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Effect of exchange rate volatility on food price inflation: Evidence from the Nigerian economy (1990 - 2021)

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Over time, the exchange rate has shown instability in the Nigerian economy, despite the implementation of stabilization policies by successive administrations. This instability has, in turn, influenced the pricing of food items in the nation. This research employed the Autoregressive Distributed Lagged (ARDL) model to investigate the impact of exchange rate volatility on food price inflation in Nigeria, utilizing annual data spanning from 1990 to 2021. The results from the bounds testing for co-integration reveal a sustained connection between exchange rate, food inflation, food production, money supply, and lending interest rate. Both in the short and long term, a notable positive correlation exists between exchange rate volatility and food price inflation. While food production demonstrates a negative relationship; money supply and lending interest rate exhibit positive associations with food price inflation. Based on these findings, it is recommended that the Nigerian government amplifies its fiscal expenditures to stimulate domestic investment and production. Furthermore, implementing export-oriented strategies, including offering tax incentives to exporting enterprises, could enhance the export of locally produced goods. This, in turn, might augment foreign reserves and potentially lead to an appreciation of the national currency, the Naira.

Key words: Food price inflation, exchange rate, food production, money supply, lending interest rate.

INTRODUCTION

Food price inflation, combined with exchange rate volatility, stands as a significant and pressing challenge for Nigeria and numerous developing economies. Economists and policymakers have expressed significant concern regarding the negative effects of exchange rate volatility on food price inflation, which has led to adverse outcomes (Musa, 2021). Food price increases have a negative impact on household purchasing power and lower real income per capita, particularly in developing nations. Most households in developing nations are majority poor, which mean that growing food inflation affects them since they tend to spend a bigger portion of their income on basic commodities (Abdlaziz et al., 2016).

The Food and Agriculture Organisation (FAO) (2022) estimates that between 702 and 828 million people

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experienced hunger in the world in 2021. The FAO's conventional indicator for tracking hunger at the global and regional levels is the prevalence of under-nourishment, which is based on national statistics on food availability, food consumption, and energy requirements. This confirmed that about 9.2% of the world, or 719 million people, live in extreme poverty, on less than $2.15 a day as a result of rising food prices.

Nigeria's economy is predominately agrarian. The land mass of the nation is over 60% arable, its waterways are good sources of seafood, and about 70% of the working force is employed in various agricultural pursuits. For fluctuations in the demand or supply of food items to have little impact on food prices, including the general price level sometimes, food production should not be much less than abundant. Additionally, it is anticipated that increased agricultural productivity will lower food product costs while also having a negative impact on the overall inflation rate (Benfica et al., 2017; Salik and Aras, 2020). This is because despite the country's substantial and advantageous agricultural resources, food costs have remained high and the inflation rate is also very high (Mbah et al., 2022). In 2022, the World Bank reported that Nigeria was designated as one of the 41 low-income food deficit nations in the world and had one of the highest rates of food prices among African nations, including Ghana and South Africa. This may be a result of the country's over reliance on imported goods, which contributed to significant food inflation (Mbah et al., 2022).

Every government wants to manage food inflation and pricing, but in Nigeria, exchange rate fluctuations affect these costs. Nevertheless, the issues faced by Nigeria's forex market run deep and have evolved into a source of distress for importers, including those dealing with food and agricultural inputs. The primary issues plaguing the forex market revolve around its complexity and the disparity between official and parallel market exchange rates. Key organizations including the Nigerian Inter-Bank Market, Bureau De Change (BDC), and Financial Market Dealers Quote (FMDQ) all share the view that the issues at hand are the result of street vendors operating in the unofficial market. Furthermore, there has been much discussion on how the currency rate affects food costs, highlighting the importance of the forex trading activities carried out by Bureau De Change (BDC) and the Inter-bank market (EXR). There are arguments both in favour of and against the claim that the regular swings in the value of the dollar have a direct impact on food prices (Edamisan et al., 2018).

Yakub et al. (2019) claim that the Nigerian currency rate is remarkably volatile and is subject to significant swings in all foreign exchange market segments, including the official, bureau de change, and unofficial markets. In the official market, the exchange rate depreciated from ₦11.08/$US in 1987 to ₦22.00 in 1994 and was later fixed at ₦21.89/$US by the Federal Government of Nigeria between 1994 and 1998. It depreciated to ₦97.95/$US in 1999, ₦125.00 between 2000 and 2006 and appreciated slightly to ₦117.97/$US in 2007. Meanwhile, in 2009 the naira depreciated to ₦149.58/$US as a result of the global financial crisis coupled with the decline in the international oil price. In 2012, it depreciated further to ₦157.50 and ₦158.55 in 2014 and then ₦196.49 in 2015, ₦253.19 in 2016, ₦305.30 in 2017, ₦350 in 2018, ₦360 in 2019, ₦380 in 2020, and ₦411.83 in 2021. The issue of shifting exchange rates is as a result of the unpredictability in export revenues brought on by the erratic swings in global oil prices. The Nigerian government has tried a number of different exchange rate regimes, but has continually failed to keep the value of the naira constant. A number of macroeconomic problems, like as a recession, rising unemployment, and elevated inflation, have been brought on by the recent decline of the value of the naira (Charles and Chilaka, 2019).

Despite efforts taken to promote food security in Nigeria, improve domestic food production and curtail the rise in food prices, through policies and programs such as Agricultural Transformation Agenda (ATA), National Special Program on Food Security (NSPFS), Anchor Borrowers Program (ABP), FADAMA III Additional Financing Project, National Program for Food Security, National Agricultural Land Development Authority (NALDA) Program, Rural Agricultural Development Authority (RADA), Commercial Agricultural Credit Scheme (CACS), and Agriculture Promotion Policy (APP), food inflation in Nigeria remains high compared to other African nations including Ghana and South Africa (Umaimah and Aliyu, 2022). This is attributed to the exchange rate fluctuation in the economy which affect economic growth and productivity and in turn reduce agricultural products (FAO, 2022).

Several studies have examined the effects of exchange rate fluctuation on inflation in Nigeria. However, little studies have been carried out specifically on the effects of exchange rate volatility on food price inflation in Nigeria. Thus, the main thrust of this study is to evaluate the effects of exchange rate volatility on food price inflation in Nigeria over the period between 1990 and 2021.

Statement of problem

Due to Nigeria's reliance on food imports, exchange rate movements can have a substantial impact on the inflation of food prices. Nigeria is a net importer of a variety of foods, from grains to processed commodities, therefore changes in currency rates have a significant impact on the country's domestic food prices.

Nigeria's population is expanding quickly, and urbanization is developing, but the agriculture sector has not kept up. As a result, the nation is heavily dependent

on imports to satisfy its food needs. The price of importing food rises when the value of the Nigerian naira declines versus the major world currencies. As a result, food items cost more on the local market, which adds to the inflation of food costs. According to the International Trade Administration (2023) report, Nigeria relies on $10 billion of imports to meet its food and agricultural production shortfalls (mostly wheat, rice, poultry, fish, food services, and consumer-oriented foods). Europe, Asia, The United States, South America, and South Africa are major sources for agricultural imports. The government of Nigeria has initiated agricultural programs such as the Anchor Borrowers Program (ABP) to diversify its economy away from oil. In October 2021, the government at the Council on Agriculture and Rural Development Regular meeting, approved the implementation of new agricultural policy named ‘’National Agricultural Technology and Innovation Plan’’ (NATIP) in 2022. The four-year blueprint designed to help Nigeria’s COVID-19 economic recovery. This policy will replace the Agriculture Promotion Policy (APP) that was lanched in 2016 but in December 2020.

Nigeria’s agricultural sector has been hurt by several shocks: regular flooding, desertification of crop and grazing land, extremist insurgencies, and conflicts between herdsmen and local farmers. Food processing continues to suffer from a lack of financing and infrastructure. These challenges have exacerbated food inflation. Food inflation rose to 23.75% in December 2022. There were wide-ranging price increases across items such as cereals, yam, meat, fish, and fruits. Additional upward pressure is caused by devaluation of the local currency (naira) which has been devalued multiple times since 2021. Also, higher fuel prices and insecurity have also contributed to rising food prices as transportation costs increase (ITA, 2023).

Against this background, a research work of this nature examining the effects of exchange rate volatility on food price inflation in Nigeria is considered inevitable currently. Thus, this study seeks to address the following questions: (i) What has been the trend of exchange rate and food price inflation rate in Nigeria between 1990 and 2021? (ii) Is there any correlation between exchange rate fluctuations and food price inflation in Nigeria over the periods under study? (iii) How does exchange rate volatility impact food price inflation in Nigeria? (iv) Is there any causal relationship between exchange rate volatility and food price inflation?

LITERATURE REVIEW

Conceptual review

Exchange rate

The exchange rate denotes the value of a nation's currency relative to other currencies. This valuation influences both the comparative cost of domestic products and the robustness of external sector engagement within domestic commerce. The debate over interest rates and exchange rate regimes is very important in both the world of international finance and among developing countries, particularly in economic circumstances where trade liberalization is promoted as being essential for promoting economic growth (Obansa et al., 2003). In addition, the term "exchange rate" refers to the relative worth of a nation's currency to other currencies under same circumstances. The basis for cross-national trade is this value, which denotes how significant a nation's currency is on a worldwide scale (Godwin and Sergius, 2021). Using the domestic currency per unit of foreign currency, when exchange rate increases, that is the amount of domestic currency required to buy a foreign currency increases, the domestic currency is said to have depreciated while the foreign currency appreciates. Likewise, a reduction in the exchange rate of the domestic currency against foreign currency signifies an increase in the value of the domestic currency and a decrease in the value of the foreign currency (Charles, 2006).

According to Mike (2006), in the larger context of formulating economic policy, the exchange rate has major significance as a macroeconomic variable, particularly in the context of economic reform initiatives. Governments keep a close eye on this important price while making a distinction between two essential ideas: the nominal exchange rate and the real exchange rate.

The nominal exchange rate (NER) quantifies the comparative value of two currencies, such as the naira concerning the U.S. dollar. In contrast, the real exchange rate (RER), as the term suggests, assesses the relative value of two categories of goods: tradable goods (exports and imports) concerning non-tradable goods (goods and services produced and consumed within the local region) (Mike, 2006).

Exchange rate volatility

There are many factors contributing to exchange rate volatility. These factors encompass output levels, inflation, economic openness, interest rates, both domestic and foreign money supply, the adopted exchange rate regime, and the extent of Central Bank independence (Stancik, 2007). The influence of each factor varies and relies on the specific economic circumstances of each nation. Consequently, countries undergoing transitional phases, like Nigeria, face heightened susceptibility to the impacts of these factors, consequently influencing decisions related to monetary policy.

According to Aliyu (2009), frequent changes in interest rates are a significant contributor to exchange rate volatility since they encourage the inflow of foreign capital

and raise exchange rates. Additionally, a huge debt raises the rate of inflation, and with high inflation, debt must be serviced and eventually repaid with less expensive real foreign currency. Additionally, if export prices increase at a faster rate than import prices, a country's terms of trade would benefit. There will be more demand for a country's exports as its terms of trade improve, which will raise export revenue and, ultimately, cause more demand for the country's currency (showing an increase in the currency value). Political unrest and economic growth have a significant impact on exchange rate volatility as well, since stable nations with robust economies will surely draw international investors seeking a secure place to park their money. For instance, political unrest has the potential to cause a crisis of confidence in a currency and encourage capital flight to currencies in more stable nations.

Deficits in the current account also affect exchange rate fluctuations. The current account shows all payments for products, services, interests, and dividends made between a country and other countries with which it conducts international trade. A current account deficit is a sign that a country spends more on foreign trade than it brings in, necessitating the use of foreign borrowing to cover the difference (Aliyu, 2009).

In that case, the country's need for foreign currency is far greater than what it can acquire through export sales, and the demand for its products among foreigners is substantially lower than the country's supply of its own currency. The country's exchange rate declines because of the surplus demand for foreign money, making domestic goods and services more affordable to international consumers while making imported goods unprofitable for domestic businesses (Aliyu, 2009).

Food price inflation

Food prices denote the average cost of food commodities on a global and international scale (Saliu, 2021). Beyond being a measure of the interplay between agricultural production and market demand, these prices significantly impact the accessibility and financial feasibility of food. Furthermore, aside from their role in shaping consumer affordability, food prices also exert a notable influence on the earnings of farmers and producers. At a broader level, the realm of macroeconomic policy, particularly monetary policy, is both directly and indirectly affected by fluctuations in food prices (Karali and Power, 2013). Elevated food prices generally favour producers, whereas lower prices offer advantages to consumers. As a result, food markets wield the potential to profoundly shape factors like food affordability, malnutrition, and hunger. Fang and Zibo (2019) posit that ‘‘the elasticity of world food price is lower than the elasticity of global food consumption’’.

Given that many Nigerian households are net food consumers or buyers, food insecurity poses a serious problem for the country. Because of this, changes in food prices throw off the regular consumption habits of many households, which worsen the nation's food insecurity (Akanni, 2002). Global food price increases have an impact on macroeconomic policy choices, causing inflationary pressures, high borrowing costs, and volatile exchange rates. Costs of production have increased because of the high interest rates charged on loans for agricultural production. The difficulty in obtaining agrochemicals because of imports and the following cost hike caused by the devaluation of the naira exchange rate have only made the problem worse. As a result of rising farm input costs and declining profitability in Nigerian agricultural firms, private sector investment in agriculture has decreased (Olukunle, 2013).

Theoretical review

Cost-push inflation

In this context, inflation is perceived as a phenomenon that can stem from the escalation of wages and the expenses linked to other essential raw materials in the production cycle, thereby culminating in a reduction in overall supply (Akinbode et al., 2019). The cost-push theory operates on the premise that the prices of goods are predominantly influenced by their production costs, while the money supply reacts to demand. In this scenario, the escalation of costs is prone to trigger inflationary tendencies. This inflationary strain persists due to the interplay of the price-wage dynamics.

Loening’s model of food prices

The theoretical framework of this study is also derived from Loening et al. (2009), who constructed a model concerning food prices within an agrarian economy. Their work introduced an experimental inflation model that incorporates diverse inflationary mechanisms, allowing for multiple hypothetical tests instead of constraining the models. This approach is particularly fitting for developing economies, primarily of agrarian nature. Loening's perspective suggests that inflation is brought about by price adjustments stemming from imbalances between demand and supply, as well as from import-related costs. The theory encompasses the monetary, external, and domestic sector markets, encompassing both tradable food and non-food agricultural products.

To be more precise, Loening et al. (2009) posited that shifts in the price level of domestic goods result from deviations "from the long-run equilibrium in the money market and the external sector, represented by food and non-food products." In the short to medium term, food inflation is influenced by the dynamics within the domestic

agricultural goods market. This is triggered by alterations in supply and other factors, notably inflation spurred by imports, oil price fluctuations, and global fertilizer price inflation. While these factors can contribute to inflation, the most pivotal impact is likely to stem from domestic agricultural market shocks.

Consequently, these theoretical foundations imply that agricultural productivity has an impact on food expenses, subsequently influencing food prices. The shifts in food prices, in turn, transmit changes in inflation within Nigeria.

Purchasing power parity (PPP)

This theory attempts to elucidate shifts in exchange rates by examining the disparities between various countries. Advocates of this theory assert that in nations that adopt flexible exchange rates, alterations in exchange rates have an impact on inflation, particularly in small and open developing economies (Akinbode et al., 2019). Agnor and Montiel (1996) argued that a deteriorating exchange rate can influence the prices of domestically traded goods in the local currency, while also indirectly influencing the overall price level if pricing determinations are influenced by the expenses of imported inputs. The concept of Purchasing Power Parity (PPP) was formulated by the Swedish economist Gustav Cassel. In algebraic terms, PPP, when considering the absence of transport costs and tariffs, can be expressed as in Equation 1:

$$P_t^{\alpha} = EXC_t P_t^{*} \quad (1)$$

where P_t^{α} represents domestic price at time *t,* P_t^{*} stands for the world import price and EXC_t is the nominal exchange rate.

Mundell-Fleming theory of exchange rate determination

This theory extends the IS-LM framework, which centres on equilibrium within the product and money markets. Within the Mundell-Fleming theory, the equilibrium within the balance of payments is introduced as an additional condition, alongside the equilibrium in the product and money markets. The Mundell-Fleming theory proposes that an expansionary monetary policy amplifies the pool of available loanable funds within the banking system, thereby causing a decline in interest rates. This decrease in interest rates subsequently results in a reduction of capital inflows, leading to a deficit in the capital account. Consequently, this puts further pressure on the domestic currency, ultimately causing a depreciation of the exchange rate. This currency depreciation, in turn, stimulates domestic production, leading to a rightward shift in both the IS curve and the balance of payments (BP) curve (Chukwuemeka, 2018; Nwoko et al., 2016).

The "IS" component represents the equilibrium between investment and savings in the product market, while the "LM" component reflects the equilibrium between liquidity preference and money supply in the money market. Odumusor (2019) provided a concise overview of this model. The equilibrium equation in the product market can be expressed as shown in Equation 2.

$$Y = c(y\text{-}t(y)) + I + g \quad (2)$$

In this model, we denote Y as the total national income. C signifies the combined consumption expenditure, determined by disposable income, where disposable income is income net of taxes. I represents real investment, a function of both the interest rate (r) and income (y), expressed as I = I(r) (Iy>0) Ir < 0. This implies that investment declines with an increase in the interest rate but rises with income. Additionally, g denotes government expenditures on goods and services.

On the contrary, the LM curve illustrates the equilibrium in the money market. This equilibrium is established by equating the money demand function with the externally predetermined money supply, resulting in Ms = Md, where Ms represents the money supply, and Md signifies the demand for real money balances. This is shown in Equation 3:

$$L^d = f(i, y) \quad (3)$$

where *L* is the demand for money, *I* stands for the interest rate and *y* is the income. The monetary authority is responsible for establishing the money supply, while the demand for money is influenced by income and interest rates. If the money supply is increased while keeping prices constant, the LM curve will shift outward to the right. Consequently, the interest rate will decline, fostering higher investment and an elevated output level. The Mundell-Fleming model elucidates how an expansionary monetary policy triggers an augmented money supply, inducing an outward shift in the LM curve, thereby leading to a reduction in interest rates and a depreciation of the domestic currency. This currency depreciation further propels domestic production, culminating in rightward shifts of both the IS curve and the BP curve, ultimately resulting in increased output (Musa, 2021).

Empirical review

Despite a wealth of literature on exchange rate volatility, there is a notable scarcity of comprehensive investigations into the inflation of food prices within emerging economies. In the years spanning 1981 to 2021, Mbah et.al. (2022) delved into the repercussions of agricultural productivity on food prices in Nigeria. They employed a structural vector autoregressive model (SVAR) with three variables to calibrate the data. The

outcomes highlighted that Nigeria's agricultural productivity wields a lasting influence on inflation. Increased agricultural productivity has a positive effect on food prices, while sustained increments in food prices are trailed by reductions in inflation.

Considering data from January 1997 to April 2017, Fasanya and Olawepo (2018) undertook an examination of the determinants behind food price volatility in Nigeria. Employing the multivariate Generalized Autoregressive Conditional Heteroskedasticity (GARCH) technique, the study aimed to assess the extent of interdependence and the dynamic nature of volatility across diverse markets. Specifically, the Dynamic Conditional Correlation (DCC) model and the Baba-Engle-Kraft-Kroner (BEKK) model were utilized for estimation. The results elucidated that, except for the oil market, shocks originating from the consumer price index (CPI), lending rate, exchange rate, and oil market exert direct influence on the prevailing conditional volatility within the food market. Umaimah and Aliyu (2022) conducted an examination, utilizing quarterly data from 2008Q1 to 2020Q4, to explore the asymmetric repercussions of exchange rate fluctuations on food inflation in Nigeria. They employed the Non-Linear ARDL model for analysis. The results of the bounds testing for cointegration reveal a lasting relationship among exchange rate, food inflation, and GDP. Furthermore, there exists a substantial and asymmetrically positive correlation between exchange rate alterations and food inflation, both in the short and long terms. Their study also establishes a negative and significant connection between food inflation and GDP.

Similarly, Edamisan et al. (2018) investigated the dynamics of return volatility within the context of the food price index, imported food price index, bureau of exchange's dollar cost, and the interbank rate. Their methodology involved the utilization of exponential generalized autoregressive conditional heteroskedasticity, with an emphasis on accounting for the evolving nature of volatility, encompassing non-linearities and varying risk premiums within food price series. This approach introduces a parameter capable of depicting how conditional variance responds to both positive and negative shocks, known as the "asymmetric effect." Their findings demonstrate notable persistence and the presence of a leverage effect in several selected models. Furthermore, the volatility of exchange rates notably impacts the volatility of the food price index return, with the impact being more pronounced for the return volatility of the imported food price index.

Moreover, Onuoha (2014) undertook an empirical investigation into the repercussions of inflation and exchange rate volatility on Nigeria's economic growth. Utilizing yearly datasets encompassing real GDP and the inflation rate spanning from 1980 to 2010, the analysis employed the Ordinary Least Squares method to assess the temporal trends of the variables in question and to estimate their changing patterns. The empirical exploration disclosed a positive correlation among exchange rate, exports, and imports. This implies a favorable association between inflation and exchange rates, as heightened volatility in exchange rates tends to yield higher inflation rates. Only economic expansion displayed an inverse relationship. The study suggests that a nation's economic growth is hindered by elevated inflation rates and fluctuating currency values, while it benefits from moderate and stable inflation rates, which encourage investment and subsequently foster economic growth.

Furthermore, Musa (2021), utilized annual time series data spanning the years 1986 to 2019 to analyze the impact of currency rate fluctuations on inflation in Nigeria. To ascertain the enduring impact of exchange rate volatility on inflation, the study employed the generalized autoregressive conditional heteroskedasticity (GARCH) and vector error correction model (VECM). The consumer price index was adopted as a proxy for inflation, with the nominal exchange rate (NER), money supply (MS), import (IMP), and export (EPT) serving as the independent variables in the analysis. The outcomes of the stationarity test revealed a mixed order of integration among the variables, while the co-integration bounds test confirmed their long-term relationship. The results indicated a noteworthy and positive association between money supply (MS) and nominal exchange rate (NER) and the consumer price index, underscoring the contribution of both factors to inflation in Nigeria.

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import (IMP), and export (EPT) serving as the independent variables in the analysis. The outcomes of the stationarity test revealed a mixed order of integration among the variables, while the co-integration bounds test confirmed their long-term relationship. The results indicated a noteworthy and positive association between money supply (MS) and nominal exchange rate (NER) and the consumer price index, underscoring the contribution of both factors to inflation in Nigeria.

In addition, Eme and Johnson (2011) delved into the repercussions of exchange rate fluctuations on Nigeria's real output growth. This study explored the potential direct and indirect correlations between exchange rates and GDP growth, drawing on quarterly data from 1986 to 2010. Employing a simultaneous equations model embedded within a comprehensive yet compact macroeconomic framework, the relationship was analyzed using two distinct approaches. The Generalized Method of Moments (GMM) method was also employed for investigation. The estimation outcomes revealed limited evidence of a significant direct impact of exchange rate alterations on output growth. Instead, the influence of monetary factors directly impacted Nigeria's economic expansion. These factors tended to perpetuate an unfavourable real exchange rate trend that hampers growth.

Godwin and Sergius (2021) conducted an inquiry into how exchange rate dynamics influence Nigeria's economic growth. They meticulously examined the effects of exchange rates on gross domestic product (GDP), gross national product (GNP), and unemployment. The Ordinary Least Square technique was employed to scrutinize the hypotheses. While the exchange rate exerted a substantial influence on both GDP and GNP, no noticeable impact on unemployment was discerned. This suggests that the quality of life for the population could be deliberately adjusted using the microeconomic indicators of GDP and GNP.

Within Nigeria, spanning from 1995 Q1 to 2015 Q1, Abiodun et al. (2016) delve into the exchange rate pass-through effect on both import and consumer prices at the aggregate level. Employing the Johansen approach to cointegration and a vector error correction methodology, this analysis reveals an inadequate exchange rate pass-through into Nigeria's CPI inflation. The effect is more pronounced in import costs compared to consumer prices, indicating a waning influence as it progresses up the pricing chain.

Furthermore, during the period from 1970 to 2007, Onosewalu and Taofeek (2008) explore the influence of currency rates on inflation within the Nigerian economy. This study scrutinizes the correlation between government spending, money supply, oil revenue, exchange rate, and inflation as dependent variables, offering insight into the inflation and exchange rate trends over the past 38 years. Fapetu et al. (2017) utilize indicators of stock market performance from MCAP and exchange rate data to investigate the impact of exchange rates on stock market performance. Employing ARCH, GARCH, E-GARCH, and TARCH estimation methods, the study uncovers a favorable association between exchange rates and market capitalization rate in Nigeria across all four models. However, the investigation reveals variance differences in the residual volatility of these models, indicating varying degrees of impact.

Azeez (2017) employs the GARCH (1, 1)-TY model to examine the impulse response function and variance decomposition of effects on food prices during pre-crisis and post-crisis periods. The findings highlight that the average prices of food respond positively to oil price shocks, particularly in the post-crisis era, with urban average food prices exhibiting a more pronounced response. Ajao and Igbekoyi (2009) investigate the sources of real exchange rate volatility in Nigeria between 1981 and 2008. Their co-integration analysis uncovers a long-term equilibrium link between REXRVOL and its various determinants. Using GARCH (1, 1) techniques to assess exchange rate volatility, the study employs the ECM to evaluate the determinants of exchange rate volatility, revealing that lagged exchange rates, government spending, interest rate changes, and economic openness significantly influence REXRVOL during this timeframe.

Gaps in literature

Utilizing a time series of annual data, this research investigates the influence of exchange rate volatility on food price inflation in Nigeria. The study employs the autoregressive distributed lagged (ARDL) model for estimation. Notably, several studies, including those by Umaimah and Aliyu (2022), Edamisan et al. (2018), Charles and Chilaka (2019), and others, have explored the ramifications of exchange rates on food inflation within Nigeria. However, limited attention has been dedicated specifically to the consequences of exchange rate volatility on food price inflation, particularly up to the year 2021. Consequently, this study endeavours to address this gap in research and comprehensively analyse the short- and potentially long-term effects up to 2021.

RESEARCH METHODOLOGY

Theoretical framework

In this study, the Purchasing Power Parity (PPP) hypothesis, formulated by Gustav Cassel, was employed to explore the impact of exchange rate fluctuations on food price inflation in Nigeria. The central premise of the PPP theory suggests that trade barriers or transportation expenses that elevate the cost of goods and services can potentially influence a country's exchange rate (Bada et al., 2016). Moreover, preceding research has employed this model to examine the asymmetric relationship between a nation's currency rate and food inflation (Olarinde and Abdullahi, 2014; Bada et al., 2016). For instance, Bada et al. (2016) posited that trade

Table 1. Data sources and variable measurement.

Variable	Source	Measurements
Food price inflation	World Bank Commodity Prices Statistical Database	Food Price Index
Exchange rate	CBN Statistical Bulletin	LCU per US$, period average
Food production	World Development Indicator	Food Production Index
Money supply	World Development Indicator	Broad Money (current LCU)
Lending rate	World Development Indicator	Lending Interest rate (%)

Source: Author's Computation (2021).

restrictions and/or transportation costs could exert influence on product pricing, leading to an overall escalation in the cost of commodities within the country. As such, this theory is articulated in Equation 4:

Food Inflation = f(Exchange rate) (4)

As per the PPP hypothesis, fluctuations in a nation's bureau de change exchange rate (appreciation and depreciation) exert an influence on food expenses. Research has illustrated that the prices of both domestic commodities, encompassing food and non-food products, could experience upward adjustments over time when a country's imports surpass its exports, and conversely (Adetiloye, 2010). Consequently, Equation 5 has been refined to incorporate variables that contribute to food inflation.

$FI_t = f(EXCR_t, FPR_t, MS_t, LR_t, \mu_t)$ (5)

where FI is food inflation — the rise in average price level of food items in an economy; EXCR is an official exchange rate — the price of one currency in terms of another; FPR refers to Food Production — the quantity of food items produced in an economy for consumption and possible export; MS refers to money supply — which is volume and quantity of money supplied in the economy for use; LR is lending interest rate — is the cost of debt for the borrower and the rate of return for the lender (bank).

Model specification

Following the works of Pesaran et al. (1999), and further developed by Pesaran et al. (2001), the model in which food inflation is dependent on exchange rate is specified in econometric model as shown in Equation 6:

$\Delta FI_t = \beta_0 + \beta_1 EXCR_t + \beta_2 FPR_t + \beta_3 MS_t + \beta_4 LR_t + \mu_t$ (6)

A priori expectations: $\beta_1>0$, $\beta_2<0$, $\beta_3>0$, *and* $\beta_4<0$.

where FI = Food Inflation; EXCR = Exchange rate; FPR = Food Production; MS = Money Supply; LR = Lending Interest rate.

Data sources and variable measurement

Method and data analysis

This study employed the autoregressive distributed lagged model to examine the effects of exchange rate fluctuations on food price inflation in Nigeria (Table 1).

Pesaran et al. (2001) introduced the ARDL approach to assess the enduring and immediate correlations between variables. This technique offers various advantages over conventional methods like Engle and Granger (1987), Johansen and Juselius (1990), and Phillips and Hansen (1990). Unlike traditional cointegration methods that necessitate the model's analysis variables to possess an integration order of one, the ARDL cointegration approach presents certain advantages: (i) exploring short- and long-term relationships between variables when they exhibit mixed integration orders of I(1), I(0), or even fractional orders; (ii) employing short- and long-term estimated parameters within the same model; (iii) mitigating endogeneity concerns; (iv) yielding improved regression outcomes for small sample sizes. Hence, the ARDL model for this study is outlined in Equation 7:

$$\Delta FI_t = \alpha_{0i} + \sum_{i=1}^{p} \alpha_{1i}\Delta FI_{t-1} + \sum_{i=1}^{q} \alpha_{2i}\Delta EXCR_{t-1} + \sum_{i=1}^{r} \alpha_{3i}\Delta FPR_{t-1} + \sum_{i=1} \alpha_{4i}\Delta MS_{t-1} + \sum_{i=1}^{t} \alpha_{5i}\Delta LR_{t-1} + \mu_t \quad (7)$$

where p, q, r, s, t, are the respective maximum lags of the dependent variable (FI) and the explanatory variables (EXCR, FPR, MS, LR) while α_{1i}, α_{2i}, α_{3i}, α_{4i}, α_{5i} are the respective coefficients associated with the dependent variable (FI) and the explanatory variables at the respective lags.

The ARDL Error Correction Model (ECM) specification is expressed in Equation 8:

$$\Delta FI_t = \alpha_{0i} + \sum_{i=1}^{p} \alpha_{1i}\Delta FI_{t-1} + \sum_{i=1}^{q} \alpha_{2i}\Delta EXCR_{t-1} + \sum_{i=1}^{r} \alpha_{3i}\Delta FPR_{t-1} + \sum_{i=1} \alpha_{4i}\Delta MS_{t-1} + \sum_{i=1}^{t} \alpha_{5i}\Delta LR_{t-1} + \emptyset ECM_{t-i} + \mu_t \quad (8)$$

In Equation 8, the coefficient Ø of the ECM term called 'the speed of adjustment' is expected to be negative in order to restore the model to equilibrium, that is, $Ø < 0$.

Given Equation 8, the long run form of the ARDL is specified as follows in Equation 9:

$$FI_t = \Psi_0 + \Psi_1 EXCR_t + \Psi_2 FPR_t + \Psi_3 MS_t + \Psi_4 LR_t \quad (9)$$

where $\Psi_1>0$, $\Psi_2<0$, $\Psi_3>0$, *and* $\Psi_4<0$

Estimation of volatility

The subject matter of this study is based on volatility, it is therefore pertinent to compute the volatility for the exchange rate using the

Table 2. Descriptive statistics.

Statistics	FPI	EXCR	FPR	LR	MS
Mean	11.825	137.819	77.67	18.943	1.12E+13
Median	11.5	128.937	78.91	17.871	3.09E+12
Maximum	21.7	401.152	111.74	31.65	4.38E+13
Minimum	6.3	8.038	39.91	11.483	5.76E+10
Std. Dev.	3.359	106.985	20.705	3.889	1.34E+13
Skewness	0.788	0.792	0.001	1.139	1.006
Kurtosis	3.67	2.96	1.964	5.088	2.727
Jacque-Bera	3.918	3.347	1.429	12.75	5.503
Probability	0.141	0.187	0.489	0.001	0.063
Observations	32	32	32	32	32

Source: Author's computation (2021).

Table 3. Correlation Matrix.

Variable	FPI	EXCR	FPR	LR	MS
FPI	1				
EXCR	0.2937	1			
FPR	0.1067	0.9276	1		
LR	0.0112	-0.6570	-0.7412	1	
MS	0.3904	0.9364	60.8768	-0.6745	1

Source: Author's computation (2021).

Generalized Autoregressive Conditional Heteroskedasticity — GARCH (1,1) model as postulated by Bollerslev (1986). The GARCH (1,1,) model adopted for the computation of volatility is shown in Equations 10 and 11:

$$x_t = \omega_0 + \omega_1 x_{t-1} + \cdots + \omega_p x_{t-p} + \mu_t \quad (10)$$

$$h_t = \varphi_0 + \varphi_1 \varepsilon_t^2 + \varphi_2 h_{t-1} + \mu_t \quad (11)$$

where x is a vector representing exchange rate, ε represents the residuals and *h* represents the conditional variance of the error. Equations 10 and 11 represent the mean equation and the variance equation, respectively. ω_0 is the constant in the mean equation and ω_1 represents the variables in question. φ_0 is the constant in the variation equation. φ_1 and φ_2 are the coefficients of the ARCH and GARCH, respectively.

Post-estimation analyses

Following the estimation of the model and acquisition of variable coefficients, the investigation proceeded to post-estimation assessments. These evaluations aimed to ascertain the model's credibility, ensuring that fundamental assumptions remained intact and validating the authenticity of the employed estimation technique and the drawn conclusions. Essential tests conducted encompassed the assessment of linearity through the Ramsey RESET test, evaluation of normality using the Jarque-Bera test, scrutiny of heteroskedasticity using the ARCH-LM test, and examination of serial correlation employing the Breusch-Godfrey test.

RESULTS AND DISCUSSION

Descriptive analysis

Table 2 provides a concise summary of the primary statistical characteristics associated with each variable. It outlines essential statistics such as mean, standard deviation, skewness, kurtosis, and the results of the Jacque-Bera test, which assesses the normality of the distribution for each series.

The mean value for the Food Price Inflation (FPI) index, calculated from 32 observations, stood at an average annual rate of 11.82%. The standard deviation indicates how closely the data points cluster around the mean. A lower standard deviation signifies a tighter clustering of the data set. Notably, Exchange Rate, Food Production, and Broad Money Supply displayed a wide dispersion around their respective means. Conversely, the Food Price Index and Lending Interest Rate tended to cluster closely around their average values (Table 3).

Skewness was employed to determine the symmetry of each series' distribution. The positive skewness values for all variables indicated that each series had a longer tail on the right side of the distribution. Kurtosis, on the other hand, gauges the peakedness of a distribution.

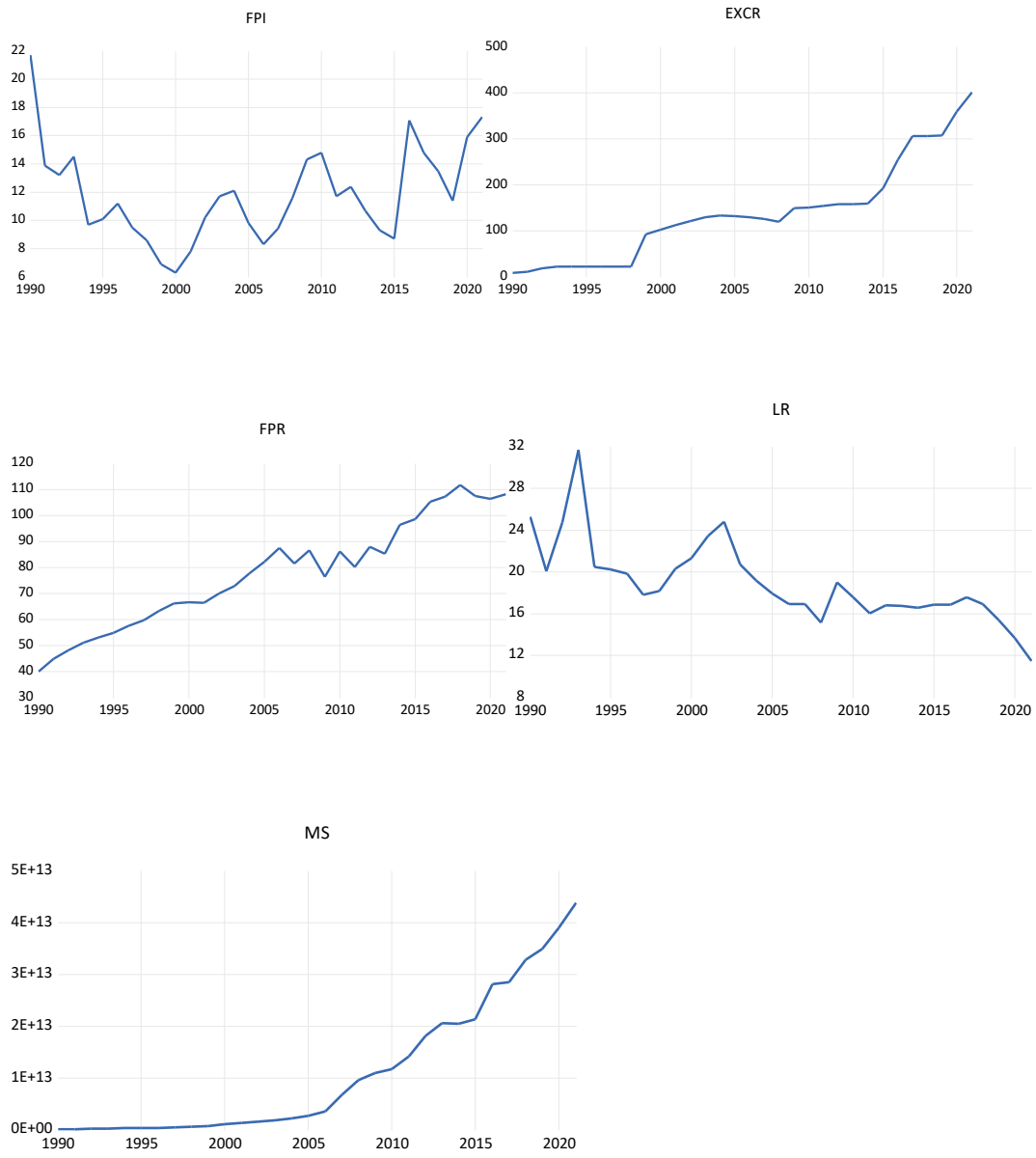

Figure 1. Study's variables.

Food Price Inflation and Lending Interest Rate exhibited leptokurtic distributions, indicating a higher peak compared to a normal distribution. In contrast, the remaining variables displayed platykurtic distributions with less pronounced peaks.

Additionally, the Jacque-Bera test was conducted to evaluate the normality of each series' distribution, considering both skewness and kurtosis. The test results indicated that the Lending Interest Rate did not follow a normal distribution, as evidenced by a Jacque-Bera probability value less than 0.05. This rejection of the null hypothesis suggests that the Lending Interest Rate's distribution deviates from normality. Conversely, the Food Price Index, Exchange Rate, Food Production, and Broad Money Supply were found to follow a normal distribution based on the Jacque-Bera test results.

Graphical analysis

Figure 1 displays the study's variables. Food Price Inflation (FPI) exhibits a declining trend from 1990 to 2000; however, it demonstrates an upward trajectory from 2001 to 2021, possibly attributed to diminished local food production and amplified food imports influenced by fluctuations in the exchange rate. Exchange Rate (EXR) showcases an ascending pattern from 1990 to 2021, likely owing to Nigeria's heightened imports, subdued

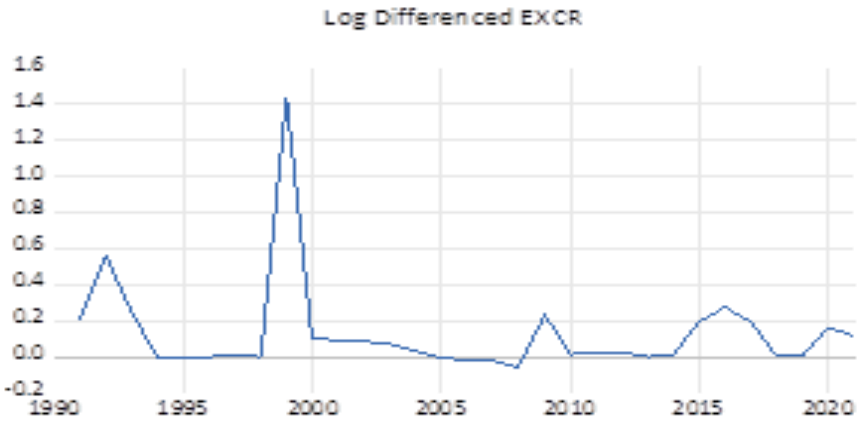

Figure 2. Trend of the volatility of exchange rate in Nigeria between 1990 and 2021.

Table 4. Augmented Dickey-Fuller (ADF) unit root result.

Variable	Level			First Difference			Order of Integration
	Intercept	Trend and Intercept	None	Intercept	Trend and Intercept	None	
FPI	0.0099	0.1898	0.2387	0.0093	0.0133	0.0005	I(1)
EXCR	0.0002	0.001	0.0001	-	-	-	I(0)
FPR	0.7841	0.0215	0.9324	0.1258	0.3374	0.0489	I(1)
MS	1.0000	0.9987	1.00000	0.9741	0.0000	0.9804	I(1)
LR	0.1728	0.022	0.2034	-	-	-	I(0)

Source: Author's computation (2021).

exports, and reduced foreign direct investment. Nigeria's Food Production (FPR) illustrates an ascending trend spanning 1990 to 2021, underscoring consistent growth in food production over time. Lending Interest Rate (LR) reveals an overall declining trend, though it experienced a significant surge between 1991 and 1993, followed by a steep decline between 1994 and 1995. In summation, Broad Money Supply (MS) demonstrates continuous growth between 1990 and 2021.

Nigeria's exchange rate volatility trend

Figure 2 depicts the trend of the volatility of exchange rate in Nigeria between 1990 and 2021. Between 1990 and 2021, Nigeria's exchange rate volatility showed a varying trend. Numerous economic changes during that time period led to varied degrees of exchange rate instability. The volatility was influenced by several variables, including alterations in domestic economic policy, fluctuations in the price of oil globally, and external market dynamics. When the economy was under pressure, such as during currency devaluations and foreign trade deficits, exchange rate changes were most noticeable. Pressures from both inside and outside the country frequently complicated efforts to manage exchange rate stability. Overall, the movement in currency rates showed a pattern of being responsive to both domestic and international economic factors, which produced a wide range of volatility levels.

Correlation analysis

Correlation pertains to the extent of the linear connection between two variables. As part of the preliminary analysis, multivariate correlation assessment was undertaken in this research to pre-emptively address the potential issue of multicollinearity among the explanatory variables in the study. As outlined by Iyoha (2004), the presence of two variables with a correlation coefficient exceeding 0.95 should be avoided within a model to prevent multicollinearity. In the current investigation, no combination of variables surpasses the specified threshold.

Test for stationarity and lag length selection

The Augmented Dickey-Fuller (ADF) test was used in the study in Table 4 to investigate the study series' stationarity. The results showed that the alternative hypothesis of the absence of a unit root was true for the exchange rate (EXCR) and lending rate (LR) at the 5%

Table 5. Optimal lag length selection.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-458.04	NA	50879257	31.93	32.17	32.01
1	-354.06	164.93	225962.4	26.48	27.90*	26.93
2	-317.64	45.20*	121751.7*	25.69*	28.29	26.51*

*Indicates lag order selected criterion.
Source: Author's computation (2021).

Table 6. ARDL bounds co-integration test.

Test Statistic	Value	Significance (%)	I(0)	I(1)
F-statistic	5.73	10	2.2	3.09
K	4	5	2.56	3.49
	-	2.5	2.88	3.87
	-	1	3.29	4.37

Source: Author's computation (2021).

Table 7. Short run analysis result.

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
FPI (-1)	0.4101	0.1285	3.1907	0.0039
EXCR	0.0289	0.0118	2.4445	0.0222
FPR	-0.0261	0.0944	-0.2763	0.7847
FPR(-1)	-0.1644	0.1072	-1.5328	0.1384
LMS	1.2437	0.7785	1.5976	0.1232
LR	0.1596	0.1489	1.0709	0.2948
CointEq(-1)*	-0.5898	0.0915	-6.4451	0.0000

Source: Author's computation (2021).

level of significance, indicating that they are integrated at order zero (I(0)) or stationary at levels. In contrast, the money supply (MS), food production (FPR), and food price inflation (FPI) showed differenced stationarity, indicating they were integrated at order one (I(1)). Decision was made to make the Autoregressive Distributed Lagged Model (ARDL) to be the most appropriate for analysis given the different orders of integration shown in the series. Also, a lag length of two (2) was found to be suitable for the analysis according to the Lag Selection Criteria test, shown in Table 5.

Co-integration test results and model selection

The results of the Auto-regressive distributed lagged (ARDL) bounds test are shown in Table 6. The F-statistic value, which was around 5.73, was higher than the I(1) critical constraint at the 5% risk level, indicating that the variables had a long-term association. This study then offers both the short run and long run estimations of the ARDL model following this co-integration conclusion.

Effects of exchange rate volatility on food price inflation

Short-run (dynamic) model

The result of the short run model is presented in Table 7. Exchange rate (P<0.05) is the significant variable affecting food price inflation in Nigeria in the short run. In line with *a priori* expectation, exchange rate increases food price inflation. The fluctuations in exchange rates influence the cost of imported food products. When a local currency depreciates, the cost of importing food increases; leading to higher prices for consumers. Import-dependent economies like Nigeria are particularly vulnerable, as they rely on global markets for food supply. Food price inflation rose by 0.028% for every percentage point increase in the exchange rate. The inflation of food prices was positively impacted by the exchange rate. This supports the findings of Njoku and Nwaimo (2019) and Akinbode et al. (2019) reports. Oyejide (1989) claimed that exchange rate depreciation frequently resulted in cost-push inflation, which raised the

Table 8. Long run analysis result.

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
EXCR	0.0491	0.0185	2.6485	0.0141
FPR	-0.3228	0.1827	-1.7673	0.0899
LMS	2.1086	1.3976	1.5087	0.1444
LR	0.2705	0.2730	0.9908	0.3317
C	-36.5890	32.4373	-1.1279	0.2705

Source: Author's computation (2021).

local currency costs of imported inputs (raw materials and intermediate capital goods) and final commodities. Volatile exchange rates can disrupt supply chains, create uncertainty for producers, and amplify inflationary pressures. This, in turn, affects consumers' purchasing power and overall food affordability, potentially leading to increased food price inflation and economic instability.

Food production and its lag have negative effect on food price inflation. This increased food production can mitigate food inflation by meeting demand adequately. Sufficient production due to factors like favourable weather, pests, and supply chain control can lead to increased supply of food items. When supply remains stable or increases, the increased supply drives prices lower. A percent increase in food production index decreased food price inflation by 0.026%.

Money supply has positive effect on food price inflation, that is, a 1% rise in money supply led to an increase of 1.243% in food price inflation. Thus, when there is more money circulating in the economy, consumers have greater purchasing power, potentially driving up demand for food items. If food production remains stagnant, increased demand can outstrip supply, resulting in higher prices. This phenomenon is known as 'demand-pull inflation'. While lending interest rate also has positive effect on food price inflation, that is, a 1% rise in lending interest rate led to a rise of 0.159% in food price inflation. Lending interest rates play a pivotal role in influencing food price inflation. Higher lending rates lead to increased borrowing costs for businesses, farmers, and consumers. This can hamper investment in agricultural production and disrupt supply chains, potentially leading to reduced food output resulting to higher prices of food products in the economy. The error correction coefficient satisfies all criteria as it is negative, less than one, and statistically significant.

Long run (static) model

The findings from the long-term (static) model indicated that, in the context of Nigeria, exchange rate ($P<0.05$) and food production ($P<0.1$) were the noteworthy factors influencing food price inflation over an extended period (Table 8). Similarly, within the short-term model, only the exchange rate emerged as a significant determinant of food price inflation. Moreover, across the long-term perspective, food production continued to exhibit a negative correlation with food price inflation, whereas both money supply and lending interest rate consistently retained their positive associations with food price inflation.

Pairwise Granger causality test

The Granger causality test suggests that exchange rates do Granger cause food price inflation, indicating that past values of the exchange rate provide predictive information for future food price inflation (Table 9). This supports the notion that changes in exchange rates can influence food prices. Also, food production does not Granger cause food price inflation. Past values of food production do not significantly contribute to predicting future food price inflation, suggesting that food production does not have a direct causal influence on food price inflation in this context.

Furthermore, the test reveals that lending interest rates do Granger cause food price inflation. Past values of lending interest rates provide predictive information for future food price inflation, indicating that changes in lending rates influence food prices, possibly through borrowing costs impacting production and consumption. Also, the test demonstrates that broad money supply Granger causes food price inflation. Past values of broad money supply significantly contribute to predicting future food price inflation, implying that changes in the money supply influence food prices, likely through their impact on purchasing power and demand for food.

Post estimation diagnostics

Table 10 displays the outcomes of the post-estimation analysis. The linearity of the estimated ARDL model was assessed via the Ramsey RESET test, which indicated a probability level exceeding 5%. This result substantiates the linearity of the model, confirming its proper specification. The presence of varying error term variance across changing regressor values (heteroscedasticity) violates fundamental OLS assumptions and poses a concern for econometric models. However, the ARCH-LM test yielded a result exceeding the acceptable 5% threshold, preventing the rejection of the null hypothesis of 'no heteroscedasticity.' Consequently, it was concluded that the estimated model demonstrated homoscedasticity.

Evaluation through the Recursive CUSUM test for stability demonstrated model stability, as the recursive CUSUM line fell within the significance level range (Figure 3). The outcome of the Breusch-Godfrey serial correlation (LM) test indicated that the hypothesis of no autocorrelation could not be refuted due to the probability value surpassing the 5% critical level.

Table 9. Causality result.

Null Hypothesis	Obs	F-Statistic	Prob.	Decision
EXCR does not Granger Cause FPI	30	2.135	0.139	Reject
FPI does not Granger Cause EXCR		0.683	0.514	Reject
FPR does not Granger Cause FPI	30	3.893	0.033	Accept
FPI does not Granger Cause FPR		0.111	0.895	Reject
LR does not Granger Cause FPI	30	1.227	0.310	Reject
FPI does not Granger Cause LR		1.357	0.275	Reject
MS does not Granger Cause FPI	30	1.543	0.233	Reject
FPI does not Granger Cause MS		3.274	0.054	Reject
FPR does not Granger Cause EXCR	30	1.292	0.292	Reject
EXCR does not Granger Cause FPR		0.956	0.397	Reject
LR does not Granger Cause EXCR	30	0.897	0.420	Reject
EXCR does not Granger Cause LR		3.921	0.033	Accept
MS does not Granger Cause EXCR	30	0.516	0.603	Reject
EXCR does not Granger Cause MS		0.118	0.888	Reject
LR does not Granger Cause FPR	30	0.091	0.913	Reject
FPR does not Granger Cause LR		5.752	0.008	Accept
MS does not Granger Cause FPR	30	2.384	0.112	Reject
FPR does not Granger Cause MS		1.533	0.235	Reject
MS does not Granger Cause LR	30	5.986	0.007	Accept
LR does not Granger Cause MS		1.245	0.304	Reject

Source: Author's Computation (2021).

Table 10. Post estimation diagnostic results.

Econometric problem	Test procedure	Statistics (probability)	Conclusion
Heteroscedasticity	ARCH LM	0.0357(0.9650)	No heteroscedasticity in the model
Auto correlation	Breusch-Godfrey LM	0.9297(0.4096)	There is no autocorrelation in the model
Linearity test	Ramsey RESET	0.0464(0.8314)	The model is correctly specified

Source: Author's computation (2021).

The favourable results of the post-estimation diagnostic tests indicate the absence of fundamental econometric issues within the estimated model.

Conclusion

This study evaluated the impact of exchange rate volatility on food price inflation in Nigeria. Pertinent data spanning from 1990 to 2021 were sourced from the World Bank and the CBN Statistical Bulletin. The variables encompassed in this study include food price inflation, exchange rate, food production, money supply, and lending interest rate. The estimation process comprised three segments: pre-estimation procedures, model estimation, and residual (diagnostic) tests.

The pre-estimation analysis involved visually depicting the variables and conducting formal pre-tests, specifically the unit root and co-integration tests. The Augmented Dickey-Fuller test established that the variables were a

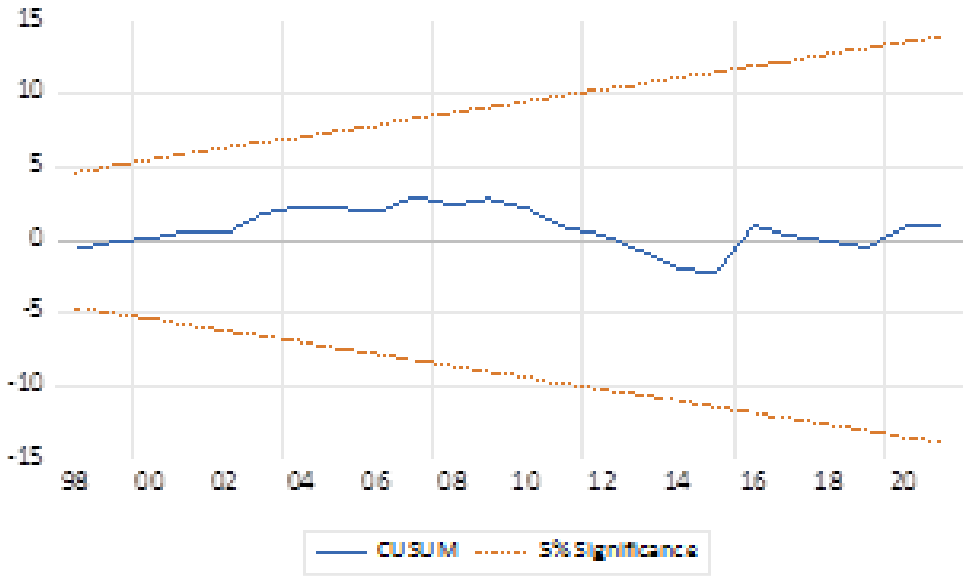

Figure 3. Recursive CUSUM test for stability.

mix of I(0) and I(1) series. Additionally, the ARDL Bounds co-integration test confirmed a long-term relationship between food price inflation and the explanatory variables.

Model estimation employed the auto-regressive distributed lagged model to establish both short-run and long-run models. In assessing the model's validity and consistency, the study ensured satisfaction of classical least square assumptions, revealing that the model was correctly specified, homoscedastic, and devoid of serial correlation.

In summary, the short-run analysis identified exchange rate volatility as the sole significant variable, while in the long run, both exchange rate and food production exhibited significance.

Recommendations

The following suggestions are provided in light of the research findings of this study in order to formulate successful policy:

(1) The Nigerian government should broaden its fiscal spending within the economy to stimulate domestic investment and production. Additionally, implementing export-promotion measures, like offering tax incentives to exporting firms, would foster the export of locally manufactured goods. This would subsequently bolster the country's foreign reserves and potentially lead to an appreciation of the national currency (Naira).

(2) The Ministry of Agriculture ought to catalyse food production by facilitating the allocation of available arable lands to farmers at no cost. Furthermore, introducing accessible soft loans and credit schemes for farmers can significantly elevate their cultivation activities, resulting in an abundance of food products in local markets. This surplus would, in turn, contribute to a reduction in food prices.

(3) To mitigate inflationary pressures, implementing monetary policy measures that control the amount of cash in the economy for use and lending interest rates is essential. These mechanisms would help to curtail the extent of inflation while maintaining overall economic stability.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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