Does the mode of financing the budget deficit matter for inflation in Nigeria?

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Purpose

The motivation for this study is to determine whether inflation in Nigeria is driven by the Central Bank's direct advances and Treasury bills/bonds as modes of financing the budget deficit. Hence, it examines whether the method of deficit financing significantly impacts inflation in Nigeria.

Design/methodology/approach

Based on the nature of the study and the availability of data in Nigeria, this study employs the ARDL bound test estimation technique to analyse annual time-series data from 1981 to 2021.

Findings

The ARDL bounds test approach to co-integration revealed a long-run co-integrating relationship between Central Bank advances, Treasury bills/bonds, and inflation in Nigeria. Furthermore, the ARDL results provide evidence of a negative and significant relationship between bonds and inflation in both the short and long run. In contrast, Central Bank advances exhibit a statistically significant direct effect on inflation in the short run and an indirect effect in the long run.

Research limitations/implications

The study focuses solely on Nigeria, limiting the applicability of the findings to other nations with differing economic structures or fiscal policies. Secondly, while the ARDL bounds testing approach is appropriate for the research context, it may not capture complex nonlinear relationships or structural breaks within the dataset. Lastly, the exclusion of additional potential determinants of inflation, such as external shocks, geopolitical factors, or exchange rate dynamics, could restrict the comprehensiveness of the analysis.

Practical implications

This study provides empirical evidence supporting the view that, to achieve lower inflation in Nigeria, policymakers should prioritize using bonds to finance the deficit budget, as they have been shown to have a short-and long-term deflationary effect on the economy.

Originality/value

The novelty of this study lies in categorizing deficit budget financing (Central Bank advances and Treasury bills) and identifying which has the greatest impact on inflation in Nigeria.

Keywords: ARDL, Bonds, Central Bank advances, Inflation

Keywords: C5, G12, E5, E31

1. Introduction

Deficit financing is not only a phenomenon among developing countries but also within developed nations. Accordingly, fiscal deficits have long been a central theme in fiscal policy discussions across nations (Amgain and Dhakal, 2017). Deficit financing often arises due to fiscal pressure, where government expenditure surpasses revenue, either as a result of an expansionary fiscal policy aimed at achieving certain financial goals or due to the ineffectiveness/inefficiency of the government in collecting sufficient revenue. Governments often finance their budget deficits using instruments such as central bank direct advances, treasury bills/bonds, external and domestic borrowing, and development assistance.

Since 1999, successive governments in Nigeria have implemented various development policies and programs aimed at boosting productivity and fostering a sustainable environment for both local and foreign investment, with the goal of promoting economic growth. It is expected that such growth will create greater employment opportunities and improve citizens' living standards. However, the lack of infrastructure and capital resources, combined with the volatility of revenue sources due to the economy's mono-cultural nature, has hindered the achievement of these goals. As a result, the government has often resorted to deficit financing to provide the necessary infrastructure and capital resources for growth and development (Anyanwu, 1997; Okoye *et al.*, 2019; Olaniyi, 2020).

At various points, Nigeria has issued treasury bonds and relied on direct credit facilities from the central bank to finance its budget deficits. In 2000, ₦430.61 billion worth of treasury bonds were issued to the public. The figure decreased to ₦424.94 billion, ₦419.27 billion, and ₦413.60 billion in 2004, 2005, and 2006, respectively. By 2010, treasury bonds issued to the public amounted to ₦353.73 billion. However, further increases were recorded in 2012, with treasury bonds reaching ₦398.27 billion. In 2015, this figure dropped to ₦255.99 billion. A subsequent review shows that the federal government's deficit financing through treasury bonds fell from ₦255.99 billion in 2015 to ₦215.99 billion in 2016, ₦175.99 billion in 2017, ₦150.99 billion in 2018, ₦125.99 billion in 2019, and ₦100.99 billion in 2020, respectively (Debt Management Office {DMO}, 2006; CBN, 2012).

The central bank credit to the federal government rose from ₦498.92 billion in 2000 to ₦613.79 billion in 2003. However, there were successive declines from ₦403.46 billion in 2004 to ₦343.14 billion in 2010 and ₦180.21 billion in 2014. In 2015, there was a remarkable surge in central bank credit to the federal government, totaling ₦877.30 billion. Since then, central bank advances have continued to rise, reaching ₦1,688.20 billion in 2016, ₦1,703.80 billion in 2017, ₦2,032.28 billion in 2018, ₦1,899.45 billion in 2019, and ₦2,564.71 billion in 2020 (CBN, 2011; DMO, 2006 ; CBN, 2012).

Inflation in Nigeria has largely ranged between 8% and 24% over the last 2 decades. The rate increased from 14.50% in 2000 to 16.50% in 2001. In 2002, the inflation rate decreased to 12.20%, then rose again to 23.80% in 2003. From 2005 to 2014, inflation remained relatively low: 11.60% in 2005, 10.80% in 2010, 8% in 2014, and 9.60% in 2015 (World Bank, 2016). However, by 2016, Nigeria's inflation rate reached 18.60%. It then declined to 15.40% in 2017 and 11.40% in 2018, but rose to 15.75% by 2020 (CBN, 2020). Generally, Nigeria's inflation rate has remained in the double digits in recent years.

Ideally, fiscal spending is aimed at promoting growth and development in areas such as capital investment, human development, poverty reduction, and social programs. However, the method of financing significantly affects the overall economic health. Okolo *et al.* (2014) and Emefiele *et al.* (2019) argued that borrowing from the central bank to finance a deficit budget often leads to macroeconomic imbalances that adversely affect output growth. Sims (2016) contended that persistent government borrowing to finance fiscal deficits generates inflationary pressures. This, in turn, crowds out domestic savings needed for private investment, generates pressure on aggregate demand, and may lead to inflation (Folonrunsho and Abiola, 2000; Okoro and Oksakei, 2020). In line with this, Trevino and Yates (2010) suggested a positive relationship between treasury bill rates and inflation.

Theoretically, in the classical view, inflation is determined within an economy by changes in the money supply. On the other hand, Keynesian economists emphasize the demand-side effects as the primary factor responsible for changes in the price level. Monetarists, however, argue that changes in the money supply, velocity, and output could drive changes in the price level within the economy (see Dornbusch *et al.*, 1990; Easterly and Schmidt-Hebbel, 1993). Over the years,

developing economies, especially Nigeria, have committed to increasing public infrastructure investment to support development goals, often relying on advances from the central bank and treasury bills.

Despite the persistent use of deficit budget financing in Nigeria to boost infrastructure development and economic growth, the mode of deficit financing—such as treasury bonds and central bank advances—has been linked to inflationary pressures. Excessive reliance on treasury bills can raise interest rates, crowd out private investments, and trigger demand-pull inflation. In contrast, central bank advances directly expand the money supply, fueling higher inflationary pressures by increasing aggregate demand without a corresponding rise in output. This dynamic leads to macroeconomic imbalances and drives up inflation. This issue is particularly concerning in Nigeria, where the volatile mono-cultural economy and inefficient revenue collection exacerbate the country's reliance on deficit financing. Additionally, reports from the International Monetary Fund (IMF) highlight the adverse effects of unsustainable debt and rising inflation in developing countries like Nigeria.

Thus, investigating the distinct effects of deficit financing methods on inflation is crucial. Previous studies have largely focused on the relationship between fiscal deficits or deficit financing and inflation without differentiating the impacts of specific financing instruments. Studies by Auckenthaler *et al.* (2015), Dominguez and Gomis-Porqueras (2019), and Mwamkonko (2022) explored deficit financing in both developed and developing economies but often concentrated on individual instruments rather than conducting a comparative analysis. In Nigeria, Marshall (2020) and Aladejare (2022) examined the deficit financing-inflation nexus but failed to categorise the distinct effects of different financing methods. This leaves a critical gap in understanding how specific instruments influence inflation. This study addresses that gap by providing a more nuanced analysis, offering insights into how each financing method contributes to inflation and informing better-targeted fiscal and monetary policies.

This study contributes to the existing contemporary literature by directly evaluating the specific modes of deficit financing—treasury bonds and central bank advances—and their distinct impacts on inflation in Nigeria. The study employs the ARDL estimation technique, which provides a nuanced understanding of both short-run and long-run dynamics. The ARDL approach is particularly flexible in handling variables of different integration orders, whether I(0) or I(1). This is critical in Nigeria's context, where economic variables such as inflation and fiscal deficits often exhibit mixed stationarity properties, making ARDL ideal for capturing the dynamic and evolving nature of the deficit financing-inflation relationship in Nigeria's volatile economic environment. The findings aim to guide policymakers by clarifying the inflationary implications of different financing modes, enabling them to design more effective fiscal and monetary strategies that balance economic growth with inflation control. Moreover, insights from this study can help reduce macroeconomic imbalances caused by inappropriate deficit financing, fostering a more stable environment for investment and development. By understanding the consequences of various financing methods, the government can prioritize efficient revenue collection mechanisms over inflation-inducing deficit financing. Finally, the estimation results reveal a diminishing and significant association between treasury bills/bonds and inflation in both the short-and long-run, while a short-run direct and long-run indirect relationship was found between central bank advances and inflation.

Following this introduction, section two presents the literature review; the methodology is discussed in section three; section four presents a discussion of results; section five is the conclusion and recommendations.

2. Literature review and theoretical framework

Factors influencing inflation have been studied in several theoretical and empirical research studies. The classical economists' position is explained through the Equation of Exchange and the simple quantity theory of money, which describe how inflation is determined in an economy. In the exchange equation, an identity states that the stock of money (M) multiplied by the velocity (V) equals the price level (p) times real output (Q).

$$MV = PQ \tag{1}$$

The Equation of Exchange, Equation (1), is interpreted as the money supply multiplied by velocity equaling the price level times real GDP. In other words, the money supply multiplied by velocity equals Gross Domestic Product (GDP), and total spending or expenditures equals the total sales revenues of business firms. Fisher (1922) and Marshall (1923)

observed that changes in velocity (V) are so small that they can be assumed to be constant, and that real GDP (Q) is fixed in the short run. By assuming both V and Q are constant, the Equation of Exchange is transformed into the simple quantity theory, where Equation (1) becomes:

$$M\overline{V} = P\overline{Q} \tag{2}$$

Solving for the price level, p yields:

$$P = \frac{M \times \overline{V}}{\overline{Q}} \tag{3}$$

It is clear from Equation (3) that the price level depends on the money supply. Thus, in our analysis of the effect of deficit budget financing on inflation in Nigeria, the money supply is incorporated as a control variable. Studies consistently support the significant effects of central bank advances and bonds on inflation. Regarding the central bank's effect on inflation, Alpanda and Honig (2014) used panel data to analyse central bank independence and inflation in developed and emerging economies. They suggest that central bank independence is not a prerequisite for countries to experience significant declines in inflation. Similarly, Kokoszczyński and Mackiewicz-Łyziak (2020) analysed 24 developed and 27 developing countries using fixed effects, serial autocorrelation in the error term, and generalized method of moments estimators. Their results indicate that central bank independence has a significant and negative impact on inflation in developing economies. Baumann *et al.* (2021) studied 124 economies and found a positive and statistically significant relationship between central bank independence and inflation, suggesting limited support for the hypothesis that an independent central bank reduces inflation. Garriga and Rodriguez (2020) also found that a higher degree of central bank independence is linked with lower inflation rates, a relationship that is particularly significant in democratic economies but also present in non-democratic ones.

Furthermore, the existing empirical literature indicates that bonds significantly influence inflation. Auckenthaler *et al.* (2015) used Ordinary Least Squares and Two-Stage Least Squares estimations to analyse the inflation-bonds relationship in three advanced economies, discovering significant effects of bonds on inflation in Canada, the United States, and the United Kingdom. Yusuf and Prasetyo (2019), using ten-year bond yields from the US and Indonesia, examined the effects of these bond yields, exchange rates, and inflation through the Vector Error Correction Model. Their findings revealed both long- and short-run causality from inflation to the US and Indonesia's bond yields. Granger causality further showed that US inflation and ten-year bond yields influenced Indonesia's bond yields. Similarly, Dominguez and Gomis-Porqueras (2019) found that bonds are long-run determinants of low inflation targets.

In Nigeria, Aladejare (2022) analysed the effect of deficit financing on inflation using 2SLS and GMM estimation techniques, finding that the components of deficit financing negatively impacted inflation. Mwamkonko (2022) investigated deficit financing and price stabilization in Tanzania using cointegration and error correction techniques, concluding that domestic deficit financing increases inflation. Osei and Ogunkola (2022b) explored the asymmetric effects of deficit financing on inflation in Ghana, establishing a nonlinear relationship. Their findings were similar to those obtained using the Markov-Switching Regime Dynamic Model (MSRDM) in another study by Osei and Ogunkola (2022a).

Giannaro and Kolluri (1985) studied the effect of budget deficits on money growth and inflation in ten industrialized countries using a two-equation econometric model, concluding that budget deficits are not direct determinants of money supply or inflation. Likewise, Guess and Koford (1986) used Granger causality to test whether budget deficits cause inflation or recession in 70 OECD countries, finding that budget deficits were not responsible for changes in inflation or recession. Karras (1994), examining 33 countries, reached similar conclusions, stating that budget deficits are not inflationary. In contrast, Nassar (2005) studied the relationship between prices, money, and exchange rates in Madagascar and found that money supply significantly and positively affects inflation.

Oladipo and Akinbobola (2011) investigated the causality between fiscal deficit and inflation in Nigeria, using the Granger-causality test and pairwise correlation test. They found that fiscal deficits cause inflation, particularly through fluctuations in the exchange rate. Habibullah *et al.* (2011) tested the relationship between budget deficits, money supply, and inflation in 13 Asian economies, finding that money supply and budget deficits Granger cause inflation. Similarly,

Samimi and Jamshidbaygi (2011) used panel analysis in Iran and found a robust positive relationship between budget deficit and inflation.

Anayochukwu (2012) examined the relationship between fiscal deficits and inflation in Nigeria from 1970 to 2009 using the Autoregressive Distributed Lag (ARDL) model and Granger-causality tests. His results indicated a significant negative relationship between fiscal deficit and inflation, suggesting that reducing the budget deficit would help control inflation. In contrast, Ezeabasili *et al.* (2012) found no significant relationship between fiscal deficit and inflation in Nigeria using Ordinary Least Squares (OLS) estimation. Khumalo (2013) studied the budget deficit-inflation nexus in South Africa and found a long-run relationship between budget deficits and inflation, where budget deficits positively contributed to inflation.

Nguyen (2015), using Pooled Mean Group (PMG) and General Method of Moments (GMM), found that money supply has an increasing effect on inflation, along with fiscal deficit, government expenditure, and interest rates as significant determinants of inflation in Asian countries. Ishaq and Mohsin (2015) also found that deficits are inflationary in 11 Asian countries, with inflationary pressures being more substantial when financial markets are underdeveloped and dependent on the central bank. Nwaeke and Korgbeelo (2016) studied the effect of budget deficit financing on the Nigerian economy using OLS and found no significant effect on inflation. Similarly, Nwakobi *et al.* (2018) found that fiscal deficits did not significantly affect Nigeria's GDP, money supply, or inflation.

Danlami *et al.* (2019) investigated the dynamic effects of fiscal deficit on inflation in Nigeria using the ARDL model, finding that fiscal deficits positively affect inflation. In contrast, Okoro and Oksakei (2020), using the ARDL model, found that fiscal deficits had an insignificant effect on inflation in Nigeria. Olaniyi (2020), using bootstrap simulations, found no symmetric or asymmetric causality between fiscal deficits and inflation in Nigeria. Similarly, Marshall (2020) used the Granger causality test and error correction mechanism to evaluate the effect of deficit financing on the price level in Nigeria, concluding that deficit financing does not influence inflation.

The most significant studies examining the relationship between deficit budgets, fiscal deficits, and inflation have been extensively covered in the literature. However, studies in Nigeria, such as Aladejare (2022), focused on deficit financing and inflation, while Marshall (2020) examined domestic debt and inflation using the Granger causality test. The Granger causality test only identifies the direction or pattern of correlation; it does not measure the causal effect. It is primarily used as a post-estimation technique to check the robustness of results and the nature of the causal relationship.

In another instance, the ratio of domestic finance to GDP was used as a measure of deficit financing. The current study deviates from previous ones by examining the mode of financing the deficit budget—measured by bonds and central bank advances—and its relationship with inflation in Nigeria, using the ARDL estimation technique. This distinction sets our study apart from earlier research.

3. Methodology

Based on the nature of the study and the availability of data in Nigeria, this study employed secondary data covering 1981 to 2021. The data were sourced from the Central Bank of Nigeria and the World Development Indicators. Specifically, data on Central bank advances, bonds, and broad money supply were sourced from Central Bank Bulletin (2022), and inflation, private debt, and commercial bank credit to the government were sourced from World Development Indicators (2022).The central bank advances and bonds data for 2022 is unavailable at the time of the data collection for this study. A detailed explanation of data sources and theoretical expectations of the variables are provided in Table 1.

Data sources and measurement of variables

Variables	Definition	Measurement	Source
Inflation (*INF*)	It is the persistent and continued rise in the economy's general price of goods and services	Consumer price index (annual %)	World Bank (2022)
Central Bank Advances (*CBNA*)	It is defined as the number of credit facilities the apex bank gives to the government to finance the deficit budget in the form of loans with legal backing provisions governing the amount lent to the government	Annual %	CBN (2022)
Bonds (*BONDS*)	Bonds are debt security issued by borrowers (governments or corporations) to raise money from investors prepared to lend them for a set time	Treasury bonds (annual %)	CBN (2022)
Money Supply (*BRDM*)	Money in circulation within a given period or the stock of cash, coins, and liquid assets in an economy Private debt	Annual %)	CBN (2022)
Private Debt (*PVD*)	It refers to financing provided by non-bank institutions, bonds, or loans not publicly traded and not negotiated directly between the borrower and lender	Annual %	World Bank (2022)
CCB	Commercial bank credit To governments	Annual %	World Bank (2022)

Table Footnotes
Source(s): Authors' computation (2024)

3.1 Model specification and estimation technique

The Autoregressive Distributed Lag model was used in the investigation, and its bounds testing approach by Pesaran *et al.* (2001) was employed to investigate the existence or otherwise of a cointegration relationship between the budget deficit financing variables and inflation. Estimating the ARDL model involved ordinary least squares (OLS) regression, and the coefficients were used to determine the long-run relationships between the variables of interest. Additionally, the error correction model derived from the ARDL model made it possible to examine the short-run dynamics and adjust for deviations from the long-run equilibrium. The ARDL model has gained popularity due to its flexibility and applicability when variables have different orders of integration (Enders, 1995). Our study adapted Akingbade and Nicholas's (2021) model specification, given as follows:

$$INF = f(BUDGETD) \tag{4}$$

Where *INF* is inflation, and $BUDGETD$ is a vector representing proxies for budget deficits.

This study's budget deficit includes Central Bank advances (CBNA), bonds (BONDS), private debt (PVD), and commercial banks' credit to the government . Hence, equation 4 can be rewritten as:

$$INF = f(CBNA, BONDS, PVD, CCB) \quad (5)$$

Nonetheless, from equation 3, the price level, as suggested by the simple quantity of money, is determined by the money supply in the economy. Thus, equation 5 becomes:

$$INF = f(CBNA, BONDS, BRDM, PVD, CCB) \quad (6)$$

where BRDM denotes a Broad money supply.
Table 1 displays the definition, measurement, and source for each variable used in Equation 6.

The ARDL model estimated is specified in Equations (7) and (8), where δ and θ are the coefficients.

$$\Delta INFt = \delta_o + \delta_1 INF_{t-1} + \delta_2 CBNA_{t-1} + \delta_3 BONDS_{t-1} + \delta_4 BRDM_{t-1} + \delta_5 PVD_{t-1} + \delta_6 CCB_{t-1} + \sum_{i=0}^{p} \rho_1 \Delta INF_{t-1} + \sum_{i=0}^{p} \gamma_1 \Delta \quad (7)$$

The coefficient δ denotes the parameters of the variables in question. The subscript $_{t\text{-}1}$ ~~Represents~~represents the operator differential. The coefficients $\psi, \gamma, \varphi, \lambda, \delta$ symbolizse the parameters of each variable

signifies the period of lag. Δ given the first differences, while μ is the error term. *t* represents the time. Equation (7) is the long-run model, and the short-run model considered is given in Equation (8)

$$\Delta INFt = \varphi_o + \varphi_1 INF_{t-1} + \varphi_2 CBNA_{t-1} + \varphi_3 BONDS_{t-1} + \varphi_4 BRDM_{t-1} + \varphi_5 PVD_{t-1} + \varphi_6 BRDM_{t-1} + \sum_{i=0}^{p} \Psi_1 \Delta INF_{t-1} + \sum_{i=} \quad (8)$$

ECM_{t-1} is the short-run speed of adjustment. All the subscripts of the variables are, as earlier explained. However, several pre-estimation and diagnostic tests were done prior to and after the ARDL estimations were done to ensure that the analysis did not generate spurious regression results and that the results interpreted were consistent. These include the ADF and PP unit root tests, the Jarque-Bera test for normality of residuals, the Breusch-Godfrey test for serial correlation, the Breusch-Pagan-Godfrey test for heteroscedasticity, and the CUSUM test for stability.

4. Results and discussion

For the estimations, this paper followed a time series data analysis procedure. However, before examining the time series properties of the data, descriptive statistics and correlation analysis were considered. Table 2 presents the summary statistics for the variables used.

Table 2
The results for descriptive Statistics and Pairwise correlation

	INF	*BONDS*	*CBNA*	*BRDM*	*PVD*	*CCB*
Mean	*19.607*	*257.478*	*540.334*	*16.706*	*9.013*	*2963.387*
Std. dev.	*17.661*	*147.931*	*678.241*	*6.070*	*3.415*	*2979.779*
Min	*0.22*	*11.35*	*4.52*	*9.063*	*4.7*	*57.68*
Max	*76.8*	*430.61*	*2564.71*	*28.625*	*18.6*	*12705.62*
Obs	*41*	*41*	*33*	*41*	*41*	*41*
INF	*1.000*					
BONDS	*-0.413***	*1.000*				
CBNA	*-0.175*	*-0.248**	*1.000*			
BRDM	*-0.170*	*-0.041*	*0.592****	*1.000*		
PVD	*-0.323***	*0.377****	*0.285***	*0.665****	*1.000*	

Std.dev.	17.661	147.931	678.241	6.070	3.415	2,979.779
Min	0.22	11.35	4.52	9.063	4.7	57.68
Max	76.8	430.61	2,564.71	28.625	18.6	12705.62
Obs	41	41	33	41	41	41
INF	1.000					
BONDS	−0.413**	1.000				
CBNA	−0.175	−0.248*	1.000			
BRDM	−0.170	−0.041	0.592***	1.000		
PVD	−0.323**	0.377***	0.285**	0.665***	1.000	
CCB	−0.049	−0.046	0.646***	0.063	−0.164	1.000

Table Footnotes

Note(s): ***, **, and * are the level of significance, representing 1%, 5%, and 10%, respectively

Source(s): Authors' computation using study data (2024)

CCB	*-0.049*	*-0.046*	*0.646****	*0.063*	*-0.164*	*1.000*

Source: Authors' computation using study data (2024). ***, **, and * are the level of significance, representing 1%, 5%, and 10%, respectively.

The first row presents the mean values of the variables. Based on the minimum and maximum values, inflation reached its highest level (76.8) in 1994 and its lowest level (0.20) in 1999. Additionally, bonds recorded their highest value (430.61) between 1999 and 2002 and their lowest value (11.35) in 1989. Central Bank advances peaked at 2,564.71 in 2020 and had their lowest value (4.52) in 1981. Furthermore, the minimum and maximum values indicate that all variables were greater than zero.

The pairwise correlation results reveal a moderate and negative correlation between the regressors and the regressand. A relatively high and positive correlation is observed between Central Bank advances, commercial bank credit to the government, and broad money, whereas the correlation between broad money and private debt is strong and positive.

Next, it was necessary to examine the stationarity properties of the data before estimation. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were employed for this purpose (Dickey and Fuller, 1979, 1981; Phillips, 1987). The null hypothesis in both tests states that a unit root exists. These tests were conducted to ensure the robustness and reliability of the findings. Table 3 presents the results of the Augmented Dickey-Fuller and PhillipsPerron unit root tests.

Table 3
The results of the Unit root test

Variable	ADF			PP		
	Level	First diff.	Remark	Level	First diff.	Remark
INF	1.751	3.488***	I(1)	3.235**	12.455***	I(0)
BONDS	1.304	1.360	NT	1.482	4.697***	I(1)
CBNA	0.919	6.142***	I(1)	1.105	6.155***	I(1)
BRDM	2.258	4.806***	I(1)	2.473	17.325***	I(1)
PVD	1.281	5.785***	I(1)	1.601	7.624***	I(1)

CCB	0.446	3.846***	I(1)	0.330	3.846***	I(1)

Source: Authors' computation using study data (2024). $NT = Not\ stationary$,

The results indicate that all variables are integrated of order one, I(1), except for inflation, which is stationary at level. Therefore, a cointegration test was necessary. The ARDL Bounds test approach was employed for the cointegration analysis due to its flexibility in accommodating variables with mixed integration orders. The Akaike Information Criterion (AIC) was used to determine the optimal lag length, which was found to be (2, 2, 2, 2, 2). The results of the ARDL Bounds test, based on the estimations for equations (7) and (8), are presented in Table 4.

Table 4
Long-run and short-run ARDL estimation of deficit financing mode and inflation

Dependent variable (INF)	**Long-run ARDL estimation**		**Short-run ARDL estimation**	
	Coefficient	**t-statistic**	**Coefficient**	**t-statistic**
BONDS	*-0.166****	*-3.016*	*-0.009***	*-3.194*
CBNA	*-0.052***	*-2.287*	*0.012***	*2.152*
BRDM	*1.030*	*0.667*	*3.736****	*4.449*
PVD	*1.156*	*0.413*	*0.996*	*1.326*
CCB	*0.009**	*1.866*	*0.002***	*2.272*
Error Correction Mechanism (ECM)			*-0.539****	*-6.405*
R^2 = 78%	**F-statistic** 4.009**	$DW = 2.379$	JB_N = 0.899	BG_{SC} = 0.578
BPG_H= 0.800	RRT = 0.133	**CUSUM & CUSUMQ** = 0.05		

Note: DW *= Durbin Watson statistics,* JB_N *= Jarque Bera Normality test,* BG_{SC} *= Breusch-Godfrey serial correlation test,* BPG_H *= Breusch-Paga-Godfrey heteroskedasticity test,* RRT *= Ramsey RESET.*

Source: Authors' computation using EViews 12

The F-statistic (4.009) for the ARDL Bounds test, presented in Table 4, exceeds the upper boundary at the 5% significance level, indicating the presence of long-run relationships between the variables. Given this finding, the ARDL estimation method is considered the most appropriate. The insignificant probability values for all diagnostic tests imply that the model is normally distributed, free from serial correlation, homoscedastic, well-specified without omitted variables, and stable within the required 5% significance level. Thus, the ARDL model results are considered reliable and unbiased.

The coefficient of BONDS in row 1 is negative and statistically significant at the 1 and 5% levels in the long and short run, respectively, indicating a deflationary effect of bonds on inflation in Nigeria. Bonds are typically fixed-income investments, where investors receive regular interest payments and a return on their principal at maturity. As such, they do not directly contribute to inflation. A 1% increase in bonds (deficit financing) reduces inflation by 0.166 in the long run and 0.009 in the short run. This result aligns with the findings of Auckenthaler *et al.* (2015), Yusuf and Prasetyo (2019) and Dominguez and Gomis-Porqueras (2019).

As shown in row 2, the estimates for central bank advances are statistically significant at the 5% level in both the long and short run. However, while the coefficient is negative in the long run, it is positive in the short run. This suggests that central bank advances as a mode of deficit financing heighten inflation in the short run but reduce it in the long run. Specifically, a 1% increase in central bank advances reduces inflation by 0.052 in the long run but increases it by 0.012 in the short run.

The short-run inflationary effect of central bank advances can be explained in two ways. First, during economic downturns or financial crises, central banks may provide liquidity support to financial institutions to encourage lending and stimulate economic activity. By injecting liquidity into the financial system, the central bank increases credit availability, leading to higher aggregate demand and potential inflationary pressures. Second, when central banks monetize debt by purchasing government bonds or extending credit to the government, the increased money supply can

drive inflation in the short run. These findings align with the work of Alpanda and Honig (2014), Garriga and Rodriguez (2020) and Baumann *et al.* (2021).

On the other hand, the long-run deflationary effect of central bank advances is justifiable. Central banks implement monetary policy tools and macroeconomic measures to ensure price stability over time. If these measures are effective, inflationary pressures from central bank advances are mitigated in the long run. Our findings are consistent with those of Kokoszczyński and Mackiewicz-Łyziak (2020) on the relationship between central bank independence and inflation.

The coefficient of broad money supply, as shown in row 3, is positive and statistically significant in the long run but insignificant in the short run. The results indicate that a 1% increase in the money supply raises inflation by 3.736 in the long run. This finding aligns with Nassar (2005) and Nguyen (2015).

Regarding the effect of private debt on inflation, the estimates in row 4 are statistically insignificant in both the long and short run. Similarly, as shown in row 5, commercial bank credit to the government is statistically significant in both the long and short run, implying its relevance in influencing inflation in Nigeria.

Additionally, the results demonstrate that the error correction term (ECM_{t-1}) is statistically significant, less than one, and has the expected negative sign. This indicates that short-term shocks will be corrected toward equilibrium at an annual adjustment rate of 54%. The coefficient of determination (R^2) suggests that bonds, central bank advances, money supply, private debt, and commercial bank credit to the government collectively explain 78% of the variations in inflation, leaving 22% unaccounted for by other factors.

5. Conclusion and recommendations

The study employed the ARDL technique to examine whether the mode of budget deficit financing influences inflation in Nigeria, using annual data from 1981 to 2021. The ARDL bounds test for cointegration revealed a long-run association among the variables. Evidence from the analysis indicated a negative and significant relationship between bonds and inflation in both the short and long run. Additionally, a statistically significant short-run direct and long-run indirect relationship was identified between central bank advances and inflation. The money supply demonstrated an enlarging effect on inflation in the short run, while private debt and commercial bank credit to the government showed no statistically significant impact on inflation in Nigeria.

The findings of this study provide critical insights for policymakers in Nigeria and other developing economies. The observed negative and significant relationship between bonds and inflation suggests that public subscription to bonds is a less inflationary and more stable financing instrument for addressing budget deficits. This underscores the need for the Nigerian government to prioritize treasury bills/bonds over central bank advances as a financing mechanism. Bonds not only mobilize domestic and foreign savings but also offer a controlled and sustainable approach to deficit financing. Conversely, central bank advances, which exhibit inflationary tendencies in the short run, should be minimized to reduce inflationary pressures and promote macroeconomic stability. Furthermore, policymakers should focus on managing the money supply, given its short-run inflationary effects. By adopting policies that promote efficient debt management and prioritize less inflationary financing options, the government can create a stable economic environment conducive to sustainable growth and private-sector investment.

This study has limitations that should be acknowledged. Firstly, it focuses solely on Nigeria, limiting the applicability of the findings to other nations with differing economic structures or fiscal policies. Secondly, while the ARDL bounds testing approach is appropriate for the research context, it may not capture complex nonlinear relationships or structural breaks within the dataset. Lastly, the exclusion of additional potential determinants of inflation, such as external shocks, geopolitical factors, or exchange rate dynamics, could restrict the comprehensiveness of the analysis.

To address these limitations and deepen the understanding of the relationship between deficit financing and inflation, future research could conduct panel studies comparing developed and developing economies to improve the generalizability of results. Future studies could also investigate nonlinear relationships between deficit financing modes and inflation. Furthermore, researchers could explore the impact of external shocks, such as oil price volatility or global financial crises, on the deficit financing-inflation nexus in resource-dependent economies like Nigeria.

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