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MACROECONOMIC DETERMINANTS OF INFLATION IN NIGERIA: AN APPLICATION OF AUTOREGRESSIVE DISTRIBUTED LAG BOUNDS TESTING TECHNIQUE

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ABSTRACT

Over the years, the actual growth rates of inflation in Nigeria have constantly been far above the Central Bank of Nigeria monetary policy targeted growth rates despite its focus on inflation targeting. This paper therefore examined macroeconomic determinants of inflation in Nigeria using annual time series data covering the period of 1981 to 2017. The study employed two inflation models based on the traditional "demand-pull" and "cost-push" theories respectively and applied autoregressive distributed lag (ARDL) technique based on the outcome of Augmented Dickey-Fuller, Phillips-Perron and breakpoint unit root tests which revealed that the variables are integrated of order 1 and 0. The ARDL bounds test result provided evidence of a long run relationship among the variables in the presence of structural break in the series. This necessitated the estimation of ARDL short-run and long-run results. The results of both models revealed that gross domestic product, money supply, general government expenditure, imports of goods and services, exchange rate, wages, interest rate, pump price of premium motor spirit and unemployment rate are significant determinants of inflation in Nigeria. The study concludes that both demand-pull and cost-push factors are determinants of inflation in Nigeria and recommends that the government should prioritize the productive sectors of the economy and also provide social infrastructure that would encourage private investment so as to provide jobs for the teeming unemployed which will bridge the output gap and reduce food imports; set interest rate at a level that would ensure sufficient supply of money for investment and productive activities.

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INTRODUCTION

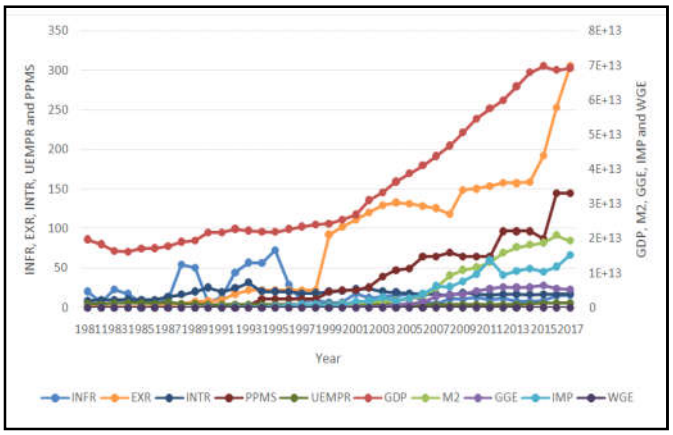
Inflation is generally defined as a sustained rising trend in the general price level (Johnson, 1973). It refers to the increase in the general level of price of a basket of goods and services that is representative of an economy over a period of time (Ochieng, Mukras and Momanyi, 2016). Inflation is measured by the percentage change in a price index, which is the average price level for a set of goods and services, relative to a base year (Romer, 2009). It is calculated using the Gross National Product (GNP) implicit deflator; the Consumer Price Index (CPI); and the Wholesale or Producer Price Index (WPI or PPI). But the CPI which measures the prices of a fixed market basket of several thousand goods and services purchased by households is the most commonly used index to measure inflation rates in Nigeria as it is easily and currently available on monthly, quarterly and annual basis (Hossain and Islam, 2013; Ndidi, 2013; Fatukasi, 2006; CBN, 1991). The literature identifies different types of inflation such as demand-pull inflation which is caused by excess demand arising from too much money chasing too few goods; cost-push inflation

caused by increase in the cost of production; imported inflation which originates from international trade where inflation is transmitted from one country to another; and structural inflation resulting from low inelastic supply of food items and agricultural products owing to structural rigidities and bottlenecks in the agricultural sector and foreign exchange shortages in developing countries (Anyanwu, 1992; Gyebi and Boafo, 2013; Undji and Kaulihowa, 2015; Nazima, 2017). Inflation has become a leading topic of discussion in Nigeria as its menace permeates into the nation's life. Continuous increases in prices are among the most serious economic problems in Nigeria as well as Africa in general (Ayinde, Olatunji, Omotesho and Ayinde, 2010); as it erodes the purchasing power of money thereby lowering the value of investment and standard of living (Greenidge and Dacosta, 2009). Low and stable inflation, high economic growth and low unemployment rate are the three most important objectives of macroeconomic policy (Taye, 2012). Hence, governments expend significant effort in monitoring and addressing trends and deviations of gross domestic product (GDP), employment and inflation compared to what is perceived to be full-capacity level. In this context, the primary goal of the Central Bank of Nigeria (CBN) is achievement of sustainable, low and predictable level of inflation which contributes towards the broader national objectives of sustainable economic growth and development.

Nigeria witnessed the first inflation in the 1970s when oil revenue rose astronomically. This was accompanied by unprecedented increase in public expenditure as the government embarked upon reconciliation, reconstruction and rehabilitation of civil war wrecked economy of Nigeria which led to enormous expansion of aggregate demand (Aiyede, 2002). The rising inflationary pressure then was aggravated by increased money supply arising from the monetization of oil earnings and Udoji Salary Awards of 1974 when wages were extensively increased (Anyanwu, 1993). The hosting of the Second World Black and African Festival of Arts and Culture (FESTAC) in Lagos Nigeria, in 1977 in which 56 African nations and countries of the African Diaspora participated helped in compounding the problem of macroeconomic instability. The prolonged over-valuation of the naira in 1980, even after the collapse of the oil boom engendered significant economic distortions in production and consumption as there was a high rate of dependence on import which led to balance of payments deficits. This resulted in taking a loan of $5.39billion in 1983 which rose to $21.6billion in 1999, from the Paris Club of creditors to finance such deficits (CBN, 2001). The oil glut of 1980s led to deficits in the balance of payments which engendered foreign exchange crises that necessitated various measures to restrict import. Consequently, shortages of raw materials for domestic production and spare parts for machinery operation led to shortage of goods and services for local consumption which spurred the inflation rate to rise from 7.69% in 1982 to 54.51% in 1988. There was a reduction in fiscal deficits as government withdrew subsidies and curtailed its involvement in the economy consequent upon the implementation of the Structural Adjustment Programme (SAP) in 1986. Surprisingly, the growth rate of real GDP declined from 11.6% in 1990 to 1.87% in 1995 while inflation rate skyrocketed to an all-time aggressive peak of 72.83% in 1995 from 7.36% in 1990 due to high monetary growth and fiscal expansions (Bawa & Abdullahi, 2012; Udoh and Isaiah, 2018). In 2016 and 2017 inflation rate rose to 15.69% and 16.5% from 9.01% in 2015 following complete withdrawal of oil subsidy which pushed up domestic pump price of premium motor spirit from ₦87 in 2015 to ₦145 in 2016 (CBN, 2018; PPPRA, 2017). The motivation behind this study is the constant deviation of the actual growth rates of inflation from the CBN monetary policy targeted growth rates over the years despite its focus on inflation targeting. Actual inflation growth rates have been far above the targeted rate over the past two decades. For instance, in 1991, 1992, 1993, 1995 and 2000 actual inflation growth rates were 23%, 48.8%, 61.3%, 51.6% and 14.5% respectively whereas the targeted inflation growth rates were 13%, 5%, 25%, 15% and 9% respectively. In 2003, 2008, 2009, 2016 and 2017 actual growth rates of inflation were 23.8%, 15.1%, 13.9%, 18.5% and 15.3% respectively while the targeted growth rates of inflation were 9%, 9%, 8.2%,11.9% and 10.7% respectively (CBN, 2018). This is a clear indication that anti-inflation policies on hand have not achieved its objective of inflation control either because it is wrongly targeted or not well implemented. Again, the resurgence of high rates of inflation in Nigeria in 2016 and 2017 which started few days after the Federal Government announced total withdrawal of oil subsidy and increased domestic pump price of premium motor spirit (PPMS) from ₦87 to ₦145. Thereafter, the economy went into recession. Though the inflation seems to have subsided, the economy is yet to recover from its shocks and there are signs of its resurgence as prices of some commodities have started rising again. This is worsened by the recent minimum wage increase in April 18, 2019 from ₦18000 to ₦30000, as minimum wage increases in Nigeria normally come with inflationary pressures. More-so, the causes of inflation have been a serious subject of debate in the economic literature. And existing research findings have added more flames to the debate instead of resolving it. While some of the findings (Uddin, Chowdhury, and Hossain, 2014; Alexander, *et al*., 2015; Lim and Sek, 2015; Nazima, 2017) lend credence to the "demand-pull paradigm". Some (Ruzima and Veerachamy, 2015) corroborate the "cost-push paradigm" whereas others (Greenidge and DaCoasta, 2009; Ayinde, Olatunji, Omotesho, and Ayinde, 2010; Odusanya and Atanda, 2010) support the "mixed paradigm". The Nigerian experience of inflation needs to be empirically re-verified in the light of these mixed findings.

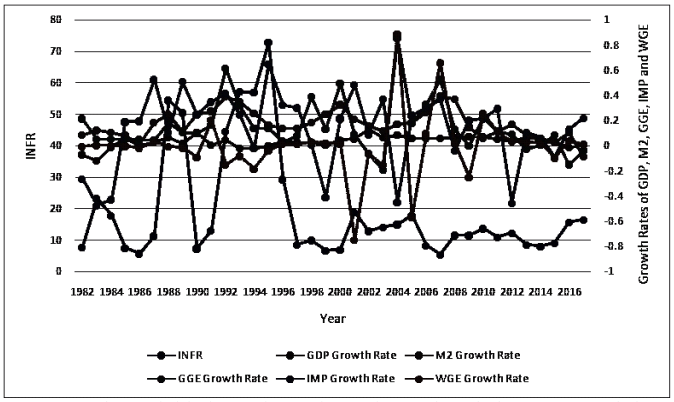
A very big gap identified in the empirical literature is that virtually all the existing research works did not formulate their models based on any theoretical framework as they lumped all the variables in one model. And most of the studies that used time series data spanning many years did not incorporate structural breaks emanating from policy shocks into their models thus ignoring the impact of policy changes on the economy. But in this study, two models which incorporate structural breaks are used based on the traditional "demand-pull" and "cost-push" theories respectively using autoregressive distributed lag (ARDL) technique which none of the previous studies in Nigeria used. Again, the last empirical work on the determinants of inflation in Nigeria is that conducted by Alexander, Andow and Danpome in 2015 which covers the period of 1986 to 2011. But this work covers the periods of 1981 to 2017 which captures the three major policy eras in Nigeria which include the pre-Structural Adjustment Programme era; the Structural Adjustment Programme era and the post-Structural Adjustment Programme era. The macroeconomic policies adopted within these three different periods are fixed/pegged or regulated exchange and interest rates; deregulated exchange and interest rates; and

guided deregulation respectively. This period also captures the most recent inflation occurrence in Nigeria. Thus, the objective of this study is to ascertain the macroeconomic determinants of inflation in Nigeria from 1981 to 2017 using two inflation models specified based on the traditional "demand-pull" and the "cost-push" theories respectively; and employing autoregressive distributed lag (ARDL) data analysis technique incorporating structural break emanating from policy shocks.



Source: Authors' initiative using data obtained from WDI (2018); CBN (2018); and PPPRA (various issues).

Figure 1. Trends of inflation and related macroeconomic variables in Nigeria (1981-2017)



Source: Authors' initiative using Microsoft excel and data computed from WDI and CBN

Figure 2. Trends of inflation and growth rates of M2, GGE and IMP in Nigeria (1981-2017)

The remaining part of this study is organised as follows: section 2 centres on literature review. Section 3 presents the materials and methods containing a brief description of the theoretical framework, model specifications and estimation technique and procedure; section 4 presents and discusses the empirical results while section 5 concludes the study and makes policy recommendations.

LITERATURE REVIEW

Theoretical literature: Theoretical literature on the determinants of inflation is filled with contradictory views with regards to the causes of inflation. In fact, there are several theories that explain what causes inflation; however, most of them are formulated on the basis of the aggregate demand (demand-pull) and aggregate supply (cost-push) theories. Below are the theoretical explanations as postulated by various schools of thought.

Demand-pull theories of inflation: Demand-pull theories of inflation define inflation situations where aggregate demand for goods and services exceed aggregate supply, thereby leading to a sustained rise in the general price levels (Otto and Ukpere, 2016). The classicists, the Keynesians, and the monetarists are the three principal proponents of demand-pull theories. The classical theory of inflation is derived directly from the classical quantity theory of money which is one of the oldest surviving economic doctrines. The theory is found in the famous equation of exchange developed in the 19th century by Irving Fisher (1876-1947). The Fisherian equation of exchange states that: MV = PY. If velocity (V) and output(Y) are constant, the increase in money (M) will cause a direct and proportionate increase in prices (P) (Almahdi and Faroug, 2018). The theory assumes full employment in the economy while M is exogenously determined by the monetary authority. The greatest shortcoming of this theory is that it does not explain the channel through which an increase in money supply causes the proportionate rise in the price level.

John Maynard Keynes (1883 – 1946) and the Keynesian economists opine that inflation is majorly caused by increase in aggregate demand, which is composed of investment, government expenditure and consumption. They explain this, in terms of inflationary gap; the excess of aggregate demand over aggregate supply. Keynes submits that the larger the gap between aggregate demand and aggregate supply, the more rapid inflation is and to reduce inflationary tendencies in any economy, entails initiating policies that reduce those components of total demand (Ndidi, 2013). The Keynesian chain of causation between changes in nominal money income and in prices is indirect via the rate of interest, which differs from the monetarists' view that inflation is caused by money supply. Keynesian theory supports the Phillips curve which originally showed an inverse relationship between the rate of change of money wage rate and the level of unemployment; and later developed into a relationship between inflation rate and unemployment rate. According to Keynesian economists, there is a tradeoff between inflation and unemployment. The curve shows that lower inflation and lower unemployment, or higher inflation and higher unemployment is incompatible; rather higher inflation is accompanied by lower unemployment and lower inflation by higher unemployment (Phillips, 1958; Jackman, Mulvey, and Trevithick, 1981, as cited in Menji, 2008). The monetarists emphasize the role of money as the principal cause of demand-pull inflation (Jhingan, 2003). They contend that inflation is always and everywhere a monetary phenomenon; hence, prices are likely to increase when the rate of increase in money supply is greater than the rate of increase in real output of goods and services, such that too much money chases too few goods (Johnson, 1973, as cited in Ayinde, Olatunji, Omotesho & Ayinde, 2010). In Milton Friedman's submission, only money matters, and monetary policy is potential in ensuring economic stabilization as against the fiscal policy, which is vehemently supported by the cost-push theory.

Cost-push theory of inflation: Cost–push inflation exists when wages and other production costs start rising. The producers in turn pass these rising costs upon the consumers, leading to higher prices (Undji and Kaulihowa, 2015). Depreciation of the exchange rate can initiate increase in the prices of goods as most firms import the bulk of raw materials required for its production at higher prices. Ogbokor and Sunde (2011) notes that this kind of inflation occurs mainly because of a rise in the cost of imported raw materials and an increase in the cost of labour. Otto and Ukpere (2016) notes

that cost push inflation can also be called the "market power inflation" because the increase in the prices of goods and services originates from the supply side of the economy. Onwioduokit (2002) notes that this school of thought attributes inflation to such random non-monetary shocks such as crop failures, commodity shortages, vagaries of weather and increase in the price of oil.

Structuralist theory of inflation: This theory was developed by Myrdal and Straiten in 1987. The structuralist theory explains the long-run inflationary trends in developing countries in terms of structural rigidities, market imperfection and social tension, relative inelasticity of food supply, foreign exchange constraints, protective measures, rise in demand for food, fall in export earnings and political instabilities. The structuralists argue that by the very nature of their economies, the less developed countries are prone to inflation. The reason assigned to this argument is that there exist structural rigidities or bottlenecks namely; economic, institutional and socio-political factors in these countries, which in one way or the other impede expansion of output (Gyebi and Boafo, 2013). This theory views inflation from the supply side of the economy and identifies some mechanisms that trigger inflation as low inelastic supply of food items and agricultural products owing to bottlenecks in the agricultural sector and foreign exchange shortages.

Empirical literature review: Several studies have examined determinants of inflation in both developed and developing nations including Nigeria. For instance, Mallik and Chowdhury (2001) investigated the short-run and long-run dynamics of the relationship between inflation and economic growth for four South Asian economies of Bangladesh, India, Pakistan, and Sri Lanka. Employing cointegration and error correction models and annual data obtained from the International Monetary Fund (IMF) and International Financial Statistics (IFS), the study revealed two motivating results. First, the relationship between inflation and economic growth is positive and statistically significant for all four countries; second, the sensitivity of growth to changes in inflation rates is smaller than that of inflation to changes in growth rates. Leheyda (2005) for Ukraine, Greenidge and DaCoasta (2009) for four Caribbean countries of Jamaica, Guyana, Barbados and Trinidad and Tobago, Uddin, Chowdhury and Hossain (2014) for Bangladesh, and Lim and Sek (2015) for two groups (high inflation countries of Iran Islamic Republic, Argentina, Uruguay, Sudan, Burundi, Colombia, Ecuador, Ghana, Iceland, Indonesia, Israel, Mexico, and Turkey; and low inflation countries of Australia, Canada, Cyprus, Denmark, Finland, Italy, Malaysia, Malta, Morocco, Netherlands, Norway, United States, Bahamas, and Singapore), have examined the determinants of inflation using ECM, UECM, ARDL and ARDL respectively and annual time series data. On the whole, these studies found that inflation inertia, money supply, wages, exchange rate, real output, oil price, interest rates, real output gap, excess money supply, GDP, GNP, imports of goods and services, national expenditure, GDP growth rate as well as some exogenous shocks influence inflation dynamics in these countries. Ahamed, Raza, Hussain and Lal (2013) and Nazima (2017) examined the determinants of inflation in Pakistan using error correction model (ECM) and auto regressive distributed lag (ARDL) methodology respectively and annual time series data over the periods of 1971-2012 and 1980-2015 respectively. The empirical evidence of Ahmed *et al* indicated that imports of goods and services, real output gap, current government expenditure and energy crises exerted significantly positive impact on consumer price index (CPI) whereas those of exports of goods and services (at lag 2) and development government expenditure are significantly negative. A positive but insignificant relationship was found between money supply and CPI. Findings of Nazim showed that money supply and government revenue have positive and significant impact on inflation whereas real GDP (at lag 1), exchange rate (at lag 1) and dummy used to proxy years of financial sector reform impacted significantly negative. In sum, these studies recommend some policy measures for keeping the inflation at a level required for the country to grow.

Jaradat, Al-Zeaud and Al-Rawahneh (2011) focused on the econometric analysis of the determinants of inflation in Jordan using error correction model and quarterly data ranging from 2000: Q1 to 2010: Q4. The study found that imports, exports, banking facilities, workers remittances and external shocks exerted positive and significant impact on inflation while GDP and broad money supply impacted negatively but significantly and insignificantly respectively. Ruzima and Veerachamy (2015) and Musa and Yousif (2018) examined the determinants of inflation in Rwanda and Sudan using OLS multiple regression analysis and generalized method of moments (GMM) respectively. These studies employed annual time series data for the periods of 1970-2013 and 2000-2017 respectively. The result of Ruzima and Veerachamy indicated that agriculture productions as % of GDP, import of goods and services as share GDP in % and population growth rates made significantly positive and negative impact on inflation respectively whereas that of foreign direct investment as % of GDP and government expenditure were insignificant but positive and negative respectively. The result of Musa and Yousif revealed that gross domestic product, consumer price index, exchange rate and government expenditure had significant and positive impact on inflation whereas that of unemployment rate and money supply were significant and negative. Ruzima and Veerachamy concludes that inflation in Rwanda is not a monetary phenomenon and recommends fiscal policy through government spending, improvement in term of trades and lessening the production cost of agriculture sector.

Odusanya and Atanda (2010) analyzed the dynamic and simultaneous inter-relationship between inflation and its determinants in Nigeria between 1970 and 2007 using Augmented Engle-Granger (AEG) cointegration test and Error Correction Mechanism (ECM). The result of the model revealed that growth rate of GDP, growth rate of money supply, real share of import and first lag of inflation rate exert positive influence on inflation rate with only growth rate of GDP, real share of import and preceding rate of inflation exerting significant effect on current inflation rate whereas the real share of fiscal deficit and exchange rate were found to exert negative influence on inflation rate in Nigeria. Interest rate impacted positively and negatively in the long-run and short-run respectively. Ayinde, Olatunji, Omotesho, and Ayinde (2010) and Alexander, Andow and Danpome (2015) examined the determinants of inflation in Nigeria using cointegration technique and vector autoregressive model respectively. Time series data of annual frequency spanning 1980-2008 and 1986-2011 respectively were employed. The result of Ayinde *et al* revealed that previous year export, interest rate and crude oil export made negative and significant impact on inflation whereas those of import, CPI for food, exchange rate was positive and significant.

Table 1. Data description and sources

Variables	Description	Source
INFR	Inflation, consumer price index (annual %)	WDI, 2018
GDP	Gross domestic product (constant LCU)	WDI, 2018
M2	Broad money (current LCU)	WDI, 2018
GGE	General government final consumption expenditure (current LCU)	WDI, 2018
IMP	Imports of goods and services (current LCU)	WDI, 2018
EXR	Official exchange rate (LCU per US$, period average)	WDI, 2018
WGE	Annual wages in (N' Million) Nigeria local currency.	Central Bank of Nigeria
INTR	Lending interest rate (%)	WDI, 2018
PPMS	Domestic pump price of premium motor spirit in (Naira) Nigeria local currency	Petroleum Product Pricing Regulatory Agency (PPRA) Bulletin (various issues)
UEMPR	Unemployment, total (% of total labor force) (modeled ILO estimate)	WDI, 2018

Source: Compiled by the authors; WDI = World Development Indicator.

Impact of agricultural output and government expenditure were insignificant but negative and positive respectively. The estimated VAR result of Alexander *et al* showed that exchange rate, fiscal deficits, GDP of agriculture, money supply and imports of goods and services have a long run influence on inflation rate in Nigeria. Only lending rate influenced inflation in the short and long run horizons. The variance decomposition and impulse response results showed that "own-shocks" were significantly responsible for the variation and innovations in all the variables in the equation. On the whole, these studies discourage excessive waste of public funds through fiscal deficit, and recommend that the monetary authority should encourage a lending rate policy that promotes investment and maintains a desired level of money supply and interest rates that reduce inflation rate in Nigeria.

MATERIALS AND METHODS

Theoretical framework: The literature review on the determinants of inflation points to the employment of several different models to capture the determinants of inflation in both developed and developing countries. In addition, a number of similar variables from each model are found to be significant in the empirical studies, which makes it difficult to choose a particular theoretical model to examine the causes of inflation in Nigeria. Therefore, two models based on the traditional "demand-pull" and "cost-push" theories respectively are specified in this study. The advantage of this approach lies in its ability to deliver results based on underlying economic theories of inflation, which is also consistent with the properties of the data. However, the study adopts the models in Greenidge and DaCoasta (2009) and Nazima (2017) but with modifications due to non-inclusion of some relevant explanatory variables. The description of variables used in this study and the sources of data are indicated in Table 1. Annual time series data covering the period of 1981 to 2017 were used in this study. The justification for collecting data on wages and PPMS from different sources is due to their unavailability in WDI and their omission would introduce serious specification bias based on the cost-push theory and the peculiarity of the Nigerian economy. It is imperative to point out that the data for wages are available for the periods of 1990 – 2016 only. Other years wages were obtained by interpolation using 4 years moving average to bring it at par with the scope of the study.

Model Specifications

Two models which hypothesized variations in inflation to be a function of the explanatory variables are algebraically specified.

Model 1 is specified based on demand-pull theories while Model 2 is specified based of cost-push theory in order to capture the demand-pull and cost-push variables responsible for inflation in Nigeria respectively.

Model 1

Model 1

$$INFR = f(GDP, M2, GGE, IMP, EXR) \quad (1)$$

The parameterized version of the inflation model 1 is presented as:

$$INFR_t = \beta_0 + \beta_1 GDP_t + \beta_2 M2_t + \beta_3 GGE_t + \beta_4 IMP_t + \beta_5 EXR_t + \mu_{1t} \quad (2)$$

Where the variables are as itemized above; β_0 is the constant while $\beta_1 \ldots \beta_5$ are the coefficients of the parameters; t is a subscript denoting time. Based on a priori, $\beta_1 < 0$; $\beta_2, \beta_3, \beta_4, \beta_5 > 0$. The ARDL dynamic representation of model 1 is specified in equation 3 as:

$$\begin{aligned}\Delta LNINFR_t &= \gamma_0 + \gamma_1 LNINFR_{t-1} + \gamma_2 LNGDP_{t-1} + \gamma_3 LNM2_{t-1} + \gamma_4 LNGGE_{t-1} + \gamma_5 LNIMP_{t-1} \\ &+ \gamma_6 LNEXR_{t-1} + \gamma_7 LNBRK2005_{t-1} + LN\gamma_{8t-1} + \sum_{j=1}^{k} \beta_{1j} \Delta INFR_{t-j} + \sum_{j=0}^{k} \beta_{2j} \Delta GDP_{t-j} + \sum_{j=0}^{k} \beta_{3j} \Delta M2_{t-j} \\ &+ \sum_{j=0}^{k} \beta_{4j} \Delta GGE_{t-j} + \sum_{j=0}^{k} \beta_{5j} \Delta IMP_{t-j} + \sum_{j=0}^{k} \beta_{6j} \Delta EXR_{t-j} \sum_{j=0}^{k} \beta_{7j} \Delta BRK2005_{t-j} + \mu_{1t} \quad (3)\end{aligned}$$

Where β_1 to $\beta_7$are the coefficients of the short-run parameters, γ_1 to γ_7 are the coefficients of the long-run parameters, Δ = first difference operator, LN denotes variables in the natural log form, K is the lag order selected by Akaike Information Criterion (AIC), TBK2005 is the dummy variable incorporated into the ARDL dynamic specification to capture the structural break observed in the inflation rates data while μ_{1t} is the white noise assumed to be normally distributed.

Model 2

$$INFR = f(WGE, INTR, PPMS, UEMPR) \quad (4)$$

The parameterized version of the inflation model 1 is presented as:

$$INFR_t = \lambda_0 + \lambda_1 WGE_t + \lambda_2 INTR_t + \lambda_3 PPMS_t + \lambda_4 UEMPR_t + \mu_{2t} \quad (5)$$

Where the variables are as itemized above; λ_0 is the constant while $\lambda_1 \ldots \lambda_4$ are the coefficients of the parameters; t is a subscript denoting time. Based on a priori, $\lambda_1, \lambda_2, \lambda_3 > 0$; $\lambda_4 < 0$. The ARDL dynamic representation of model 2 is specified in equation 6 below

$$\Delta LNINFR_t = \psi_0 + \psi_1 LNINFR_{t-1} + \psi_2 LNWGE_{t-1} + \psi_3 LNINTR_{t-1} + \psi_4 LNPPMS_{t-1} + \psi_5 LNUEMPR_{t-1} + \psi_6 TBK2005_t + LN\psi_{6t-1} + \sum_{j=1}^{k} \lambda_{1j} \Delta INFR_{t-j} + \sum_{j=0}^{k} \lambda_{2j} \Delta WGE_{t-j} + \sum_{j=0}^{k} \lambda_{3j} \Delta INTR_{t-j} + \sum_{j=0}^{k} \lambda_{4j} \Delta PPMS_{t-j} + \sum_{j=0}^{k} \lambda_{5j} \Delta UEMPR_{t-j} + \sum_{j=0}^{k} \lambda_{6j} \Delta BRK2005_{t-j} + \mu_{2t} \quad (6)$$

Where λ_1 to $\lambda_6$are the coefficients of the short-run parameters, ψ_1 to ψ_6 are the coefficients of the long-run parameters, others remain as previously defined.

Estimation technique and procedure: This study employs the auto-regressive distributed lag (ARDL) technique suggested by Pesaran, Shin and Smith (2001) for the analysis of data. The choice of this technique is because of its merits over the conventional Johansen cointegration and Engle Granger static procedure. The Johansen cointegration allows for I(1) variables only but ARDL technique allows for I(1), I(0) or a mixture of I(1) and I(0) variables for estimating short-run and long-run coefficients. In addition, this technique is also appropriate for finite sample size. However, one of the condition of ARDL is that none of the variables should be I(2), because bounds test to cointegration is only applicable to I(1) and I(0) variables. ARDL technique is better suitable for this study as the variables are integrated of I(1) and I(0).

Recent developments in econometrics have shown the limitations of traditional modeling construct in empirical analysis. The outcome of such generating series leads to spurious regression from which further inference may be meaningless. Thus, unit root and cointegration tests are important tests that are often used to circumvent the inherent limitations of traditional models (Amin and Audu, 2006). In the light of this, the Augmented Dickey- Fuller (ADF) and the Philips-Perron (PP) unit root tests in which the null hypothesis is $H_0 = \beta = 0$ (i.e. β has a unit root) were employed to test for the stationarity of the series so as to avoid analyzing inconsistent and spurious relationships. However, in the presence of structural breaks, the conventional ADF and PP unit root tests provide biased results because of their low explanatory power to reject the null hypothesis of unit root as they do not incorporate information about structural break dates emanating from structural changes in the economic and political environment (Perron 2006).

Therefore, a unit root test that detects unknown single structural break in time series data was also employed using Eviews in order to overcome this anomaly. This test which applies the basic framework outlined in Perron (1989); and Vogelsang and Perron (1998), is performed with the break years selected when Dickey–Fuller t-statistic is at the minimum. The decision rule is that the ADF and PP tests statistics must be greater than the critical values at 1%, 5% or 10% in absolute terms before the variables can be adjudged stationary. The study moved on to test for cointegration among the variables to determine whether there exist long run relationships among the variables. In this study, the ARDL bound test approach to cointegration test incorporating the structural break observed in the data series was adopted because it offers several desirable statistical features that overcome the limitations of other cointegration techniques (Pesaran *et al*., 2001); and has become increasingly popular among researchers in recent years (Jayaraman and Choong, 2009). The use of the ARDL bounds test to cointegration has been applied for the estimation of F-statistic, that determines whether a long run relationship exists for the data under study or not. The condition for the existence of cointegration is that the ARDL bounds test F-statistic value must be greater than the upper critical bound value at 5% significance level. If the calculated F-statistics is less than the lower bound, then there is no cointegration among the variables but if the calculated F-statistic remains between the lower and upper critical bounds then the decision is inconclusive.

Subsequently, the study estimated the short-run and long-run impact of the explanatory variables on inflation in Nigeria. The coefficient of the cointegration equation [CointEq(-1)] of the short-run result conventionally known as the error correction term (ECT) which is expected to be negative and significant measures the speed of adjustment of the model back to long-run equilibrium after disequilibrium which occurs in response to shocks (Ahmad, 2011). Precisely, it shows the rate at which inflation rate adjusts to changes in the explanatory variables. Hence, the greater the coefficient of the ECT, the higher the speed of adjustment of the model from short run to long run and vice versa. Lastly, the study conducted several diagnostic tests of model adequacy. Precisely, the study adopted the Breusch-Godfrey serial correlation LM test, the Breusch-Pagan-Godfrey heteroskedasticity test, the Jarque-Bera histogram normality test, and the cusum and cusum of squares tests of stability. The condition for no serial correlation and existence of homoscedasticity is that the probability Chi-square values of the Observed R-squared and F-statistic values must be more than 5% respectively. Whereas the condition for the existence of normality is that the probability value of the Jarque-Bera coefficient must be greater than 5%; that of stability is that both the cusum and the cusum of squares lines must appear in-between the two critical lines of the graph.

Presentation and analysis of results

Unit root tests results: The unit root tests results are presented in tables 2 and 3. The maximum lag length of 9 was selected automatically based on Schwarz Information Criterion (SIC) for Augmented Dickey–Fuller (ADF) test and Newey–West Bandwidth using the Bartlett–Kernel procedure for Phillips–Perron (PP). Models are estimated with intercept. The results of the ADF and PP unit root tests of the series in Table 2 show that all the variables are stationary at first difference except inflation rate that is stationary at levels. The variables are therefore integrated of I(1) and I(0). The Null hypothesis of unit root is therefore rejected since the ADF and PP tests statistics are greater than the critical values at the indicated levels of significance. The results in Table 3 show a structural break in all the data series. For inflation rate, a structural break is found in the series in 2005 which is an indication that the economy has observed significant policy shocks at the selected break date. It was in 2005 that the Paris Club of creditors granted Nigeria huge external debt cancellation to the tune of US$18 billion which had massive implications on both the Nigerian economy and the Federal Government policy directions. The stationary properties validate the ADF and PP tests results of I(1) and I(0) in table 2 above. The test is implemented with intercept. Having determined the stationarity properties, the results of the ARDL bounds test to cointegration for models 1 and 2 are presented in Table 4. From the results in Table 4, the null hypotheses of no long-run relationships are rejected as the F-statistic values of 9.211701 and 17.73574 are greater than the critical upper (I1) bounds values of 3.79 and 4.01 at 5% level of significance for the two models respectively. This confirms the existence of long run relationships among the variables.

Table 2. Results of ADF and PP unit root tests of stationarity

	ADF Test			PP Test		
Variables	t- statistic I(0)	t- statistic I(1)	Result	t- statistic I(0)	t- statistic I(1)	Result
LNINFR	-3.298617**	-5.906445*	I(0)	-3.179146**	-9.766531*	I(0)
LNGDP	0.142174	-3.749647*	I(1)	0.952894	-3.749647*	I(1)
LNM2	-1.265221	-2.702109***	I(1)	-0.773163	-5.015489***	I(1)
LNGGE	-0.507203	-5.895801*	I(1)	-0.501365	-5.895572*	I(1)
LNIMP	-0.623636	-5.226673*	I(1)	-0.623636	-5.206705*	I(1)
LNEXR	-1.880531	-5.113505*	I(1)	-1.994378	-5.113505*	I(1)
LNWGE	-0.778288	-7.082401*	I(1)	-0.600131	-7.174779	I(1)
LNINTR	-2.401555	-5.868307*	I(1)	-2.411990	-5.873224*	I(1)
LNPPMS	-1.255030	-4.610912*	I(1)	-1.345285	-4.458007*	I(1)
LNUEMPR	-1.255056	-6.846785*	I(1)	-1.848438	-6.778386*	I(1)

Source: Computed by the authors using Eviews
Note: *, **, *** implies rejection of the null hypothesis at 1%, 5%, or 10% level of significance.

Table 3. Results of unit root test with unknown single structural break

	Level form I(0)		First difference form I(1)		
	t-Statistic	Break Date	t-Statistic	Break Date	Results
LNINFR	-6.410111*	2005	-6.886675*	1999	I(0)
LNGDP	-2.310918	2001	-4.200150***	2013	I(1)
LNM2	-1.535591	1993	-4.282965***	2008	I(1)
LNGGE	-2.395349	2003	-7.674091*	2004	I(1)
LNIMP	-1.251412	1994	-8.559227*	1999	I(1)
LNEXR	-2.271990	1998	-7.507032*	1999	I(1)
LNWGE	-9.410833*	2003	-7.589499*	2001	I(0)
LNINTR	--2.374357	2008	-6.595117*	1994	I(1)
LNPPMS	-5.588469*	1993	-6.040042*	1994	I(0)
LNUEMPR	-3.195765	1997	-7.210990*	2015	I(1)

Source: Computed by the authors using Eviews
*, *** implies rejection of the null hypothesis at 1% and 10%, significance levels respectively.

Table 4. Result of ARDL bounds test to cointegration for models 1 and 2

Model 1		Result	Model 2		Result
F-Statistic Value	=	9.211701	F-Statistic Value	=	17.73574
	Critical value bounds			Critical value bounds	
Significance	I0 Bounds	I1 Bounds	Significance	10 Bounds	I1Bounds
10%	2.26	3.35	10%	2.45	3.52
5%	2.62	3.79	5%	2.86	4.01
2.5%	2.96	4.18	2.5%	3.25	4.49
1%	3.41	4.68	1%	3.74	5.06

Source: Computed by the authors using Eviews

Table 5. ARDL short run and long run results for model 1 (dependent variable: INFR)

	Short run	result		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNINFR(-1))	0.672255*	0.147529	4.556773	0.0002
D(LNGDP)	-11.352738*	2.063635	-5.501330	0.0000
D(LNM2)	1.788165**	0.848106	2.108421	0.0478
D(LNGGE)	-0.138214	0.225478	-0.612983	0.5468
D(LNIMP)	0.303782	0.312116	0.973296	0.3420
D(LNIMP(-1))	0.927739*	0.299887	3.093626	0.0057
D(LNEXR)	-0.967592*	0.300611	-3.218746	0.0043
D(LNEXR(-1))	-0.389186	0.303828	-1.280944	0.2149
D(BRK2005)	1.449996**	0.614631	2.359132	0.0286
CointEq(-1)	-1.141565*	0.159260	-7.167936	0.0000
	Long run	result		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	-0.138087	0.694408	-0.198855	0.8444
LNM2	1.566415***	0.794845	1.970717	0.0628
LNGGE	-0.851623**	0.332354	-2.562395	0.0186
LNIMP	-0.571997	0.349053	-1.638710	0.1169
LNEXR	-0.001897	0.257608	-0.007363	0.9942
BRK2005	1.270183**	0.562571	2.257817	0.0353
C	1.601114	17.359136	0.092235	0.9274
R-squared	0.824577	F-statistic	6.714998	
Adjusted R-squared	0.701780	Prob(F-statistic)	0.000078	
Durbin-Watson stat	1.680150			

Source: Computed by the authors using Eviews;
Note: *, ** and *** denotes significant variables of the model at 1%, 5%, and 10% significance levels.

Lag length of 2 and 3 was automatically selected for models 1 and 2 respectively based on AIC. Having established the existence of long run relationships, short run and long run impacts of the explanatory variables on inflation are estimated. The results of the two models are presented in Tables 5 and 6 respectively. The results in Table 5 reveal that in the short run, broad money supply (M2) and imports of goods and services at lag 1 (IMP (-1))made positive and significant impact on inflation whereas gross domestic product (GDP), general government final consumption expenditure (GGE)and official exchange rate (EXR) made negative and significant impact. Specifically, a unit increase in M2 and IMP generates about 1.78%, and 0.92% increase in inflation rate (INFR) respectively while a unit increase in GDP, GGE and EXR reduces INFR by 11.35%, 0.13% and 0.96% respectively. impact of GDP is in tandem with theory as increase in output supposed to reduce INFR, ceteris paribus. It supports the findings of Jaradat et al (2013), Nazima (2017) but contradicts that of Musa and Yousif (2018). The negative impact of GGE on inflation in both periods undermines a priori expectation and the findings of Ayinde et al (2010), Lim and Sek (2015) and Ruzima and Veerachamy (2015) but corroborates that of Musa et al (2018). The non-conformity of GGE result to a priori may be attributed to the high level of illicit financial outflows where some corrupt political office holders deposit money meant for executing domestic projects and programmes in foreign bank accounts thereby starving the economy of funds. Sadly, those illicit outflows are recorded as expenditure on the economy. The IMP indicated mixed result. The positive impact of IMP is in line with theory and corroborates the

Table 6. ARDL short run and long run results for model 2 (dependent variable: INFR)

	Short run	result		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNINFR(-1))	0.566740*	0.138193	4.101090	0.0005
D(LNWGE)	0.262189**	0.096639	2.713072	0.0130
D(LNINTR)	-0.330793	0.593738	-0.557137	0.5833
D(LNINTR(-1))	-0.836362	0.545341	-1.533649	0.1400
D(LNPPMS)	0.099924	0.220340	0.453501	0.6548
D(LNPPMS(-1))	-0.774319**	0.327457	-2.364643	0.0278
D(LNPPMS(-2))	1.001980*	0.223318	4.486786	0.0002
D(LNUEMPR)	0.868534***	0.500770	1.734396	0.0975
D(BRK2005)	0.136163	0.383674	0.354892	0.7262
CointEq(-1)	-1.215973*	0.140668	-8.644290	0.0000
	Long run	result		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNWGE	0.215621**	0.081648	2.640873	0.0153
LNINTR	1.746314*	0.413975	4.218399	0.0004
LNPPMS	-0.205540*	0.044652	-4.603119	0.0002
LNUEMPR	0.714270	0.425005	1.680616	0.1077
BRK2005	0.111979	0.316489	0.353815	0.7270
C	-4.864135**	2.014765	-2.414245	0.0250
R-squared	0.836896	F-statistic	8.979367	
Adjusted R-squared	0.743694	Prob(F-statistic)	0.000009	
Durbin-Watson stat	1.841078			

Source: Computed by the authors using Eviews;

Current IMP and EXR at lag 1made insignificant but positive (0.30%) and negative (-0.38%) impact on INFR respectively. In the long run, M2impacted positively on INFR while GDP, GGE, IMP and EXR impacted negatively. While M2 and GGE impacted significantly, GDP, IMP and EXR did not. Precisely, a unit increase in M2leads to about 1.56% rise in INFR whereas a unit increase in GDP, GGE, IMP and EXR bring about 0.13%, 0.85%, 0.57% and 0.001% decline in INFR respectively. The error correction term is well behaved as its coefficient is negative and significant though it exceeds 1. The coefficient of the ECT of -1.14% reveals that the speed with which inflation rate adjusts the repressors is about 114% in the short run. The implication is that the errors are being corrected within the same period to ensure convergence at the long-run. The R-squared value of 0.82 shows that about 82% variations in inflation are jointly explained by variations in the demand-pull variables of the model while the remaining 18% are attributed to other variables not included in the model (error term). The probability F-statistic value of 0.000078 shows that the overall model is significant in explaining demand-pull inflation in Nigeria. The consistent positive and significant impact of M2 on inflation in both short-run and long-run conforms to a priori expectation and lends credence to the monetarists assertion that inflation is always and everywhere a monetary phenomenon. It also corroborates the work of Uddin, et al (2014), Lim and Sek (2015) and Nazim (2017) but contradicts that of Musa and Yousif (2018). The negative findings of Ahamed et al (2013) and Ruzima et al (2015) while its negative impact contradicts both. That of EXR does not conform to theoretical expectation and the result of Ayinde et al (2010) but it supports the findings of Odusanya et al (2010) for Nigeria and Uddin et al (2014) for Bangladesh. The non-conformity of EXR may be attributed to high volatility of naira exchange rate vis-à-vis the US dollar. One striking finding about this model is that previous inflation rate is a significant determinant of inflation in Nigeria as INFR at lag 1led to a 0.67% increase in inflation in Nigeria. This means that inflation inertia could generate more inflation. Interestingly, the structural break observed in 2005 (BRK2005) made positive and significant impact on inflation in both short-run and long-run. A possible economic intuition to this result could be that the debt cancellation granted to Nigeria in 2005 by the Paris Club released additional fund for local spending which exerted positive pressure on the general prices. The results in Table 6 indicate that in the short run, INFR at lag 1, wages (WGE), domestic pump price of premium motor spirit (PPMS) at lag 2 and unemployment rates (UEMPR) made positive and significant impact on inflation whereas interest rate (INTR) and PPMS at lag 1 impacted negatively on INFR. Precisely, a unit increase in immediate previous INFR, WGE, PPMS at lag 2 and UEMPR generates about 0.56%, 0.26%, 1.00% and 0.86% rise in INFR respectively while a unit increase in INTR, INTR(-1) and PPMS at lag 1 leads to 0.33%, 0.83% and 0.77% decline in inflation rate respectively. In the

long run, WGE, INTR and UEMPR impacted positively on INFR whereas PPMS impacted significantly negative on inflation. Numerically, a unit increase in WGE, INTR, and UEMPR increases INFR by 0.21%, 1.74% and 0.71% respectively while a unit increase in PPMS generates about 0.20% decline in INFR. The coefficient of the error correction term is negatively signed and significant.

this result corroborates the findings of Greenidge and DaCosta (2009) for Barbados economy. The short run impact of INTR lends credence to the findings of Odusanya et al (2010) and Ayinde *et al* (2010) but contradicts economic theory. A possible reason for this deviation is that interest rate in Nigeria has been used to control money supply rather than cost of investible funds.

Table 7. Summary of diagnostic tests results for models 1 and 2

Model 1			
Breusch-Godfrey serial correlation LM test			
F-statistic	1.046420	Prob. F	0.3716
Obs*R-squared	3.645548	Prob. Chi-Square	0.1616
Heteroskedasticity test: Breusch-Pagan-Godfrey			
F-statistic	0.540702	Prob. F	0.8790
Obs*R-squared	9.609927	Prob. Chi-Square	0.7901
Jarque-Bera test of normality			
Jarque-Bera	1.354188	Probability	0.508091
Model 2			
Breusch-Godfrey serial correlation LM test			
F-statistic	1.377941	Prob. F	0.2762
Obs*R-squared	4.306879	Prob. Chi-Square	0.1161
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.903020	Prob. F	0.5590
Obs*R-squared	11.57273	Prob. Chi-Square	0.4806
Jarque-Bera test of normality			
Jarque-Bera	0.536227	Probability	0.764821

Source: Computed by the authors using Eviews.
Tests critical values are compared at 5% level of significance.

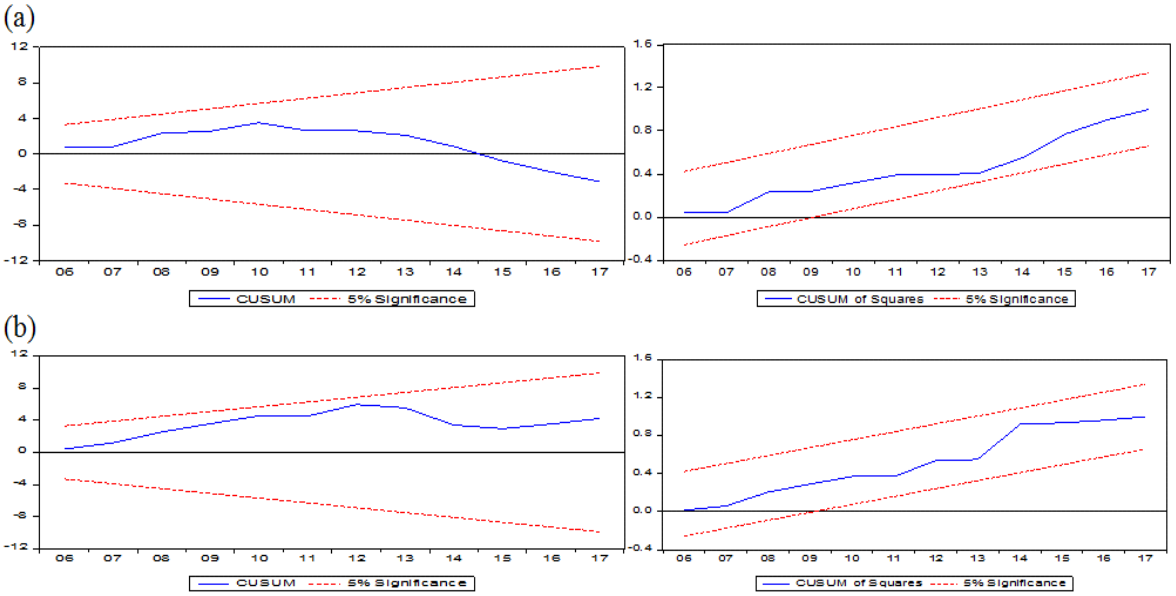


Figure 3. Results of CUSUM and CUSUM of Squares tests of stability for models 1 and 2 (a) is for model 1; (b) is for model 2

The coefficient of the ECT of -1.21 reveals that the speed with which inflation rate adjusts the repressors is about 121% in the short run. This implies that the errors are being corrected within the same period to ensure convergence at the long-run. The R-square value of 0.83shows that 83% variation in inflation are jointly explained by variations in the cost-push variables of the model whereas the remaining 17% are attributed to other variables not included in the model (error terms). The probability F-statistic value of 0.000009 shows that the overall model is significant in explaining cost-push inflation in Nigeria. The results of WGE and PPMS conform to a priori expectation in the short. The relationship between INFR and UEMPR in both periods does not support the Phillips curve. This may be due to the tripartite nature of the Nigerian economy where an oil dependent economy co-exists with large agrarian and small industrial sectors. Interestingly, The long-run impacts of WGE and INTR on INFR is well behaved whereas that of PPMS is not. Interestingly, the structural break observed in 2005 (BRK2005) made positive impact on INFR which is a confirmation that its positive impact in model 1 was not a fluke. The summary of the results of diagnostic tests of model adequacy for the two models are presented in Table 7 and Figure 4. The outcome of the diagnostic tests of model adequacy is satisfactory as the assumptions of normality, homoscedasticity and no auto-correlation are not violated. This is indicated by the probability value of all test statistics which is greater than 0.05. The CUSUM and CUSUM of squares tests of stability results show that estimated parameter coefficients are stable at 5% level of significance. Therefore, the models are well specified, and hence the results are plausible.

Conclusion and policy recommendations

This paper investigated the macroeconomic determinants of inflation (INFR) in Nigeria using the auto-regressive distributed lag (ARDL) data analysis technique and annual time series data spanning 1981 to 2017. Review of related literature was in-depth. Two inflation models were specified based on the traditional "demand-pull" and "cost-push" theories of inflation respectively. The results of ADF, PP and breakpoint unit root tests of stationary revealed that all the variables are integrated of I(1) and I(0). The ARDL bounds test results provided evidence of long run relationships among the modeled variables in the presence of structural break in the series. The short run results of both models revealed that GDP, M2, IMP, EXR, WGE, PPMS, and UEMPR are significant determinants of inflation in Nigeria whereas the long run results indicated that M2, GGE, WGE, INTR and PPMS are significant determinants of inflation in Nigeria. One striking finding of both models is that previous year inflation rate significantly and positively impacted on inflation. That means that inflation inertia and expectations could generate additional inflation. Both models explain about 82% and 83% variations in demand-pull and cost push inflation in Nigeria respectively. The coefficients of the ECT are well behaved in both models as they are negatively signed and significant. The outcome of all the diagnostic tests supported the acceptability of the models' results as the probability value of all test statistic is greater than 0.05.

In the light of the empirical findings, the study recommends as follows:

(a) The government should prioritize the productive sectors of the economy like agricultural and manufacturing industries by investing more in them and also provide social infrastructure that would encourage the private sector to invest so as to increase its output. This should be complemented by the establishment of import substitution industries which will help to provide jobs for the teeming unemployed which would bridge the output gap and reduce food imports;

(b) The monetary authority should set interest rate at a level that would ensure sufficient supply of money for investment and productive activities but not large enough to generate inflation. This can be achieved using selective credit control to provide short, medium- and long-term loans to small and medium scale industries and businesses at lower rate of interest as they are integral part of the growth and transformation process of an agro and oil-based economy of Nigeria;

(c) The government should revitalize local refineries and operate at full capacity so as to produce petroleum products in sufficient quantities and at lower cost. Consequently, the government should reduce the pump price of all petroleum products including PPMS which is the engine of economic activities in Nigeria.

(d) Exchange rate should be maintained at a level that will neither generated inflation nor impose threat on the Nigerian economy. This can be achieved using the managed floating exchange rate policy.

REFERENCES

Agba, V.A. 1994. Principle of macroeconomics. Lagos: Concept Publication Ltd.

Ahamed, F., Raza, H., Hussain, A., and Lal, I. 2013. Determinant of inflation in Pakistan: An econometrics analysis, using Johansen co integration approach. *European Journal of Business and Management, 5(30), 115-123.*

Ahmad, N. 2011. Impact of institutional credit on agricultural output: A case study of Pakistan. *Theoretical and Applied Economics, 10(563), 99-120.*

Aiyede, E.R. 2002. Decentralizing public sector collective bargaining and the contradictions of federal practice in Nigeria. *African Study Monographs, 23(1), 11-29.*

Alexander, A.A., Andow, A., and Danpome, M.G. 2015. Analysis of the main determinants of inflation in Nigeria. *Research Journal of Finance and Accounting, 6(2), 144-155.*

Almahdi, M.A.M., and Faroug, M.K.Y. 2018. Modeling the determinants of inflation in Sudan using generalized method of moments for the period 2000-2017. *International Journal of Information Research and Review, 05(02), 5154-5165.*

Amin, A.A., and Audu, I. 2006. External debt, investment and economic growth: Evidence from Nigeria. *CBN Economic and Financial Review, 44(1), 59-76.*

Anyanwu, J. 1992. President Babangida's structural adjustment programme and inflation in Nigeria. *Journal of Social Development in Africa 7(1), 5-24.*

Anyanwu, J.C. 1993. Monetary economics: Theory, policy and institutions, Onitsha: Hybrid Publishers Ltd.

Anyanwu, J.C., and Oaikhenan, H.E. 1995. Modern macroeconomics: Theory and application in Nigeria. Onitsha, Nigeria: Joanee Educational Publishers Ltd.

Ayinde, O.E., Olatunji, G.B., Omotesho, O.A., and Ayinde, K. (2010). Determinants of inflation in Nigeria: A Cointegration approach. Contributed paper presented at the Joint 3rd Africa Association of Agricultural Economists (AAAE) and 8th Agricultural Economist Association of South Africa (AEASA) Conference, Cape Town, 19–23rd September.

Bawa, S., and Abdullahi, I.S. 2012. Threshold effect of inflation on economic growth in Nigeria. *CBN Journal of Applied Statistics, 3(1), 43-63.*

Central Bank of Nigeria 2001. Annual reports and statement of accounts. Abuja, Nigeria

Central Bank of Nigeria 2018. Statistical bulletin, Abuja. Nigeria

Fatukasi, B. 2006. Determinants of inflation in Nigeria: An empirical analysis. *International Journal of Humanities and Social Science, 1(18), 262-271.*

Goamab, I.I.M. 1998. Modelling inflation in Namibia. Occasional Paper, No. 1. Bank of Namibia.

Greenidge, K., and DaCoasta, D. 2009. Determinants of inflation in selected Caribbean countries. *Business, Finance & Economics in Emerging Economies. 4(2), 371-397.*

Gyebi, F., and Boafo, G.K. 2013. Macroeconomic determinants of inflation in Ghana from 1990 – 2009. *International Journal of Business and Social Research (IJBSR), 3(6), 81-93.*

Hossain, T., and Islam, N. 2013. An economic analysis of the determinants of inflation in Bangladesh. *The International Journal of Social Sciences, 11(1), 29-36.*

Jaradat, M., Al-Zeaud, H.A., and Al-Rawahneh, H. 2011. An econometric analysis of the determinants of inflation in Jordan. *Middle Eastern Finance and Economics, 15, 120-132.*

Jayaraman, T.K., and Choong, C.K. 2009. Growth and oil price: A study of causal relationships in small Pacific Island countries. *Energy Policy 37, 2182–2189.*

Jhingan, M. L. 2002. Macroeconomic theory. (10th ed.). New Delhi, India: Vrinda Publications Ltd.

Jhingan, M. L. 2003. Advanced economic theory. (12th ed.). Delhi, India: Vrinda Publications Ltd

Johnson, H.G. 1973. Further essays in monetary economics. London: George Allen and Unwin.

Leheyda, N. 2005. Determinants of inflation in Ukraine: A cointegration approach. Centre for Doctoral Studies in Economics and management (CDSEM). University of Mannheim, Mannheim, 68159

Lim, Y.C., and Sek, S.K. 2015. An examination on the determinants of inflation. *Journal of Economics, Business and Management, 3(7), 678-682.*

Mallik, G., and Chowdhury, A. 2001. Inflation and economic growth: Evidence from South Asian countries. *Asian Pacific Development Journal, 8(1), 123-135*

Menji, S. 2008. Determinants of recent inflation in Ethiopia. Munich Personal RePEc Archive. Retrieved online at https://mpra.ub.uni-muenchen.de/29668/

Musa, A.M.A., and Yousif, F.M.K. 2018. Modeling the determinants of inflation in Sudan using generalized method of moments for the period 2000-2017. *International Journal of Information Research and Review, 05(02), 5154-5165.*

Nazima, E. 2017. The determinants of inflation in Pakistan: An econometric analysis. *Romanian Economic Journal, XX(64), 2-12.*

Ndidi, D. E. 2013. Determinants of inflation in Nigeria (1970 – 2010). *The Business & Management Review, 3(2), 106-114.*

Ochieng, O., Mukras, M.S. and Momanyi, G. 2016. The determinants of inflation in the Kenyan economy. *International Journal of Economics, 1(1), 40-60.*

Odusanya, I. A. and Atanda, A. A.(2010). Analysis of inflation and Its determinants in Nigeria. *Pakistan Journal of Social Sciences, 7(2), 97-100.*

Ogbokor, C.A., and Sunde, T. 2011. Is Namibia's inflation import driven? An econometric investigation, [Electronic version]. *Journal of Development Alternative and Area Studies 30(1, 2), 1–14.*

Okpara, G.C. 1988. Government expenditure, money supply and prices in Nigeria (1970-1987): An econometric analysis (Master's thesis, University of Jos, Plateau State, Nigeria).

Onwioduokit, E.A. 2002. Fiscal deficit and inflation in Nigeria: An empirical investigation of causal relationships, *CBN Economic and Financial Review 37(2), 1-12.*

Osagie, E. 1988. The relevance of income policy in a free market economy. A paper presented at the workshop on Income Policy and Structural Adjusted Economy, Lagos

Otto, G., and Ukpere, W.I. 2016. Inflation in Nigeria: Possible determinants and remedies to tackle it in Nigeria. Risk Governance & Control: *Financial Markets & Institutions, 6(2), 35-43.*

Perron, P. 1989. The great crash, the oil price shock, and the unit root hypothesis. Econometrica 57, 1361–1401.

Perron, P. 2006. Dealing with structural breaks. In Hassani, H., Mills, T.C., and Patterson, K. (eds.). Palgrave Handbook of Econometrics. Basingstoke, UK: Palgrave Macmillan

Pesaran, M.H., Shin, Y., and Smith, R.J. 2001. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16(3), 289-326.*

Petroleum Product Pricing Regulatory Agency 2017. Why FG increased petroleum pump price to N145 per litre. Retrieved from https://www.vanguardngr.com/ 2016/05/fg-increased-petrol-pump-price-n145-per-litre-kachikwu/

Phillip, A.W. 1958. The relationship between unemployment and the rate of change of money wage rate in the U.K 1861-1957. Economica, 15, 238-299

Ruzima, M., and Veerachamy, P. 2015. A study on determinants of inflation in Rwanda from 1970-2013. *International Journal of Management and Development Studies, 4(4): 390-401*

Taye, H.K. (2012). The determinants of inflation in Botswana and Bank of Botswana's medium-term objective range. *Botswana Journal of Economics, 57-74*

Uddin, S., Chowdhury, N.M., and Hossain, M.A. 2014. Determinants of inflation in Bangladesh: An econometric investigation. *Journal of World Economic Research, 3(6), 83-94.*

Udoh, N.S., & Isaiah, A.S. 2018. A predictive model for inflation in Nigeria. *CBN Journal of Applied Statistics, 9(2), 103-129.*

Udu, E. 1989. New System Economics. Onitsha: African Publishers Ltd.

Undji, V.J., and Kaulihowa, T. 2015. Determinants of inflation in Namibia: A co-integration Approach. *Journal of Business Management Dynamics, 5(1), 1-6.*

Vogelsang, T.J., and Perron, P. 1998. Additional test for unit root allowing for a break in the trend function at an unknown time. *International Economic Review 39, 1073–1100.*

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