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Macroeconomic determinants of food inflation in Nigeria

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Abstract

This study investigates the macroeconomic determinants of food inflation in Nigeria covering the period from 2005Q1 to 2023Q4. The research specifically examines the effects of fuel subsidy, trade openness, exchange rate, and real gross domestic product (RGDP) on food inflation using the Autoregressive Distributed Lag (ARDL) model and the Toda–Yamamoto causality approach. The Augmented Dickey Fuller and Phillips–Perron unit root tests confirmed that all variables were integrated of order one, justifying the use of ARDL bounds testing. The long-run results reveal that trade openness has a negative and statistically significant impact on food inflation, implying that increased integration into international trade helps reduce domestic food prices. In contrast, fuel subsidy and real gross domestic product show no significant effect on food inflation, while exchange rate exerts a negative and significant short-run influence. The causality analysis further establishes a bidirectional causal relationship between exchange rate and food inflation. The error correction term is negative and significant, confirming long-run stability. The study concludes that stable exchange-rate management, moderate trade liberalization, and gradual subsidy reforms supported by enhanced agricultural productivity are crucial for achieving sustained food price stability and ensuring food security in Nigeria.

Keywords: Food inflation, exchange rate, fuel subsidy, trade openness, ARDL.

1. Introduction

Inflation is one of the key indicators of price stability as used by government, households and private investors. This is because inflation is linked to economic instability, increasing cost of living, worsening income inequality as vulnerable population finds it difficult to meet basic needs. In addition, the macroeconomic instability distorts savings and investments which deepens macroeconomic problems such as unemployment and poverty. According to International Monetary Fund (2024). Inflation has been on the rising trend across the globe over the last 10 years. National Bureau Statistics (2024) reported that overall inflation rate (based on consumer price index) stood at 1.6 percent in 2016, which jumped to 2.2 percent in 2019, later to 3.5 and 7.9 percent in 2021 and 2022 respectively.

Nigeria, like any other economy in the world, strongly desires to achieve stable food price so as to ensure that Nigerians have not only access to adequate food but also at affordable rate. This is really important as stable food price can guarantee high food security as that will attract commercial farmers into farming. It is worrisome that Nigeria is among the countries with higher rate of food prices among the 41 low income food deficits nation in the world (World Bank, 2018), this might be due to the overdependence on imported products. Moreover, Nigeria

faces the adverse impacts of climate change, posing significant challenges to various sectors of its economy, including agriculture, water resources and infrastructure. Irregular rainfall patterns, prolonged droughts, increased flooding, and rising temperatures have resulted in reduced agricultural productivity, water scarcity, and environmental degradation (FAO, 2025). These effects worsen food insecurity and contribute to surging food prices, endangering the livelihoods of millions of Nigerians (Kralovec, 2020).

The central question of this study is whether trade openness, Fuel subsidy, and exchange rates significantly influenced food price inflation in Nigeria during the period under study. These relationships are essential for policy makers to design strategies that can mitigate the impact of these macroeconomic factors on food inflation and promote food security in the country.

This dissertation Seeks to revisit the determinants of food inflation in Nigeria. It aims to explore the underlying causes of food price inflation and its contribution to the broader inflationary environment in the country. By identifying the key drivers of food price inflation, this study hopes to provide insights into policy interventions that could mitigate inflationary pressures and promote economic stability in Nigeria. The rest of the paper is structured as follows: section two reviews literature, section three outlines the methodology, section four presents the results and discussion, and section five offers conclusions and recommendations.

2. Literature Review

This section provides conclusive empirical evidence on revisiting the determinants of food price inflation in Nigeria. Hence we reviewed the following studies and ascertain the empirical determinants of food price inflation in Nigeria Shehu, et al. (2023) investigated inflation dynamic and food prices in Nigeria. The study employed autoregressive distributed lag (ARDL) model to analyze the empirical data spanning from 1990-2021. Finding of the study revealed that oil prices, exchange rate, money supply, and government expenditure are their varying long and short term effects on inflation and food prices in Nigeria. In addition, the result of the bound test revealed that there is a presence of long term relationship among the variables under studied. However, the result of short term shows that higher oil prices exert a large positive influence on food prices. In addition, the result of the long term revealed that the impact is negligible. Consequently, increased in money supply impact food price significantly both in the short and long term. However, exchange rate impacts food prices inversely in the long-term.

Rasak (2023) conducted empirical study on trade openness and inflation in Nigeria. The study employed Auto regressive distributed lag (ARDL) to analyses empirical data for the period of 2000 to 2021. Findings of the study shows, there is existence of long run relationship among trade openness and inflation. Similarly, the study further identified trade openness endangered inflation rate in both the short run and the long run in Nigeria. Akinboyo (2023) investigated the impact of fuel subsidy removal on inflation. The study employed vector auto regressive (VAR) model to analyses empirical data for the period of 2014m01 to 2023m05, finding of the study reveals that, the ex- ante result shows significant positive response of inflation due to shocks to domestic fuel price in 11 months periods, as a result of transitory with about two months lag, using the simulation scenario analysis. Similarly, the result of ex-post shows the trajectory path of inflation due to subsidy removal which suggests 9 months acceleration in inflation in the future

Nigeria. Asuzu and Anyanwu (2023) conducted empirical investigation of money supply, inflation and economic growth nexus in Nigeria. The study employed vector auto regressive and granger causality to analyses the empirical data spanning 2006 to 2022. Findings of the study shows, money supply growth and lending rate both have the evidence of joint causality. In addition, increase in growth for money supply can causes additional rises in inflation moreover, increase in the level of money supply growth cause a persistent decline in GDP growth. Ezebilo, et al. (2023) examined effect of monetary policy on food inflation in Nigeria. The study employed non-linear auto regressive distributed lag model (NARDL) to analyses the empirical data spanning 1980 to 2021. Findings of the study shows, exchange rate have negative affect the price of food inflation in Nigeria. Similarly, money supply has favorable impact on food inflation in Nigeria. Stella, et al. (2025) investigate empirical study on How Does fuel subsidy removal drive food inflation in Nigeria. The study was employed co integration and error correction model (VECM) to analyses the data for the period of 1990-2024' finding of the study show there is significant long run relationship between fuel subsidy removal and inflation. Similarly, the short run result reveal that the speed of adjustment dynamic indicates a relatively show convergence to equilibrium

3. Methodology

In view of the main objective of this research work which aim at assessing the macroeconomic determinants of food inflation in Nigeria. The study employed quarterly data from 2015 Q_1 to 2023Q_4. Data on Food price inflation, Real Gross Domestic Product were collected from National Bureau of statistic (NBS) and fuel subsidy was collected from Nigeria Extractive industries (NEITI) Policy advisory. While data on exchange rate and Trade openness were collected from the Central Bank of Nigeria (CBN). The study examined the stationarity of the variables using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests to test the null hypothesis that assumes the presence of a unit root for the variables at the level by including the constant and time trend and the same at the first difference. The short run and long run relationship among Food price inflation and the independent variables are examined using Autoregressive Distributed Lag (ARDL) Model

3.1. Theoretical Framework

This study adopts an integrated framework combining cost-push inflation theory, exchange rate pass-through theory, and Romer's openness inflation hypothesis. The cost push theory posits that rising input and transportation costs particularly fuel translate into higher output prices. In Nigeria, fuel subsidy reforms raise transportation and processing costs, which are rapidly passed on to food prices. The exchange rate pass through theory explains how currency depreciation increases the domestic prices of imported food and agricultural inputs, raising production costs and customer prices. Romer's hypothesis links greater trade openness to lower inflation through in import dependent economies openness may also transmit external shocks. Together, these theories explain the channels through which fuel subsidy, exchange rate and trade openness affect food inflation in Nigeria

3.2. Model Specification

This study adopted the model by Berhanu and Girma (2023) with adjustments to analyze the determinants of food inflation in Nigeria. This study modified the above model, by incorporating the key macroeconomic variables and included Real Gross Domestic Product in the model line with the aforementioned objectives of

the study. Consequently, the modified model can be specified as:

FPI=f (FS, EXR, TOP, RGDP) 3.2

Where: FPI = Food Price Index (FPI), FS = Fuel Subsidy, EXR =Exchange Rate, TOP= Trade Openness, RGDP = real gross domestic productThe econometric form of the model is specified as:

$$FPI_t = \beta_0 + \beta_1 FS_t + \beta_2 EXR_t + \beta_3 TO_t + \beta_4 RGDP_t + +\varepsilon_t \quad 3.3$$

Taking the natural log of equation 3.3

$$lnFPI_t = \beta_0 + \beta_1 lnFS_t + \beta_2 EXR_t + \beta_3 lnTO_t + \beta_4 RGDP_t + \varepsilon_t \quad 3.4$$

Where: FPI_t is Food Price Inflation, FS_t is Fuel Subsidy, TO_t is Trade Openness, POP_t is Real Gross Domestic Product, $RGDP_t$ β_0 is Constant Parameter, β_S is Coefficient of the Independent Variables, ε_t and is Stochastic Disturbance Term. β_1 to β_4>0

An Autoregressive distributed lag (ARDL) model will is used to examine the macroeconomic determinants of food inflation in Nigeria. Pesaran & Shin (1999) and Pesaran, Shin, and Smith (2001) developed the ARDL model. It examines potential connections between two or more variables. Given its superiority over other long-term analytical tools, the Autoregressive Distributed Lag (ARDL) model's firstness, dependability, and statistical features make it justifiable for employment (Harris & Sollis, 2003; Ramazan, 2021). The ARDL approach to cointegration is estimated using the following Unrestricted Error Correction Model (UECM) equations:

$$\Delta lnFPI_t = \beta_0 + \beta_1 lnFPI_{t-1} + \beta_2 lnFS_{t-1} + \beta_3 EXR_{t-1} + \beta_4 lnTOP_{t-1} + lnRGDP_{t-1} + \sum_{i=1}^{p} \beta_5 FPI_{t-1} + \sum_{i=0}^{p} \beta_6 FS_{t-1} + \sum_{i=0}^{p} \beta_7 EXR_{t-1} + \sum_{i=0}^{p} \beta_8 TOP_{t-1} + \sum_{i=0}^{p} \beta_9 RGDP_{t-1} + +\varepsilon_t \quad 3.5$$

The variables remain as previously described, Δ stands for the difference (or change) in respective variables. To satisfy the long-run relationship, ARDL bound test requires a null hypothesis for no co-integration H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4$ the variables remain as previously described, Δ stands for the difference (or change) in respective variables. To satisfy the long-run relationship, ARDL bound test requires a null hypothesis for no co-integrationH_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 0$; for equations. The letters p and g in the equation denote that the dependent and independent variables do not necessarily have to have the same lag length (Pesaran, Shin & Smith, 2001).

4. Results and Discussion

In order to avoid the issue of spurious regression, this study employed the Augmented Dickey Fuller (ADF) Test in comparison with the Phillips and Perron (PP) Test. The ADF and PP results are presented in table 1.

Table 1: ADF and PP Unit Root Tests

Panel A: Augmented Dickey Fuller (ADF) Test

	Level		**First Difference**	
Variables	Intercept	Intercept/ Trend	Intercept	Intercept/ Trend
LNFPI	7.219	5.460	-0.153	-3.624**
LNFS	-2.453	-2.426	-8.250*	-8.203*
LEXR	0.382	-1.922	-9.110*	-9.536*
LNTOP	-2.145	-2.305	-8.330*	-8.363*
RNGDP	-1.696	-1.685	-7.928**	-7.947**
Panel B: Phillips- Perron (PP) Test				
LNFPI	14.926	15.953	-1.426	-3.898**
LNFS	-2.573	-2.561	-8.250*	-8.203*
LEXR	1.751	-1.538	-9.077*	10.662*
LNTOP	-2.145	-2.392	-8.330*	-8.363*
LNRGDP	-2.020	0.976	10.01*	10.25*

Source: Researcher's computation

*, ** and *** indicates significant at the 1%, 5%, and 10% respectively

The results of the stationarity tests for the variables using the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests are shown in Table 4.3. Every variable is tested at both the level and the first difference under various model specifications, including intercept only and intercept with trend.

Levels of Stationarity When compared to the critical values at the 1%, 5%, or 10% significance levels, the test statistics for all variables (LNFPI, LNFS, LEXR, LNTOP, and LNGDP) are not statistically significant, according to the ADF and PP results at levels. This indicates that it is not possible to reject the null hypothesis of a unit root (non-stationarity) at levels. Hence ARDL model was used.

4.1. ARDL Model Analysis

In order to examine the macroeconomic determinants of food inflation in Nigeria, the ARDL was utilized.

Table 2: Bounds Test

F-Statistics =	9.540443	
Critical Value	Upper bound I(1)	Lower bound I(0)
10%	2.2	3.09
5%	2.56	3.49
1%	3.29	4.37

Source: Researcher's Computation

From table 2 the ARDL bound test shows that the value of F- statistics 9.540443 is higher than both the lower and the upper bounds critical value at 5% level of significance. Therefore, the null hypothesis which stated that there is no cointegrating relationship amongst the variables under study is rejected and cointegration is confirmed. The findings is in line with Shehu et al., (2023); Berhanu and Girma (2023).

4.2. ARDL Long run Analysis

Table 3: Linear ARDL Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFS	-0.076	0.0294	-2.574	0.012
LNEXGR	-0.089	0.026	-3.424	0.001
LNTOP	-2.817	1.311	-2.147	0.036
LNRGDP	1.250	3.650	3.426	0.001

Source: Researcher's computation

The long-run coefficient for fuel subsidy (FS) is negative and statistically significant, indicating that fuel subsidies contribute to reducing food prices over time. Specifically, the coefficient of –0.076 shows that a one-unit increase in fuel subsidy leads to an approximate 7.6 percent decline in the Food Price Index (FPI) in the long run. This suggests that maintaining or increasing fuel subsidies helps to lower food production and transportation costs, which stabilizes food prices over an extended period.

The exchange rate (EXGR) also exhibits a negative and significant long-run relationship with food prices, with a coefficient of –0.089. This implies that currency depreciation is associated with a decrease in food prices in the long run. Although this result appears counter-intuitive, it may indicate that over time, exchange rate movements stimulate domestic production or trigger structural adjustments that eventually reduce reliance on expensive imports. It may also reflect long-term policy interventions that

counteract the inflationary effects of exchange rate depreciation.

Trade openness (TOP) has a large negative and significant effect on food prices in the long run, as shown by its coefficient of –2.817. This suggests that increasing trade openness by reducing trade barriers, improving import policies, and expanding global market access contributes to lowering long-term food prices. The result implies that over time, greater integration into global markets enhances competition, increases food supply options, and improves pricing efficiency.

Real gross domestic product (RGDP) shows a positive and significant long-run effect on food prices, although the coefficient is extremely small (1.25E-10). This indicates that economic growth slightly raises food prices over time, likely due to higher demand for food as household incomes increase. In essence, rising economic activity places upward pressure on food demand, which may marginally increase food prices in the long run.

4.3 ARDL Short run Analysis

Table 4 illustrates the short-run dynamics among the variables. Thus, the short run dynamics describes the speed at which equilibrium is restored in the model.

Table 4: ARDL Short Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFS	-0.071	0.014	-4.710	0.000
LNEXGR	0.077	0.019	3.943	0.000
LNTOP	0.109	0.035	3.137	0.003
LNRGDP	1.330	1.560	8.532	0.000
ECT	-0.066	0.009	-7.579	0.000
R-squared	0.839			
Adjusted R-squared	0.836			

Source: Researcher's computation

The error correction term (ECT) is negative and statistically significant, with a coefficient of –0.0661, confirming the existence of a stable long-run relationship among the variables. The magnitude of the ECT suggests that approximately 6.6 percent of deviations from the long-run equilibrium are corrected each period, indicating a gradual but steady adjustment toward long-run stability.

4.4. Diagnostic Analysis

To assess the model's statistical adequacy, various diagnostic tests were conducted, including the Breusch-Godfrey LM test for serial correlation, the Jarque-Bera test for normality, the Breusch-Pagan-Godfrey test for heteroscedasticity.

Table 5: Result of the Diagnostic Test

Test Statistics	F-statistic	Probability
Breusch-Godfrey test (Serial Correlation)	0.423	0.657
Heteroscedasticity (Breusch-Pagan-Godfrey	0.879	0.595
Normality (Jaque-Bera)	2.034	0.362
Ramsey Reset Test	18.132	0.271

Source: Author's Computation

The results, in the 4. Confirm the model's robustness. The test statistic for the Breusch-Godfrey LM test (0.422617) is statistically insignificant, hence we cannot reject the null hypothesis which states that the residuals in the model are not serially correlated. In the same direction, the Breusch-Pagan-Godfrey F-statistic (0.879225) is not statistically significant which means we cannot reject the null hypothesis if homoscedasticity. The Jarque-Bera result also confirms the normality of the model, as the test statistic was found to be statistically insignificant.

5. Conclusion and Policy Implications

The following conclusion were drawn based on the findings of the macroeconomic determinants of food price inflation in Nigeria from $2015Q_1$to $2023Q_4$, using the Autoregressive Distributed Lag (ARDL) model. Based on the empirical findings of this study, there is no evidence of direct impact of fuel subsidy on food inflation in Nigeria both in the short-run and the long-run. Therefore, it can be concluded that, fuel subsidy does not exert any significant impact on food inflation in Nigeria. In addition the study concludes that trade openness is the major determinant of food inflation in the Long-run in Nigeria. Considering the inverse relationship between trade openness and food inflation, there is need for more liberal policies to upon up the economy, allow the free movement of goods and services across borders so as to minimize food inflation and achieve sustainable food price stability in Nigeria. The policy implication for these findings is that the Nigerian government should promote trade openness by removing import bottlenecks, improving infrastructure, and simplifying customs processes to lower the cost of food import. This will minimize food inflation and ensure food price stability in the long-run. Another implication is that The Central Bank of Nigeria (CBN) should strengthen exchange rate policies to ensure a stable and market reflective rate that will reduce the inflationary effect on imported food items. Also, The CBN and relevant agencies should coordinate monetary and fiscal policies to ensure long-term macroeconomic stability and control food inflation. Furthermore, more investment should be made in agriculture to boost domestic food production and reduce dependence on imports, which will help stabilize food prices.

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