muhammad, K.H., & Muhammad, U.H. (2010). External debt and economic growth: Empirical evidence from Pakistan. *International Research Journal of Finance and Economics*. 44 (20), 87-97.

Sulaiman, L.A., & Azeez, B.A. (2012).Effect of external debt on economic growth of Nigeria. *Journal of Economics and Sustainable Development*. 3(8), 71-79.

Tarek, B.A., & Tarek, S. (2013). External debt and financing of economic development: Evidence from North African countries, *Journal of North African Research in Business*. 21(7), 31-89.

Tsokar, K. (2012). Nigeria needs $100b for Infrastructure, says Sanusi. Retrieved from https://www.ngrguardiannews.com

Udeh, S.N., Ugwu, J.I., & Onwuka, I.O. (2016). External debt and economic growth: The Nigeria Experience. *European Journal of Accounting, Auditing and Financial Research*, 4(2), 33-48.

Udeh, S.N., Ugwu, J.I., & Onwuka, I.O. (2016). External debt and economic growth: The Nigeria experience. *European Journal of Accounting, Auditing and Finance Research*. 4(2), 33-48.

Ugwuegbe, S.U., Okafor, I.G., & Akarogbe, C.A. (2016).Effect of external borrowing and foreign aid on economic growth in Nigeria. *International Journal of Academic Research in Business and Social Sciences*, 6(4), 155-175.

Ukpe, U.H., Umeh, J.C., Ater, P., & Asogwa, B.C. (2017). Effects of public external debt and private investment on agricultural growth in Nigeria: From 1980-2016. Agricultural Research & Technology. *Open Access Journal*. 10(2), 1-5.

Umaru, A., Hamidu, A.A., & Musa, S. (2013). External debt and domestic debt impact on the growth of the Nigerian economy. *International Journal of Educational Research*. 1(2), 70-85.

Wikipedia (2013). Infrastructure; retrieved 14th February, 2013 from en.wikipedia.org

World Bank (1994). World Development Report 1994- Infrastructure for Development, Oxford University Press, New York.

APPENDIX

	LNINFR	LNEXT	LNDDT	LNEXR	LNINTR
Mean	3.874149	6.369416	6.19995	3.389487	2.837598
Median	5.127913	6.739276	6.450597	4.573729	2.8667
Maximum	6.226556	9.825056	8.495003	5.316282	3.454738
Minimum	-0.42114	2.415021	0.845868	-0.48174	2.187922
Std. Dev.	2.301751	2.177835	1.952042	1.945728	0.294543
Skewness	-0.60943	-0.244717	-1.0614	-0.80762	-0.70242
Kurtosis	1.675948	1.907855	3.450301	2.294002	3.249891
Jarque-Bera	5.127961	2.267847	7.455978	4.920076	3.723706
Probability	0.076998	0.321768	0.024041	0.085432	0.099518
Sum	147.2177	242.0378	235.5981	128.8005	107.8287
Sum Sq. Dev.	196.0282	175.4897	140.9873	140.0768	3.209961
Observations	38	38	38	38	38

ARDL Cointegrating And Long Run Form
Dependent Variable: LNINFR
Selected Model: ARDL(1, 3, 2, 3, 3)
Date: 07/15/21 Time: 11:43
Sample: 1981 2018
Included observations: 35

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNDDT)	-0.122126	0.249018	-0.490430	0.6298
D(LNDDT(-1))	0.367652	0.301219	1.220549	0.2380
D(LNDDT(-2))	-0.413940	0.208245	-1.987757	0.0623
D(LNEXT)	-0.336316	0.615372	-0.546525	0.5914
D(LNEXT(-1))	-1.003053	0.629044	-1.594568	0.1282
D(LNEXR)	0.338307	0.371483	0.910692	0.3745
D(LNEXR(-1))	-1.415230	0.483471	-2.927226	0.0090
D(LNEXR(-2))	1.342760	0.356360	3.767981	0.0014
D(LNINTR)	0.741162	0.708365	1.046300	0.3093
D(LNINTR(-1))	1.581398	0.715135	2.211329	0.0402
D(LNINTR(-2))	-2.411593	0.626087	-3.851850	0.0012
CointEq(-1)	-0.299975	0.101075	-2.967838	0.0082

Cointeq = LNINFR - (-0.6080*LNDDT + 1.4382*LNEXT -0.4716*LNEXR + 5.8470*LNINTR -15.5665)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDDT	-0.608020	0.623964	-0.974447	0.3427
LNEXT	1.438196	0.835571	1.721215	0.1024
LNEXR	-0.471592	1.108791	-0.425321	0.6756
LNINTR	5.847016	3.016744	1.938188	0.0684
C	-15.566464	8.248643	-1.887154	0.0754

ARDL Bounds Test
Date: 07/15/21 Time: 11:45
Sample: 1984 2018
Included observations: 35
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	4.136514	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Test Equation:
Dependent Variable: D(LNINFR)
Method: Least Squares
Date: 07/15/21 Time: 11:45
Sample: 1984 2018
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNDDT)	-0.122126	0.249018	-0.490430	0.6298
D(LNDDT(-1))	-0.046288	0.225072	-0.205660	0.8394
D(LNDDT(-2))	-0.413940	0.208245	-1.987757	0.0623
D(LNEXT)	-0.336316	0.615372	-0.546525	0.5914
D(LNEXT(-1))	-1.003053	0.629044	-1.594568	0.1282
D(LNEXR)	0.338307	0.371483	0.910692	0.3745
D(LNEXR(-1))	-0.072470	0.407609	-0.177793	0.8609
D(LNEXR(-2))	1.342760	0.356360	3.767981	0.0014
D(LNINTR)	0.741162	0.708365	1.046300	0.3093
D(LNINTR(-1))	-0.830195	0.654169	-1.269083	0.2206
D(LNINTR(-2))	-2.411593	0.626087	-3.851850	0.0012
C	-4.669542	1.888338	-2.472832	0.0236
LNDDT(-1)	-0.182390	0.193874	-0.940768	0.3593
LNEXT(-1)	0.431422	0.211713	2.037769	0.0565
LNEXR(-1)	-0.141466	0.306623	-0.461366	0.6501
LNINTR(-1)	1.753956	0.731315	2.398359	0.0275
LNINFR(-1)	-0.299975	0.101075	-2.967838	0.0082

R-squared	0.790100	Mean dependent var	0.138458
Adjusted R-squared	0.603521	S.D. dependent var	0.585572
S.E. of regression	0.368714	Akaike info criterion	1.148863
Sum squared resid	2.447104	Schwarz criterion	1.904318
Log likelihood	-3.105099	Hannan-Quinn criter.	1.409646
F-statistic	4.234683	Durbin-Watson stat	2.381095
Prob(F-statistic)	0.002115		

Dependent Variable: LNINFR
Method: ARDL
Date: 07/15/21 Time: 11:46
Sample (adjusted): 1984 2018
Included observations: 35 after adjustments
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): LNDDT LNEXT LNEXR LNINTR

Fixed regressors: C
Number of models evalulated: 768
Selected Model: ARDL(1, 3, 2, 3, 3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNINFR(-1)	0.700025	0.101075	6.925796	0.0000
LNDDT	-0.122126	0.249018	-0.490430	0.6298
LNDDT(-1)	-0.106553	0.329864	-0.323020	0.7504
LNDDT(-2)	-0.367652	0.301219	-1.220549	0.2380
LNDDT(-3)	0.413940	0.208245	1.987757	0.0623
LNEXT	-0.336316	0.615372	-0.546525	0.5914
LNEXT(-1)	-0.235315	0.782349	-0.300779	0.7670
LNEXT(-2)	1.003053	0.629044	1.594568	0.1282
LNEXR	0.338307	0.371483	0.910692	0.3745
LNEXR(-1)	-0.552242	0.476004	-1.160164	0.2611
LNEXR(-2)	1.415230	0.483471	2.927226	0.0090
LNEXR(-3)	-1.342760	0.356360	-3.767981	0.0014
LNINTR	0.741162	0.708365	1.046300	0.3093
LNINTR(-1)	0.182598	0.793612	0.230085	0.8206
LNINTR(-2)	-1.581398	0.715135	-2.211329	0.0402
LNINTR(-3)	2.411593	0.626087	3.851850	0.0012
C	-4.669542	1.888338	-2.472832	0.0236

R-squared	0.985548	Mean dependent var	4.119045
Adjusted R-squared	0.972701	S.D. dependent var	2.231612
S.E. of regression	0.368714	Akaike info criterion	1.148863
Sum squared resid	2.447104	Schwarz criterion	1.904318
Log likelihood	-3.105099	Hannan-Quinn criter.	1.409646
F-statistic	76.71745	Durbin-Watson stat	2.381095
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Variance Inflation Factors
Date: 07/15/21 Time: 11:46
Sample: 1981 2018
Included observations: 35

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LNINFR(-1)	0.010216	54.97972	13.30519
LNDDT	0.062010	725.5384	34.84418
LNDDT(-1)	0.108811	1220.122	71.65770
LNDDT(-2)	0.090733	974.1869	68.45160
LNDDT(-3)	0.043366	444.6334	40.28121
LNEXT	0.378683	4719.513	368.7517
LNEXT(-1)	0.612071	7236.910	603.3625
LNEXT(-2)	0.395696	4424.286	396.9267
LNEXR	0.138000	584.8373	94.70159
LNEXR(-1)	0.226579	913.3049	176.8554
LNEXR(-2)	0.233745	894.0394	202.3709
LNEXR(-3)	0.126993	459.7603	119.6742
LNINTR	0.501781	1085.205	7.642195
LNINTR(-1)	0.629819	1348.563	11.14881
LNINTR(-2)	0.511418	1083.681	10.44384
LNINTR(-3)	0.391985	821.2795	9.252450
C	3.565820	918.0102	NA

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.668995	Prob. F(2,16)	0.5260
Obs*R-squared	2.700984	Prob. Chi-Square(2)	0.2591

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/15/21 Time: 11:48
Sample: 1984 2018
Included observations: 35
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNINFR(-1)	0.050093	0.111794	0.448085	0.6601
LNDDT	-0.123267	0.290125	-0.424876	0.6766
LNDDT(-1)	0.094266	0.346833	0.271792	0.7893
LNDDT(-2)	-0.007499	0.308475	-0.024311	0.9809
LNDDT(-3)	-0.019694	0.214080	-0.091993	0.9278

LNEXT	-0.119825	0.667190	-0.179596	0.8597
LNEXT(-1)	0.120490	0.822360	0.146518	0.8853
LNEXT(-2)	-0.001223	0.643392	-0.001902	0.9985
LNEXR	0.180030	0.429262	0.419395	0.6805
LNEXR(-1)	-0.103301	0.494495	-0.208902	0.8372
LNEXR(-2)	-0.032556	0.499980	-0.065115	0.9489
LNEXR(-3)	-0.060116	0.366812	-0.163888	0.8719
LNINTR	-0.089305	0.748949	-0.119240	0.9066
LNINTR(-1)	0.032004	0.821581	0.038954	0.9694
LNINTR(-2)	0.203179	0.786027	0.258488	0.7993
LNINTR(-3)	-0.035034	0.645862	-0.054243	0.9574
C	-0.114448	1.957356	-0.058471	0.9541
RESID(-1)	-0.345248	0.301756	-1.144131	0.2694
RESID(-2)	-0.197080	0.324030	-0.608216	0.5516

R-squared	0.077171	Mean dependent var	-3.25E-15
Adjusted R-squared	-0.961012	S.D. dependent var	0.268279
S.E. of regression	0.375688	Akaike info criterion	1.182837
Sum squared resid	2.258259	Schwarz criterion	2.027169
Log likelihood	-1.699652	Hannan-Quinn criter.	1.474300
F-statistic	0.074333	Durbin-Watson stat	2.114769
Prob(F-statistic)	0.999999		

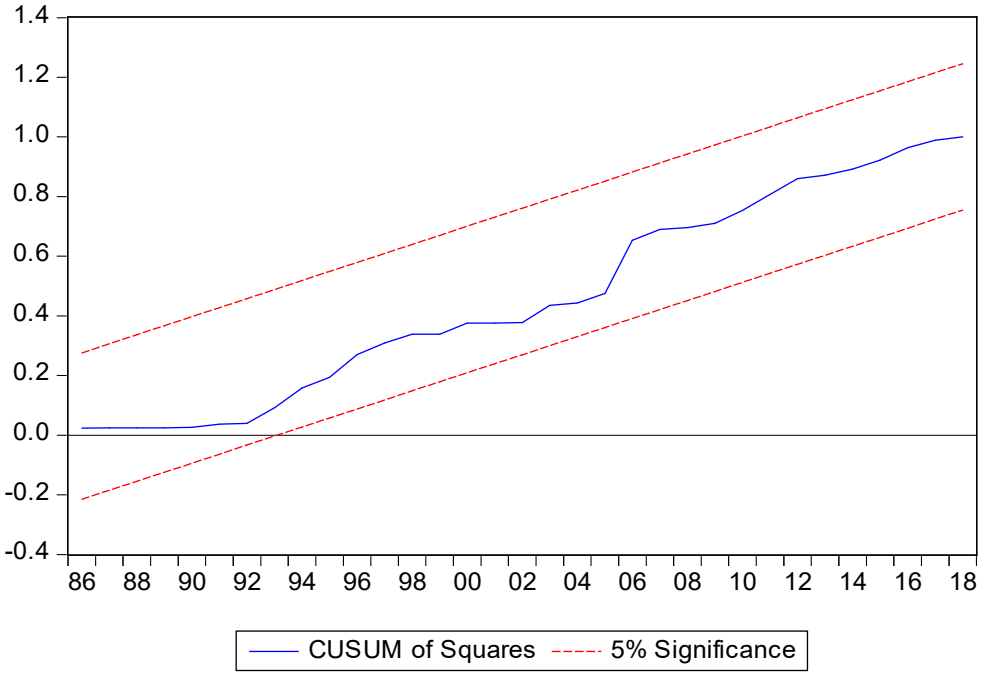
Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.522583	Prob. F(16,18)	0.1942
Obs*R-squared	20.12795	Prob. Chi-Square(16)	0.2145
Scaled explained SS	5.862996	Prob. Chi-Square(16)	0.9895

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/15/21 Time: 11:49
Sample: 1984 2018
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.171013	0.483052	-0.354025	0.7274
LNINFR(-1)	-0.060739	0.025856	-2.349133	0.0304
LNDDT	0.072056	0.063701	1.131162	0.2728
LNDDT(-1)	-0.059998	0.084382	-0.711030	0.4862
LNDDT(-2)	0.018306	0.077054	0.237576	0.8149
LNDDT(-3)	-0.059650	0.053271	-1.119757	0.2775
LNEXT	-0.127346	0.157417	-0.808972	0.4291
LNEXT(-1)	0.108466	0.200131	0.541974	0.5945
LNEXT(-2)	-0.041096	0.160914	-0.255389	0.8013
LNEXR	-0.002694	0.095028	-0.028349	0.9777
LNEXR(-1)	0.070013	0.121766	0.574985	0.5724
LNEXR(-2)	-0.073504	0.123676	-0.594331	0.5597
LNEXR(-3)	0.152224	0.091160	1.669857	0.1122
LNINTR	0.023952	0.181206	0.132179	0.8963
LNINTR(-1)	-0.203079	0.203012	-1.000329	0.3304
LNINTR(-2)	0.298260	0.182937	1.630397	0.1204
LNINTR(-3)	0.079408	0.160158	0.495811	0.6260

R-squared	0.575084	Mean dependent var	0.069917
Adjusted R-squared	0.197381	S.D. dependent var	0.105281
S.E. of regression	0.094320	Akaike info criterion	-1.577793
Sum squared resid	0.160133	Schwarz criterion	-0.822338
Log likelihood	44.61137	Hannan-Quinn criter.	-1.317010
F-statistic	1.522583	Durbin-Watson stat	2.433384
Prob(F-statistic)	0.194189		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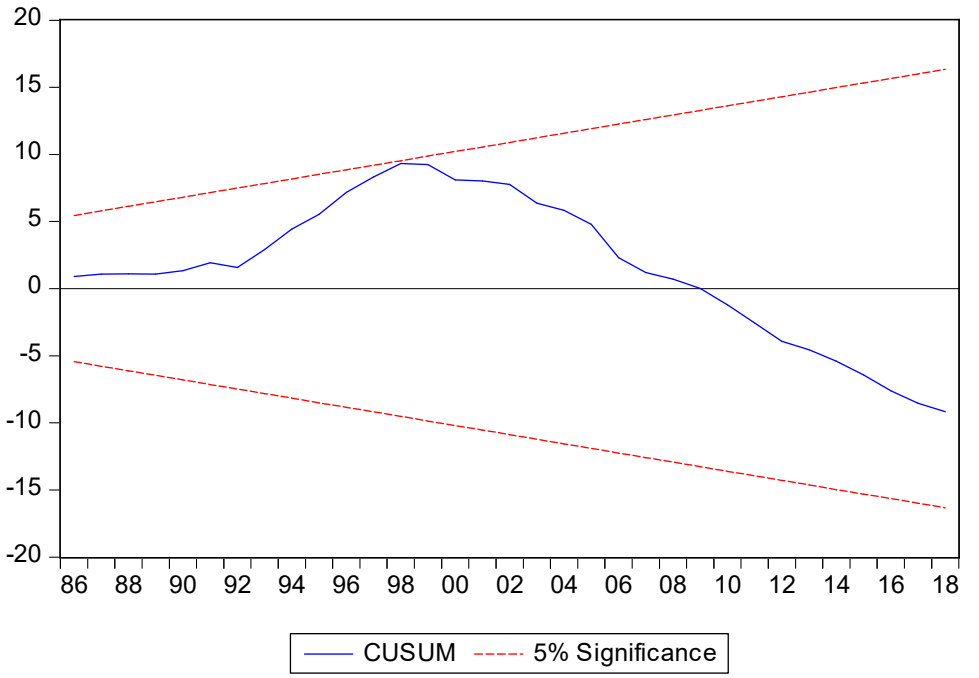
CUSUM of Squares
5% Significance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86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18
CUSUM
5% Significance

Null Hypothesis: LNINFR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.967011	0.7548
Test critical values:	1% level	-3.621023	
	5% level	-2.943427	
	10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNINFR)
Method: Least Squares
Date: 07/15/21 Time: 11:53
Sample (adjusted): 1982 2018
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNINFR(-1)	-0.040167	0.041537	-0.967011	0.3402
C	0.272192	0.185024	1.471114	0.1502

R-squared	0.026022	Mean dependent var	0.118536
Adjusted R-squared	-0.001806	S.D. dependent var	0.576075
S.E. of regression	0.576595	Akaike info criterion	1.789185
Sum squared resid	11.63616	Schwarz criterion	1.876262
Log likelihood	-31.09992	Hannan-Quinn criter.	1.819884
F-statistic	0.935111	Durbin-Watson stat	2.102653
Prob(F-statistic)	0.340173		

Null Hypothesis: D(LNINFR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.352557	0.0000
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNINFR,2)
Method: Least Squares
Date: 07/15/21 Time: 11:54
Sample (adjusted): 1983 2018
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNINFR(-1))	-1.075946	0.169372	-6.352557	0.0000
C	0.140878	0.099664	1.413525	0.1666

R-squared	0.542734	Mean dependent var	0.011067
Adjusted R-squared	0.529285	S.D. dependent var	0.853071
S.E. of regression	0.585281	Akaike info criterion	1.820502
Sum squared resid	11.64682	Schwarz criterion	1.908475
Log likelihood	-30.76904	Hannan-Quinn criter.	1.851207
F-statistic	40.35497	Durbin-Watson stat	2.002238
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNEXT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.746905	0.0005
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEXT,2)
Method: Least Squares
Date: 07/15/21 Time: 11:54
Sample (adjusted): 1983 2018
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXT(-1))	-0.798909	0.168301	-4.746905	0.0000
C	0.156807	0.042264	3.710193	0.0007

R-squared	0.398582	Mean dependent var	-0.005560
Adjusted R-squared	0.380894	S.D. dependent var	0.189301
S.E. of regression	0.148948	Akaike info criterion	-0.916486
Sum squared resid	0.754308	Schwarz criterion	-0.828513
Log likelihood	18.49675	Hannan-Quinn criter.	-0.885781
F-statistic	22.53311	Durbin-Watson stat	1.991211
Prob(F-statistic)	0.000036		

Null Hypothesis: LNEXT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.217062	0.6567
Test critical values:	1% level	-3.621023	
	5% level	-2.943427	
	10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEXT)
Method: Least Squares
Date: 07/15/21 Time: 11:55
Sample (adjusted): 1982 2018
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXT(-1)	-0.014062	0.011554	-1.217062	0.2317
C	0.288526	0.076468	3.773176	0.0006

R-squared	0.040603	Mean dependent var	0.200271
Adjusted R-squared	0.013191	S.D. dependent var	0.148600
S.E. of regression	0.147617	Akaike info criterion	-0.935858
Sum squared resid	0.762673	Schwarz criterion	-0.848782
Log likelihood	19.31338	Hannan-Quinn criter.	-0.905160
F-statistic	1.481239	Durbin-Watson stat	1.621973
Prob(F-statistic)	0.231724		

Null Hypothesis: LNDDT has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.900128	0.3286
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNDDT)
Method: Least Squares
Date: 07/15/21 Time: 11:56
Sample (adjusted): 1983 2018
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDDT(-1)	-0.082406	0.043369	-1.900128	0.0662
D(LNDDT(-1))	0.219816	0.149644	1.468925	0.1513
C	0.647103	0.290879	2.224649	0.0331

R-squared	0.185961	Mean dependent var	0.174873
Adjusted R-squared	0.136626	S.D. dependent var	0.468504
S.E. of regression	0.435325	Akaike info criterion	1.254206
Sum squared resid	6.253749	Schwarz criterion	1.386166
Log likelihood	-19.57571	Hannan-Quinn criter.	1.300263
F-statistic	3.769308	Durbin-Watson stat	1.789237
Prob(F-statistic)	0.033546		

Null Hypothesis: D(LNDDT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.723112	0.0005
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNDDT,2)
Method: Least Squares
Date: 07/15/21 Time: 11:56
Sample (adjusted): 1983 2018
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNDDT(-1))	-0.712052	0.150759	-4.723112	0.0000
C	0.114957	0.081562	1.409446	0.1678

R-squared	0.396176	Mean dependent var	-0.033207
Adjusted R-squared	0.378416	S.D. dependent var	0.572963
S.E. of regression	0.451728	Akaike info criterion	1.302478
Sum squared resid	6.937963	Schwarz criterion	1.390451
Log likelihood	-21.44460	Hannan-Quinn criter.	1.333183
F-statistic	22.30779	Durbin-Watson stat	1.870491
Prob(F-statistic)	0.000039		

Null Hypothesis: D(LNEXR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.115698	0.0002
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEXR,2)
Method: Least Squares
Date: 07/15/21 Time: 11:56
Sample (adjusted): 1983 2018
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXR(-1))	-0.872611	0.170575	-5.115698	0.0000
C	0.138173	0.057209	2.415222	0.0213

R-squared	0.434938	Mean dependent var	-0.002130
Adjusted R-squared	0.418318	S.D. dependent var	0.394977
S.E. of regression	0.301241	Akaike info criterion	0.492143
Sum squared resid	3.085376	Schwarz criterion	0.580116
Log likelihood	-6.858568	Hannan-Quinn criter.	0.522848
F-statistic	26.17036	Durbin-Watson stat	1.999838
Prob(F-statistic)	0.000012		

Null Hypothesis: LNEXR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.251923	0.1924
Test critical values:	1% level	-3.621023	
	5% level	-2.943427	
	10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNEXR)
Method: Least Squares
Date: 07/15/21 Time: 11:57
Sample (adjusted): 1982 2018
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXR(-1)	-0.054011	0.023985	-2.251923	0.0307
C	0.336962	0.092336	3.649285	0.0008

R-squared	0.126554	Mean dependent var	0.156703
Adjusted R-squared	0.101598	S.D. dependent var	0.295384
S.E. of regression	0.279977	Akaike info criterion	0.344321
Sum squared resid	2.743552	Schwarz criterion	0.431397
Log likelihood	-4.369934	Hannan-Quinn criter.	0.375019
F-statistic	5.071158	Durbin-Watson stat	1.886931
Prob(F-statistic)	0.030705		

Null Hypothesis: LNINTR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.425285	0.1420
Test critical values:	1% level	-3.621023	
	5% level	-2.943427	
	10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNINTR)
Method: Least Squares
Date: 07/15/21 Time: 11:57
Sample (adjusted): 1982 2018
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNINTR(-1)	-0.179987	0.074213	-2.425285	0.0206
C	0.528927	0.211660	2.498950	0.0173

R-squared	0.143878	Mean dependent var	0.018336
Adjusted R-squared	0.119417	S.D. dependent var	0.141673
S.E. of regression	0.132945	Akaike info criterion	-1.145227
Sum squared resid	0.618601	Schwarz criterion	-1.058151
Log likelihood	23.18670	Hannan-Quinn criter.	-1.114529
F-statistic	5.882006	Durbin-Watson stat	1.943133
Prob(F-statistic)	0.020594		

Null Hypothesis: D(LNINTR) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.470928	0.0011
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNINTR,2)
Method: Least Squares
Date: 07/15/21 Time: 11:59
Sample (adjusted): 1984 2018
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNINTR(-1))	-1.107517	0.247715	-4.470928	0.0001
D(LNINTR(-1),2)	0.109384	0.175315	0.623927	0.5371
C	0.018157	0.025567	0.710154	0.4828

R-squared	0.505550	Mean dependent var	-0.000738
Adjusted R-squared	0.474647	S.D. dependent var	0.205601
S.E. of regression	0.149022	Akaike info criterion	-0.887630
Sum squared resid	0.710641	Schwarz criterion	-0.754315
Log likelihood	18.53353	Hannan-Quinn criter.	-0.841610
F-statistic	16.35919	Durbin-Watson stat	1.918515
Prob(F-statistic)	0.000013