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ARE FISCAL DEFICITS INFLATIONARY IN NIGERIA? NEW EVIDENCE FROM BOUNDS TESTING TO COINTEGRATION WITH STRUCTURAL BREAKS

ABSTRACT: *In this paper, we model the relationship between fiscal deficit and inflation for Nigeria using annual data from 1980 to 2016. We employ the linear ARDL approach and account for structural breaks using the Bai and Perron (2003) test that allows for multiple structural changes in regression models. The paper finds that the fiscal deficit is a major determinant of inflation along with other macroeconomic factors considered in the study. However, we observe that it may be necessary to pretest for structural breaks when modelling the relationship between the fiscal deficit and the price level, as it performs better than when structural events are not considered. The results imply that a fiscal management process that does not encourage increased revenue and reduce fiscal deficits will further worsen the level of inflation in the country.*

KEY WORDS: *fiscal deficit, price level, ARDL cointegration, structural breaks*

JEL CLASSIFICATION: C32; E31; E62

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1. INTRODUCTION

The monetary authority in Nigeria has used two monetary policy frameworks to implement monetary policy: exchange rate targeting and monetary targeting. An exchange rate targeting framework was used between 1959 and 1973, while monetary targeting has been in use from 1974 to the present. The shift to monetary targeting was largely informed by the collapse of the Bretton Woods system of fixed exchange rates in 1974 and a change in strategy to demand management as a means of containing inflationary pressures and balance of payments imbalances. Monetary targeting involves the use of market-based instruments. The focus of monetary policy here is on controlling growth in the monetary aggregates, a policy based on the belief that inflation is essentially a monetary phenomenon.

The long-standing controversies between the monetarists and fiscalists on the theory of price level have received a tremendous amount of renewed interest in academic discussions as well as policy debates over the last decades. The monetarist school of thought regards the theory of price as a monetary phenomenon (see, inter alia, McCallum, 2003; Komulainen and Pirttila, 2002; Niepelt, 2004; Grauwe and Polan, 2005; Salami and Kelikume, 2013) and this has also been echoed by Friedman's (1951) statement that "inflation is always and everywhere a monetary phenomenon", providing an exclusive role for monetary policy regarding inflation dynamics. However, an influential strand of literature, inspired by the seminal contribution of Sargent and Wallace (1981), argues that the monetary authority's control over inflation is limited, and for this reason, fiscal policy can equally be a source of inflation (Hashem, 2017). Indeed, in a context of 'fiscal dominance', a loose fiscal policy can drive inflation because the central bank must ultimately monetize the public debt, consistently with the unpleasant monetarist arithmetic (Sargent and Wallace, 1981; Kwon et al., 2009). An alternative rationale, which is at the heart of the Fiscal Theory of the Price Level (see, inter alia, Cochrane, 2001; Sims, 2011; Bassetto and Cui, 2018) or, more broadly, of the literature on price level determinacy (see Woodford, 1994), is that under fiscal dominance, newly issued nominal government bonds will cause the price level to rise to meet the government's intertemporal budget constraint.

The structural characteristics of most developing countries have made the study of fiscal inflation quite intriguing and well studied in the literature, as these characteristics have created bottlenecks which include dynamic monetary policy inconsistencies as a result of the non-independence of central banks (see Minea et al., 2012), political instability (see Fischer et al., 2002; Vu, 2004; Catao and Terrones, 2005; and Wimanda et al., 2011), and poor tax systems (see Catao and Terrones, 2005) that tend to reduce seigniorage revenue and compel the government to increase dependence on inflation tax. Intuitively, the government can reduce budget deficits through the aggregate demand component either by increasing tax revenue or by decreasing expenditure. As an alternative way of financing fiscal deficits, the government can easily borrow from banks. If government finances budget deficits by selling government bonds to the public, then budget deficits will not create any inflation, as no new money is created in the process.

While numerous studies have been conducted, no consistent evidence exists for a significant relationship between fiscal deficit and inflation, in either a positive or a negative direction. Results and evidence differ by country/region, analytical method employed, and budget deficit categorisation. For example, empirical studies of the United States (Aksoy and Melina, 2011; Klein and Linnemann, 2020) and of other industrial or developed countries (Sahan and Bektasoglu, 2010; Catão and Terrones, 2005; Kliem et al, 2016) have not yielded conclusive results on the deficit–inflation relationship. Meanwhile, empirical studies of developing countries, such as those of Samimi and Jamshidbaygi (2011), Kia (2010), Loungani and Swagel (2003), Ahmed and Suliman (2011), and Jalil et al. (2014), generally indicate that the inflationary effect of deficit financing is significant, and also observe a strong causality of fiscal deficits on inflation in high-inflation countries.

The focus of this study is therefore to examine the relationship between fiscal deficit and inflation, rather than just monetary factors. Nigeria is a reliable candidate for evaluating the deficit–inflation nexus because the monetary authority in Nigeria has recently been pointing the finger at budgetary borrowing as the main source of inflation in the country. However, this area is not well researched in the case of Nigeria. Although a few studies have shown monetary policy to be behind the inflation in Nigeria (Olomola and Olagunju, 2004;

Umeora, 2010), these papers did not incorporate the fiscal side. There are a few studies, like Chimobi and Igwe (2010), Oladipo and Akinbobola (2011), and Dockery et al. (2012), which have shown conflicting results regarding the fiscal deficit–inflation relationship. Assessing the role of inflation in Nigeria is crucial, because as a developing country it has suffered inflation that may negatively affect the living standards and purchasing power of the vulnerable segments of society. Inflation also has a political cost, as governments cannot afford to allow an undue increase in prices, as this would have a negative impact on the voting attitude of the public during elections. This has induced the need to find the underlying causes of inflation in the Nigerian economy.

We find a positive relationship between inflation and fiscal deficit. In addition, the results seem to perform better when likely structural events are modelled with the nexus between budget deficits and inflation in Nigeria. Therefore, this paper calls for fiscal consolidation to bring down prices and dependence on less inflationary deficit-financing policies.

The remainder of the paper is organized as follows. Section two deals with the literature review. Section three pursues the methodological framework of the study, while the empirical results are discussed in section four. Section five presents the conclusion and policy implications of the paper.

2. LITERATURE REVIEW

The observed interactions between fiscal deficit and price level have spurred great interest among both academicians and policymakers. Theoretically, Friedman (1968), Sargent and Wallace (1981), and Miller (1983) widely discuss this link. Sargent and Wallace (1981) present a model where higher government deficits do not lead to higher taxes; rather, higher deficit or debt results in higher money growth in the current period or in the future, and thus leads to inflation. Dornbusch et al. (1990) assert that in economies where money creation is the only way to finance government budget deficits it becomes a principal determinant of money growth and inflation. Easterly and Schmidt-Hebbel (1993) argue that money creation is a cause of inflation. Critics also hold deficits responsible for crowding-out phenomena by affecting the interest rate. When fiscal deficits are financed by borrowing, governments' demand for credit increases and less remains for the private sector. Hence, the vast and voluminous theoretical literature has created a broader line between the different schools of thought explaining the nexus between budget deficit and inflation, ranging from monetarists to Keynesians.

In recent years, several empirical studies have used both the time and cross-sectional dimensions of data (panel data) to examine the relationship between fiscal deficits and inflation in different countries, using different estimation procedures and theories and with varying findings and conclusions. The inferences drawn from these studies have also varied considerably depending on whether the countries involved are developed or developing. Thus, the link between fiscal deficits and inflation has been inconclusive.

Fluctuations in fiscal variables contain valuable information for predicting fluctuations in output and prices. State and federal fiscal variables help predict output and inflation respectively in the U.S. (Aksoy and Melina, 2011). As fiscal variables have been helpful in predicting inflation, Klein and Linnemann (2020) observe that fiscal spending increases lowered inflation in the first half of the post-war period, but have been inflationary from about 1980 onwards. In all Economic and Monetary Union (EMU) countries except Finland, evidence supports the sustainability of fiscal policy (Bajo-Rubio et al., 2009). The autonomy of monetary authorities and proactiveness of fiscal policy provides ample evidence of the relationship that might exist between budget deficit and price level. Kliem et al. (2016) observe that the low-frequency relationship between fiscal stance and inflation is low during periods of an independent central bank and responsible fiscal policy, and more pronounced in times of non-responsible fiscal policy and accommodative monetary authorities. Switches in the monetary–fiscal policy interaction and accompanying variations in the propagation of structural shocks can well account for changes in the low-frequency relationship between fiscal stance and inflation (Kliem et al., 2016).

The structure and inherent characteristics of an economy also provide significant details on the inflation–fiscal deficit nexus. Sahan and Bektasoglu (2010) observe no long-run relation between inflation and budget deficits, but the relationship changes depending on the developmental level and structural features of the economy. Hence, the financial structure of the economy becomes crucial in the analysis of the inflation–budget deficit nexus. Kwon et al. (2009) provide empirical evidence that an increase in public debt is inflationary in countries with large public debt. The study finds that the relationship holds strongly in indebted developing countries and weakly in other developing countries, and does not hold in developed economies. The results suggest that the risk of a debt–inflation trap is significant in highly indebted countries and pure money-based stabilization is unlikely to be effective over the medium term. Deficits have an impact on inflation and such an impact is stronger in high-inflation or developing countries (Catão and Terrones, 2005). The deficit–inflation relationship is strong in high-inflation episodes due to the increase in money creation, and persistent fiscal deficits are inflationary in high and middle-inflation economies and less inflationary in low-inflation economies (Lin and Chu, 2013). In a study that accommodates asymmetry and suits the African countries, Ahmad and Aworinde (2019) also indicate that there is a long-run relationship between fiscal deficits and inflation and that fiscal deficit is inflationary.

Other studies provide support for the deficit–inflation relationship based on both panel and country-specific data. Nguyen (2015) empirically investigates the effects of fiscal deficit and broad money M2 supply on inflation in Asian countries. The study finds that fiscal deficit, government expenditure, and interest rate are the statistically significant determinants of inflation. Samimi and Jamshidbaygi (2011) strongly confirm a positive relationship between budget deficits and inflation in Iran. Lozano (2008) finds that a long-run relationship exists between deficit, money growth, and inflation in Colombia. Habibullah et al. (2011) confirm that a long-run relationship exists between deficits, money growth, and inflation for 13 Asian countries over the period 1950–1999. Ahmed and Suliman (2011) explore the long-run relationship between money supply, real GDP, and price level for the Sudanese economy, using annual data for the period 1960–2005.

The studies of the relationship between fiscal deficit and inflation in Nigeria are inconclusive. For instance, Oladipo and Akinbobola (2011) observe a causality running from fiscal deficit to inflation. Olusoji and Oderinde (2011) show no evidence of causality between fiscal deficit and inflation in Nigeria. Chimobi and Igwe (2010) show the presence of a positive long-term relationship between inflation and money supply. Ezeabasili et al. (2012) find a positive but insignificant long-run relationship between fiscal deficits and inflation. Also, the impulse response and variance decomposition result does not support fiscal deficit as a significant contributor to inflationary trends in Nigeria. Wosowei (2013) reveals a negative but insignificant relationship between fiscal deficit and gross domestic product. On the direction of causality, a bi-directional relationship is reported between fiscal deficit and GDP and also between government tax and unemployment in Nigeria (see inter alia, Danlami et al. 2019; Tule et al. 2020). Danlami et al. (2019) reveal that fiscal deficit is inflationary in both the short run and the long run. Tule et al. (2020) indicate that while an expansionary monetary policy may have contemporaneous positive effects on the economy, expansionary fiscal policy does not automatically translate to growth. Fiscal expansion aggravates price level.

The implications of studies from other parts of the world, and especially as expressed by Kwon et al. (2009) for the Nigerian context, are therefore inherent in Nigeria's profile of burgeoning domestic and foreign debt, increasing price level, and inadequate financial infrastructure to finance growing expenditure.

3. DATA AND METHODOLOGY

3.1 Data

This study uses yearly data from 1980 to 2016 for the Consumer Price Index (CPI) used to measure inflation rate, Fiscal Deficit (FD) measured as a ratio of gross domestic product, Real Exchange Rate (EXR), Lending Interest Rate (LR), and Money Supply (MS). The data is sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and the World Development Indicator (WDI) database.

This study further includes exchange rate and lending interest rate for better specification of the model. Exchange rate is measured in Naira (₦) per US dollar, meaning that an increase in the exchange rate refers to depreciation in the Naira, while a decrease means appreciation of the Naira. On the other hand, the lending interest rate is usually measured in percentage (%) and an increase (decrease) in this percentage denotes an increase (decrease) in the interest rate. The growth rate of M2 is taken as a measure of growth of the money supply, defined according to the following: "money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government" (CBN, 2017).

Table 1 highlights some of the statistical properties of the selected variables for this study over the period 1980–2016. The description in Table 1 reveals that the average percentage of inflation, fiscal deficit, lending interest rate, real exchange rate, and money supply between the years 1980 and 2016 was approximately 2.57%, –2.87%, 17.53%, 154.8%, and 48.59%, respectively. Over the period the values of CPI, FD, LR, EXR, and MS range between –0.895% and 5.21%, –6.73% and 0.79%, 8.43% and 31.65%, 33.06% and 546.04%, and 13.23% and 43.27%, respectively.

Table 1: Descriptive Statistics of Variables

	CPI	**FD**	**LR**	**EXR**	**MS**
Mean	2.574	–2.871	17.526	154.803	24.224
Maximum	5.214	0.794	31.650	546.038	43.266
Minimum	–0.894	–6.730	8.431	33.061	13.230
Skewness	–0.406	–0.306	0.149	1.607	0.812
Kurtosis	1.664	2.110	3.327	4.733	3.473
Jarque-Bera (probability)	3.764 (0.152)	1.799 (0.406)	0.304 (0.858)	20.568 (0.000)	4.412 (0.110)
Observations	37	37	37	37	37

Also, regarding the skewness statistics whose threshold value for symmetry (or normal distribution) is zero, none of the variables are exactly zero, although some are close to zero. While the skewness statistics of –0.41 and –0.31 for inflation rate and fiscal deficit show that both variables are negatively skewed (since they are less than zero), denoting that more of the inflation rate and fiscal deficit values fall on the left-hand side of the mean, lending rate, exchange rate, and money supply are positively skewed since their skewness statistics are greater than zero.

Furthermore, the kurtosis value, whose threshold is three, indicates that all variables are leptokurtic (highly peaked), with the exception of inflation rate and fiscal deficit, which are platykurtic (low-peaked). However, neither skewness nor kurtosis can singularly confirm the normality of a series. Hence, the Jarque-Bera statistics provide more comprehensive information because they combine skewness and kurtosis properties . Since the Jarque-Bera probability values for the variables (with the exception of EXR) are less than 5% the hypothesis of normal distribution cannot be rejected and the series can be regarded as having a normal distribution. However, since the Jarque-Bera probability value for EXR is less than 5% the hypothesis of normal distribution is rejected for EXR. Thus, EXR is not normally distributed. The behaviour of the predictors in relation to fiscal deficit are presented in Figures 1 and 2.

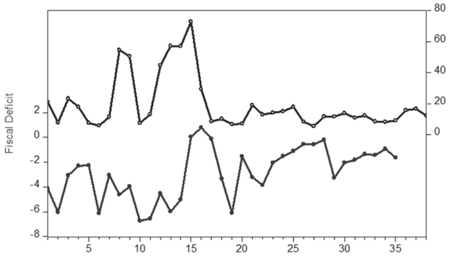
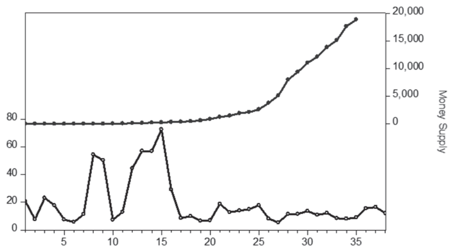


Figure 1: Nigeria's Fiscal Deficit and Inflation rate



Fgure 2: Nigeria's Money supply and Inflation rate

Figure 1 shows the trend and pattern of the relationship between inflation rate and fiscal deficit. It shows evidence of a positive relationship between fiscal deficit and inflation rate in Nigeria. Figure 2 shows the relationship between money supply and inflation rate.

3.2 Methodology

Following the literature, we present an econometric model that essentially is informed by standard economic theory as evinced in the Keynesian approach. The inflation–fiscal deficit function adopted in this model is:

$$logCPI_t = \alpha_0 + \alpha_1\left(\frac{FD}{GDP}\right) + \alpha_2 logLR_t + \alpha_3 logEXR_t + \alpha_4 logMS_t + U_t \quad (1)$$

$$\alpha_1 > 0, \alpha_2 \langle 0, \alpha_3 \rangle 0, \alpha_4 > 0$$

To empirically analyse the relationship between fiscal deficit and inflation, the ARDL model specification – popularly known as the bounds test – is used to show both the short- and long-run relationships. This method is adopted for this study for three reasons. First, compared to other multivariate cointegration methods, the bounds test is a simple technique because it allows the cointegration relationship to be estimated by OLS once the lag order of the model is identified. Second, adopting the bound testing approach means that a pre-test such as a unit root test is not required; i.e., the regressors can either be I(0), purely I(1), or mutually cointegrated. However, while the bounds test for cointegration does not depend on pre-testing the order of integration, to satisfy curiosity and quell the anxiety of getting a spurious result from the regression that is obtainable from regressing non-stationary series, and also to scrutinize the integrating level of the variables which is to ensure that the variables are not of order I(2), we decided to conduct the unit root tests. Following the study by Ouattara (2004), the computed F-statistics provided by Pesaran et al. (2001) are not valid in the presence of I(2) variables because the bounds test is based on the assumption that the variables are I(0) or I(1). Therefore, the implementation of unit root tests in the ARDL procedure might still be necessary in order to ensure that none of the variables are integrated of order 2 or beyond, but fall within the computed F-statistic range provided by Pesaran et al. (2001). Third, the long-run and short-run parameters of the models can be simultaneously estimated. The ARDL framework of Equation (1) is as follows:

$$\Delta lcpi_t = \beta_0 + \sum_{i=1}^{p} \psi_i \Delta lcpi_{t-i} + \sum_{i=0}^{p} \phi_i \Delta fd_{t-i} + \sum_{i=0}^{p} \nu_i \Delta lr_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta lexr_{t-i}$$
$$+ \sum_{i=1}^{p} \delta_i \Delta lms_{t-i} + \theta_1 lcpi_{t-1} + \theta_2 fd_{t-1} + \theta_3 lr_{t-1} + \theta_4 lexr_{t-1} + \theta_5 lms_{t-1} + u_t \qquad (2)$$

where β_0 is the drift component and U_t white noise. Furthermore, the terms with summation signs represented the error correction dynamics, while the second part of the equation with θ_i corresponds to the long-run relationship. This is an error correction representation, so the following error correction model is estimated in the third step**.**

$$\Delta lcpi_t = \beta_0 + \sum_{i=1}^{p} \psi_i \Delta lcpi_{t-i} + \sum_{i=0}^{p} \phi_i \Delta fd_{t-i} + \sum_{i=0}^{p} \nu_i \Delta lr_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta lexr_{t-i}$$
$$+ \sum_{i=0}^{p} \delta_i \Delta lms_{t-i} + \alpha ecm_{t-1} + u_t \qquad (3)$$

The error correction model result designates the speed of adjustment back to long-run equilibrium after a short-run shock**.** We extend the model in Equations (2) and (3) to include endogenous structural breaks. Neglecting structural breaks when they actually exist can bias the study findings (see Fasanya et al., 2018, 2019). In the case of modelling inflation, structural breaks have been observed as crucial in improving the inflationary behaviour of Nigeria (Fasanya and Adekoya, 2017). Hence, the model is then specified as below:

$$\Delta lcpi_t = \beta_0 + \sum_{i=1}^{p} \psi_i \Delta lcpi_{t-i} + \sum_{i=0}^{p} \phi_i \Delta fd_{t-i} + \sum_{i=0}^{p} \nu_i \Delta lr_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta lexr_{t-i}$$
$$+ \sum_{i=0}^{p} \delta_i \Delta lms_{t-i} + \theta_1 lcpi_{t-1} + \theta_2 fd_{t-1} + \theta_3 lr_{t-1} + \theta_4 lexr_{t-1} + \theta_5 lms_{t-1} + \sum_{r=1}^{s} D_r B_{rt} + u_t \quad (4)$$

As shown in Equation (4), the breaks are captured with the inclusion of $\sum_{r=1}^{s} D_r B_{rt}$ where B_{rt} is a dummy variable for each of the breaks defined as B_{rt} =1 for t> T_B and B_{rt} =0 otherwise. The time period is represented by t; T_B are the structural break dates where r =1, 2, 3,……., k, and D_r is the coefficient of the break dummy. All the other parameters have been previously defined. The Bai-Perron (2003) test is used to determine breaks endogenously. This test is relevant when dealing with models with probable multiple structural changes over time. Apart from its computational simplicity, the test allows for up to five breaks in the regression model and is therefore considered a more general framework for detecting multiple structural changes in linear models. We also test for the existence of a long-run relationship in the presence of structural breaks using the ARDL test. In essence, we are also able to determine long-run and short-run estimates for the fiscal deficit–inflation nexus in the presence of structural breaks. In addition, the results obtained are compared with those from Equation (5) to see if accounting for breaks in the regression is necessary. Subsequently, the Wald test is used to test for the joint significance of structural breaks in Equation (4). That is, we test $\sum_{r=1}^{s} D_r = 0$ against $\sum_{r=1}^{s} D_r \neq 0$. The rejection of the null hypothesis implies that the breaks are important and should be included in the model, suggesting the adoption of Equation 4, while the non-rejection implies that structural breaks do not matter in this case.

4. RESULTS AND DISCUSSIONS

This section presents the unit root tests to test the level of integration of the variables under consideration, and the estimation result of the ARDL with and without structural breaks.

Table 2: Unit Root Results

	Unit root without structural breaks						Unit root with structural breaks			
	ADF			PP			Vogelsang-Perron SB test			
Variable	Level	First Diff.	I(d)	Level	First Diff.	I(d)	Break Date	Coeff.	T-stat.	I(d)
CPI	-1.81^{b}	-3.36^{a**}	I(1)	-1.12^{b}	-3.20^{a**}	I(1)	1994	13.25^{b***}	−7.139	I(0)
FD	-5.26^{b***}	-------	I(0)	−5.42b***	-------	I(0)	1994	-5.84^{b***}	−9.002	I(0)
LR	-1.12^{b}	-6.43^{a***}	I(1)	-1.27^{b}	-6.45^{a**}	I(1)	1994	-6.51^{a***}	−11.056	I(0)
EXR	-1.70^{b}	-5.42^{a***}	I(1)	-1.95^{b}	-5.42^{a**}	I(1)	2016	-4.42^{b**}	−4.169	I(1)
MS	-3.35^{b*}	-------	I(0)	-2.20^{b}	-5.45^{a***}	I(1)	2006	-4.93^{b***}	−6.290	I(0)

Note: ^{a} indicates constant without deterministic trend; ^{b} is the model with constant and deterministic trend as exogenous lags are selected based on Schwarz info criteria. *, **, *** imply that the series is stationary at 10%, 5%, and 1% respectively. ADF and PP denote Augmented Dickey-Fuller and Phillip-Perron Unit Root tests. The ADF test with structural breaks is determined using the Vogelsang (1993) asymptotic one-sided p-values. Critical values are from Vogelsang (1993), which are −4.04 and −4.44 for 5% and 1% levels of significance respectively.

All three specifications – with intercept and trend, with intercept only, and with none – outlined in ADF and PP are assessed to ensure a robust conclusion in Table 2. The ADF test result shows that fiscal deficit and money supply are stationary at their level form. However, inflation rate, lending rate, and exchange rate are rendered stationary at their first difference. This result is consistent with the PP test result, with the exception of money supply as it is rendered stationary at its first difference rather than in its level form, as reported in the ADF test result.

Regarding the structural break test, Bai and Perron (2003) advocate the determination of multiple breaks among series, rather than the conventional way of determining breaks individually among variables that post a challenge while estimating the variables or while trying to neutralize the effect of the breaks during estimation. The tests identified several breaks in the linear combination of the variables used in this study. Table 3 shows selected dates from breakpoint least square results for four models: Model 5 is not presented in the table as no break dates are identified. The result shows the several breaks identified by the tests. Hence, with the existence of significant breaks in the models, the study compares each model with and without a structural break to investigate the consequence of the inclusion or exclusion of a break in the signs, magnitude, and significance of the model's explanatory variables.

Table 3: Bai-Perron Multiple Structural Breaks

Model	Breaks	Range	Signs
Inflation rate and fiscal deficit (1) *lcpi= f(fd)*	1988 1994 2004	1980 – 1987 1988 – 1993 1994 – 2003 2004 – 2016	+ – – –
Inflation rate, fiscal deficit, and real exchange rate (2) *lcpi=f(fd, exr)*	1987 1993 1999 2009	1980 – 1986 1987 – 1992 1993 – 1998 1999 – 2008 2009– 2016	– – + + +
Inflation rate, fiscal deficit, and lending interest rate (3) *lcpi= f(fd, lr)*	1993 2000	1980 – 1992 1993 – 1999 2000 – 2016	+ – –
Inflation rate, fiscal deficit, and money supply (4) *lcpi=f(fd, ms)*	1990 1998 2008	1980 – 1989 1990 – 1997 1998 – 2007 2008 – 2016	+ + + –

Note: ****, **, and * imply significance at 1%, 5% and 10% respectively*

The unit root test conducted above indicates that some of the variables are stationary I(0) while some variables are not stationary I(1). Thus, it is necessary to check whether similar trend properties exist between or among the series.. Hence, the Autoregressive Distributed Lag (ARDL) bounds test is employed, which allows for the combination of stationary and non-stationary series.

Table 4: ARDL Bounds Co-Integration Test Results (Without Breaks)

Model	F-statistic	Significance level	Critical Value I(0)	Bound I(1)
lcpi= f(fd)	4.708	10%	5.59	6.26
		5%	6.56	7.3
		1%	8.74	9.63
lcpi=f(fd, exr) lcpi= f(fd, lr) lcpi=f(fd, ms)	4.891	10%	4.19	5.06
	4.388	5%	4.87	5.85
	3.701	1%	6.34	7.52
lcpi= f(fd, exr, lr, ms)	4.717**	10%	3.03	4.06
		5%	3.47	4.57
		1%	4.4	5.72

Note: ****, ** and * imply significance at 1%, 5% and 10% respectively*

Table 5: ARDL Bounds Co-Integration Test Results (With Breaks)

Model	F-statistic	Significance level	Critical Value I(0)	Bound I(1)
lcpi= f(fd)	19.078***	10%	3.03	4.06
		5%	3.47	4.57
		1%	4.4	5.72
lcpi=f(fd, exr)	26.284***	10%	2.53	3.59
		5%	2.87	4
		1%	3.6	4.9
lcpi= f(fd, lr)	4.918**	10%	3.03	4.06
		5%	3.47	4.57
		1%	4.4	5.72
lcpi= f(fd, ms)	5.604***	10%	2.75	3.79
		5%	3.12	4.25
		1%	3.93	5.23
lcpi= f(fd, exr, lr, ms)	----------	----------	----------	----------
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Note: ****, ** and * imply significance at 1%, 5% and 10% respectively*

Table 6: Long-Run Model Estimation Results (Without Breaks)

Explanatory Variable	Model 1	Model 2	Model 3	Model 4	Model 5
FD	−1.508(−0.529)	0.098(0.78)	0.124(1.89)*	−0.751(−0.86)	0.016(0.299)
EXR	-------	−1.288(−1.82)*	-------	-------	0.54(1.83)*
LR	-------	-------	2.284(3.954)***	-------	2.55(4.599)***
MS	-------	-------	-------	−1.81(0.65)	0.469(1.467)
Constant	−3.29(−0.58)	7.58(1.59)*	4.76(−4.23)***	3.92(0.648)	−11.19(−3.28)***
@Trend	--------	0.119(2.735)***	0.117(5.816)***	0.211(3.54)***	0.158(13.9)***

Note: ****, ** and * imply significance at 1%, 5% and 10% respectively. T-statistics are presented in parenthess and probability values are presented in brackets.*

Table 7: Short-Run Model Estimation Results (Without Breaks)

Explanatory Variable	Model 1	Model 2	Model 3	Model 4	Model 5
D(CPI)(−1))	0.475(3.31)***	0.698(4.27)***	0.488(2.96)***	0.469(3.01)***	0.548(2.91)***
D(CPI)(−2))	-------	−0.488(−2.68)***	−0.426(−2.53)***	-------	-------
D(CPI)(−3))	-------	0.385(2.477)**	-------	-------	-------
D(FD)	0.004(0.434)	0.0083(0.784)	0.021(1.737)*	0.002(0.207)	0.004(0.293)
D(FD)(−1))	0.026(2.397)**	-------	-------	0.038(3.299)***	-------
D(EXR)	-------	0.012(0.254)	-------	-------	0.045(0.963)
D(EXR)(−1))	-------	-------		-------	0.036(0.505)
D(EXR)(−2))	-------	--------		-------	−0.196(−3.283)***
D(LR)	-------	-------	0.01(0.077)	-------	0.049(0.292)
D(LR)(−1))	-------	-------	−0.246(2.022)**	-------	−0.329(−2.158)***
D(LR)(−2))	-------	-------	-------	-------	−0.161(−0.979)
D(LR)(−3))	-------	-------	-------	-------	−0.028(−1.806)*
D(MS)	-------	-------	-------	−0.140(−1.227)	−0.028(−0.308)
D(MS)(−1))	-------	-------	-------	0.246(2.306)**	-------
@trend	--------	--------	--------	---------	---------
ECT(−1)	−0.025(−0.58)	−0.085(−2.017)*	−0.165(−3.35)***	−0.05(−1.01)	−0.265(−3.737)***
F-stat.	2295.12***	1753.98***	1963.8***	1698.1***	1227.48***
Adj. R^2	0.928	0.928	0.928	0.928	0.898
DW	1.759	1.907	1.752	1.716	2.169
Diagnostics tests					
J-B test	1.667[0.435]	5.039[0.080]	4.14[0.126]	1.666[0.435]	6.057[0.053]
ARCH-LM test:	0.007[0.934]	0.473[0.497]	0.394[0.535]	0.221[0.641]	0.299[0.589]
B-G LM test:	2.66[0.089]	0.077[0.926]	0.646[0.533]	1.204[0.318]	5.023[0.021]
RESET test	6.70[0.015]	7.57[0.011]	0.294[0.593]	5.299[0.030]	1.545[0.232]
CUSUM	stable	stable	stable	stable	stable
CUSUMSQ	stable	stable	stable	stable	stable

Note: ****, ** and * imply significance at 1%, 5% and 10% respectively. T-statistics are presented in parentheses and probability values are presented in brackets.*

Tables 4 and 5 show the co-integration test results for all five models with and without breaks. For the models without breaks, the statistical values of Models 1, 3, and 4 are lower than the I(0) critical value at the 5% chosen level of significance, signifying no long-run relationship. While the Model 2 result was found to be inconclusive, evidence of a long-run relationship was found in Model 5. However, with the inclusion of structural breaks, as specified in the Bai-Perron break test result in Table 3, the conclusion was completely reversed, as there was presence of a long-run relationship among the variables considered in the models. Following this result, the study examines both the short-run dynamics and the long-run relationship for all five models.

Tables 6 and 7 present the long-run and short-run estimation results between inflation rate and the other explanatory variables. In the long run, the result shows that the coefficient of fiscal deficits exerts a positive relationship in all regressions except for Models 1 and 4. However, in Model 3, fiscal deficits are seen to be significantly positive. Specifically, the coefficient 0.124 implies that a 1% increase in fiscal deficit may increase inflation by 0.12%. The positive relationship between fiscal deficit and inflation follows the proposition of the fiscal theory of price level, which attributes inflation as a fiscal phenomenon (Woodford, 1995; Cochrane, 2001; Sims, 2011). Our result that the fiscal deficit affects inflation positively in Nigeria is also corroborated in earlier results by Oladipo and Akinbobola (2011), who finds positive and significant results. The result also shows that the real exchange rate is significantly positive in influencing the rate of inflation. A unit change in the percentage of the exchange rate results in only a 1.29% total variation in the rate of inflation in Model 2 and a 0.54% total variation in the rate of inflation in Model 5. With the increase in the exchange rate, inflation increases moderately.

In the short run, the result shows that inflation has a significantly positive relationship with past fluctuations. The significance of lagged inflation indicates that the inflationary process in Nigeria has been influenced by its past behaviour. Lagged inflation explains stickiness in prices, with periods of high inflation tending to persist and, conversely, periods of low inflation also persisting. The error correction coefficient also shows that there is 26.5% speed of adjustment from short-run to long-run equilibrium.

The adjusted R-squared indicates that 92.8% of variation in the inflation rate is explained by fiscal deficit, real exchange rate, lending interest rate, and money supply. The F-stat also indicates that each of the estimated models is statistically significant, implying that at least one of the explanatory variables in each case is statistically significant. The Durbin-Watson statistic reported in each case also reveals that the models do not suffer from autocorrelation.

Table 8: Long-Run Model Estimation Results (With Breaks)

Explanatory Variable	Model 1	Model 2	Model 3	Model 4
FD	0.001(2.01)***	0.058(0.01)	0.11(2.05)***	0.46(1.952)**
EXR	-------	–0.53(0.107)	-------	-------
LR	-------	-------	1.376(0.359)	-------
MS	-------	-------	-------	– 1.344(1.906)**
D_{1987}	-------	0.078(1.881)*	-------	-------
D_{1988}	1.103(0.169)	-------	-------	-------
D_{1990}	-------	-------	-------	2.256(0.528)
D_{1993}	-------	1.85(0.101)	0.968(1.824)*	-------
D_{1994}	1.01(0.165)	-------	-------	-------
D_{1998}	-------	-------	-------	2.63(0.52)
D_{1999}	-------	–0.699(0.149)	-------	-------
D_{2000}	-------	-------	–0.425(0.196)	-------
D_{2004}	0.06(4.051)***	-------	-------	-------
D_{2008}	-------	-------	-------	1.646(0.439)
D_{2009}	-------	0.159(0.06)	-------	-------
Constant	–0.81(0.066)	2.99(0.696)	–3.18(0.526)	6.03(1.694)**

Note: ****, ** and * imply significance at 1%, 5% and 10% respectively. T-statistics are presented in parenthesesand probability values are presented in brackets.*

Table 9: Short-Run Model Estimation Results (With Breaks)

Explanatory Variable	Model 1	Model 2	Model 3	Model 4
D(CPI(−1))	0.688(3.98)***	0.004(0.07)	0.13(0.96)	−1.08(−2.32)*
D(CPI(−2))	-------	−0.423(−9.57)***	−0.57(−3.81)***	−1.07(−1.59)
D(CPI(−3))	-------	-------	-------	−0.40(−0.98)
D(FD)	0.000(0.09)	0.026(6.31)***	0.03(3.18)***	0.009(0.54)
D(FD(−1))	-------	-------	-------	0.13(4.67)**
D(FD(−2))	-------	-------	-------	0.08(1.99)**
D(FD(−3))	-------	-------	-------	0.08(2.30)**
D(EXR)	-------	−0.064(−4.07)***	-------	-------
D(LR)	-------	-------	0.104(0.87)	-------
D(MS)	-------	-------	-------	0.13(0.617)
D(MS(−1))	-------	-------	-------	0.17(1.30)
D(MS(−2))	-------	-------	-------	−0.42(−2.31)*
D(D_{1987})	-------	−0.25(−7.958)***	-------	-------
D(D_{1987}(−1))	-------	−0.114(−3.06)***	-------	-------
D(D_{1988})	0.33(9.129)***	-------	-------	-------
D(D_{1988}(−1))	0.144(1.92)*	-------	-------	-------
D(D_{1988}(−2))	−0.26(−3.81)***	-------	-------	-------
D(D_{1988}(−3))	−0.25(−5.61)***	-------	-------	-------
D(D_{1990})	-------	-------	-------	−0.29(−1.31)
D(D_{1990}(−1))	-------	-------	-------	0.60(1.88)
D(D_{1990}(−2))	-------	-------	-------	0.16(1.13)
D(D_{1990}(−3))	-------	-------	-------	0.199(1.59)
D(D_{1993})	-------	0.248(6.554)***	0.12(1.50)	-------
D(D_{1993}(−1))	-------	−0.284(−6.67)***	−0.29(−2.35)**	-------
D(D_{1993}(−2))	-------	-------	0.237(2.28)**	-------
D(D_{1994})	0.17(2.17)**	-------	-------	-------
D(D_{1994}(−1))	0.103(1.205)	-------	-------	-------
D(D_{1994}(−2))	−0.11(−1.32)	-------	-------	-------
D(D_{1994}(−3))	−0.104(−2.44)**	-------	-------	-------
D(D_{1998})	-------	-------	-------	0.17(1.72)
D(D_{1998}(−1))	-------	-------	-------	0.84(3.32)**

$D(D_{1998}(-2))$	-------	-------	-------	0.70(2.51)*
$D(D_{1998}(-3))$	-------	-------	-------	0.25(1.65)
$D(D_{1999})$	-------	–0.098(–3.06)***	-------	-------
$D(D_{1999}(-1))$	-------	–0.143(–6.06)***	-------	-------
$D(D_{2000})$	-------	-------	–0.16(–3.00)***	-------
$D(D_{2004})$	0.04(1.095)	-------	-------	-------
$D(D_{2008})$	-------	-------	-------	–0.24(–1.47)
$D(D_{2008}(-1))$	-------	-------	-------	0.19(2.19)
$D(D_{2008}(-2))$	-------	-------	-------	0.14(0.7)
$D(D_{2008}(-3))$	-------	-------	-------	0.408(3.03)*
$D(D_{2009})$	------	0.07(3.12)***	-------	-------
@trend	0.061(3.05)***	0.04(7.896)***	0.047(2.97)***	0.07(2.25)*
ECT(–1)	–0.57(–3.03)***	–0.44(–10.04)***	–0.38(–2.94)***	0.70(2.44)*
F-Stat	7133.9***	21417.7***	2767.6***	2755.8***
Adj. R^2	0.912	0.913	0.929	0.899
DW	1.799	2.108	1.915	2.65
J-B test	1.054[0.591]	11.491[0.003]	0.935[0.627]	25.83[0.000]
ARCH-LM test:	1.758[0.195]	0.143[0.708]	0.943[0.339]	3.756[0.062]
B-G LM test:	1.471[0.416]	0.463[0.639]	0.532[0.597]	3.134[0.371]
RESET test	2.951(0.264)	2.31[0.149]	0.000[0.987]	1.026[0.418]
CUSUM	stable	stable	stable	stable
CUSUMSQ	stable	stable	stable	stable

Note: ****, ** and * imply significance at 1%, 5% and 10% respectively. T-statistics are presented in parentheses and probability values are presented in brackets.*

Table 8 reveals that the coefficient of fiscal deficit is positive in all regressions, but the level of significance and magnitude of the coefficient differs in the models. Real exchange rate and lending interest rate are significantly positive in Model 2 and Model 4 respectively. Extensively, the long-run result shows that exchange rate and lending interest rate are positively and negatively related to inflation rate. The results also provide evidence of a positive long-run relationship between money supply and inflation in the Nigerian economy over the study period.

In the short run (see Table 9), the significance of lagged inflation indicates that the Nigerian inflationary process has been influenced by its past behaviour. The results also show that the coefficient of fiscal deficits exerts a positive influence in all the estimated models. Specifically, fiscal deficit is statistically significant in Model 2 and Model 3, and in Model 4 lagged by one year when money supply is incorporated into the model. The adjusted R-squared indicates that around 93% of variation in the inflation rate is explained by fiscal deficit, real exchange rate, lending interest rate, and money supply. The F-stat also indicates that each of the estimated models is statistically significant, implying that at least one of the explanatory variables in each case is statistically significant. The Durbin-Watson statistics reported in each case also reveal that only Model 3 suffers from autocorrelation.

5. CONCLUSION AND POLICY IMPLICATIONS

This study assesses fiscal deficits and inflation in Nigeria, using yearly data for the period 1980–2016. The unit root test reveals that the series are integrated of order 1 and 0, and as a result a dynamic model that incorporates fractionally integrated series is employed. Specifically, five models are estimated using the Autoregressive Distributed Lag Model. Furthermore, given the importance of structural breaks in the behaviour of these series over time, a multiple structural break test is adopted, such as that suggested by Bai-Perron (2003). Thus, both the ARDL with structural breaks and without structural breaks are estimated. The results show that fiscal deficit, exchange rate, lending rate, and money supply affect the inflation rate in both the short run and the long run, both with and without structural breaks. Specifically, in the short run, expected inflation positively affects current inflation. The significance of inflation expectation indicates that the inflationary process is influenced by its past behaviour. Expected inflation explains stickiness in prices, with periods of high inflation tending to persist and, conversely, periods of low inflation also persisting. The long-run estimates show that fiscal deficits have a positive impact on inflation along with other variables, taking into account only Model 3. However, when structural breaks are considered, the coefficient of fiscal deficit becomes positive in all regressions where only Models 2, 3, and 4 are significantly positive. All other variables also have a significant influence on the inflation rate, taking into account the various models.

Given the above findings, it is imperative that Nigeria provides an enabling environment for industries and firms to thrive, as this will help check the extensive homemade inflation; the regulatory authorities should also pursue a contractionary monetary policy to check money-induced inflation, and the price regulatory bodies should be fully equipped to function effectively, in order to address the impact of expected inflation. To bring about a realistic fiscal surplus, the fiscal operations of the Nigerian government should be very transparent. When a fiscal surplus is recorded it should be channelled to productive investments like road construction and electricity provision, which would incentivize productivity by attracting foreign direct investment and reduce inflation. In addition, regarding the fiscal deficit–inflation nexus, the prime concern of policymakers should not necessarily be the level of fiscal deficits but the channels through which the deficits are financed, and the ability of the productive economic base to absorb the impact of such financing. A fiscal management process that does not encourage increased revenue and reduce fiscal deficits in Nigeria will further worsen the level of inflation in the country.

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