Symmetric and Asymmetric Effects of Inflation on Government Expenditure in Nigeria[1]

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Abstract
This paper examines the symmetric and asymmetric effects of Nigeria's inflation on government expenditure using the linear and nonlinear ARDL frameworks and annual data from 1981 to 2018. The result showed robust evidence of symmetric and asymmetric co-integration between inflation and government expenditure. The linear ARDL model and Toda-Yamamoto causality test with structural breaks are robust, performed well and confirmed that Nigeria's inflation increased government expenditure. We observed that in Nigeria, government expenditure exerted positive impacts on economic output in both short and long run. The paper recommends solving inflation challenges, with the objective of achieving sustainable long-run growth and prosperity, since the structure of the Nigerian economy is such that about 10 per cent increase in inflation translates to higher expenditure by government.

Keywords
Symmetric, Asymmetric, Linear and nonlinear ARDL, Toda-Yamamoto, Inflation and Government Expenditure.
Jel. Classification: *G14, G15*

I.   Introduction

Inflation is a known problem around the entire globe that both developing and developed nations endure. It threatens all economies and high inflation tends to disrupt and destabilise the functioning of a market economy if not effectively managed. Long-term inflation always leads to long-term economic consequences and "deep scarring" on unemployment numbers, job losses unless serious reforms are implemented by government to attract foreign direct investment and improve ease of doing business. Inflation in an economy, can be described as a situation where increase in money supply is greater than the production of goods and services. Hamilton (2001), depicted inflation as an economic situation where there is a continuous general rise in the prices of goods and services, this implies that there is excess money in the economy chasing fewer goods and services. Part of the aims of macroeconomic policies is to promote economic growth putting into consideration investment as a major trend, by keeping inflation on the low. There has been a consensus over time amongst economists to keep inflation at a one-digit rate to further improve investment rate amongst nations both at the domestic and international level, thereby improving and sustaining high economic and global growth. Studies have shown that the inflation and economic growth relationship will continue to generate debate in empirical studies because of many fascinating findings. Understanding growth behaviour and its relevance to inflation remains relevant. Inflation in Nigeria is exposed to internal and external shocks and is highly volatile, Obi (2016).

Inflation is a key factor that leads to social, economic instability and security challenges (Anyanwu (2011). Empirically, inflation is one of the most observed and tested economic indicators. Its effect on other economic variables, and the economy at large are well known globally. The continuous rise in inflation in Nigeria year on year has affected our economy's growth thereby creating negative impact on our development.

In late 2003, the inflation rate in Nigeria accelerated from its long consistent slow rate in previous years. This greatly affected food prices and impacted the budget and purchasing power of families, i.e. the real value of money became greatly reduced (Anyanwu 2011). Several authors had expressed different views on the impact of inflation on cost of living in Nigeria. One viewpoint shared was that the problem created by the rising prices of goods and services has become something unresolvable by government alone and from time to time creating labour unrest, undue hardship on the populace and thereby reducing government revenue.

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[1]The views and opinions expressed in this paper are those of the authors and do not necessarily reflect position of the Central Bank of Nigeria.
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The great depression recorded in the 1930s and the subsequent failures of the stock market led to a reversal of economic arrangements. Say's law or the law of markets was appraised, faulted and a new doctrine was proposed based on the prescription of John M. Keynes (Jumbo, 2010). Jumbo explained that Keynes' ideologies sought for government intervention to forestall the intense disaster of the great depression and subsequent economic crisis.

According to Keynes (1936) the solution to economic depression was to persuade firms to invest in the economy. This could be done by reducing interest rates and by government itself making capital investments in infrastructure. The argument that increase in government expenditure enhances economic development is not supported by some scholars in the country. A number of prominent authors especially of the neoclassical school view argued that increase in government expenditure may slow down the collective performance of the economy because in an attempt to finance growing expenditure, governments may have to result in borrowing both domestically and externally. At times, increase in taxation and/or drawing on foreign reserves which is not healthy for the balance of payments and the economy at large.

The above assertion can further be broken down in increasing taxes, the higher income tax payers may be discouraged or disincentised to pay which would further lead to reduced income and aggregate demand. Also, high corporate tax leads to high production costs and reduced profitability of firms which may also lead to job losses. In the long run, citizens suffer as they end up bearing the brunt of the increase in costs of goods and services which stifles economic consequences.

Another important point is that increase in government borrowing from the banks to finance its expenditure may compete and crowd-out the private sector of the economy. A key aspect of development is a thriving private sector economy, with less access to credit by the private sector, this developmental role would be unachieved. For developing countries, another aspect that is worrisome is the improper allocation of resources by politicians to seek political relevance. This action is usually done at costs that the private sector could have done more cheaply and efficiently and ends up impeding national output.

Government's stake in macroeconomic activities over the years has given rise to the concept of fiscal policy which is the onus of this research. Fiscal policy entails government's prudential management of its limited income and its spending power to achieve sustainable macroeconomic objectives, among which is economic growth and stability. It generally implies revenue generation through taxation and expenditure for development.

The lofty position of fiscal policy in management of an economy, notwithstanding, especially for developing countries, "the Nigerian economy is yet to approach a path of sound growth and development through its intrinsic worth" (Ajiobenebo, 2003). He lamented that Nigeria is still bedevilled with chronic poverty, high level of unemployment, outraging inflationary trend, dependence on foreign technology, poor infrastructural development, and poor maintenance of existing ones as well as characterised by mono-cultural foreign earnings. The Nigerian economy is blessed with growth capabilities due to her large settlement of oil and gas, solid minerals, rich agricultural landscape, abundant human capital as well as other natural resources across the country. Despite all these characteristics, successive governments have not done enough to put the nation's resources to effective use. And thus, the economy is producing below her potential coupled with some leakages in government revenue.

1.2 Problem Statement

Nigeria as a country has experienced the worst consequences of poverty depicted by increases in food prices, price hikes etc. especially during the military regime. Mahmood, *et. al.*(2009) concluded in their study that inflation can cause poverty. Post-independence, Nigeria was a growing agro-allied country with a healthy foreign account balance as each part of the nation was striving to keep itself afloat and be seen as a viable part of the nation. Nigeria was known for cocoa, rubber, groundnuts, oil palm, timber, cotton to mention but a few cash crops. About 10 years later, we discovered oil and gas and did not consciously continue to grow our capabilities in the agro-allied industries, but rather contracted. Oil production brought in easy money, and even when Nigeria's agricultural and mineral exports dipped, it seemingly had no effect on the economy. With easy money, our expenditure grew unfettered. Reality hit us unprepared and with it inflation due to our inability to curb our expenditure to reflect our economic reality. One of our attempts to correct it was to accept the Structural Adjustment Programme (SAP) by the IMF/World Bank with its stringent rules.

Government expenditure has continued to rise in Nigeria since the '70s. Breaks in the increase could be attributed to global recession and not to the ingenuity of the people. In 1970, recurrent expenditure of the federal government (FG) stood at N716.1 million, a mere 10 years later, the value was N4,805.2 million, by 2010 the amount had moved up to N3,310,343.38 million (CBN Statistical Bulletin 2012). Unfortunately, the yearly increase in both recurrent and capital expenditure of government has brought about a less than proportionate increase in economic development in Nigeria. The pattern of expenditure increase has not corresponded to any

meaningful level of development in our infrastructure, education, health, security etc. All areas are bereft of tangible development.

The rise in government expenditure has not translated to substantial development, as Nigeria remains among the poorest countries in the world. This shows that many Nigerians continue to wallow in poverty with high insecurity. Statistics shows that 60.9% of over 200 million Nigerian population are poor. The Business Day Newspaper of Tuesday 14 February 2012 reported that the percentage of Nigerians living in abject poverty – those that can afford only the bare essentials of food, shelter and clothing – rose to 60.9% in 2010 compared to 54.7% in 2004. As at June 2018, the report by The World Poverty Clock shows Nigeria has overtaken India as the country with the most extreme poor people in the world. The population of India is seven times larger than Nigeria's. The struggle to lift more citizens out of extreme poverty is an indictment on successive Nigerian governments which have mismanaged the country's vast oil riches through incompetence and corruption.

Although the Nigerian economy is projected to be growing, poverty is likely to worsen in the country as the rich get richer and the poor get poorer on a daily basis. The gap between the rich and the poor is expected to widen coupled with the dismal state of the nation's run-down infrastructure (especially roads and power supply) which has led to the collapse of many industries, a high level of unemployment and insecurity. Key macroeconomic indicators like balance of payments, debts obligations, inflation rates, exchange rate, and national savings reveal that Nigeria has not perform well in the period under review. Except something drastic is done to address the increasing rate of unemployment, our infrastructure and national security we may not get out of the poorest nation matrix.

The study examines the effect of inflation on government expenditure in Nigeria. It evaluates the impact of public expenditure on economic growth and establish the causal relationship between components of government expenditure and inflation.

The study would present cutting-edge findings to the fiscal and monetary authorities and other stockbrokers.

This paper is divided into five chapters. Chapter one provides the background. Chapter two presents the theoretical framework. The research methodology is stated in chapter three while results and discussions, analysis and interpretation of models' result were presented in chapter four. Chapter presents the Concluding remarks.

II. Theoretical Framework

2.1 Conceptual Framework

Acceptable definitions of inflation can be attributed to any of these three dominant schools of thought; the neo-classical/monetarists, neo-Keynesian, and structuralists. The neo-classical/monetarists say that money is an asset used to purchase goods and services on a regular basis. It is a means of exchange in every economy. Following from the Quantity Theory of Money (QTM), the quantity of money is the main determinant of the price level such that any change in the quantity of money produces an exactly direct and proportionate change in price level. However, these views has been disputed by experiences of the Federal Reserve in the United States (US). The US money supply growth rates increases faster than prices itself because of the increased demand for the US dollar as a global trade currency as shown in the works of Hamilton (2001) and Colander (1995).

The neo-Keynesians disagree with the monetarists' viewpoint of direct and proportional relationship between the quantity of money and prices. They believe that the relationship has nothing to do with proportionality but are indirect, through interest rates. They further attribute inflation to diminishing returns of production.

Keynesian theory integrate monetary theory, the theory of output and employment through the interest rate, for instance, when the quantity of money increases, the interest rate falls, when interest rate falls it attracts more investors into the economy which eventually leads to an increase in the volume of investment and aggregate demand. Keynesian theory also examines the relationship between the quantity of money and prices under unemployment and full employment situations. Keynesians believe that as long as there is unemployment, output and employment level will change in the same proportion as the quantity of money, but prices will not change. At full employment, changes in the quantity of money will affect a proportional change in price.

However, the structuralists attribute inflation to structural factors underlying characteristics of an economy (Adamson, 2000). For instance, in developing countries, with strong underground economy, prevalent hoarding or hedging, individuals expect future prices to rise above current prices and hence, demand for goods and services are not only transactionary, but also precautionary. This creates artificial shortages of goods and puts pressure on inflation.

2.1.1   Concept of Inflation

Hamilton (2001) described inflation as an economic situation when the increase in money supply is "faster" than the new production of goods and services in the same economy. Piana (2001) noted that economists usually try to distinguish inflation from an economic phenomenon of a one-time increase in prices or when there are price increases in a narrow group of economic goods or services.

There are many factors that could affect inflation and they are found in a myriad of literature. Inflation can be construed as either a good or a bad, depending upon which side one takes, and how rapidly the change occurs. These factors can be institutional, fiscal, monetary and balance of payments. Several studies such as Melberg (1992); Grilli, *et. al* (1991); Alesina and Summers (1993); and Debelle and Fisher (1995) have shown that a determining factor of inflation especially in industrialised countries, is the level of independence (legal, administrative and instrument) of the monetary authority, while in developing countries, the rate of turnover of Central Banks governor was seen as an important factor that influenced inflation. These findings must be interpreted with caution, given the difficulty in measuring the actual level of independence of a monetary authority.

Inflation is attributed to large fiscal imbalances, arising from inefficient revenue collection procedures and limited development of the financial markets (Agenor and Hoffmaister, 1997 and Essien, 2005). The monetary factors (demand side determinants) include increases in the level of money supply in excess of domestic demand, monetisation of oil receipts in Nigeria, interest rates, real income and exchange rate (Moser, 1995).

Alesina and Summers (1993) attributed prudent monetary management to aid the reduction in the level and variability in inflation. The balance of payments factors, relate to the effects of exchange rate movements on the price level has also been stressed by scholars. Melberg (1992); Odusola and Akinlo (2001) and Essien (2005) opined that exchange rate devaluation or depreciation includes higher import prices, external shocks and accentuates inflationary expectations.

2.1.2 Government Spending as a Fiscal Policy Tool

Government expenditure involves any form of spending by the public sector including both purchase of final goods and services, or gross domestic products and transfer payments. Simply put, government expenditure is a term used to describe money that a government spends. Expenditure occurs at every level of government, from the grassroots to the federal level. The public sector undertakes expenditures to carry out certain functions. Some key functions include:

Common Defense, **Education, Transportation, Public Health and Safety, and Legal and Judicial System**.

Government expenditure are usually in the form of recurrent or capital expenditure. Recurrent expenditure refers to the usual continuous cost of running the government machinery, while capital expenditure refers to funds allocated to viable and relevant projects that can generate employment, make some profit to repay the capital source. Financial discipline/management should form the core of capital expenditure pattern.

In most countries, Nigeria included, public expenditure has recorded a continuous increase over time. However, according to (Ajie *et al*, 2008), "traditional thinking and philosophy do not favour the trend because it rates market mechanism as a better guide for the working of the economy and allocation of its resources". The traditional economists argue that each economic unit is to be the judge of their own economic interest and that the government has no business deciding on behalf of others. However, according to the Keynesian view, the government could reverse economic recessions by borrowing money from the private sector and then returning the money to the private sector through various spending programs.

High levels of government consumption are likely to increase employment, profitability and investment via multiplier effects on aggregate demand" (Nkiru and Daniel, 2013)

The major objectives of fiscal policy are as follows:

a) **Full employment:** Obtaining full employment the condition in which all who are able and desire to work are employed is a very important objective of fiscal policy. Unemployment reduces the level of production, and hence the level of economic growth. It also creates many problems to the unemployed people in their day-to-day life. So, countries try to remove unemployment and attain full employment.

b) **Price stability:** Sharp rises or falls in overall price levels are not desirable. This is because sharp rises in prices makes many goods and services unaffordable to the consumers whereas sharp falls in prices discourages the producers from creating goods and services. Fiscal policy helps to maintain price stability through the multiplier effect with the accompanying increase or decrease in taxes and expenditure, as the case may be, has on aggregate demand and subsequently, price.

c) **Economic growth**: The ability of an economy to increase and sustain their capacity to produce goods and services is also an important objective of fiscal policy. By attaining and sustaining higher rate of economic growth, the problem of unemployment may also be solved. According to Ibrahim (2013), "the more developing countries, like USA, UK, Japan, etc. give attention to the relationship of actual growth rate to

the potential growth rate permitted by the consumption – saving ratio, technological considerations and other factors, while less developing countries give emphasis to the increase in the potential growth rate as well as the relationship of the actual and potential growth rate".

2.2 Theoretical Review
2.2.1Wagner's Law
     Wagner's Law - "law of increasing state activity" named after Adolph Wagner (1835-1917). He developed an empirical analysis on Western Europe at the end of the 19th century. He argued that the growth of the state is hinged on increased industrialisation and economic development. Wagner stated that during the industrialisation process, as the real per capita income of a nation increases, the share of public expenditure in total expenditures increases. The law cited that "the advent of modern industrial society will result in increasing political pressure for social progress and increased allowance for social consideration by industry."
     Wagner (1893) designed three focal bases for the increase in state expenditure. Firstly, during the industrialisation process, public sector activity would replace private sector activity. State functions like administrative and protective functions would increase. Secondly, governments would need to provide cultural and welfare services like education, public health, old age pension or retirement insurance, food subsidy, natural disaster aid, environmental protection programmes and other welfare functions. Thirdly, increased industrialisation would bring up technological change and large firms that tend to monopolise. Governments would have to offset these effects by providing social and merit goods through budgetary means.

2.2.2 Peacock and Wiseman Theory of public expenditure.
     In 1961, Peacock and Wiseman based on their study of public expenditure in England elicited a salient shift about the nature of increase in public expenditure. In their 1967 work, they proffered a different opinion than that theorised by Wagner concerning growth in public expenditure. Peacock and Wiseman elucidated that the nature of public expenditure does not trend but that increases take place in steps or jerks. Three concepts were used to explain their hypothesis. They are:
- Displacement effect
- Inspection effect
- Concentration effect

     According to Peacock and Wiseman, there would be need for increased expenditure due to some social or other disturbance in an economy. This is necessitated since existing revenue is insufficient to solve the disturbance. Worthy of note is that successive social disturbances are met up with by the step by step fiscal activities of the government.
     Displacement effect occurs when government falls short of revenue and upwardly revises taxation to increase revenue targeted to the social disturbance, moving revenue and expenditure to fresh levels. Primarily, citizens will create displeasure but in the long run they have no option than to agree with the situation, creating a fresh side by side "tax tolerance". After the economy 'heals', if there are no new disturbances, the motivation to return to the former lower taxes does not exist. The revenue obtained by the newly created taxation levels are used in higher levels of public expenditure by a supportive citizenry. This is now known as the Inspection effect.
     Peacock and Wiseman considered the period of displacement and economic growth, as time when central government's economic activities grow at a much faster rate than that of other sub-government units. This disparity in growth is known as concentration effect. It is more of an issue of political set up than economic.

2.3 Empirical Review
     For Grilli *et. al.* (1991) inflation and government spending are positively correlated. Similarly, Han and Mulligan (2006) found a positive relationship between government spending and inflation. Ezirim, *et, al* (2008) in their work "Inflation Versus Public Expenditure Growth in the US: An Empirical Investigation using cointegration analysis and Granger Causality Model" discovered that inflation significantly influences public expenditure decisions in the United States of America. They added that, growth in public expenditure aggravated inflationary pressures in the country, whereas reduction in public expenditure reduced inflation. This is in line with previous studies, on the efficacy of Keynesian's fiscal policy as a veritable tool to combating inflation in developed countries. Their work lends credence to the effectiveness of Keynes fiscal policy as an instrument of macroeconomic stabilisation.
     By examining the causality among economic growth, public expenditure and inflation rate in Nigeria from 1970 to 2010, Olaiya, *et al* (2012) described the reality of long-run relation among the variables. Their findings showed bi-directional causality between government expenditure and economic growth both in the short and long runs while a unidirectional causality was observed in the short run from economic growth and

government expenditure to inflation rate. It implies that inflation rate in Nigeria is inclined by government spending based on these findings, they advised that government should moderate its spending and also lending rates should be reduced to boost investment in the private sector. For the economy to grow, it is important for inflation rate to be reduced, the monetary authority as part of its responsibility has to stabilise prices this can positively influence investment and motivate foreign inflow of capital.

There was a different view by Compillo and Miron (1997) and Click (1998), their findings shows that inflation is not related to any component of government expenditure. Sergeant (1982) advocates that inflation is not suitable for predicting inflation. Okpara (1988), study on government spending, said money supply and prices in Nigeria, are meagre and irrelevant. He resolved by saying that inflation in Nigeria is a monetary concept.

Cukierman (1992), advocates that government expenditure could respond to inflation and not the contrary. Judd (1989) used long-run inflation. Mankiw (1987), Veigh (1989) and Poterba and Rotemberg (1990), recommended that the best inflation rates should rise with government spending. While Kimbrough (1986), Woodford (1990) and Correia and Tales (1996) agreed that it is not essential for governments to expand more. Oladipo and Akinbobola (2011) said that there is a significant causal relationship from budget deficit to inflation while Chimobi and Igwe (2010) finding was that money supply causes budget deficit. Empirical studies in Nigeria have not clearly addressed the connection between government expenditure, growth and inflation. Most of the works investigated except Okpara (1988) focused on the causal relationship between fiscal deficit and macroeconomic variables such as, private investment, money supply, interest rate and economic growth. It is evident from the review of literature that there is lack of studies on the link between government expenditure growth and inflation. The interest of this paper is, to address the tie between government spending and inflation.

The control of inflation has been a major macroeconomic policy goal in most countries of the world. In the period of inflation, prices and wages rise disproportionately, affecting income distribution negatively.

For instance, retirees in many countries have payments that do not keep up with the price level and this makes them to suffer. Also, when some prices for goods and services are fixed by law/regulation, they lag behind other prices resulting in changes in relative prices and price distortions.

Inflation is detrimental to long-term economic growth because it erodes the standard of living and distorts economic decision-making. Also, price increases in one sector of the economy may be transmitted to other sectors of the economy (Adelowokan and Maku, 2013). High deflation has negative economic consequences as high inflation rate. Therefore, the 'best' rate of inflation is a low and stable rate of inflation (between 0 percent and 3 percent, Blanchard,2006).

According to Komolafe (1996), government expenditure (together with monetary and exchange rate policies) influences inflation (and other macroeconomic aggregates). Also, Addison (1996) opines that fiscal policies affect inflation and advocates for a reduction of overall expenditure in selected areas by consolidating overlapping expenditure programmes and by reprioritisation of expenditure to improve budgetary transparency. He added that government should investigate the impact of its spending on the economy so as to guide it in its future spending.

In 2008, the aggregate expenditure of the federal government stood at N2,117.36 billion (or 11.4% of GDP in the first half of 2008) higher than the aggregate expenditure in the corresponding period of 2007(CBN,2008 Annual Statistical Bulletin). This increased value resulted from an increase in personnel cost and interest payments on outstanding domestic debts; and non-debt expenditure increased by 27.8% from the level in 2007 (CBN, 2008b).

This trend continued as in the first half of 2009 aggregate expenditure of the Federal government stood atN2,127.97 billion (or 13.5% of GDP in the first half of 2009). Also, this is higher than the aggregate expenditure in the corresponding period of 2008 partly due to increased recurrent expenditure especially personnel and overhead cost (2010 CBN Annual Statistical Bulletin). As a remedy towards mitigating the problem of inflation in Nigeria, Mbutor (2008) suggested the adoption of inflation targeting (IT) since it is considered a better option in contemporary times in controlling inflation. Thingan (2011) suggests that when the pattern of public expenditure does not secure a balance between the demand and supply of goods, inflationary tendencies may set in.

An empirical analysis of the Nigerian economy of the monetary base in 2008 (4th quarter) to 2009 (2nd quarter) conducted by Akanji and Ikoku (2009) shows that a one standard deviation increase in the monetary base (sum of currency in circulation-CIC-and bank deposits at the Central Bank of Nigeria) results in an increase in inflation. When government expenditure adds to CIC, it further increases the monetary base which in turn exerts inflationary pressures on the economy. In this regard, Uchendu (2009) suggested that inflation rate can be effectively managed through appropriate monetary-fiscal policy mix, not fiscal dominance occasioned by expansionary fiscal operation of government.

Although it is common knowledge that there is no research work that is devoid of flaws and lapses. This research seeks to reduce or limit the lapses identified in previous studies on the subject matter. Previous studies are limited in the areas that includes inflationary trend and its effect on government spending in comparison with less developed countries especially Nigeria. Therefore, this study seeks to cover these gaps by focusing on the effect of inflation on government spending in Nigerian covering the period of 34 years from 1981-2018. This research work also seeks to advocate the policies that will curb inflation in the country which previous studies failed to point out.

2.6 Theoretical Framework

The theoretical framework of this research is based on the Keynesian theory of economic development, as it recognises the importance of government interference in the workings of the economy. The Keynesians are twentieth-century economists widened John Maynard Keynes' principle in the reality of never-ending unemployment symmetry, opposing the idea of classical economists on **Say's law of market** disagreeing that market economies can adjusting itself without government involvement. They accept as true that only government policy can make the economy to be stable. Keynesians therefore insist government interference (public sector) through the use of open policy measures could take enterprise economy out of a depressed state and ensure stable growth. Unrestricted policies which include government expenditure and taxation are used to regulate the economy. According to Keynes, in order to correct a depressed economy, the government should increase spending in order to increase aggregate demand and subsequently, growth.

III. Research Methodology

3.1 Study Scope and Data Sources

The empirical analysis and estimation covers 1981 to 2018. The data for this study was collected from the Central Bank of Nigeria Statistical Bulletin, CBN Annual Reports and Statements of Accounts, and National Bureau of Statistics publications.

3.2 Model Specification
3.2.1 Linear and Nonlinear ARDL

The linear and nonlinear ARDL frameworks are employed to study the symmetric and asymmetric effects of inflation on government expenditure in Nigeria. This is necessary because we cannot expect proportional changes in the regressand (i.e. government expenditure) when there is either increase or decrease in prices. This paper therefore specified linear and nonlinear Autoregressive Distributed Lag (ARDL) models. The attractions around the models are noteworthy in that they help to circumvent the problem of endogeneity, they accommodate mixed order of integration in the series, and produce short run and long run (with error correction) parameter estimates.

We specify the linear model on the nexus between inflation (cpi) and government expenditure (exp) in Nigeria in line withPesaran and Shin (1999) and Pesaran et al. (2001) as follows:

$$\Delta \exp_t = \alpha + \rho \exp_{t-1} + \beta cpi_{t-1} + \sum_{i=1}^{p-1} \gamma_i \Delta \exp_{t-i} + \sum_{j=0}^{q-1} \lambda_j \Delta cpi_{t-j} + \varepsilon_t \qquad (1)$$

where the variables are defined as; exp is government expenditure, cpi is consumer price index, ρ and β are the long run parameters and γ_i and λ_j are the short run parameters; p and q are the optimal lag lengths for the regressand and the exogenous variables respectively.

In order to explore the possibility of asymmetry in the relationship, we followed the approach of Shin et al. (2014) to disaggregate prices into positive and negative to isolate the dissimilar effects of rising and falling prices on government expenditure. The Shin *et al.* (2014) technique decomposes cpi_t into positive and negative partial sums as:

$$cpi_t^+ = \sum_{k=1}^{t} \Delta cpi_k^+ = \sum_{k=1}^{t} \max(\Delta cpi_k, 0) \qquad (2a)$$

$$cpi_t^- = \sum_{k=1}^{t} \Delta cpi_k^- = \sum_{k=1}^{t} \min(\Delta cpi_k, 0) \qquad (2b)$$

Like the linear counterpart, the Shin *et al.* (2014) nonlinear ARDL also accommodates variables of not the same order of integration of the series and produce estimates in short run, long run and error correction parameters. Above that, it allows nonlinearity in the regressor. The nonlinear specification is therefore given as:

$$\Delta \exp_t = \theta_1 \exp_{t-1} + \theta_2^+ cpi_{t-1}^+ + \theta_3^- cpi_{t-1}^- + \partial_1^+ \Delta cpi_t^+ + \partial_2^- \Delta cpi_t^- + \upsilon_{it}, \qquad (3)$$

where cpi_t^+ and cpi_t^- are the positive and negative price changes. Eq. (3) indicates the presence of short run ($H_0^{short} : \partial_1^+ = \partial_2^-$) and long run ($H_0^{long} : \theta_2^+ = \theta_3^-$) asymmetries. The non-rejection of the null hypothesis reduced Eq. (3) to Eq. (1) i.e. the symmetric ARDL model. However, if we reject the nulls, the elaborate specification of Eq. (3) becomes:

$$\Delta \exp_t = \rho \exp_{t-1} + \beta_1^+ cpi_{t-1} + \beta_2^- cpi_{t-1} + \sum_{i=1}^{p-1} \gamma_i \Delta \exp_{t-i} + \sum_{j=0}^{q-1} \lambda_{1j} \Delta cpi_{t-j}^+ + \sum_{j=0}^{q-1} \lambda_{2j} \Delta cpi_{t-j}^- + \varepsilon_t \qquad (4)$$

We adopted the conventional bounds testing procedure to evaluate the cointegration between the variables using the Pesaran et al. (2001) critical values; the lower and upper bounds $F_{tab(LB)}$ and $F_{tab(UB)}$. We compared the calculated F-statistics with the critical values. The decision rule for testing the null is such that:

Scenario	Decision	Implication
$F_{cal} > F_{tab(UB)}$	Reject H_0	There is cointegration
$F_{cal} < F_{tab(LB)}$	Do not reject H_0	There is no cointegration
$F_{tab(LB)} < F_{cal} < F_{tab(UB)}$	Indecisive	Test is inconclusive

We tested the model for relevant diagnostics to show that the error term behaved well and the results can be trusted for policy decisions. The relevant residual diagnostics are the Engle (1982) LM test for conditional heteroscedasticity and Ljung and Box (1979) Q- and Q^2-statistics for serial correlation.

The specification for the heteroscedasticity ARCH effect is specified in Eq. (5) and the equation for the null hypothesis of no ARCH effect is specified in Eq. (6):

$$\hat{\varepsilon}_t^2 = \alpha_0 + \alpha_1 \hat{\varepsilon}_{t-1}^2 + \alpha_2 \hat{\varepsilon}_{t-2}^2 + ... + \alpha_q \hat{\varepsilon}_{t-q}^2 + \xi_t \qquad (5)$$

$$H_0 = \alpha_1 = \alpha_2 = ... = \alpha_q = 0 \qquad (6)$$

The rejection of the null implies the presence of ARCH effect, otherwise, there is no heteroscedasticity in the model.

On the other hand, the null hypothesis of no serial correlation is computed via the chi-square test using the following test equation: (7)

$$Q_p = n(n+2) \sum_{k=1}^{p} \frac{r_k^2}{n-k} \; ; \; r_k = \frac{\sum_{t=k+1}^{n} x_t x_{t-k}}{\sum_{t=1}^{n} x_t^2} \qquad (7)$$

p optimal lag and k degree of freedom.

3.2.2 Linear ARDL
The second objective of this study which evaluates the impact of public expenditure on economic growth also adapted the Autoregressive Distributed Lag (ARDL) model of Pesaran et al. (2001):

$$\Delta gdp_t = \alpha + \rho gdp_{t-1} + \beta \exp_{t-1} + \sum_{i=1}^{p-1} \gamma_i \Delta gdp_{t-i} + \sum_{j=0}^{q-1} \lambda_j \Delta \exp_{t-j} + \varepsilon_t \qquad (8)$$

GDP is gross domestic product as the proxy for economic growth; $\exp$ is public expenditure which could be total government expenditure, capital or recurrent expenditures; the notations of the parameters are retained for ease of reference; ρ and β are the long run parameters; γ_i and λ_j are the short run parameters; p and q are the optimal lag lengths for the regressand and the exogenous variables respectively.

The analytical process for estimating Eq. (8) follows the detailed description provided under the first objective. The post estimation techniques described therein are also relevant here and are executed for the second objective.

3.2.3   Toda-Yamamoto model approach To establish the causal relationship between various components of government expenditure and inflation, we adopt a Toda-Yamamoto model that also allows for the series to have mixed order of integration:

$$\exp_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} \exp_{t-i} + \sum_{j=k+1}^{k+d_{max}} \alpha_{2i} \exp_{t-i} + \sum_{i=1}^{k} \phi_{1i} cpi_{t-i} + \sum_{j=k+1}^{k+d_{max}} \phi_{2i} cpi_{t-i} + \xi_{it}$$

$$cpi_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} \exp_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{2i} \exp_{t-i} + \sum_{i=1}^{k} \vartheta_{1i} cpi_{t-i} + \sum_{j=k+1}^{k+d_{max}} \vartheta_{2i} cpi_{t-i} + \xi_{2t}$$

$$(9)$$

series are as previously defined, k optimal lag length specified by suitable model selection criteria and d_{max} is the maximum order of integration of the two series under investigation. This is evaluated from the results of the unit root analyses. Government expenditure is said to granger cause inflation if $\beta_{2i} \neq 0$; otherwise, it does not granger cause it. Whereas , inflation granger cause government expenditure if $\phi_{2i} \neq 0$; otherwise it does not.

IV. Results and Discussions
4.1   Preliminary Investigations/Analyses
 Peculiar nature of the variables needs to be understood before the econometric approaches. Consequently, the raw data are probed to reveal their statistical properties and thereby serve as guidance for appropriate modelling technique to be adopted for estimating the relationships. In Table 1, the descriptive analyses of the series revealed the average value of consumer price index as 53.4% between 1981 and 2018. The Table indicated an average nominal GDP of N27, 569 billion, an average real GDP of N33, 725 billion and average total expenditure of N1838.96 billion within the same period. Further analyses suggested that all the series are positively skewed (see skewness statistics) and differ from normal distribution as shown by the rejection of null hypothesis of normality test indicated by the probability value of Jarque-Bera statistics.

These positions are further corroborated by the graphical depictions in Figures 1 to 4 showing upward trends in all the series. We examined the unit root information of the series using the baseline augmented Dickey-Fuller (ADF) test and corroborated it with the Zivolt-Andrews-based unit root test that accounts for structural breaks (see Table 2). Rather than using the series in their raw form, we conducted the unit root test on the transformed series as they were used in the model estimate. This is the standard practice in the literature. Thus, we transformed consumer price index (CPI) into inflation as INF=log(CPI/CPI(-1)), growth rate of nominal GDP as GGDP=log(GDP/GDP(-1)) and growth rate of real GDP as GRGDP=log(RGDP/RGDP(-1)).

In the ensuing analyses, we established that inflation sequence is integrated of order zero i.e. stationary at levels and the result improved with the inclusion of trend component in the unit root test equation. Bearing insufficient evidence at level, we fail to declare the two GDP series as I(0) series. This is because the results were not consistent i.e. statistical significance worsened after accounting for additional (trend) effects. The condition of the total government expenditure series is however more readily clearer as evidences show that it is integrated of order one going by both the traditional ADF and Zandrews test that accounts for structural breaks.

In the final analyses, we established that the series are combinations of I(0) and I(1)hence, the adoption of Autoregressive Distributed Lag (ARDL); linear and nonlinear variants, and Toda-Yamamoto model for causality test.

***Table 1:** Descriptive statistics*

	CEXP	CPI	NGDP	NOREV	REXP	RGDP	TEXT
Mean	426.2259	69.07482	27569.37	942.7092	1286.977	33725.22	1838.962
Median	289.3337	29.70519	6102.422	269.6246	455.6312	23068.85	824.3705
Maximum	1682.099	278.5008	127762.5	4006.000	5675.186	69810.02	7813.741
Minimum	4.100100	15.04371	144.8312	2.984100	4.750800	13779.26	9.636500
Std. Dev.	441.8904	71.13359	37734.90	1224.677	1637.927	19578.10	2239.536
Skewness	0.901350	1.453903	1.279906	1.117249	1.119582	0.734406	1.060739
Kurtosis	2.989323	4.189925	3.322978	2.809225	2.981852	1.996529	2.874319
Jarque-Bera	5.145582	15.62949	10.54017	7.963179	7.939124	5.010238	7.151071
Probability	0.076322	0.000404	0.005143	0.018656	0.018882	0.081666	0.028000

Sum	16196.59	2624.843	1047636.	35822.95	48905.14	1281558.	69880.56
Sum Sq. Dev.	7224884.	187219.5	5.27E+10	55493876	99263783	1.42E+10	1.86E+08
Observations	38	38	38	38	38	38	38

Note: CPI: consumer price index; NGDP: nominal gross domestic product; RGDP: real gross domestic product; TEXP: total expenditure, CEXP: capital expenditure, NOREV: non-oil revenue REXP: recurrent expenditure
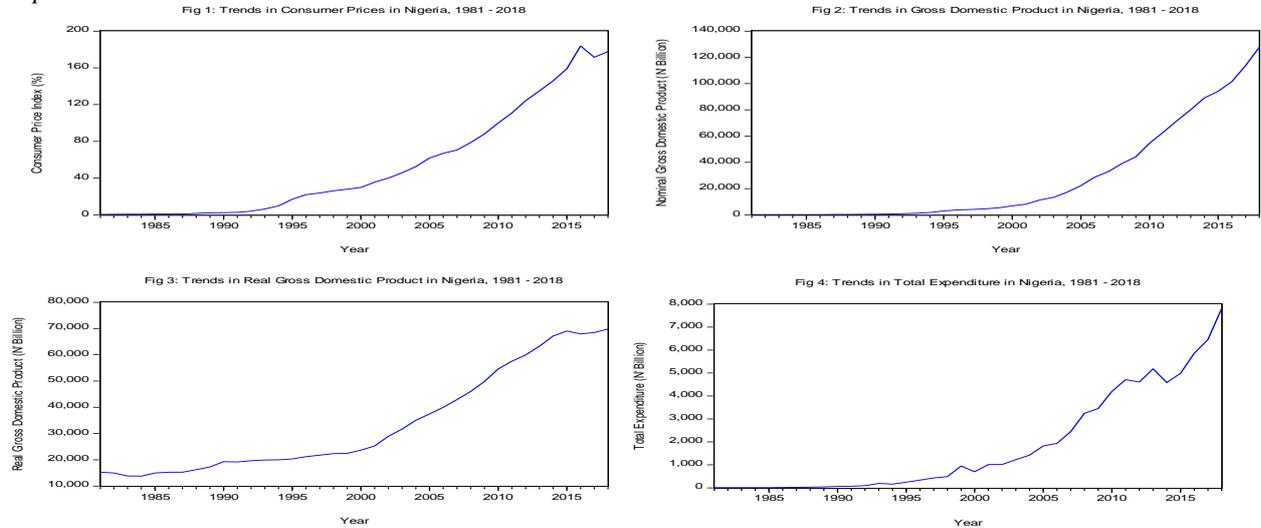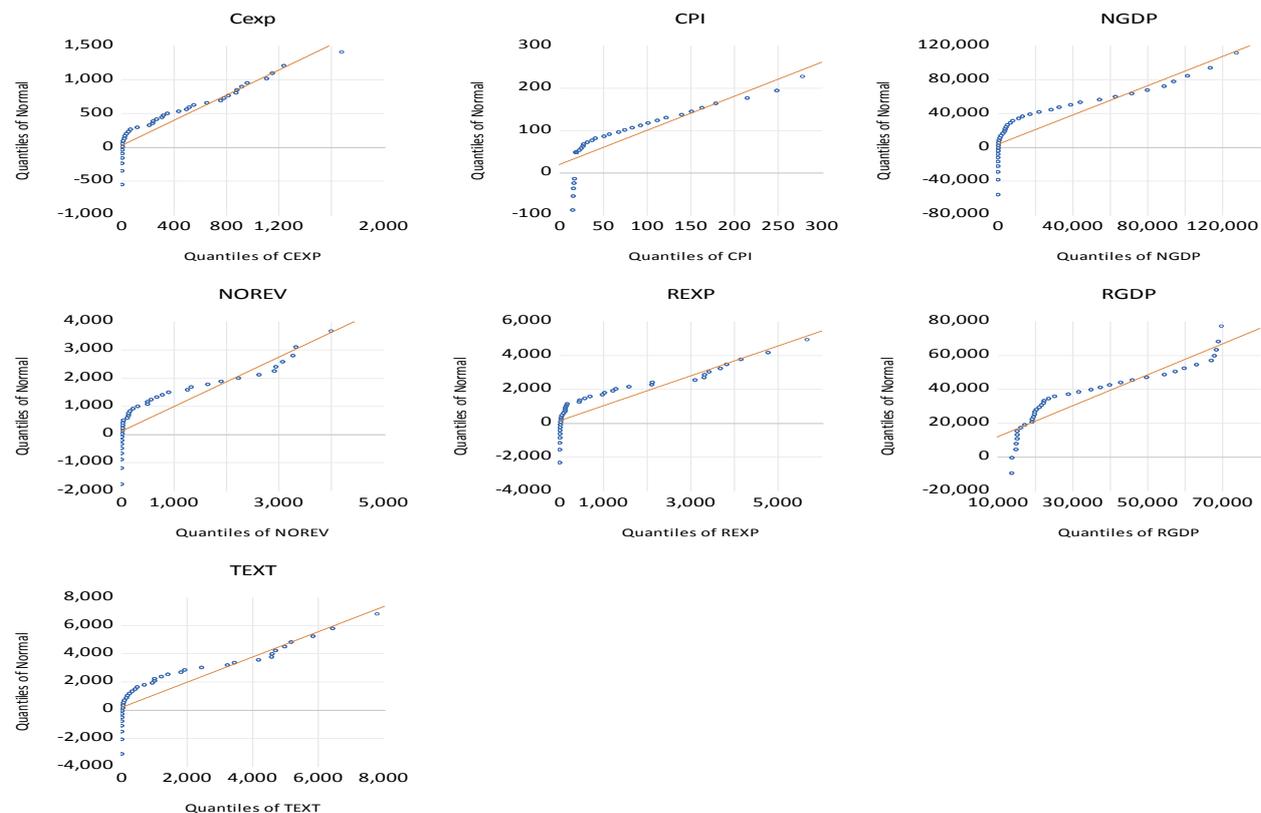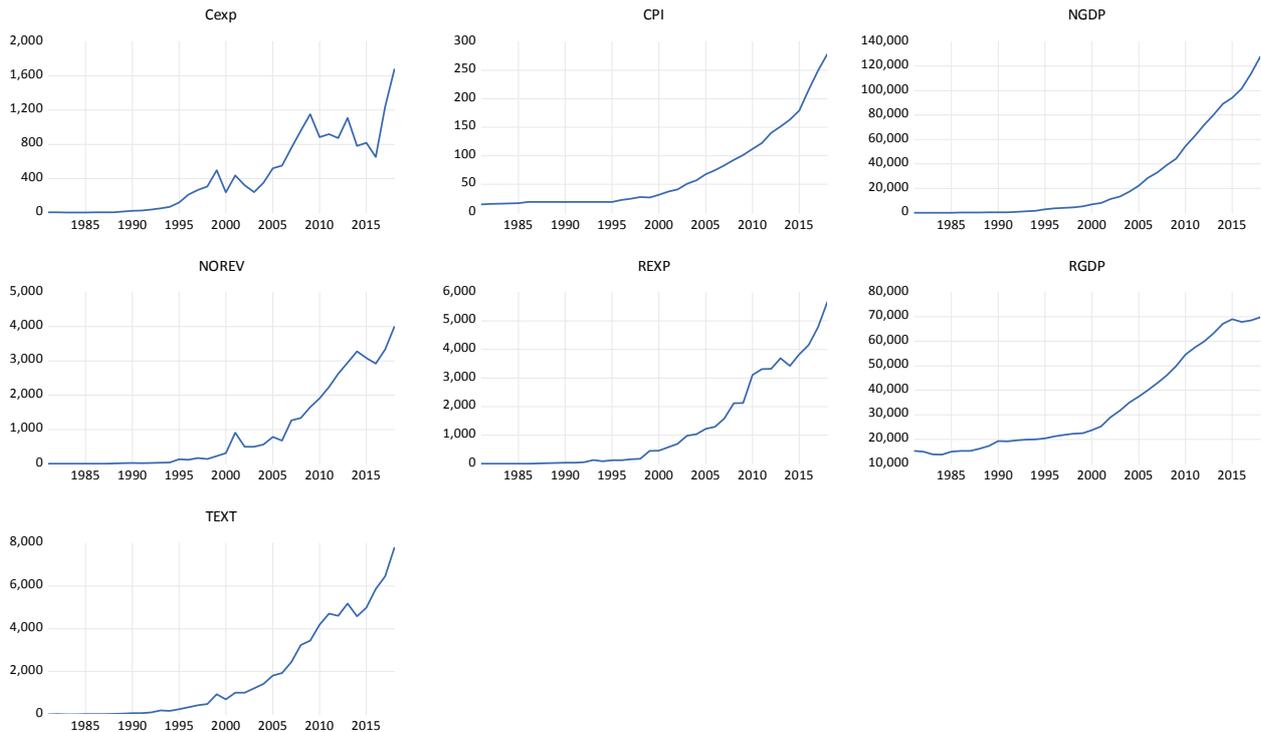

Fig 1: Trends in Consumer Prices in Nigeria, 1981 - 2018

Fig 2: Trends in Gross Domestic Product in Nigeria, 1981 - 2018

Fig 3: Trends in Real Gross Domestic Product in Nigeria, 1981 - 2018

Fig 4: Trends in Total Expenditure in Nigeria, 1981 - 2018

Fig.5: Quantiles

Table 2: Unit root analyses

	ADF Unit root without structural break		First difference	Zandrews unit root with structural break		First difference	I(d)
	At level		First difference	At level		First difference	
	Const. & Trend		Const.& Trend	Const. & Trend		Const. & trend	
INF	-3.47**		-	-6.81** (1996)		-	I(0)
NGDP	-1.15		-3.18**	-3.62 (2004)		-6.13*** (1996)	I(1)
GRGDP	-2.83*		-5.77***	-4.94 (2002)		-7.04*** (1994)	I(1)
TEXP	-1.48		-4.09**	-4.86 (1999)		-5.19** (2000)	I(1)

Source: Extract from Regression Printout using Stata 15. **Note**: INF: inflation computed from consumer price index as INF=log(CPI/CPI(-1)); GGDP: growth rate of nominal gross domestic product computed as GGDP=log(GDP/GDP(-1));GRGDP: growth rate of real gross domestic product computed as GRGDP=log(RGDP/RGDP(-1)); TEXP: total expenditure. ***, **, * signify 1%, 5% and 10% significance levels respectively. Values in "()" are the break dates revealed by the unit root tests with structural break.

The Gregory-Hansen Cointegration Test

The study carried out the Gregory and Hansen (1996) test designed for cointegration testing when controlling for structural breaks on non stationary series with identical order of integration, I(n) which the two variables growth rate of gross domestic product (GRGDP) and government expenditure (TEXP) possessed. The test is conducted in three models; at intercept, intercept and trend and regime shift based on the traditional ADF, Z_t and Z_a.

The results of Gregory and Hansen presented below shows the Z_t Statistic and ADF are less than the critical values at 5%, an indication that the null hypothesis of no cointegration cannot be rejected with a break point in year 2012.

Table 4: Gregory-Hansen Cointegration Test

	ADF		Z_t		Z_a	
Gregory-Hansen Models	**Statistic**	**Break Point**	**Statistic**	**Break Point**	**Statistic**	**Break Point**
Intercept Shift	-3.77	2012	-4.46*	2012	-25.56	2012
Intercept & Trend	-4.02	2012	-4.88*	1991	-27.85	1991
Regime Shift	-3.90	2001	-4.98*	2000	-29.09	2000

Note: Break Date: 2012. ***, **, * signify 1%, 5% and 10% significance levels respectively. G-Hansen (Intercept Z_t) Critical values: 1%: -5.13 5%: -4.61 10%: -4.34. G-Hansen (Intercept &Trend Z_t) Critical values: -5.45 -4.99 -4.72 @ 1% 5% 10% resp. G-Hansen (Regime Z_t) Critical values: -5.47 -4.95 -4.68 @ 1% 5% 10% resp

4.2 Discussion of Findings

We approached the first objective of this study by estimating linear and nonlinear autoregressive distributed lag models to examine the relationship between inflation and government expenditure in Nigeria. In both cases, we accounted for possible structural breaks in the data. This is found to be correct as the evidence of co-integration between the variables shown by the statistical significance of the Bounds test could not be established when the models were estimated without structural breaks. The study therefore showed robust evidence of co-integration i.e. symmetric and asymmetric co-integration between inflation and government expenditure in Nigeria (see Table 3). Judging by the linear and nonlinear ARDL models with structural breaks that perform well, the findings show that inflation increased government expenditures in Nigeria, although statistically insignificant.

On objective two which examine the relationship between economic growth and government expenditure, we conducted robust analyses using nominal and real GDP in the computation of economic growth series. Interestingly, we reported identical results for the two growth series indicating the result is insensitive to the choice of proxy. The Gregory-Hansen Cointegration test consistently on the three models (Intercept, Intercept and Trend and regime shift) show no co-integration between the series with a break date in 2012. We found that government expenditure exerted positive impacts on economic growth in both 1st and 2nd step Engel-Granger ECM with and without break results. Significantly, the model that produce this results passed all the diagnostics and proper behaviour expected from the error correction term. Thus, the findings can be trusted to guide policy.

With respect to the third objective, the Toda-Yamamoto models reported in Table 5 shows evidence of unidirectional causality between inflation and government expenditure in Nigeria. Inflation granger caused government expenditure at 5% significance while the evidence of causality cannot be affirmed of government expenditure on inflation at 5% level of significance.

Table 3: Linear and nonlinear ARDL with structural breaks

Linear ARDL with structural breaks			Non-Linear ARDL with structural breaks		
Dependent Variable = TEXP	ARDL (4, 0)		Dependent Variable = TEXP	ARDL (2, 0, 0)	
	Short run	Long run		Short run	Long run
INF	0.137	16.82	INF	0.200	0.065
ECT(-1)	-0.037***		ECT(-1)	-0.003**	
Bounds test	7.07**		Bounds test	-	
Estimated Break date	2007		Estimated Break dates	2007	
Diagnostics: R2= 0.75 F= 9.47*** Q-Stat(2)= 3.95 Q-Stat(4)= 4.37 Q²-Stat(2)= 2.59 Q²-Stat(4)= 4.20 ARCH(2)= 1.09 ARCH(4)= 0.79			**Diagnostics:** R2= 0.99 F= 355.22*** Q-Stat(2)= 0.32 Q-Stat(4)= 4.82 Q²-Stat(2)= 5.52* Q²-Stat(4)= 10.94** ARCH(2)= 3.04* ARCH(4)= 2.21*		

Note: ***,**,* signify 1%, 5% and 10% significance levels respectively. INF = inflation, TEXP = total government expenditure. ECT is the error correction term that is expected to be negative, less than one in absolute values and statistically significant. Q-stat and Q2-stat are tests for serial correlation of the model while ARCH-LM test for heteroscedasticity.
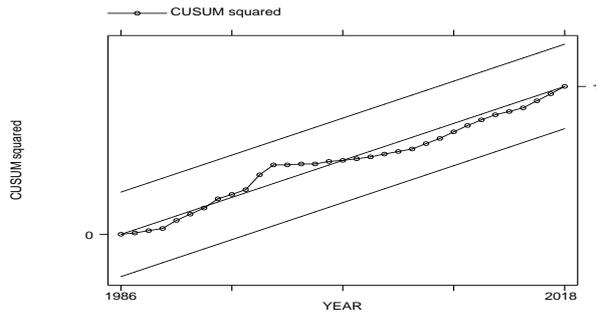
Fig. 6:Cusum Test for Dynamic ARDL   **Fig7: Root of Companion Matrix for Dynamic ARDL**
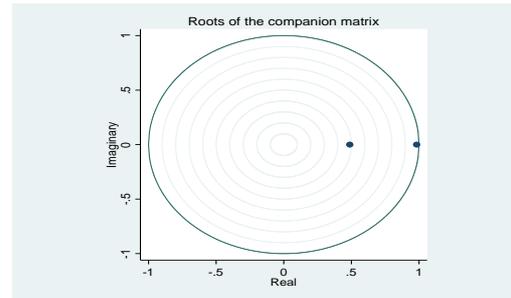

Table 4: Engel-Granger ECM with structural breaks

Engel-Granger ECM without Breaks			Engel-Granger ECM with Breaks		
Dependent Variable = GRGDP	1st Step	2nd Step	Dependent Variable = GRGDP	1st Step	2nd Step
TEXP	0.7958 (0.011**)	1.0660 (0.723)	TEXP	1.3432 (0.000***)	0.6268 (0.836)
ECT(-1)	-0.513 (0.010***)		ECT(-1)	-0.666 (0.005***)	
Break date	2012		Break date	2012	
Diagnostics: R2= 0.37 F= 6.15*** Q-Stat(2)= 0.47 Q-Stat(4)= 0.54 Q²-Stat(2)= 0.55 Q²-Stat(4)= 4.02 ARCH(2)= 0.22 ARCH(4)= 0.72			**Diagnostics:** R2= 0.35 F= 5.78*** Q-Stat(2)= 0.43 Q-Stat(4)= 0.79 Q²-Stat(2)= 0.70 Q²-Stat(4)= 1.70 ARCH(2)= 0.35 ARCH(4)= 0.67		

Note: ***,**,* signify 1%, 5% and 10% significance levels respectively. GRGDP = Growth Rate of gross domestic product, TEXP = total government expenditure. ECT is the error correction term that is expected to be negative, less than one in absolute values and statistically significant. Q-stat and Q2-stat are tests for serial correlation of the model while ARCH-LM test for heteroscedasticity.

Table 5: Toda-Yamamoto with and without structural breaks

Toda-Yamamoto model with structural breaks		
Variable	Expenditure	Inflation
INF	8.96 (0.0298**)	-
TEXP	-	7.18 (0.0663*)

Note: INF = inflation, TEXP = total government expenditure. The statistics reported are Chi-square statistics with the associated probability values in brackets. The break dates included in the estimation are the dates obtained for the series from the unit root analyses conducted with structural breaks.

V. Concluding Remarks

The Schwarz information criterion (SIC) has been employed to determine the optimal lag k. The estimated equation by OLS method passes all the diagnostic test. Both the linear and nonlinear Autoregressive Distributed Lag (ARDL) models between inflation (cpi) and government expenditure were estimated. The estimated models help to circumvent the problem of endogeneity, they accommodate mixed order of integration and produce short run and long run (with error correction) parameter estimates. The result showed robust evidence of symmetric and asymmetric co-integration between inflation and government expenditure. We found that government expenditure exerted positive impacts on economic growth in both short and long run. The Toda-Yamamoto model reported showed a uni-directional causality between inflation and government

expenditure. Inflation Granger caused government expenditure at 5% level of significance while government expenditure did not Granger cause inflation at 5% level of significance. The linear ARDL model with structural breaks shows that inflation increased government expenditures in Nigeria. Much of the time, policy makers are silent or inactive when the consumer price increases, which creates an asymmetric response. Without addressing the difficulties of inflation, it will be tough to attain continuous long-run growth and prosperity, predominantly if the structure of the economy is such that a 10 per cent rise in inflation can lead to higher expenditures of government.

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