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Infrastructural Funding in Nigeria: Investigating the Use of Bonds in Bridging the Gap

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Abstract

The broad objective of the study is to study infrastructural funding in Nigeria by investigating the use of bonds in bridging the gap, 1980 – 2018. The research further narrowed it down to the relationship between corporate bonds and capital expenditure, where capital expenditure on economic services was used as a proxy for infrastructure. In addition, other key variables relating to the subject matter were used: corporate bonds, bonds coupon, external loans. The ADF, cointegration and Error correction mechanism were adopted. The result showed that external debts have negative and significant impact on the capital expenditure in Nigeria over the period of study while bonds have positive but insignificant impact on capital expenditure in Nigeria. However, corporate bond has positive and significant impact on the capital expenditure. The ECM shows a satisfactory speed of adjustment. The bounds test indicates a long run equilibrium relationship among the variables. The result recommends that the government at all levels should be in favour of bonds than external borrowing as towing this route has no negative impact on the capital expenditures.

Keywords: Capital expenditure, Corporate bonds, Bond coupons

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Background to the Study

Economists have acknowledged the importance of infrastructure as an important instrument in the development process. Public infrastructure has remained a central issue in economic development, especially developing countries in Sub-Saharan Africa, whose economies are characterized by structural rigidities, weak support services and institutional framework, declining productivity, high level of corruption as well as policy instability. This situation has led to researches aimed at investigating whether public spending on infrastructure has yielded significant results over time. Certain factors have influenced public spending on infrastructure, that is, rate of urbanization, openness, government revenue, external reserves, population density, and type of government. A good number of studies have been carried out on the impact of public spending on economic growth in the short and long-run in most developed and less developing countries, using cross sectional data of many countries (Edame, 2009; 2010; 2011; 2012).

In Nigeria, several government policies have led to infrastructure decay, which has been characterized by erratic power supply, inefficient telecommunication, poor urban and rural road networks which have resulted in a near stagnant economic performance (Bureau of Public Enterprises (BPE), 2003).

Arthur and Sheffrin (2003) see infrastructure as the fundamental facilities and systems serving a country, city or area, including the service and facilities necessary for its economy to function. It typically characterises technical structures such as roads, bridges, tunnels, water supply, sewers, electrical grids, telecommunications and so forth. Thus, it suffices to opine that public infrastructure is a key element of the essence of governance structure in a society, for which reason the emergence of state and by extension government is validated. Given the huge capital outlay required to fund Public infrastructure, intended for public good and social service, a cost-effective option such as bond finance is desirable, even as fiscal budgeting estimates define the limits and scope of public expenditure. Modern economies are usually graded in a hierarchical template that not only typifies the size of their economy, but that also underlines the state of public infrastructure, human capital development index, good governance index, rule of law, in their state. Thus, these matrices help to determine whether a nation is ***developed, developing*** or ***underdeveloped***, thus justifying Fulmer (2009) assertion that delineates infrastructural developments as the physical components of interrelated systems providing commodities and services essential to enable, sustain or enhance societal living conditions.

In Nigeria, like other underdeveloped economies, the dearth of critical public infrastructure occasioned by a severe shortfall on the capital expenditure of government is in itself a limitation to good governance and human development. In the last five decades, some nations across the world have tackled the absence of public infrastructures limiting economic development in their environment with successful outcomes. Whether such nations are Taiwan, Japan, Indonesia, and South Korea in Asia (commonly called the Asian Tiger Nations), Brazil, Mexico, Argentina in South America or Dubai in United Arab Emirate, Turkey, Cyprus, Qatar in the Middle Eastern blocs, it has been the same impressive result.

Thus, it can be seen that in the face of the dwindling national revenues and capital expenditure, the geometrical increases in human population figures, against housing deficits and urban renewal needs, bond market instruments can offer alternative funding for infrastructure development in Nigeria, given the evidence of its successful outcomes in other world economies with much more critical pre-conditions.

Nigeria, being the case study of this work presently has a foreign debt profile of US$18.91bn made up of Federal Government of Nigeria US$14.8bn (78.27%) and States USS$4.11bn (21.73%) as at the end of 2017, (DMO, 2007). These huge debt stocks ought to have been applied effectively to public infrastructure, but the realistic evidence on ground disputes this assumption. The government hopes to lean towards foreign bonds and allied borrowings to rebalance its obligations; since its existing debt classifications as at 2017 stood at 73% local debts as against a 27% foreign debt portfolio (DMO, 2017). It is no doubt that to drive a modern production-driven Nigerian economy that has an estimated 180 million people and an extensive land mass of about 923768 sq km (Orion-me, 2018) an ambitious public infrastructure development scheme is a prerequisite for sustainable growth.

Only recently, World Bank (2018) suggests that Nigeria and other African Nations need a sustainable yearly annual funding of US$9bn for infrastructure development. Regularly, the World Bank and its sister agencies such as International Finance Corporation (IFC), or other strategic intervention organs such as the China-World Partnership Facility (CWPF), continue to partner key states in Africa in order to bring the inherent benefits of its trust and multilateral funds to bear so as to create leverages and knowledge-based resources that matter in achieving inclusive and sustainable development. The CPWF, being a liaison trust fund that collaborates Chino-African drive of leading private sector developers in African projects by way of project facilitation, technical assistance and development amongst other areas of mutual interest.

The deficit in public and private infrastructure which has become a snag to national development interestingly also has been understood to be an assailable challenge given the benefit of the hindsight in the evident successes of such highlighted economies as Dubai, Singapore, Taiwan and Hong Kong amongst others. Indeed, closer home in Africa, the exhilarating experiences of Rwanda and Botswana are equally interesting examples to understudy.

To situate the effect of inactive bond market on public infrastructure finance in Nigeria, it is necessary to understand the historical perspective of domestic bond in the Nigerian economy, be it (Federal, State and Local Governments) in addition to corporate bonds which remained significantly moribund from inception of the nation in 1960 up until the advent of the fourth republic government in 1999. Perhaps, the ad-hoc nature of successive military governments that administered the Nigerian economy from July 29, 1966 to October 1, 1979, and December 31, 1983 to May 1999 thereafter, may have accounted for this lull. Thus, bond issuance by the respective government would require the approval of the law makers, a guarantee and sometimes a counter-guarantee, as well as the involvement and approval of the Federal Ministry of Finance based on the Debt Management Office (Mailafia, 2007).

The fundamental benefits of an economy which funds its critical infrastructure with investment grade bonds cannot be overemphasized. Scholars such as Harwood (2000), Witheral (2003) and Grandes and Pinaud (2004) all agree with this position. There is usually a significantly low transaction cost. The tenor, template and flexibility of the scheme and its instrument align suitably to the long-term tendency of the public bond repayments. The bond market transactions altogether relieve the undue pressure on the short-term financing capacity of the money market which is often borne by the banking sector, where a viable bond market structure is lacking. An example is Nigeria before the 2005 introduction of the Debt Management Office (DMO), as well as South Korea and Argentina during their financial crises.

Besides, other regulatory reforms in Nigeria that were made, brought about the Pension Reform Act (2004) enabling Pension Fund Managers to invest in bonds, and the Infrastructure Concession Regulatory Commission (ICRC Act, 2005) which provides the legal and regulatory framework for infrastructure concession in public and private partnership arrangements (PPP) and Joint venture (JV) operating models amongst others.

As at the time of this study, certain realities of economic significance had set the tone for the redirection of Foreign Direct Investments from Nigeria. In the United States (US), the emergence of President Donald Trump's ***America first*** philosophy shifted the polemic disposition of American and other international investors against potential investment deals in national economies such as in Nigeria and other emerging markets. Thus for the Nigerian economy that is trying to strengthen its gait from the debilitating disruptions of 2008/09 global financial meltdown in the United States of America and Europe which literarily dried up its investments appeals as well as the recent economic recession the Nigerian economy sunk into between year 2015 to 2017; the prospect that bond finance offers is a necessity.

Some fundamental bond market developments in Nigeria in 2003 ensued after the government successful debt write-off negotiation, alongside its' US$18 billion debt pay down to the Paris and London club of creditors. These include but not limited to the successful navigation of an international bond to underwrite the Liquefied Natural Gas (LNG) train IV US$1.25 billion and even another expectant US$25 billion LNG train 7 project bond; other successful corporate bonds namely; Guaranty Trust Bank Nigeria Plc Eurobond US$276.93; Access Bank Nigeria Plc, UBA Plc, First Bank Plc US$300.00m Eurobond due August 7, 2020, Zenith Bank Plc US$500.00 Eurobond due April 22, 2019, Fidelity Bank Plc, US$400m 5 year 10.75% bond due October 2017; Diamond Bank US$200m 5year subordinated bond due May 21, 2019 among others, positioned the Nigerian economy for investment and growth. No wonder the Eurobond market was receptive to series of placements that the Nigerian economy has had to underwrite afterwards. There is also the case of Fidelity Bank Plc which, facing the unfavourable window of high interest costs in sovereign bonds yield of 17.10% in 2015, sought Eurobonds worth US$400m to repurchase its initial US$256m US dollar notes due May 2018 at 6.875%.

According to (Harwood, 2000) an effective bond market therefore facilitates access to alternative sources of debt capital thereby serving as a supplement to bank financing. In a similar occurrence to the observation of Harwood, dwindling fiscal budgetary provisions in Nigeria which directly funds public infrastructure has made alternate financing inevitable. Since capital expenditure is being outstretched by burgeoning overall fiscal expenditure, a radical recourse to ingenious ways of external debt financing has become self-evident. Notwithstanding, this bond market context, even for its novel approach, would matter less for most underdeveloped economies, whose economic models lack structures for private investment driven investment markets. Reports on the infrastructural situation in Nigeria abound:

The Ibrahim Bantu Presidential Project Assessment Committee Report (2011) during the President Goodluck Jonathan administration had reported 11,886 failed or abandoned federal government infrastructure project dating back to Nigeria independence in 1960. The reported determined that a finding of N7.78 trillion is required to complete the projects to be spread equally over five (5) fiscal budget years with at least N1.5 trillion per year.

The Chartered Institute of Project Management of Nigeria (2015) in a professional assessment report identified 56,000 failed Public and Private infrastructural projects in Nigeria valued at N12.0 trillion. These are spread across the six-geo-political zones namely; 15,000 in South West Region, 11,000 in South South Region, 10,000 in South West Region, 6,000 in North West Region, 7,000 in North Central Region and 5,000, in North East Region respectively.

The abandoned Ajaokuta Steel Company, National Iron Ore Mining Company Itakpe, Delta Steel Complex, Aladja that would have provided the hub for industrialization of Nigeria was halted. Ajaokuta Steel Company alone was valued at US$6.00 as at 2006. In addition to the Nigerian bond market, whether viewed from the prism of domestic or international bond market activities has been actively revived from its slack state prior to year 2003 to a bullish state today.

This vibrancy notwithstanding, the proportion of recurrent expenditure in Nigerian national budget estimates which range from 60% to 80%, render the financing of public infrastructure projects difficult. It is this difficulty that the divergent option of bond finance, tends to assuage. It is also a known fact that the relative small size of the Nigerian bond market (stock and financial markets inclusive) pales into insignificance compared to the Egyptian and South African markets.

Given that the ready structure for the fast-paced development of the Nigerian economy rests squarely on such cardinal sectors as power infrastructure, road infrastructure, rail infrastructure, housing infrastructure, IT and technological infrastructure, then it becomes clear that the critical finance to fund these projects will determine how fast Nigeria develops. Being a regional economic power in sub-Saharan Africa and the most populous black nation on earth with current population estimate of 195 million people and a

staggering 60% youth population (Mbachu & Alake, 2016) then a robust bond finance structure is very important. Thus, structural factors, "such as the size of the economy, its openness and the origin of its legal system (Adelegan and Radzewicz-Bak, 2009) becomes prerequisite for a vibrant bond market.

Although, this study is hampered by the paucity of scholarly works on the determinants of bond market development in Nigeria and other economies in Africa as against the elaborate studies on Western and Asian nations, the same trend is the reasons for the preponderant growth in money market as against the bond market as well as its failure to attract investment and hedge funds to drive critical public infrastructures.

The tragedy of this stunted developmental reality is that whereas a preponderant part of these failed public infrastructural projects were funded from national and state budgets, an important fraction of the funds were also sourced from the money markets (Deposit money banks; multilateral financial institutions, intervention institution, amongst others) thereby haemorrhaging the financial life-line of these agencies, since completion and repayments are stultified due to the project failure.

The above observations are without prejudice to the documented narrative of Nigerian Public infrastructural projects being among the most exorbitant in the world in terms of project valuation, transaction costs, contract inflation, and widespread corruption in the form of bribery, kickbacks and outright corrupt machinations. Some examples are the Ajaokuta Steel Complex Development imbroglio with the Russians, the Halliburton US$182 million bribery scandal to Nigerian officials etc. The well-known opaque nature of international project bid processes in Nigeria the apparent systemic risks, the shenanigan of insider-related interest and its abuses, the lapses in corporate governance procedure applications and such other nebulous concerns.

Some studies have been conducted in the past to investigate the funding gap and the infrastructural predicament in Nigeria. Some of the key studies in this area used the technique of VAR to investigate the relationship between capital expenditure and bonds on infrastructural development in Nigeria. Therefore, the researcher used the technique of cointegration and error correction mechanism in the estimation of the variables.

The major objective of the study was to investigate the causal effect of bond market on infrastructural development in Nigeria, 1980 – 2018. However, the researcher also inquired into the relationship between: federal government debts outstanding and infrastructural financing in Nigeria; investigated the relationship between banking system holdings of the federal government debt outstanding and public infrastructural finance; analysed the significance of Nigeria's external debt and public infrastructural finance; studied the significance of corporate bond portfolio and public infrastructural finance; and investigated the causal relationship between bond coupons rates and public infrastructural financing options.

Review of Related Literature

Conceptual framework

Imandejomu (2017) argues that Sub national borrowing enables SNGs to capture the benefits of major development projects immediately, rather than waiting until sufficient savings from current income and transfers from the Federal Government Federation Account can be accumulated for the financing. This thinking underlies the concept of this study which is cast on the dual framework of bond market and infrastructure finance. The volatility inherent in oil revenue which incidentally is the dominant component of the Nigerian mono-product economy compels the fiscal authorities to innovate alternate approaches to shore up shrinking government revenue and its budgetary constraints.

Bello and Osinubu (2008) defines infrastructure as public goods and services that go into the production process as complementary inputs for traditional factors of production such as capital, labour and entrepreneur. Estache and Garson (2012) defines infrastructure as electricity, gas, telecoms, transport and water supply, sanitation and sewage. Kathmandu Workshop Report (2009) broadly opines that infrastructure can help solve four problems: social; health and environment; development; and economics. These definitions hover around what the World Bank identifies as sustainable development goals (SDGs).

On the other hand, bond market, which is used interchangeably, for debt market or the credit market, is a convergence point for financial market participants, wherein interest bearing debt investments that secure fixed income securities for investors is provided by the issuers of project bonds. Investopedia.com defines *"bond market as a financial market in which participants are provided with the issuance and trading of debt securities".* These bonds are usually government-issued securities, corporate debt-securities, or municipal bonds which is a variant of government (sovereign) bond. Pandey (2000) simply defines a bond (or a debenture) as a long-term debt instrument. The concept of perpetuity and going concern principle that applies to national government and corporate entities make that definition apt.

In the bond market, savers usually transfer their capital by way of an investment decision to issuers of the bonds or organizations facilitating the issues for government projects, business expansion or on-going business operations. Bonds could be issued in the primary market or traded in the secondary market. The Nigerian Securities and Exchange Commission (SEC) in collaboration with Proshare defined "a bond as an interest bearing debt security/instrument issued by corporate bodies, governments and government agencies for the financing of infrastructure or for expansion purposes".

For the purpose of this study, operating definitions of these core themes are also provided. *Bond Market is that component of the Debt market wherein bond issuers and investors interact for the mutual goal of sourcing and allocating cheap resources for large project execution at a prescribed fee. The distinct features of the bond market are its huge volume access to funds and cheap and competitive rate of return.*

Similarly, *Public Infrastructure Finance refers to the model of funding the development of public facilities, systems, utilities, and institutions that supports the growth of the society and economic factors of production.* Thus, financing model may refer to options such as bank finance, corporate bond finance or sovereign bond and government securities. A bond may be issued locally or internationally.

Thus, there is a natural correlation between a bond issue and project financing either of a public or corporate infrastructure project. Clearly, there are usually distinct features that delineate a debt market transaction as a bond issue; namely:

If it ingratiates the investors with an IOU of a fixed amount, redeemable at a deterministic future maturity date.

1. If it is a secured debt instrument with a par or face value printed on the document deployed to fund projects, utilities or other infrastructure.
2. If it is usually a negotiable debt instrument transferable through the stock exchange to a third party or even through nominal transfer to a beneficiary or blood relation.
3. Where payment of the principal investment amount is through a regular stream of payments whilst interest payment falls due twice yearly.
4. If it's classification is made according to the issuer i.e. Government (Sovereign) bond, Agency Bond, Municipal Bond, Corporate bonds or Global (International) Bonds.

Generally speaking, as the spectrum of economic activities expand in leaps and bounds across national economies; the ever-growing gap in global infrastructure and its funding constraints becomes even more evident. Sovereign governments increasingly seek shared responsibility for provision of critical infrastructure with capitalists and multilateral corporate institutions. Over the last 27 years, many governments have successfully negotiated public private partnerships (PPP's) to attract private capital and indeed expertise to their investment programs.

The World Economic Forum (WEF) estimates that shortfalls in essential infrastructural projects could exceed US$1 trillion annually. Currently, global stakeholders such as the G20; WEF and IMF have all pushed infrastructural improvements to the very top of their agenda. As public finances continue to be stretched following the financial meltdown and fluctuations in prices of commodities, there is even more urgency in the need to explore new sources of funds to shore up the funding gap.

The reason for issuing bonds as opposed to other forms of debt market securities stem from its compatibility to financing huge capital project with long gestation periods. Examples are information technology projects, construction of roads, bridges, rails and tunnels, electrification of urban and rural settings and such other utilities as dams, irrigations etc.

Bonds offer a more effective strategy for financing local currency portion of government budget deficits. In Nigeria, the commonly used Nigerian Treasury Bill (NTB) stock is a glaring occurrence. The use of bonds also helps to reduce local and external debt stock and present a

manageable strategic template for the administration and management of governmental debt. An instance is the deployment of bonds by the Debt Management Office in Nigeria (DMO)

Apart from the obvious benefit of cheaper floatation or transaction cost to the issuer e.g. government, it allows them the breathing space to spread out interest and principal repayments. It reduces inflationary pressure on the economy and aligns with strategic long-term repayment matrix of government investment in infrastructure. Similarly, it is a safe investment window for the bondholder and offers a fairly better return as against bank deposit rates. Apart from diversifying a holders' investment portfolio, it encourages a savings culture which not only helps the citizenry but solidifies the economy.

Bond Market Theories

To align to the focus of this work, the theoretical frameworks in the bond market are very important. Some of these theories are; Term structure theory, theory of Corporate Capital Structure, Financial Structure Theory, Financial Innovation Theory, Information economics theory, Ricardian Equivalence theory, Financial Deepening theory, Segmented Market theory, Loanable Funds theory, Financial Dualism theory,

Labenstein's theory on shocks and stimulants, Domar model, Debroverhang theory and Institutional economics engineering theory (Mailafia, 2014: 68) amongst others, Of particular relevance to this study are; Liquidity Premium theory, Expectation Theory, Keynesian marginal efficiency of capital, Classical theory of investment, Harrod-Domar Growth model, Term Structure Theory, The Ricardian Equivalence Theory, The Segmented Market Theory and Institutional Economic Engineering Theory which encompasses most of the relevant theories. Brief reviews of the relevant theories are provided in this study, while the irrelevant once are ignored.

Liquidity Premium theory: This theoretical model assumes the explanation for the tendency of differing security types, though all stocks, with identical features except in their liquidity structure. It has a segmented three part theory that explains the behavior of yield curves for different instruments and those interest rates. Even Default free bonds are risky investments because of the uncertainty related to inflationary pressure and future interest rates. Thus, it is a premium demanded by investors when it is certain that at maturity, a given security cannot be easily converted to cash from its face value. The Nigerian Treasury Bills (NTB) which is a near liquid investment is easily convertible as opposed to mortgage security.

Expectation Theory : Holders of bond products have no inherent preference of one bond stock of a given maturity over another so that they will not be liable to hold any particular bond, if its expected yield return is less than that of another bond with a varying maturity.

The bond market in Nigeria is a strand of the capital market and the totality of occurrence in the capital market could either directly or indirectly affect the bond market. Another view to explore here is that what happens to government securities and bonds could directly or

directly impact on the performance of corporate bonds and equities in the market. In all, forward rates represent the real motivation to investment decisions in the bond market where the market expectation is stable and favourable to the investor. A long term investment, such as the bond market, will be meaningless if the expectation in the market is slim.

"Wikipeida (2017) explains that expectation hypothesis of the term structure of interest rates (graphically called yield curve) is the proposition that the long-term rate is determined purely by current and future expected short term rates, in such a way that the expected final value of wealth from investing in a sequence of short term bonds equals the final value of wealth from investing in long-term bonds".

Keynesian Marginal Efficiency of Capital Theory: John Maynard Keynes (1936) postulates that final investment decisions does not depend on interest rate alone , but on the differential value called internal rate of return (IRR) generated by investing in a given asset called marginal efficiency investment (MEI) as well as the prevailing market rate of interest. Keynes introduced his general theory by affirming that the rate of discount which would make the present value of the series of annuities given by the returns expected from the capital asset during its life just equals its supply price" is the marginal efficiency of capital. Thus, the future rate of return is imbedded in the discount factor by way of the differential value called internal rate return (IRR).

Classical theory of investment: According to Jorgenson (1963) investment decision is propelled by interest rate, a mechanism that guarantees equality of investments and savings from the circular flow of income. This theory is actually an amalgam of the classical stationary state capital theory, Keynes investment theory and traditional neoclassical investment theory in a self-regulating and interacting manner. Thus, decrease in investment and decrease in interest rate is achieved over time when factors of production are fully employed to achieve a natural level of growth (GDP). Though it serves investment and financial purpose, it is more of an economic tool.

Harrod-Domar Growth model: Harrod, (1939) & Domar (1946) had their Keynesian based work improved by Cassel (1924). Here, blend savings ratios and capital coefficient (K) in any economic is regard as critical factor for accumulation. The crux of this model is the summation of independent works of Harrod 1948 model (HM); Domar 1957 model (DM) and the subsequent review of Harrod-Domar Growth Model (HDM). An economic model which states that to maintain the growth that results from an equilibrium state of full employment, level of income, a continuous maintenance of which requires stability in the volume of spending from investment in order to absorbs the increase output resulting from full employments. The model underscores this prior explanation since it states that the blend of the savings ratio(s) and the capital coefficient (k) in any economy are regarded as critical factors for capital accumulation and growth provided that there are no leakages in the system that diverts such savings away from financing fixed investment.

Thus, the growth rate of real stock of fixed capital (k) is:

$$\frac{\Delta K}{K} = \frac{\frac{\Delta K}{Y}}{\frac{K}{Y}} = \frac{S}{K}$$

Where:

Y = is the real national income
K = is the capital coefficient
S = is the savings ratio.

(Note that if the capital-output ratio or capital coefficient $\left[K = {}^{K}\!/_{Y}\right]$ is constant, the rate of growth of Y is equal to the rate of growth of X. this is determined by s[ratio of net fixed investment or saving to Y] and K).

Term Structure Theory examines the relationship between maturity of debt and its cost (Pandey, 2010:662), just as the riskless yield element in government securities determines its market acceptance.

The benchmark of bond market activities is the interest rate which is more or less a tool of monetary policy governance mechanism. Thus, it is best estimated through yields in the risk-free government securities (Bhalla; 2009-374). The yield curve, stability of the Monetary Policy Rate (MPR), provides the template for inter-bank rates and short term rates in the money market. The Central Bank of Nigeria in the last 3 years, have deployed a number of monetary policy tools to tackle and correct the distortions in the financial system occasioned by oil price shocks and the economic recession the country just experienced.

The Ricardian Equivalence Theory (propounded in 19th century by David Ricardo) posits that the savings attitude of the public towards future tax increase neutralizes in the long run, the impact of debt financed government spending. Robert Barro would later expand on the scope of the earlier work by Ricardo hence it became known as Barro/ Ricardian Equivalence Theory.

This theory alters the very basis for project finance as the cash flow generated from public infrastructure project over time is assumed to defray the initial cost of the project execution over time (excluding interest rate factor). Thus, it could be given that a cycle of economic stimulation in order to boost productivity could be derived in the assumptions of this theory. In Nigeria for instance, an underdeveloped economy where tax system is largely untapped and distorted, there is ample variance from the assumptions of this model. First, the tax collection mechanism is largely restricted to working class in the formal sectors with a disproportionate part of the taxable class not covered in the tax net. Secondly, there is mismanagement of tax revenue on the part of the government that does not set its development priorities right. The current voluntary Assets and Income Declaration Scheme (VAIDS) of Federal Inland Revenue Service (FIRS) authorities is to correct this anomaly.

Empirical Reviews

Otchere, Sourmare & Yourougu (2011) exploring the areas of gap in Foreign Direct Investment, Financial Market Development and economic growth in Africa as at October 2011 and using data/generated from foreign direct investments and financial market developments of African countries from (1996 – 2009) conducts empirically backed results deploying:

i. Granger causality test between FDI and FMD.
ii. Multivariate analysis of the relationship between FDI and FMD by using.
iii. Arellano-Bond dynamic Panel data estimation method robustness check.
iv. Explain the growth thereof by control of simultaneous effects of FDI and FMD.

Thus, the study focuses on two main planks, the causal relationship between FDI and economic growth and the symmetric role played by FMD in that linkage. This is with the mindset that African financial markets are less liquid, less transparent and often incur attraction for financial market reforms. It thus, becomes onerous that an active financial market helps to channel FDI effectively to needy sectors with onerous value for investors.

Findings from the study confirm that FDI impacts positively and significantly on economic growth in Africa. It creates a gap in recommending that studies involving both FDI and FMD should account for this potential endogeneity issue.

Chong & Poole (2013), using a statistical methodology of comparative approach, did carry out a cross-national analysis in infrastructure financing along public private equity and PPP models. The study was benchmarked using four economics namely China, India, Australia and United Kingdom. The findings were that these different nations use a variety of methods to finance their infrastructure. It further highlighted peculiar challenges in promoting private infrastructure finance according to the differences in the countries studied.

Overall, it becomes clear that government decisions and policy thrust affect the calculations for the investing private and institutional interests to be attracted to each economy. M. Adelino, et al. (2017) examined the market reactions and externalities pertaining to recalibrated municipal bond issues ranging from zero to three notches in USA in March 2010 by International Rating Agency, Moody from its traditional municipal bond ratings into the Global rating scale. This singular consideration stimulated the market environment resulting in the following measurable impact:

1. Upgraded counties experienced significant lowering in their borrowing costs relative to non-upgraded counties and thus raised more bond financing for public infrastructure.
2. Overall increase in debt-financed government spending due to improved access to credit.
3. Positive spill-over effects to private sector transactions resulting in increases in employment figures.

General Improvements in Economic Conditions
Alonso et al. (2016) deployed investment portfolio data from the US (vis-a-viz other countries revealed some interesting result. Using data of recalibrated investment grade bonds from Moody's (only 56 municipal bonds had a speculative-grade rating) comprising 69,657 bonds with per value of US$2.2 trillion (sample period of April 2006 to March 2013); private-sector employment and income at the country level, local government employment and expenditures, government employments, yearly changes in house prices, Housing Price Index (HPI) data from Federal Housing Finance Agency (FHFA) at the Metropolitan Statistical Area (MSA) level to run a James Tobin (1958) Tobit Model Regression analysis, they found that:

Expansion of portfolio limit in domestic and foreign asset especially of pension funds in an additional investment request of the pension fund managers.

Country specific characteristics affect pension fund investment in infrastructure.
Levels of development of financial market in an economy affect the corresponding level of investment in infrastructure.

Modalities vary from country to country.
Pradhan, et al., (2015) reveal that internalization of project finance bring up issues of governance and best practices in project execution, namely:

1. Sovereign and political risks.
2. Rating classification of projects.
3. Project review along Kyoto protocol and renewal energy expectations.
4. Project risk measurements.
5. Globalization and Public/Private sector co-operation.

Mu, et al., (2013), used broad indexes of classification namely:

1. Structural variables (Economic size and trade openness), financial variables (Size of banking sector, bank interest spread) and development variables (Income per capita and institutions).
2. Macroeconomic variables (The overall fiscal balance, interest rate, variability and concerns whether capital controls are in place).

The authors' adopts the econometric model of Eichengreen and Luengnaruemitchai (2004) (A two-phase estimation model accounting for time variant and time invariant variables, wherein the variables are classified into *structural, financial, developmental* and *macroeconomic* in methodology to find that:

i. Domestic African securities markets are underdeveloped even though the various governments rely on government securities to fund fiscal deficits.
ii. Corporate bonds are at a nascent stage in all sub-Saharan countries except in South Africa.
iii. Notwithstanding the aforesaid, there is a growing relevance of corporate bond markets across Africa.

iv. The author's thus advised governments across the sub region to deepen the markets.

Mostafavi, et al (2015), using data from US department of Transportation and Road and Transport infrastructure, database, World Bank, Washington reviewed Agent-based techniques to stimulate the micro behaviours of stakeholders in highway development, department of transportation, private institutional investors and the public at large. The author's thus had to use stimulation model for ex-ante analysis of financing policies in order to anticipate uncertainties and adoptive behaviours of policy options. The recommendations from this work are:

i. Need to expand pay as you go capacity in road infrastructures.
ii. Public Private Partnership (PPP) initiatives to be expanded.
iii. Increase funding for debt repayment in fiscal and budgetary estimates.
iv. Changes the structure of infrastructure financing to reflect the needs assessment inherent in the sector.

Sarmento and Tilburg (2014), took glaring interest in the PPP infrastructural fiancé and management of Fertagus bridge, Lisbon Portugal (the 25th of April Bridge) and Lusoponte, Vas da Gama Bridge, Lisbon (Vasco da Gama Bridge).

The authors concluded that given the specific and general import of that study, a conclusion could be made to the effect that;

1. Public Private Partnerships (PPP) impinges no extraneous financial costs to public budget during investment stage and so without budgetary constraints as is often common place in public sector investments.
2. Public Private Partnerships (PPP) generates opportunity for ease of renegotiation of contract terms along the line of investment and project execution as anticipated and often unforeseen tendencies emerge to impact the project timeline.

Sinha (2014) focused on the Indian economy, discussing the dilemma of the government in seeking to enhance the desired long term financing of infrastructural projects which ought to be best served with insurance and pension funds. This is because of the peculiarity of preponderance of savings in deposit money banks by Indian household savers as against low investments inclinations in insurance products and the relatively small percentage of pension fund. There is therefore no doubt that the banks dominate the India financial system (IMF 2013; Sinha 2014).

Research Design

Nachmias and Nachmias (1976) cited in Baridam (2001) see research design as a framework or plan that is used as a guide in collecting and analyzing data for a study. The study shall adopt the quasi-experimental research design. This is adopted because the study seeks to explore the effect of the proxies for foreign inflows on economic growth. Nwankwo (2013), has it that the quasi-experimental design allows for the evaluation of the effect of independent variable(s) on a dependent variable using time series data.

Data Collection Methods and Sources
The study will rely on time series secondary data covering the dependent and independent variables which will be obtained, mainly, from the World Bank data, SEC Statistical Bulletins and the CBN covering the periods 1980 – 2018.

Method of Data Analysis
The researcher used the descriptive statistics, unit root test, autoregressive distributed lag (ARDL), cointegration analysis and error correction mechanism to analysis the data used. Thereafter, the researcher conducted post estimation test: Ramsey Reset test to check whether or not the model is correctly specified in linear form, the Breusch-Godfrey Serial Correlation LM test to check if the model suffers autocorrelation problem in the residuals up to the specified lag order, the White's heteroskedasticity test to verify whether or not the variance of the residuals of the model are homoscedastic, the Jarque-Bera test to verify if the variables of the model are normality distributed and the CUSUM test for stability to determine whether or not the model is stable and suitable for making long run decision.

Model Estimation Technique
Autoregressive Distributed Lag (ARDL) Testing Approach
The model was specified as follows:

$$GCE_t = \lambda_o + \lambda_1 BON_{t-1} - \lambda_2 EXD_{t-1} + \lambda_3 BOC_{t-1} + \varepsilon_t$$

Where: *GCE* represents the government capital expenditure (infrastructural spending), *BON* represents Federal government Bonds, *EXD* represents external debts, and *BOC* represents bond coupon. and ε_t= white noise error term.

Data Analysis
Table 1: Descriptive Analysis

	BON	GCE	EXD	BOC
Mean	9.59E+08	1.71E+10	-2.17E+08	9.12E+08
Median	8.94E+08	6.74E+09	0.000000	1.31E+08
Maximum	1.76E+09	6.33E+10	1.27E+08	3.49E+09
Minimum	2.59E+08	4.04E+09	-2.54E+09	2000000.
Std. Dev.	3.92E+08	1.84E+10	4.97E+08	1.34E+09
Skewness	0.209214	1.327262	-3.080796	1.056741
Kurtosis	2.275707	3.288195	13.77161	2.264610
Jarque-Bera	1.107829	11.28845	243.8218	7.928705
Probability	0.574696	0.003538	0.000000	0.018980
Sum	3.64E+10	6.50E+11	-8.24E+09	3.47E+10
Sum Sq. Dev.	5.69E+18	1.26E+22	9.13E+18	6.64E+19
Observations	38	38	38	38

Source: Eviews test results

The descriptive stats give a researcher an idea of the type of data they are using at a glance. From the table above, the researcher will focus on the skewness, kurtosis and JB of the data set to determine whether they are normally distributed or not. The Std deviation however, shows how much faraway the data is from the mean. The skewness shows that some of the variables have a fairly normal distribution based on the rule of thumb of 0 while others do not. However, the JB shows that BON, is the only normally distributed variable among all the variables used.

Unit Root Tests

The ADF is used to test for the presence of random walk among the variables used. The unit root tests for the presence of stationarity. The table below shows the test results at levels and at second difference. The results reveal that the variables are stationary at second difference.

Table 2.

Coefficient	I(0)	I(1)	Comments
BOC (At levels: prob= 0.4475) (At I(1): prob=0.0000	Nonstationary	Stationary	
EXD (At levels: prob= 0.0898) (At I(2): prob=0.0001	Nonstationary	Stationary	
GCE (At levels: prob= 0.8587) (At I(1): prob= 0.0009	Nonstationary	Stationary	
BON (At levels: prob= 0.0299) (At I(1): prob= 0.0000	Stationary	NA	

Source: Eviews results

Table 3: Short-Run ARDL Results

Variables	Coefficients	Std Error	t-Stat
BOC	-1.455295	2.872914	-0.506557
EXD	2.970592	1.086124	2.735039
BON	3.823043	3.106959	1.230477
C	-8.35E+09	1.30E+10	-0.644365
R-Square	0.998816		
F-Stat	548.3028		
DW	2.139321		

Source: Eviews test results

The short run ARDL results show that the coefficient of determination is 99.8%. This means that the independent variables were able to explain 99.8% of the changes in the dependent variables over the period. The F-stat showed that the overall model is statistically significant while the DW shows that there is absence of serial autocorrelation of the first-order. The test shows that EXD is statistically significant at 5% level.

Bounds Test

In order to determine whether the variables are cointegrated or not, a bounds test for cointegration must be conducted. Cointegration shows if there is a long-run relationship or not. This showed that there is a long-run relationship between the GCE and the independent variables over the period based on the F-stat of 8.7 which is higher than I(1) of 3.35.

The presence of a cointegrating factor becomes the basis for the conduct of error correction model.

Table 4.

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	14.23035	10%	2.26	3.35
K	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68

Source: Eviews test results

Granger Causality Test

The pair-wise granger causality test shows the direction of cause between the dependent and the independent variables. The table below shows that there is a bidirectional causality between GCE and EXD. Also, there unidirectional causality between GCE, BOC while there is no causality between GCE and BON. BOC is shown to granger cause GCE. This is shown below:

Table 5.

Pairwise Granger Causality Tests
Date: 08/26/19 Time: 00:03
Sample: 1980 2018
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EXD does not Granger Cause GCE	36	5.24071	0.0109
GCE does not Granger Cause EXD		5.38421	0.0098
BON does not Granger Cause GCE	36	1.59277	0.2196
GCE does not Granger Cause BON		1.29921	0.2872
BOC does not Granger Cause GCE	36	13.9526	5.E-05
GCE does not Granger Cause BOC		1.23259	0.3054

Source: Eviews test results

Table 6: Error Correction Model

Variables	Coefficients	Std Error	t-Stat
BOC	10.08324	4.518894	2.231351
EXD	-5.686614	1.839929	-3.090670
BON	2.572171	3.855056	0.667220
C	-1.33E+09	4.79E+09	-0.276987
R-Square	0.789124		
F-Stat	6.044952		
DW	1.340128		
ECM	-0.201124	0.095502	-2.105957

Source: Eviews test results

The long-run ECM analysis shows that the coefficient of determination is 0.79. This means that 79% of the changes in the dependent variable are explained by the changes in the independent variables. The overall model is also statistically significant at 5% level of significance. We also note that the ECM is rightly signed as it shows that the speed of adjustment is 20%. It is statistically significant at 5% level of significance.

Serial correlation

The researcher used the serial correlation test to know if there is the existence of serial autocorrelation or not among the variables. The result shows that there is absence of serial autocorrelation.

Table 7.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.901620	Prob. F(2,19)	0.0795
Obs*R-squared	8.188986	Prob. Chi-Square(2)	0.0167

Source: Eviews test results

Table 8: Heteroskedasticity Test

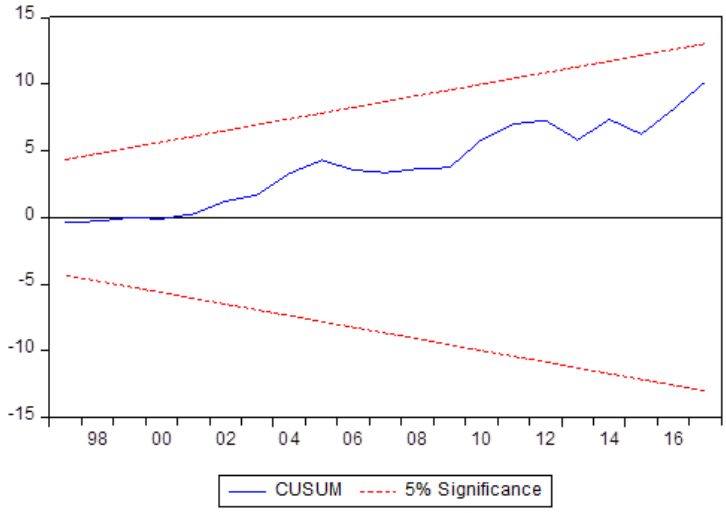
Heteroskedasticity Test: Breusch -Pagan-Godfrey

F-statistic	1.011524	Prob. F(13,21)	0.4752
Obs*R-squared	13.47718	Prob. Chi-Square(13)	0.4117
Scaled explained SS	7.697574	Prob. Chi-Square(13)	0.8627

Source: Eviews test results

The variance of the model is also constant based on the results of the heteroskedasticity test.

Fig. 1



The CUSUM test also shows that the model lies within the 5% boundaries and therefore, stable over the period.

H_{01}: GDP and BOC

The result of the analysis shows that BOC is positively related to GCE as expected apriori. The result reveals that as BOC increases by a unit, GCE increases by 10.08units and vice versa. Again, BOC is statistically significant at 5% level of significance using the t-value. The analysis shows that we will reject the null hypotheses and conclude that there is a significant relationship between BOC and GCE over the period.

H_{02}: GCE and EXD

The result above reveals that EXD has a negative relationship with GCE. As EXD decreases over the period by a unit, GCE increases by 5.7units and vice versa. EXD is also statistically significant at 5% level. We would accept the alternative hypotheses, reject the null hypotheses and conclude that there is a significant relationship between EXD and GCE over the period.

The above analysis shows that external debt does have unpleasant relationship with government capital expenditure (especially, in the case of Nigeria). Borrowed funds have huge burdens attached to them. They attract interest that could have been invested in a profitable venture. When governments borrow externally to finance their infrastructural development and end up not using the borrowed funds for the right reasons, the economy (including the infrastructures) suffer.

H_{03}: GCE and BON

The result above also shows that BON has a positive relationship with GCE. As BON increases over the period by a unit, GCE increases by 2.57units and vice versa. BON, however, is not statistically significant at 5% level according to the t-value (0.667). We would reject the alternative hypotheses, accept the null hypotheses and conclude that there is no significant relationship between BON and GCE over the period.

Discussion of the Findings

The researcher investigated and analysed the relationship between government capital expenditure (representing infrastructure), federal government bonds, bond coupon and external debts. The analysis shows that while external debts had positive but insignificant relationship with government capital expenditures, corporate bonds and bond coupons had positive and significant relationship.

The findings from this study agree with the findings of Sarmento and Tilburg (2014), Pan & Zhang (2015) who understudied the relationship between internal debt and China's urbanization. They found that there is a positive and significant relationship between the two variables. As with the findings from this study, there is a connection between internal debts and capital expenditure on public infrastructural development. Well-harnessed public internal debt management would always result to a better infrastructural development. However, in the case of Nigeria, the results have shown that there is a disconnect between external debts for infrastructural development and government capital expenditures. Mismanagement of external debt results in debt overburden on the economy and this results to a slow economic growth and development.

Following, the results on corporate bonds and bond coupon slightly agree with the findings of M. Adelino et al (2017) who studied the market reactions and externalities regarding municipal bonds issues in the USA. Although they found a positive relationship between bonds and infrastructural development, it was not significant. But this study found a negative and insignificant relationship between capital expenditure and corporate bonds of the federal government and a positive and significant relationship between government capital expenditure and bond coupons. The findings showed a tiny but strong relationship according to the results of the ECM.

Conclusion and Recommendations

Even though there are many studies on government expenditure on infrastructure and economic growth, past empirical studies didn't use the ARDL analytical technique to measure the impact. This study expanded the existing literatures on this by using the ARDL model in the analysis. More so, the researcher also included the use of bond coupon so as to effectively determine the general impact of bonds on infrastructural development in Nigeria. This study was motivated by the need to avoid parameter bias arising from possible model misspecification as well as the need to re-examine the impact of bonds on infrastructural developments in Nigeria. Using annual time series data, the researcher examined the short- and long-run relationships between capital expenditure and corporate bonds, external reserves, corporate and coupon bonds.

The heteroscedasticity shows that the variances for the variables have been constant over time while the normality test shows an evidence to reject the null hypothesis. The serial LM correlation showed that there is absence of autocorrelation of the first order among the variables. The CUSUM test shows that the model is good.

1. The results of the long run model confirmed a significant and positive impact of corporate and coupon bonds on capital expenditures over the period. It was also found that external reserves were statistically significant with the proper apriori signs.
2. The results of the estimated error correction model showed a properly signed speed of adjustment.
3. This work is in-line with the works of previous authors such as Adelino et al (2017) who found that bonds have significant effect on the infrastructural development in Nigeria.
4. Therefore, it is recommended that corporate and coupon bonds should be favoured more by the governments at all levels than external borrowing. Towing this line has little or no negative impact on the economy both in the short and long runs, although, funding from external reserves is shown to have significant impact on infrastructural development.

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Appendix
Descriptive Stat

	BON	GCE	EXD	BOC
Mean	9.59E+08	1.71E+10	-2.17E+08	9.12E+08
Median	8.94E+08	6.74E+09	0.000000	1.31E+08
Maximum	1.76E+09	6.33E+10	1.27E+08	3.49E+09
Minimum	2.59E+08	4.04E+09	-2.54E+09	2000000.
Std. Dev.	3.92E+08	1.84E+10	4.97E+08	1.34E+09
Skewness	0.209214	1.327262	-3.080796	1.056741
Kurtosis	2.275707	3.288195	13.77161	2.264610
Jarque-Bera	1.107829	11.28845	243.8218	7.928705
Probability	0.574696	0.003538	0.000000	0.018980
Sum	3.64E+10	6.50E+11	-8.24E+09	3.47E+10
Sum Sq. Dev.	5.69E+18	1.26E+22	9.13E+18	6.64E+19
Observations	38	38	38	38

VAR Lag Order Selection Criteria
Endogenous variables: BOC
Exogenous variables: C
Date: 08/24/19 Time: 17:49
Sample: 1980 2018
Included observations: 34

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-763.2748	NA	1.96e+18	44.95734	45.00223	44.97265
1	-712.5652	95.45344*	1.05e+17*	42.03324*	42.12303*	42.06386*
2	-712.1242	0.804078	1.09e+17	42.06613	42.20081	42.11206
3	-712.1240	0.000362	1.16e+17	42.12494	42.30451	42.18618
4	-711.1509	1.659991	1.16e+17	42.12652	42.35099	42.20307

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
Endogenous variables: EXD
Exogenous variables: C
Date: 08/24/19 Time: 17:50
Sample: 1980 2018
Included observations: 34

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-730.0822	NA	2.78e+17	43.00483	43.04973	43.02014
1	-723.9558	11.53195	2.06e+17	42.70328	42.79307	42.73390
2	-716.1287	14.27296	1.38e+17	42.30169	42.43637	42.34762
3	-707.7085	14.85912*	8.91e+16*	41.86521*	42.04478*	41.92645*
4	-707.6115	0.165503	9.40e+16	41.91833	42.14279	41.99487

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
Endogenous variables: GCE
Exogenous variables: C
Date: 08/24/19 Time: 17:50
Sample: 1980 2018
Included observations: 34

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-852.3131	NA	3.69e+20	50.19489	50.23978	50.21020
1	-805.8613	87.43874*	2.55e+19*	47.52125*	47.61104*	47.55187*
2	-805.4032	0.835277	2.63e+19	47.55313	47.68781	47.59906
3	-805.0461	0.630192	2.73e+19	47.59095	47.77052	47.65219
4	-805.0333	0.021811	2.90e+19	47.64902	47.87349	47.72557

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
Endogenous variables: BON
Exogenous variables: C
Date: 08/24/19 Time: 17:51
Sample: 1980 2018
Included observations: 34

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-716.1973	NA	1.23e+17	42.18808	42.23297	42.20339
1	-702.3135	26.13430*	5.76e+16	41.43020	41.51999*	41.46082
2	-700.7135	2.917565	5.56e+16*	41.39491*	41.52959	41.44084*
3	-700.3449	0.650486	5.78e+16	41.43205	41.61162	41.49329
4	-700.3344	0.017875	6.13e+16	41.49026	41.71472	41.56681

* indicates lag order selected by the criterio n
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Unit Root Test
At Levels

Null Hypothesis: BOC has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.650265	0.4475
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(BOC)
Method: Least Squares
Date: 08/26/19 Time: 12:10
Sample (adjusted): 1981 2017
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BOC(-1)	-0.118231	0.071644	-1.650265	0.1078
C	4.23E+08	2.65E+08	1.595650	0.1196

R-squared	0.072193	Mean dependent var	1.14E+08
Adjusted R-squared	0.045684	S.D. dependent var	1.17E+09
S.E. of regression	1.14E+09	Akaike info criterion	44.60479
Sum squared resid	4.57E+19	Schwarz criterion	44.69187
Log likelihood	-823.1886	Hannan-Quinn criter.	44.63549
F-statistic	2.723373	Durbin-Watson stat	2.340904
Prob(F-statistic)	0.107836		

Null Hypothesis: EXD has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.664373	0.0898
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(EXD)
Method: Least Squares
Date: 08/26/19 Time: 12:10
Sample (adjusted): 1981 2017
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXD(-1)	-0.402292	0.150989	-2.664373	0.0116
C	-6.63E+08	4.83E+08	-1.371468	0.1790

R-squared	0.168624	Mean dependent var	-2.30E+08
Adjusted R-squared	0.144870	S.D. dependent var	2.99E+09
S.E. of regression	2.77E+09	Akaike info criterion	46.37314
Sum squared resid	2.68E+20	Schwarz criterion	46.46022
Log likelihood	-855.9031	Hannan-Quinn criter.	46.40384
F-statistic	7.098885	Durbin-Watson stat	1.558540
Prob(F-statistic)	0.011585		

Null Hypothesis: GCE has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.597987	0.8587
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(GCE)
Method: Least Squares
Date: 08/26/19 Time: 12:11
Sample (adjusted): 1982 2017
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GCE(-1)	-0.022340	0.037359	-0.597987	0.5539
D(GCE(-1))	0.344705	0.154927	2.224949	0.0330
C	6.48E+09	8.63E+09	0.750757	0.4581

R-squared	0.130732	Mean dependent var	5.87E+09
Adjusted R-squared	0.078049	S.D. dependent var	3.68E+10
S.E. of regression	3.53E+10	Akaike info criterion	51.49182
Sum squared resid	4.11E+22	Schwarz criterion	51.62378
Log likelihood	-923.8528	Hannan-Quinn criter.	51.53788
F-statistic	2.481492	Durbin-Watson stat	1.678791
Prob(F-statistic)	0.099091		

Null Hypothesis: BON has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.171704	0.0299
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(BON)
Method: Least Squares
Date: 08/26/19 Time: 12:11
Sample (adjusted): 1981 2017
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BON(-1)	-0.455992	0.143769	-3.171704	0.0031
C	6.21E+08	3.42E+08	1.815345	0.0780

R-squared	0.223253	Mean dependent var	87490000
Adjusted R-squared	0.201060	S.D. dependent var	2.03E+09
S.E. of regression	1.81E+09	Akaike info criterion	45.52643
Sum squared resid	1.15E+20	Schwarz criterion	45.61350
Log likelihood	-840.2389	Hannan-Quinn criter.	45.55712
F-statistic	10.05970	Durbin-Watson stat	1.776408
Prob(F-statistic)	0.003148		

Unit Root at First difference

Null Hypothesis: D(BOC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.590370	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(BOC,2)
Method: Least Squares
Date: 08/26/19 Time: 12:13
Sample (adjusted): 1982 2017
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BOC(-1))	-1.255266	0.165376	-7.590370	0.0000
C	1.19E+08	1.93E+08	0.616593	0.5416

R-squared	0.628877	Mean dependent var	-61918517
Adjusted R-squared	0.617961	S.D. dependent var	1.86E+09
S.E. of regression	1.15E+09	Akaike info criterion	44.61361
Sum squared resid	4.48E+19	Schwarz criterion	44.70159
Log likelihood	-801.0450	Hannan-Quinn criter.	44.64432
F-statistic	57.61372	Durbin-Watson stat	1.971545
Prob(F-statistic)	0.000000		

Null Hypothesis: D(EXD) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.225021	0.0001
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(EXD,2)
Method: Least Squares
Date: 08/26/19 Time: 12:14
Sample (adjusted): 1983 2017
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXD(-1))	-1.333714	0.255255	-5.225021	0.0000
D(EXD(-1),2)	0.348936	0.180279	1.935535	0.0618
C	-2.51E+08	5.08E+08	-0.493729	0.6249

R-squared	0.512082	Mean dependent var	-1.94E+08
Adjusted R-squared	0.481588	S.D. dependent var	4.17E+09
S.E. of regression	3.00E+09	Akaike info criterion	46.56541
Sum squared resid	2.89E+20	Schwarz criterion	46.69873
Log likelihood	-811.8947	Hannan-Quinn criter.	46.61143
F-statistic	16.79242	Durbin-Watson stat	2.004633
Prob(F-statistic)	0.000010		

Null Hypothesis: D(GCE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.512927	0.0009
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(GCE,2)
Method: Least Squares
Date: 08/26/19 Time: 12:14
Sample (adjusted): 1982 2017
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GCE(-1))	-0.675637	0.149712	-4.512927	0.0001
C	2.80E+09	6.00E+09	0.467094	0.6434

R-squared	0.374615	Mean dependent var	-3.59E+09
Adjusted R-squared	0.356221	S.D. dependent var	4.36E+10
S.E. of regression	3.50E+10	Akaike info criterion	51.44705
Sum squared resid	4.16E+22	Schwarz criterion	51.53502
Log likelihood	-924.0468	Hannan-Quinn criter.	51.47775
F-statistic	20.36651	Durbin-Watson stat	1.662926
Prob(F-statistic)	0.000073		

Null Hypothesis: D(BON) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.446369	0.0000
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(BON,2)
Method: Least Squares
Date: 08/26/19 Time: 12:15
Sample (adjusted): 1983 2017
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BON(-1))	-1.525414	0.236632	-6.446369	0.0000
D(BON(-1),2)	0.415257	0.161163	2.576637	0.0148
C	1.27E+08	3.30E+08	0.385823	0.7022

R-squared	0.617393	Mean dependent var	23433429
Adjusted R-squared	0.593480	S.D. dependent var	3.06E+09
S.E. of regression	1.95E+09	Akaike info criterion	45.70328
Sum squared resid	1.22E+20	Schwarz criterion	45.83659
Log likelihood	-796.8074	Hannan-Quinn criter.	45.74930
F-statistic	25.81834	Durbin-Watson stat	2.118656
Prob(F-statistic)	0.000000		

ARDL Results

Dependent Variable: GCE
Method: ARDL
Date: 08/25/19 Time: 23:57
Sample (adjusted): 1984 2017
Included observations: 34 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): EL EMR BOC EXD BON
Fixed regressors: C
Number of models evalulated: 3125
Selected Model: ARDL(1, 4, 3, 1, 3, 3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GCE(-1)	0.806395	0.075330	10.70489	0.0000
BOC	-1.455295	2.872914	-0.506557	0.6209
BOC(-1)	16.54321	3.142414	5.264491	0.0002
EXD	2.970592	1.086124	2.735039	0.0170
EXD(-1)	-3.779220	0.958694	-3.942049	0.0017
EXD(-2)	-2.125847	1.114903	-1.906756	0.0789
EXD(-3)	5.787616	1.494519	3.872561	0.0019
BON	3.823043	3.106959	1.230477	0.2403
BON(-1)	6.175418	3.286276	1.879154	0.0828
BON(-2)	4.035652	2.313904	1.744088	0.1047
BON(-3)	-15.19162	2.220112	-6.842727	0.0000
C	-8.35E+09	1.30E+10	-0.644365	0.5305

R-squared	0.998816	Mean dependent var	1.83E+11
Adjusted R-squared	0.996994	S.D. dependent var	1.71E+11
S.E. of regression	9.40E+09	Akaike info criterion	49.03872
Sum squared resid	1.15E+21	Schwarz criterion	49.98147
Log likelihood	-812.6583	Hannan-Quinn criter.	49.36023
F-statistic	548.3028	Durbin-Watson stat	2.139321
Prob(F-statistic)	0.000000		

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

Bounds Test Results

ARDL Long Run Form and Bounds Test
Dependent Variable: D(GCE)
Selected Model: ARDL(1, 4, 3, 1, 3, 3)
Case 3: Unrestricted Constant and No Trend
Date: 08/25/19 Time: 23:58
Sample: 1980 2018
Included observations: 34

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.35E+09	1.30E+10	0.000000	0.0000
GCE(-1)*	-0.193605	0.075330	-2.570110	0.0233
BOC(-1)	15.08791	3.651670	4.131784	0.0012
EXD(-1)	2.853141	3.093570	0.922281	0.3732
BON(-1)	-1.157510	3.918560	-0.295392	0.7724
D(BOC)	-1.455295	2.872914	-0.506557	0.6209
D(EXD)	2.970592	1.086124	2.735039	0.0170
D(EXD(-1))	-3.661768	2.062527	-1.775380	0.0992
D(EXD(-2))	-5.787616	1.494519	-3.872561	0.0019
D(BON)	3.823043	3.106959	1.230477	0.2403
D(BON(-1))	11.15597	3.084940	3.616268	0.0031
D(BON(-2))	15.19162	2.220112	6.842727	0.0000

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BOC	77.93129	36.37302	2.142557	0.0517
EXD	14.73689	21.26280	0.693083	0.5005
BON	-5.978709	21.03280	-0.284256	0.7807

EC = GCE + 77.9313*BOC + 14.7369
*EXD -5.9787*BON)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	14.23035	10%	2.26	3.35
K	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68
			Finite Sample: n=35	
Actual Sample Size	34			
		10%	2.508	3.763
		5%	3.037	4.443
		1%	4.257	6.04
			Finite Sample: n=30	
		10%	2.578	3.858
		5%	3.125	4.608
		1%	4.537	6.37

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-2.570110	10%	-2.57	-3.86
		5%	-2.86	-4.19
		2.5%	-3.13	-4.46
		1%	-3.43	-4.79

ARDL Error Correction Model

ARDL Error Correction Regression
Dependent Variable: D(GCE)
Selected Model: ARDL(1, 4, 3, 1, 3, 3)
Case 3: Unrestricted Constant and No Trend
Date: 08/25/19 Time: 23:59
Sample: 1980 2018
Included observations: 34

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.35E+09	2.49E+09	0.000000	0.0000
D(BOC)	-1.455295	1.609434	-0.904228	0.3823
D(EXD)	2.970592	0.643947	4.613100	0.0005
D(EXD(-1))	-3.661768	0.530476	-6.902798	0.0000
D(EXD(-2))	-5.787616	0.567991	-10.18963	0.0000
D(BON)	3.823043	2.314836	1.651540	0.1226
D(BON(-1))	11.15597	2.242412	4.974988	0.0003
D(BON(-2))	15.19162	1.528827	9.936783	0.0000
CointEq(-1)*	-0.193605	0.017806	-10.87297	0.0000

R-squared	0.973743	Mean dependent var	8.20E+09
Adjusted R-squared	0.951862	S.D. dependent var	3.64E+10
S.E. of regression	7.98E+09	Akaike info criterion	48.74460
Sum squared resid	1.15E+21	Schwarz criterion	49.46289
Log likelihood	-812.6583	Hannan-Quinn criter.	48.98956
F-statistic	44.50164	Durbin-Watson stat	2.139321
Prob(F-statistic)	0.000000		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	14.23035	10%	2.26	3.35
K	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-10.87297	10%	-2.57	-3.86
		5%	-2.86	-4.19
		2.5%	-3.13	-4.46
		1%	-3.43	-4.79

Granger Test

Pairwise Granger Causality Tests
Date: 08/26/19 Time: 00:03
Sample: 1980 2018
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EXD does not Granger Cause GCE	36	5.24071	0.0109
GCE does not Granger Cause EXD		5.38421	0.0098
BON does not Granger Cause GCE	36	1.59277	0.2196
GCE does not Granger Cause BON		1.29921	0.2872
BOC does not Granger Cause GCE	36	13.9526	5.E-05
GCE does not Granger Cause BOC		1.23259	0.3054
BON does not Granger Cause EXD	36	0.57730	0.5673
EXD does not Granger Cause BON		0.18694	0.8304
BOC does not Granger Cause EXD	36	6.46629	0.0045
EXD does not Granger Cause BOC		2.46930	0.1011
EMR does not Granger Cause EXD	36	1.47950	0.2434
EXD does not Granger Cause EMR		0.04857	0.9527
EL does not Granger Cause EXD	36	0.16602	0.8478
EXD does not Granger Cause EL		0.34029	0.7142
BOC does not Granger Cause BON	36	3.08402	0.0600
BON does not Granger Cause BOC		4.14869	0.0253

ECM

Dependent Variable: D(GCE)
Method: Least Squares
Date: 08/26/19 Time: 00:54
Sample (adjusted): 1983 2017
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.33E+09	4.79E+09	-0.276987	0.7845
D(GCE(-1))	0.325756	0.144945	2.247450	0.0355
D(GCE(-2))	0.032604	0.137508	0.237102	0.8149
D(BOC(-1))	10.08324	4.518894	2.231351	0.0367
D(BOC(-2))	2.576404	6.319785	0.407673	0.6876
D(EXD(-1))	-5.686614	1.839929	-3.090670	0.0055
D(EXD(-2))	-2.558771	2.043478	-1.252165	0.2243
D(BON(-1))	2.572171	3.855056	0.667220	0.5119
D(BON(-2))	8.169684	2.996095	2.726777	0.0126
ECM(-1)	-0.201124	0.095502	-2.105957	0.0474

R-squared	0.789124	Mean dependent var	6.66E+09
Adjusted R-squared	0.658581	S.D. dependent var	3.70E+10
S.E. of regression	2.16E+10	Akaike info criterion	50.72028
Sum squared resid	9.81E+21	Schwarz criterion	51.34242
Log likelihood	-873.6049	Hannan-Quinn criter.	50.93504
F-statistic	6.044952	Durbin-Watson stat	1.340128
Prob(F-statistic)	0.000151		

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.901620	Prob. F(2,19)	0.0795
Obs*R-squared	8.188986	Prob. Chi-Square(2)	0.0167

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 08/26/19 Time: 00:54
Sample: 1983 2017
Included observations: 35
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.52E+09	4.53E+09	0.336531	0.7402
D(GCE(-1))	-0.275593	0.186081	-1.481038	0.1550
D(GCE(-2))	-0.055166	0.164076	-0.336221	0.7404
D(BOC(-1))	-0.220137	4.185071	-0.052600	0.9586
D(BOC(-2))	2.927061	6.256404	0.467850	0.6452
D(EXD(-1))	2.187415	2.132707	1.025652	0.3179
D(EXD(-2))	-0.478853	1.908137	-0.250953	0.8045
D(BON(-1))	-2.337592	3.739274	-0.625146	0.5393
D(BON(-2))	1.131622	2.941114	0.384760	0.7047
ECM(-1)	-0.112940	0.100056	-1.128773	0.2730
RESID(-1)	0.609931	0.320889	1.900754	0.0726
RESID(-2)	0.532612	0.370465	1.437684	0.1668

R-squared	0.233971	Mean dependent var	-8.72E-07
Adjusted R-squared	-0.370789	S.D. dependent var	1.70E+10
S.E. of regression	1.99E+10	Akaike info criterion	50.56803
Sum squared resid	7.52E+21	Schwarz criterion	51.27905
Log likelihood	-868.9405	Hannan-Quinn criter.	50.81347
F-statistic	0.386883	Durbin-Watson stat	1.664359
Prob(F-statistic)	0.966405		

Heteroskedasticity Test

Heteroskedasticity Test: Breusch -Pagan-Godfrey

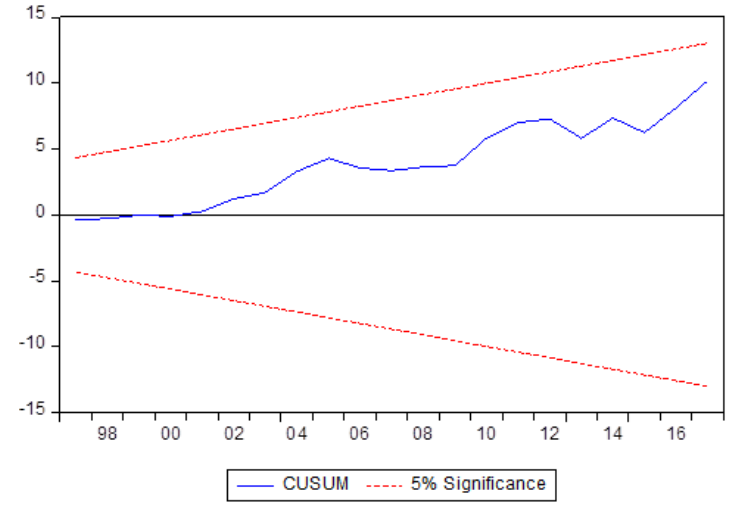
F-statistic	1.011524	Prob. F(13,21)	0.4752
Obs*R-squared	13.47718	Prob. Chi-Square(13)	0.4117
Scaled explained SS	7.697574	Prob. Chi-Square(13)	0.8627

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/26/19 Time: 00:55
Sample: 1983 2017
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.94E+20	1.12E+20	1.733046	0.0977
D(GCE(-1))	-5.32E+09	3.39E+09	-1.570294	0.1313
D(GCE(-2))	4.82E+09	3.22E+09	1.498515	0.1489
D(BOC(-1))	6.03E+10	1.06E+11	0.570895	0.5741
D(BOC(-2))	2.21E+11	1.48E+11	1.498515	0.1489
D(EXD(-1))	7.42E+08	4.30E+10	0.017245	0.9864
D(EXD(-2))	-3.27E+10	4.78E+10	-0.683598	0.5017
D(BON(-1))	3.83E+10	9.02E+10	0.424578	0.6755
D(BON(-2))	5.32E+10	7.01E+10	0.758760	0.4564
ECM(-1)	-2.80E+08	2.23E+09	-0.125281	0.9015

R-squared	0.385062	Mean dependent var	2.80E+20
Adjusted R-squared	0.004387	S.D. dependent var	5.07E+20
S.E. of regression	5.05E+20	Akaike info criterion	98.47115
Sum squared resid	5.37E+42	Schwarz criterion	99.09329
Log likelihood	-1709.245	Hannan-Quinn criter.	98.68591
F-statistic	1.011524	Durbin-Watson stat	1.755329
Prob(F-statistic)	0.475243		

CUSUM Test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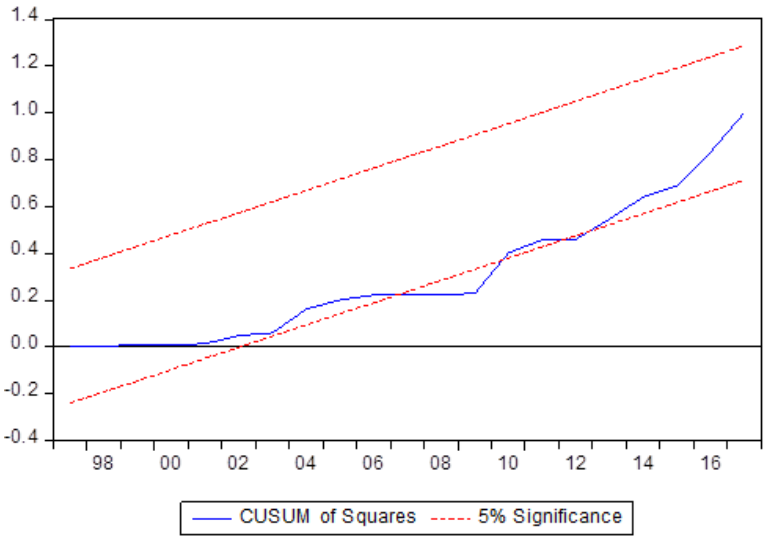
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