EFFECT OF EXCHANGE RATE ON DOMESTIC PRICE LEVEL IN NIGERIA

Abstract

Nigeria experienced significant depreciation of her currency during the specified period of this study, mainly due to factors such as falling oil prices, external economic conditions such as slowdown in global economic growth, trade tensions which led to capital outflows from emerging markets including markets in Nigeria, tightening of global monetary policy which affected capital flows to these emerging markets, coupled with domestic macroeconomic challenges like concerns over policy consistency, governance issues and security challenges, capital flight and weakened investors'' confidence. These conditions collectively created an adverse environment for the Nigerian economy, leading to the depreciation of Naira. Consequently, this study set out to achieve the main objective of investigating on a more recent basis, effects of exchange rate on domestic price level in Nigeria. The period covered was from January 2015 through December 2022. The study adopted the Autoregressive Distributed Lag (ARDL) model and the variables included consumer price inflation, nominal exchange rate, import prices, international crude oil prices and real output growth. We found insignificant positive impact of the nominal exchange rate on consumer price inflation in Nigeria. The import prices also proved a significant effect on consumer price inflation in Nigeria. the study recommends that Governments at all levels in the country should encourage and support the innovative ideas of business firms and individuals. This will support local production, hence, there can be substitution of imported goods for domestically produced goods and the exchange rate will be stable.

Keywords: Exchange rate, Domestic price level, Real output growth, Nigeria, ARDL.

JEL: C01, E31, F31, O4

Introduction

Domestic price level is the average of the current prices across the entire range of goods and services within a country's market. It is an important economic indicator that reflects the overall level of inflation and the purchasing power of consumers, and is a crucial macroeconomic indicator that provides insights into the overall health of an economy. Mankiw (2016) defined domestic price level as the average level of prices in the economy, measured by a price index such as the consumer price index (CPI), the gross domestic product deflator (GDP deflator) or the producer price index (PPI). Similarly, in their book "Principles of Macroeconomics", Mankiw and Taylor (2017) explained that the domestic price level is affected by various factors, including changes in the money supply, shifts in aggregate demand and supply, and fluctuations in international trade.

In developed countries, domestic price levels are typically more stable than in developing countries, as a result of more robust institutional frameworks, which are often characterized by high productivity and low levels of corruption. This stability is further supported by sound and effective monetary and fiscal policies, and a more diversified economic base. However, these countries are not immune to inflationary pressures, with factors such as global economic shocks, supply chain disruptions, and shifts in consumer behavior all potentially contributing to inflationary pressures.

In Nigeria, the formulation and implementation of monetary policy by the Central Bank of Nigeria (CBN) is aimed at maintaining price stability which is consistent with the achievement of sustainable economic growth. However, high and volatile domestic price level in Nigeria has been a major impediment to overall economic growth, as it leads to reduced purchasing power of especially the vulnerable segment of the population, discourages savings, induces uncertainty for investment, and raises the cost of doing business (Bawa & Abdullahi, 2012).

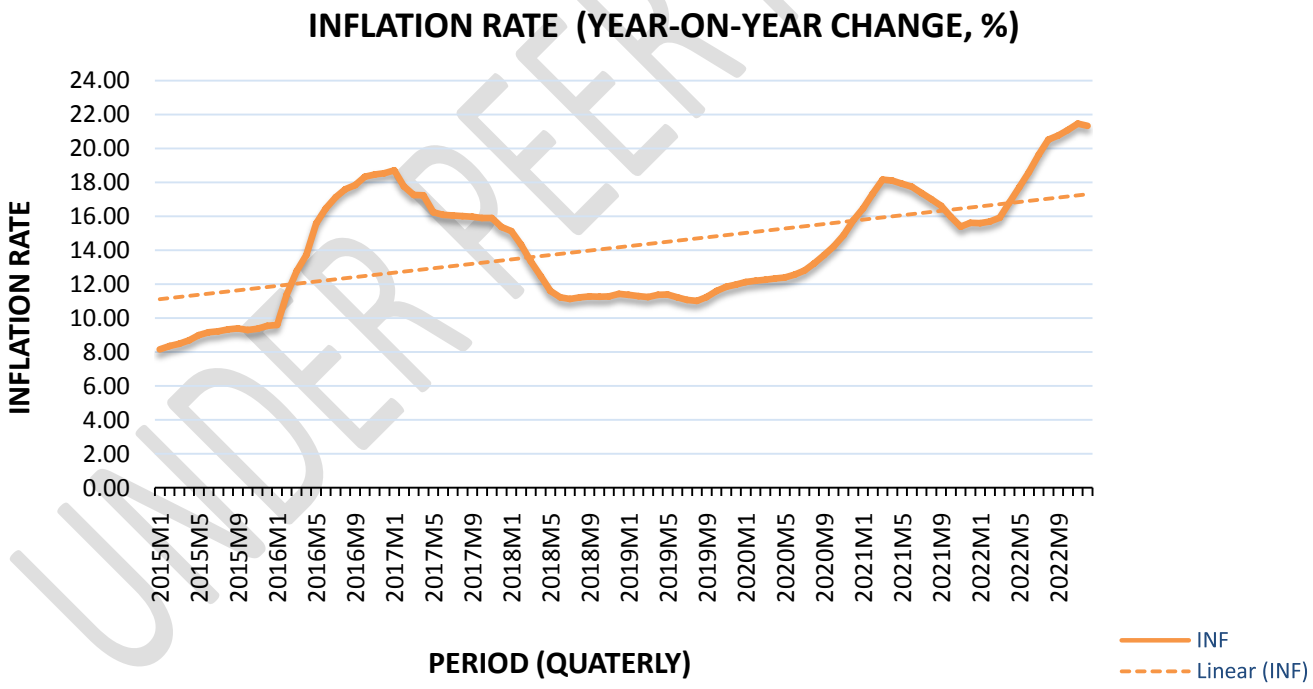

Figure 1: Inflation Rate Trend in Nigeria (2015–2021)

Source: Researcher's Compilation (2023), using data from the Central Bank of Nigeria

According to the National Bureau of Statistics (NBS, 2021), Nigeria's inflation rate rose to a four-year high of 18.17% in March 2021, up from 17.33% in February 2021. The rate grew faster than usual for the 10th straight month to 21.47 percent in November of 2022 from 21.09 percent in October and above market estimates of 21.15 percent. The high inflation rate has been attributed to several factors, including insecurity, the COVID-19 pandemic, and the naira's devaluation. High inflation has also had adverse effects on standard of living, as it leads to reduced disposable income, lower purchasing power and a decline in the welfare of the Nigerian populace.

In Nigeria, the exchange rate has experienced fluctuations over time, reflecting the dynamics of the economy and external factors. While there have been periods of stability and managed exchange rate regimes, there have also been episodes of volatility and significant depreciations. These fluctuations have been influenced by various factors, such as global oil price shocks, economic crises, and policy adjustments. As a result, the Nigeria exchange rate has exhibited a mixed pattern, characterized by both appreciations and depreciations, which can have varying impacts on the domestic price level. These challenges have contributed to foreign exchange shortages, weakening the naira and driving up inflation rates.

Policymakers in Nigeria have responded to exchange rate instability and high inflation with various programs and policies. CBN has increased interest rates and implemented foreign exchange controls to stabilize the exchange rate and reduce inflation rates. With some success however, these policies have also had negative effects on the economy. Nigeria has also employed monetary policy interventions and diversification strategies to address the issue. The country is promoting the growth of non-oil sectors such as agriculture, manufacturing, and services to reduce reliance on foreign exchange. They have prioritized infrastructure development to attract foreign investment and improve the country's competitiveness. They have embarked on projects to improve the country's transport, power, and communication infrastructure to reduce business costs and improve the overall economic environment. Efforts to maintain price stability and manage exchange rate fluctuations in Nigeria have been ongoing, but challenges persist.

The relationship between exchange rate and inflation has also been explored by several authors such as Ijeoma (2014) who found a positive relationship between exchange rate and inflation in

Nigeria, while Nwankwo and Okafor (2013) found a negative relationship. According to Dornbusch and Fischer (1993), exchange rate movements can affect a country's trade balance, inflation, and interest rates. As explained by Mordi and Adeleke (2014), it is a key determinant of inflation in Nigeria, and its effects can be transmitted through both imported goods and can also directly affect the price of goods sold in the domestic markets.

It is against this backdrop that this study examines the effect of exchange rate on domestic price level in Nigeria. The rest of the paper is structured as follows. Section two presents the review of empirical literature, while section three expresses the data and methodology. While section four presents the analysis and interpretation of result, section five shows the conclusion and policy recommendations.

2. Review of Empirical Literature

In Musa's (2021) study, the aim was to assess the impact of exchange rate volatility on inflation in Nigeria using annual time series data from 1986 to 2019. The study employed the generalized autoregressive conditional heteroskedasticity (GARCH) and vector error correction model (VECM) to examine the long-run effects of exchange rate volatility on inflation. The variables included in the model were consumer price index, nominal exchange rate, money supply, import, and export. The findings indicated that both money supply and nominal exchange rate had a positive and significant impact on the consumer price index, suggesting that inflation in Nigeria is influenced by fluctuations in the exchange rate and an increase in money supply.

Ari et al. (2021) conducted a study on the exchange rate pass-through (ERPT) to inflation in Mozambique by analyzing monthly data from 2001 to 2019. Their findings indicate that the ERPT is asymmetric, significant, and rapid, with approximately 50 percent of exchange rate variations transmitting to prices within a span of less than six months. The authors employed the auto-regression distributed lag (ARDL) model to analyze various variables, including Mozambique CPI, bilateral exchange rates of the Mozambican Metical (MZN) against the South African Rand (ZAR) and the United States Dollar (USD), nominal effective exchange rate, import price index, real money supply (M3), and rainfall index.

In their study, Gbalam and Dumani (2020) examined the relationship between the general price level and foreign exchange rate in Nigeria using annual historical data from 1990 to 2018. The variables included in the analysis were the general price level (proxied by CPI), exchange rate,

and real interest rate. The findings indicated that the foreign exchange rate had a positive but insignificant impact on the level of inflation in Nigeria. This suggests that the changes in the general price level in the country are not primarily influenced by imported inflation.

Usman and Mohammad (2018) conducted a study to examine the extent of exchange rate pass-through to consumer price inflation in Nigeria, considering both the short-run and long-run dynamics. They utilized historical annual data covering the period from 1960 to 2015. The study employed the Cointegrated Autoregressive Model proposed by Johansen (1988, 1995) to analyze the relationships. The findings indicated that the exchange rate had a positive and significant effect on the consumer price index (CPI) in both the short run and long run. Additionally, the study found that the import price index and trade openness index had positive and significant effects on consumer price inflation, although some statistical flaws were observed in the short-run impact of the import price index.

In their empirical study, Tela et al. (2018) investigated the impact of domestic price level and monetary policy on exchange rate fluctuations. They utilized time series annual data covering the period from 1987 to 2014. The study employed the Ordinary Least Square technique to analyze variables such as real exchange rate, crude oil prices, consumer price index, domestic interest rate, terms of trade, monetary policy rate, foreign exchange reserve, and foreign interest rate. The results indicated a significant relationship between commodity prices, nominal interest rate, crude oil prices, monetary policy, and the exchange rate.

Helmy, Fayed, and Hussien (2018) conducted a study in Egypt to analyze exchange rate pass-through (ERPT). Their research findings revealed that the pass-through effect was high but incomplete, and it occurred at a slow pace across three categories of prices: consumer price index, producer price index, and import prices. The authors further explained while reporting their findings that the consumer basket in Egypt is significantly influenced by subsidized commodities and goods with regulated prices.

Hernán and Norberto (2018) conducted a study focusing on the nature of exchange rate pass-through to prices across the distribution chain. They employed a logistic smooth transition autoregressive vector model and utilized Bayesian methods to estimate the model using data from the Colombian economy and its main trading partners. The study covered the period from January 2002 to May 2015 and included variables such as CPI inflation, real exchange rate,

output gap, economic openness, commodity prices and interbank interest rate (IBR). The main finding of their research indicates that exchange rate pass-through is non-linear and varies depending on the state of the economy and the specific shocks experienced.

Abiodun et al. (2016) conducted a study to examine the transmission of exchange rate effects on import prices and consumer prices at the aggregate level in Nigeria. They utilized quarterly historical data from 1995 to 2015 and included variables such as inflation (CPI), world import prices (represented by the US producer price index), nominal exchange rate, nominal effective exchange rate, real output (proxied by Real GDP), and oil prices. The study established two equations, namely the baseline model for showing transmission of exchange rate effect to import prices and alternative model indicating the transmission to consumer prices. They applied Johansen cointegration and vector error correction techniques to analyze the collected data. The results indicated that the effect of exchange rate pass-through is higher in imports compared to aggregate consumer prices in Nigeria.

In a study by Victor (2016), annual data from 1974 to 2013 was utilized to investigate the factors contributing to inflation and their respective magnitudes in Nigeria. The study aimed to identify both traditional and institutional variables associated with the inflation phenomenon and determine their impact on the general price level. The variables included in the analysis were the consumer price index (CPI), lagged inflation, real wages, output gap, real profits, real effective exchange rate, crude oil index, real broad money supply, and dummies for institutional density and product market density. The historical data collected was analyzed using the autoregressive distributed lag (ARDL) model. The findings indicated a short-run relationship where 60% of disequilibrium errors from the previous year's shock converged back to the long-run equilibrium in the current year.

Lariau et al. (2016) conducted a study comparing the magnitude of exchange rate pass-through (ERPT) in Angola and Nigeria. The findings revealed that in Angola, the long-run ERPT was substantial but had been decreasing in recent years due to de-dollarization efforts. On the other hand, in Nigeria, the long-run ERPT was found to be statistically insignificant. However, in the short run, there was a significant estimate of ERPT for nonfood prices.

3. Data and Methodology

3.1. Model specification

In line with other studies such as Ari et al. (2021); Abiodun et al. (2016), we consider controlling for other relevant variables in the model. We have incorporated international crude oil prices and real output growth as relevant control variables. Including international crude oil prices in our model is crucial for analyzing the relationship between exchange rate and domestic prices, particularly in the context of an oil-rich economy like Nigeria. This variable allows us to account for global shocks that can have a substantial impact on Nigeria's economy, considering that oil receipts play a significant role in the country's revenue.Our empirical model takes the following functional form:

$$CPI = f(NER, USWPI, OILP, RGDPG) \quad 1$$

Where;

CPI = Domestic consumer prices; NER = Nominal exchange rate; USWPI = Import price index; OILP = International crude oil prices; RGDPG = Real output growth. The econometric representation of equation (2) is expressed in the form:

$$CPI = \beta_0 + \beta_1 NER + \beta_2 USWPl + \beta_3 OILP + \beta_4 RGDPG + \varepsilon_t \quad 2$$

To facilitate the interpretation of estimated coefficients as elasticities and to address the issue of heteroscedasticity, the econometric model is transformed into natural logarithmic form, allowing for a long-run regression analysis. The equation can be represented as follows:

$$Ln(CPI) = \beta_0 + \beta_1 Ln(NER) + \beta_2 Ln(USWPl) + \beta_3 Ln(OILP) + \beta_4 Ln(RGDP) + \varepsilon_t 3$$

Where;

LnCPI = Log of domestic consumer price index; LnNER = Log of nominal exchange rate; LnUSWPI = Log of import price index; LnOILP = Log of international crude oil prices; LnRGDPG = Log of real output growth; β_0 = Constant term or the intercept of the model; β_1 - β_4 = Elasticities or the expected effect of their respective independent variables; ε_t = Error term

The coefficients β_1 represent the impact of exchange rate on the Consumer Price Index (CPI), specifically capturing the influence of exchange rate changes on the prices of imported goods and domestically produced tradable goods, which can be affected by variations in the prices of imported inputs.

Linear ARDL Model

Equation (3) is a static model which does not capture the economic reality of the dynamic impact exchange rate might have on domestic price level. To capture this dynamic impact of exchange rate on domestic price level, we employ the autoregressive distributed lag (ARDL) model of Pesaran, Shin and Smith (2001). The above equation (3) is now specified in ARDL form as:

$$\Delta Ln(CPI)_t = \alpha_0 + \sum^{n}_{i=1} \alpha_{1i} \Delta Ln(CPI)_{t-i} + \sum^{n}_{i=0} \alpha_{2i} \Delta Ln(NER)_{t-i} + \sum^{n}_{i=0} \alpha_{3i} \Delta Ln(USWPI)_{t-i} + \sum^{n}_{i=0} \alpha_{4i} \Delta Ln(OILP)_{t-i} + \sum^{n}_{i=0} \alpha_{5i} \Delta Ln(RGDPG)_{t-i} + \beta 1\ Ln(CPI)_{t-i} + \beta_2 Ln(NER)_{t-i} + \beta_3 Ln(USWPI)_{t-i} + \beta_4 Ln(OILP)_{t-i} + \beta_6 Ln(RGDPG)_{t-i} + \varepsilon_t \quad 4$$

3.2. Technique of Estimation

Prior to deciding on the appropriate econometric estimation technique, the study tests the individual variables for unit root using Augmented Dickey-Fuller (ADF) unit root test. Consequent to this test, cointegration test using ARDL Bound testing approach was employed. Then the study estimates both the short-run and the long-run versions of the ARDL model. The study employed ARDL model. Autoregressive distributed-lag modelis a model which captures the dynamic relationship between the dependent and the independent variables over time. The choice of this model is based on the fact that it does not require all variables to be integrated of same order. Thus, variables can be stationary at level and first difference.

4. Presentation and Interpretation of Results

4.1. Descriptive Statistics

Table 1 presents the summary of descriptive statistics of the dependent variable and the explanatory variables included in the model.

Table 1: Summary of Descriptive Statistics

	CPI (%)	NER	USWPI	OILP	RGDPG
Mean	14.20927	210.9095	127.7632	62.50344	1.359112
Median	14.28000	181.8050	124.4000	61.53500	2.065593
Maximum	21.47000	696.0100	165.9700	130.1000	3.600000
Minimum	8.160000	93.41000	109.6000	14.28000	-1.800000
Std. Dev.	3.458795	125.4330	15.01392	20.50544	1.943643
Skewness	0.123709	2.194614	1.224027	0.966521	-0.666986
Kurtosis	2.011297	7.183233	3.542012	4.608964	1.931522

Jarque-Bera	4.154999	147.0590	25.14697	25.30166	11.68451
Probability	0.125243	0.000000	0.000003	0.000003	0.002902
Sum	1364.090	20247.31	12265.27	6000.330	130.4748
Sum Sq. Dev.	1136.510	1494676.	21414.68	39944.92	358.8860
Observations	96	96	96	96	96

Source: Researcher's Computation (2023) using E-views 10.

Results in Table 1 shows that the average inflation rate (CPI) during the study period was 14.20927, while the minimum and the maximum level recorded during this period was 8.160000 and 21.47000 respectively. The minimum level shows that the lowest level of inflation experienced in the country during the period of the study was 8.160000 percent while the highest level was 21.47000 percent, which is almost two-fold of the average indicated above, thus showing the level of price instability in Nigeria. During the study period, the average exchange rate in Nigeria was N210.9095. The minimum was N93.41000 and the maximum recorded was N6 96.0100, with the standard deviation indicating high level of exchange rate volatility in the country. The average import price index was $127.7632, while the minimum and the maximum was $109.6000 and $165.9700 respectively, indicating high cost of importation in Nigeria during the study period. The average crude oil price was $62.50344 while the minimum and the maximum crude oil prices were 14.28000 and $130.1000, respectively. The average real GDP growth during the study period was 1.359112 percent, while the maximum and the minimum were 3.600000 percent and -1.800000 percent, respectively, implying that the real GDP growth was not constant throughout the observed timeframe in Nigeria.

The residuals of CPI are normally distributed, whereas the residuals of all other variables have high rate of dispersion from their mean (with P-values less than 0.05 at the 5% significant level) which is evidenced in the Jarque Bera statistics. The results also suggest that all the variables are positively skewed except real GDP growth, which implies that the data is not distributed symmetrically.

4.2. Correlation Analysis

The correlation analysis is employed to ascertain the strength of the linear relationship among the explanatory variables of the model. The essence of this is to ensure that multicollinearity does not constitute a serious problem. These results are summarized in Table 2.

Table 2: Summary of Correlation Analysis

Correlation Probability	CPI	NER	USWPI	LnOILP	RGDPG
CPI	I.000000				

NER	0.624920	1.000000			
	(0.0000)	----			
USWPI	0.579071	0.902761	1.000000		
	(0.0000)	(0.0000)	----		
LnOILP	0.273089	0.531739	0.622982	1.000000	
	(00071)	(0.0000)	(0.0000)	----	
RGDPG	0.028462	0.347595	0.437640	0.684385	1.000000
	(0.7831)	(0.0005)	(0.0000)	(0.0000)	(0.0000)

Source: Researcher's Computation (2023), using E-Views 10

The result reveals that all the variables are positively correlated. However, it was found that no pair-wise correlation coefficient between any two regressors was up to the stipulated benchmark of 0.8 except for USWPI and NER. However, this will not invalidate our entire regression results based on our specific research context and the goals of our analysis. Therefore, we conclude that no serious problem of multicollinearity exists in the sample.

4.3. Data Analyses: Pre-Estimation Test

The analyses start with the test for unit root. This is followed by the estimation of the long run relationship among the variables.

4.3.1 Unit Root Test

The Table 3 below is a summary of the unit root test on the data at level and first difference. The augmented dickey fuller (ADF) unit root test was performed to ascertain the order of integration. Thus, the critical values and probability values are shown in open brackets and parentheses respectively below the ADF test statistics.

Table 3: Summary of ADF Unit Root Test Results

Variables	At Level	Level of Significance	At First Diff	Order of Integration	Decision

CPI	-1.5988 (-2.8936) {0.4791}	5%	-3.9138** (-2.8936) {0.0029}	I(1)	Stationary
NER	2.7903 (-2.8929) {1.0000}	5%	-4.3821** (-2.8932) {0.0006}	I(1)	Stationary
USWPI	2.2791 (-2.8922) {1.0000}	5%	-8.3784** (-2.8925) {0.0000}	I(1)	Stationary
OILP	-3.0315 (-2.8925) {0.0356}	5%	-7.6852** (-2.8929) {0.0000}	I(0)	Stationary
RGDPG	-2.1632 (-2.8922) {0.2211}	5%	-9.5920** (-2.8925) {0.0000}	I(1)	Stationary

Source: Researcher's Compilation (2023), using E-Views 10

Note: {} = Probability values.

() = Critical values

** =Significant at 5%, Obtained from MacKinnon (1996)

Results of the unit root test using Augmented Dickey Fuller procedure shows that all the variables are stationary at first difference with an exception of oil price which is stationary at level. This supports the use of autoregressive distribution lag (ARDL) model. However, the presence of a unit root in the series suggests the need to carry out cointegration test.

4.3.2 ARDL Bounds Test (F-test for Cointegration)

In order to determine the existence or otherwise of a long-run relationship among the variables, this study used the ARDL Bounds test. The hypothesis of the Bounds test states that;

H_0: There is no long run relationship existing amongst the variables.

H_1: There is long run relationship amongst the variables.

The test result is summarized below:

Table 4: Summary of Linear ARDL Bounds Test Results

F-Statistic	Significance	Critical Values		Conclusion
		Lower Bound	Upper Bound	
	10%	2.2	3.09	Cointegrated

4.210932	5%	2.56	3.49	at 10%, 5% & 2.5% levels
	2.5%	2.88	3.87	
	1%	3.29	4.37	

Source: Researcher's Computation (2023), using E-Views 10

Under the null hypothesis of no long-run relationship, the result indicates that the null hypothesis cannot be accepted. This is because the computed F-statistic of about 4.21 is greater than the upper bounds I(1) critical value of 3.49 at the 5% significance level. This implies that all the variables are co-integrated. Based on this, we conclude that a long-run relationship exists between domestic price level and its fundamentals.

4.4 Model Estimation and Evaluation

Given that we have confirmed the existence of long run relationship amongst the variables, we then estimate the short-run and long-run parameters of the Linear ARDL model.

4.4.1 Evaluation of Estimated Linear Long-run Results

The estimated long-run coefficients of our linear model is reported in Table 5.

Table 5: Summary of Estimated Linear Long-run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NER	0.024087	0.010919	2.205974	0.0305
LnUSWPI	2.966561	12.15318	0.244097	0.8078
LnOILP	-1.231525	2.519424	-0.488812	0.6264
RGDPG	-0.769113	0.398485	-1.930094	0.0575
C	0.257155	55.80244	0.004608	0.9963

Note: not all variables are in log, (** = significant at the 5% level)

Source: Researcher's Computation (2023), using E-Views 10

Table 5 shows that on average, a percent positive change in nominal exchange rate (NER) is associated with about 0.024 percent increase in Nigeria's domestic prices in the long run. The *p value* of 0.03 shows that the positive effect is significant in the long run at 5% level. This finding corroborate the findings of Musa (2021) on exchange rate vis-à-vis consumer price index.

On the average, import prices also has a positive coefficient of about 2.9666, which shows that import prices in Nigeria exert positive influence on domestic price level in the long run.

Consequent upon this, we can assert that in the long-run, a unit percent change in import prices increase domestic prices on the average by about 2.9666 percent. The *p-value* of 0.8078 indicates that the positive effect of import price index on domestic price inflation in the long run is not significant at 5% level. The findings of Usman and Mohammad (2018) is supported by the findings of this study.

The long run effect of oil price on domestic price level in Nigeria is negative. This is evident in the negative coefficient of -1.231525. What this entails is that a unit percent increase in oil price per barrel, on average, results to 0.4688 percent decrease in domestic prices in the long run. The decrease was also found to be insignificant at 5% level. This is in tandem with the findings of Tela et al. (2018) which established that crude oil prices is positively related to domestic price level.

Real output growth on the other hand decreases domestic prices in the long run but not significantly in Nigeria. This implies there is 0.769113 percent decrease on the average in domestic prices, when real output growth in the Nigeria economy increases by a unit percent. The negative relationship between real output growth and domestic prices is in contrast with the findings of Abiodun et al. (2016).

The intercept in the long run estimate is positive (0.257155). This implies that there is a positive trend in domestic price inflation in Nigeria occasioned by factors, other than the variables included in the model.

4.4.2 Evaluation of Estimated Linear Short-run Results

The short-term relationship between the exchange rate and consumer price inflation in this study was estimated using the appropriate lag order. The distributed lag (DL) of the autoregressive (AR) model determined that 4 lag periods were selected for the dependent variable (consumer price inflation), 3 lag periods for the nominal exchange rate. 2 lag periods were chosen for the import price index (USWPI), 1 lag period for crude oil prices and 4 lag periods for real output growth. However, the aim of error correction modeling (ECM) is to assess whether a short-term disequilibrium can be corrected in the long run. In this context, the error correction term serves as an indicator of the speed at which adjustments occur from one period to another. It is expected to exhibit a negative sign, fall within the range of 0 and -1, and be statistically significant at the

5% level to demonstrate a robust convergence process towards long-run equilibrium. The detailed estimation results can be found in Table 6.

Table 6: Summary of Estimated Linear Short-run Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CPI(-1))	0.390174**	0.099816	3.908914	0.0002
D(CPI(-2))	0.188752	0.107367	1.758001	0.0829
D(CPI(-3))	0.311056**	0.099126	3.137969	0.0025
D(NER)	-0.000514	0.001096	-0.468927	0.6405
D(NER(-1))	-0.003224**	0.001077	-2.993095	0.0038
D(NER(-2))	-0.002817**	0.001171	-2.404392	0.0187
D(LnUSWPI)	5.841110**	2.720192	2.147315	0.0351
D(LnUSWPI(-1))	4.827323	2.744554	1.758873	0.0828
D(LnUSWPI(-2))	7.078102**	2.772270	2.553179	0.0128
D(LnUSWPI(-3))	6.716908**	2.717758	2.471489	0.0158
D(LnOILP)	0.265530	0.196875	1.348719	0.1816
D(RGDPG)	0.025556	0.036367	0.702726	0.4845
D(RGDPG(-1))	-0.054712	0.039044	-1.401294	0.1654
CointEq(-1)*	-0.069762**	0.013427	-5.195778	0.0000
R-squared	0.742549			
Adjusted R-squared	0.699640			
Durbin-Watson stat	1.780019			

Note: not all variables are in log, (** = significant at the 5%)

Source: Researcher's Computation (2023), using E-Views 10

The estimated short-term coefficients in Table 6 indicate a speed of adjustment of 0.069762 units per month. This means that the model corrects any deviations from equilibrium from the previous month at a rate of approximately 0.0698 units each month. Essentially, if the exchange rate remains constant at this monthly rate, the domestic price level will gradually reach its long-run equilibrium. This adjustment occurs when there are changes in the exchange rate, such as an appreciation or depreciation of the domestic currency. The adjustment process takes place over several months, with approximately 0.0698 units of adjustment occurring each month. The error correction term, which is correctly signed and statistically significant, indicates that in Nigeria, any deviations from equilibrium in the short run will be corrected in the opposite direction over time.

We can also see from the result that a unit percent increase in domestic inflation (CPI) continues to have a significant influence on its own growth in Nigeria. The positive and significant lagged coefficients indicate that a unit percent increase in previous one month's inflation on an average, contributes approximately 0.3902 percent to its current month's growth. On average, increases of around 0.1888 percent in CPI can be attributed to a unit percent increase in inflation rate observed two months ago, while an average increase of approximately 0.3111 percent can be attributed to a unit percent increase in inflation rate observed three months ago.

The observed data suggests also, that a unit percent positive change in the nominal exchange rate has a small negative but statistically significant impact on inflation (CPI). Specifically, on an average, for every unit percent increase in the nominal exchange rate, there is a decrease in CPI by approximately 0.0005 percent in the current month. Furthermore, the data shows that this impact is not limited to the current month but extends to the preceding two months as well, where it accounts for decreases of 0.0003 and 0.0002 percent in CPI, respectively. However, the statistical analysis revealed a probability value of 0.6405. This value suggests that the negative trend observed in the nominal exchange rate is not statistically significant at the 5% level in the current month. In contrast, the negative trend was found to have shown significance in the previous two months.Meanwhile, the finding corroborates the result from Gbalam and Dumani (2020), but contradicts the findings of Musa (2021); Usman and Mohammad (2016); and Victor (2016), who found positive significant impact of exchange rate on domestic prices in Nigeria.

A unit percent increase in the import price index on average, triggers a rise in the domestic price level in Nigeria by approximately 5.8411 percent in the current month. However, the three preceding months' unit percent positive change on average, leads positive trends in Nigeria's domestic inflation, with the first, second, and third previous months lags increasing the domestic price level (CPI) by approximately 4.8273, 7.0781, and 6.7169 percent respectively. The probability values associated with the import price index for the current month, second lagged month, and third lagged month indicate that their positive short-term impact on the current month inflation in Nigeria is statistically significant. However, the positive short-term effect in the first lagged month was not statistically significant at the 5% level. This finding is in tandem with the findings of Usman and Mohammad (2016).

The short-run coefficient of oil price is positive although it is not significant at 5% level. This means, on the average, a unit percent increase in international crude oil prices will cause inflation to increase by about 0.2655 percent in Nigeria. This corroborates the findings of Tela et al. (2018) which established that crude oil price is positively related to domestic price level.

The coefficient (0.025556) of real output growth in the current month leads to a rise in domestic price level on average, by that percentage for a unit percent increase in real output growth in Nigeria, whereas the coefficient from the previous month triggers about 0.0547 percent decrease in Nigeria's consumer price inflation (CPI) for a unit percent growth in real outputs. The probability values of 0.4845 and 0.1654 indicate that the observed positive and negative effects of real output growth on CPI in Nigeria, were not statistically significant at the 5% level.The negative relationship between real output growth and domestic price level supports the findings of Abiodun et al. (2016).

Overall, a lack of significance does not necessarily mean that there is no relationship between the variables; it simply indicates that the observed relationship (given the available data used for the analysis) is not statistically strong enough to establish a confident conclusion.

The coefficient of determination (R^2) is reported as 0.7425. This means on the average, approximately 74 percent of the changes in the domestic price level in Nigeria can be attributed to the combined influence of the nominal exchange rate, import prices, international crude oil prices, and real output growth. The remaining 26 percent of the variation in consumer price inflation is likely due to other factors not captured in the model (residuals). These findings indicate that the model has a relatively high explanatory power and a strong ability to predict, suggesting that it fits well with the available data. From the regression estimates, it can be further observed that the calculated F-statistic is 4.210932. This shows that the variables are jointly statistically significant at 5 percent.The Durbin Watson (DW) Statistic in the model is approximately equal to 2, suggesting that there is no autocorrelation problem in the model.

4.5. Post Estimation Diagnostic Tests

Relevant post-estimation diagnostic tests were conducted to check whether the estimated model is robust, suitable and valid for policy application and recommendation purposes. Specifically, we tested for serial correlation, Heteroscedasticity, normality and model stability.

4.5.1 Serial Correlation Test

We test for the presence of serial correlation among the explanatory variables in the model using the Breusch-Godfery LM test. The test is conducted under the following hypotheses.

H_0: Residuals are not serially correlated in the ARDL model (no autocorrelation)

H_1: Residuals are serially correlated in the ARDL Model (autocorrelation)

Table 7: Results of Serial Correlation Test

F-statistic	2.510442	Prob. F (2,71)	0.0884
Obs*R-squared	6.076243	Prob. Chi-Square (2)	0.0479

Source: Researcher's Computation (2023), using E-Views 10

From Table 7, the probability of the F-statistic in the models is greater than 0.05 (5% significant level). This implies the null hypothesis of no autocorrelation or no serial correlation in the ARDL model is accepted at the 5 percent level of significance, hence we conclude there is no autocorrelation in the model. However, the results of the LM test for serial correlation further corroborate the Durbin Watson test-statistic result for serial correlation.

4.5.2 Heteroscedasticity Test

In Table 8, we present the results of the heteroscedasticity test for the model using the Breusch-Pagan LM approach, in order to see whether the error variance of each observation is fixed or not. The null hypothesis of no heteroscedasticity against its alternative hypothesis is:

H_0: Error term of the ARDL model is homoscedastic (there is no heteroscedasticity in the residuals)

H_1: Error term of the ARDL model is not homoscedastic (there is heteroscedasticity in the residuals)

Table 8: Results of Heteroscedasticity Test

F-statistic	0.519488	Prob. F (18,73)	0.9403
Obs*R-squared	10.44643	Prob. Chi-Square (18)	0.9164

Scaled explained SS 7.982608	Prob. Chi-Square (18) 0.9789

Source: Researcher's Computation (2023), using E-Views 10

We reject the null hypothesis if the Probability Chi-Square of the Observed*R-Squared is less than 0.05 (5% significant level). The results of the model indicate that we cannot reject the null hypothesis, since the Probability of Chi-Square of the Observed*R-square is greater than 0.05. This suggests that the estimated model does not have the issue of heteroskedasticity at the 5 per cent level of significance, which is a good signal that the ARDL model is homoscedastic and adequate over the period covered by this study and therefore, the data is reliable for predication.

5. Conclusion and Policy Recommendations

Given the institutional framework in Nigeria which is characterized by reduced productivity, policy inconsistencies and macro-economic fluctuations, the rise in domestic prices has become part and parcel of the Nigerian economy. However, based on the findings in (4.8), inflation in Nigeria during the recent time is as a result of increases in import prices which probably had origin in endogenous demand shock and exogenous foreign producers' pricing shocks, which cause the marginal costs of Nigerian businessmen and producers to increase. As a result of existing inflation persistence in the country as observed from the short-run analysis, businessmen in Nigeria are able to pass the increases in marginal costs of production on to Nigeria consumers in the form of increases in the prices of consumer durables and non-durables in the country. This study therefore concludes that in recent time, exchange rate has insignificant positive long-run relationship with domestic price level in Nigeria, domestic prices responds swiftly to import prices reflecting Nigeria's trading partners price levels, and that, positive and negative changes in the nominal exchange rate have similar effects on domestic prices during the period studied; January 2015 to December 2022.

Policy Recommendations

i. Governments at all levels in the country should encourage and support the innovative ideas of business firms and individuals. This will support local production, hence, there can be substitution of imported goods for domestically produced goods and the exchange rate will be stable.

ii. The monetary authority's recent efforts to move towards greater flexibility in the exchange rate should be part of a consistent and credible package of sustainable

policies, since the impact of exchange rate on domestic price level in Nigeria is insignificant.

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