ANALYSIS OF THE IMPACT OF INSECURITY, EXCHANGE RATE AND ENERGY PRICES ON INFLATION IN NIGERIA

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ABSTRACT
The study investigates the impact of insecurity, exchange rate, and energy prices on inflation rate in Nigeria. To document this study, time series data were used from 1985 to 2022. Major variables used include insecurity, which was proxied by security expenditure, exchange rate, premium motor spirit prices, crude oil prices, and inflation. Descriptive and inferential statistics was employed specifically the autoregressive distributive lag (ARDL) model. Findings revealed that LCRPR, LPMS and LINSEC are stationary at first difference whereas LINFL and LEXCH achieved stationarity at levels and a long run relationship exists among the series. However, in the short run, insecurity and premium motor spirit have a positive relationship to inflation whereas exchange rate is on the contrary. Also, crude oil prices and premium motor spirit possesses an inverse relationship while exchange rate and insecurity are on the contrary in the long run. The study further reveals that insecurity, exchange rate and premium motor spirit has a unidirectional relationship to inflation. Consequently, the study concluded that all the variables insecurity, exchange rate, crude oil prices and premium motor spirit have significant impact with varying magnitude on inflation under the period considered. Therefore, the study suggested that government should aggressively diversify her economy towards the non-oil sector with emphasis on the critical sectors and also a Marshallian action plan need to be instituted by all stakeholders within the value chain on how to bring the insecurity condition to its knees as this will revive and spur economic activities.

Keywords: Insecurity, Energy prices, Exchange rate, Inflation, Autoregressive Distributive Lag, Crude Oil Prices, Premium Motor Spirit Prices, Nigeria
JEL Classification: E00, H56, P44, Q43

1. INTRODUCTION

Inflation targeting has been a key focus of monetary authorities across the world which the Central Bank of Nigeria (CBN) is not an exception. Global inflation has been recording upward trajectory in recent times as it stood at 8.7 per cent as at the end of 2022 (International Monetary Fund [IMF], 2023). The factors that has triggered the upward inflation rate was the spill over effect of the COVID-19 pandemic coupled with the Ukraine-Russia war. This largely affected the supply side of food and non-food items across the globe.

In the Sub-Saharan Africa, inflation has also increased since the pandemic, with median inflation reaching 9% in 2022, compared to a little more than 5% pre-pandemic (2009-2019) average. Although inflation is at its highest in a decade, it remains below the region's record of 12 percent (median) during the global financial crisis. Furthermore, food and tradeable products account for a sizable portion of regional inflation, accounting for around 36 and 29 percent of the consumption basket, respectively (IMF, 2022).

Subsequently, this scenario tends to have a trickle-down effect on the Nigerian economy owing to the interdependence and interrelationship that exist among economies of the world. However, the case of Nigeria further has its own peculiarities because of certain structural imbalances. The economy is mono-cultural in nature owing to its over-dependence on oil, over importation of consumable and non-consumable goods including refined Premium Motor Spirit (PMS) which is attributed to its dilapidated refining facilities, low agricultural production output among others. This has end up creating a pressure on foreign exchanges (FXs), thus resulting to excess demand over supply for FXs which by default has caused a significant variation in the exchange rate of the country.

Amidst this nature of economy, there exist some level of insecurity across the divide that is the Indigenous People of Biafra (IPOB) in the East, the Oduduwa People Congress in the West, the Niger Delta Militant in the South and famers-herders, banditry, kidnapping and Boko haram insurgency in the North (Abubakar, Sule and Tijjani, 2023). The Boko haram for instance started in 2009 and it has gradually spread across some part of the country. Their activities have significantly affected output level, lives and properties which has directly or indirectly affected the supply side of the economy, thus seems to be mounting pressure on general level of prices of goods and services.

Accordingly, the inflation rate of Nigeria as at July, 2023 rose to 24.08 per cent while urban and rural inflation recorded 25.83 and 22.49 per cent respectively. Major contributors of items to the index include food and non-alcoholic beverages (12.47%), housing, water, electricity, gas and other fuel (4.03%), clothing and footwear (1.84%). transport (1.59%), furnishing and household equipment and maintenance (1.21%) [National Bureau of Statistics, 2023]. Apart from other factors earlier mentioned, this upward trajectory is further attributed to the withdrawal of subsidies, which has resulted to an increase in PMS prices, and the unification of the foreign exchange market as they seem to be exerting pressure on the naira.

However, there are various studies that have been conducted on the nexus between energy prices, exchange rate and inflation which include the works of Okereke and Obinna (2022), Musa (2021), Adesete and Bankole (2020), Sakanko, Adejor and Adeniji (2021), Adejola *et al* (2022), Akighir and Zakari (2020), Apere (2017), Nokoro and Uko (2016), Nokoro and Uko (2016), Eregha *et al* (2015), and among others while other studies such as Siry and Traore

(2023), Olawale and Lukman (2020), Mohammed (2022) Abubakar, Sule and Tijjani (2023) have been able show a link between insecurity and inflation or economic development alone but little have been documented to establish a combined impact of insecurity, exchange rate and energy prices on inflation. More so, some of these studies especially works of Peersman, Ruth, and Der-Veken (2021) Siry and Traore (2023), Sarmah and Bal (2021), Olayungbo, (2021) Abu-Bakar and Masih (2018) were carried out in countries other than Nigeria, so it will be unfair to generalise the outcome of their study to Nigeria context. It is against these vacuums that necessitate the need for this study.

Consequently, the objective this study is to examine the impact of insecurity, exchange rate and energy prices on inflation in Nigeria from 1985 to 2022. However, the study is structured into five (5) sections. Section one covers introduction, while section two is the literature review where key concepts were discussed and conceptualized. In addition, relevant theories were presented, adopted and empirical literatures were also carried out on the nexus between key variables and inflation. Section three comprises the methodology employed in carrying out the study while section four encapsulates the results and discussions of findings. Section five has to do with the conclusion and policy recommendations of the study.

2. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1. *Insecurity and Inflation:* Achumba *et al* (2013) define insecurity from two perspective. To begin, insecurity is the state of being open to or prone to risk or the threat of danger, where danger is the condition of being vulnerable to harm or injury. Second, insecurity is the state of being vulnerable to risk or anxiety, where anxiety is a vague unpleasant emotion felt in expectation of some calamity. These definitions of insecurity emphasize a key point: persons affected by the circumstance are not only unclear or ignorant of what will happen, but they are also exposed to threats and dangers when they occur (Ajufo, 2013; Aghaulor, 2020). Insecurity, according to Abubakar, Sule, and Mamman (2022), is defined as uncertainty, hazard, risk, lack of safety, lack of confidence, state of doubt, insufficiently guarded and protected, lack of protection and being dangerous, and instability, among other things. The definition of achumba *et el* (2013) is appropriate for the purposes of this study, and it was measured based on the security spending as adapted from the works of (Owolabi and Ayenakin 2015).

Inflation, according to Ishola (2010) refers to "an increase in the volume of money and credit relative to the available goods and services, resulting in a substantial and persistent rise in the general price level." Johnson (1972) sees it as a long-term rising trend in the general price level. More so, the Central Bank of Nigeria, (n.d.) refer to it as an economic condition in which the prices of goods and services continue to grow. However, inflation is measured by the consumer price index, wholesale price index, and GDP deflator. Consequently, to conceptualize this concept, the study adopted the definition of Central Bank of Nigeria and the consumer price index measures which captures the changes in the price of goods and services directly consumed by individuals (Ishola, 2010).

2.1.2 *Energy Price:* This encapsulates the varying prices at which various energy sources are exchanged at the local or international market. However, for the purpose of this study, the crude oil and PMS is considered. Crude oil price measures the spot price of various barrels of oil. Alhough, crude oil has its own benchmark which include west Texas Intermediate (WTI), rent

and OPEC. This study is delimited to the OPEC benchmarking which captures seven different crude oil from different countries which Nigeria is not exempted. However, the prices of this crude is largely determined by the forces of demand and supply of crude oil. This is measured in USD dollars as obtained at the International Oil market. On the other hand, PMS is an acronym for Premium Motor Spirit which is popularly refer to as petrol or fuel. By PMS price, it refers to the price of automotive gas oil (Okereke and Obinna, 2023) and for the sake of the study, it was measured in Naira.

2.1.3 ***Exchange rate*****:** According to the Central Bank of Nigeria (2016) sees exchange rate as the 'price of one currency in terms of another currency'. It is usually expressed as the number of units of a domestic currency that will purchase one unit of a foreign currency and vice versa. The foreign currency can be Dollars, Euro, Pound sterling, Yuen among others. However, the study adopted the definition presented by the Central Bank of Nigeria and further considers the US Dollars at the official rate to suffice as the exchange rate by this official exchange rate captures exchange rate determined by monetary authorities.

2.1 Theoretical Literature

2.1.1 Theory of Purchasing Power Parity (PPP): The theory explains the relationship between product price levels and exchange rates. Gustav Cassel, a Swedish economist, developed it in his book "The Present Situation of Foreign Trade" in 1916. It is assumed that trade in commodities and services between countries causes significant changes in their spot exchange rates. The theory asserts that a currency has the same purchasing power in its home country as it does when converted to foreign currency and spent in another country. However, differences across countries creates problem of overvalue and undervalue of currencies. A country's currency is said to be undervalued when its purchasing power in its own country is lower, and vice versa. Consequently, the hypothesis is relevant to the study because it reveals the relationship between the exchange rate and inflation taking into consideration Nigeria is an import-dependent economy. The theory has been questioned because it only applies to nations where the BOP is established by the merchandise trade account rather than the capital account (Ishola, 2010). Furthermore, according to Keynes, the theory fails to account for the elasticity of reciprocal demand because the exchange rate is affected by more than just changes in price levels.

2.1.2 Keynes Theory of Inflation: John M. Keynes and his followers advocated the hypothesis of demand-pull inflation. The theory differs from the monetary perspective of inflation, which sees inflation as a monetary process. According to Keynes' theory, the primary cause of demand-pull inflation is a rise in aggregate demand. By aggregate demand, it comprises of consumption, investment, and government expenditure by various economic entities (i.e., households, firms, and government) [Jhingan, 2009]. The theory explains that if the value of aggregate demand exceeds the aggregate supply at full employment, then an inflationary gap tends to exist and the gap that exist is what Keynes applied to demonstrate the inflationary rise in crises. Consequently, the theory is relevant because it presents a typical blueprint of what explains inflation in Nigeria due to the level of insecurity, rising petroleum product costs, and exchange rate, which affects firms' capacity to produce goods and services, and when contrasted with rising aggregate demand attributed to a rising population, a gap exists which explains the inflationary condition. The Keynes theory is a short run analysis in which prices are considered to be fixed, which suggests that the theory's applicability in the long term

when prices vary is uncertain. Therefore, this study adopted a theory triangulation because both theories possess certain fundamentals or features that are critical in explaining the theme.

2.2 Empirical Literature

Several literatures have revealed the nexus between petroleum products, exchange rate and inflation in Nigeria and across the globe. Olawale and Lukman (2020) examined PMS pricing and inflationary dynamics in Nigeria from 1980 to 2018 using secondary data. To document the study, key variable such as PMS, AGO, DPK, EXGR and inflation was employed. In the analysis, econometric tools such as unit root, ARDL was employed which the findings revealed that PMS has a positive relationship with inflation which in other words, as the prices of PMS increase inflationary tendencies increases but the relationship is contrary regarding AGO and DPK. More so, there exist no causality relationship between price of PMS and inflation. The study concluded that price of PMS significantly spur inflation in Nigeria under the period under consideration.

Likewise, Okereke and Obinna (2022) examined petroleum price changes, exchanges and prices of food items in Nigeria using ARDL revealed that price of PMS and exchange rate have a significant impact on prices both in the short and long run in Nigeria. More so, non linear ARDL was employed by Ajala, Sakanko and Adeniji (2021) and it revealed that there is an asymmetric connection between pump price and consumer price index in Nigeria. Similar study by Wale-Awe and Sulieman (2020) shows a strong evidence that PMS prices spur inflation in Nigeria but there is a causality relationship between them.

In addition, Sakanko, Adejor and Adeniji (2021) carried out a study on petroleum pump price swing on Consumer price index in Nigeria by employing time secondary data from 1980 to 2021 alongside Nonlinear Autoregressive distributive lag model. By so doing the findings revealed that PMS has a significant positive relationship on CPI both in the short and long run period. Thus, the study concluded that PMS has an asymmetric effect on consumer price index. More so, Olayungbo (2021) while employing panel ARDL model in examining the nexus between global oil prices on food prices in food importing and oil exporting developing countries show a strong evidence that there is an inverse and positive relationship between oil prices and price of food in the short and long run respectively.

Eregha *et al* (2015) carried similar study in Nigeria while trying to investigate the nexus between petroleum product prices and inflation dynamics employed the OLS model with a data set from 1994 to 2012 which findings depicts that PMS, AGO and money supply has a significant positive relationship with inflation where as DPK has a negative relationship. Likewise, the works of Bobai (2012) found that there exists a positive relationship between inflation, PMS and AGO especially PMS under the period from 1990 to 2011 on quarterly basis. It further concluded than an increase in the petroleum prices will results to an increase in the rate of inflation owing to the nature of the Nigeria economy as it is skewed towards the oil sector. Adejola *et al* (2022) examined the relationship between oil prices and exchange rate using monthly data and wavelet analysis which show that there is a lead lag effect of oil price on exchange rate in the long run but its contrary in the short run. Further findings show a unidirectional and bidirectional causality between them in the short and long run under the period.

Adesete and Bankole (2020) investigated on the nexus between oil price shock and macroeconomic aggregates while employing SVAR model and impulse response Function

(IRF) supported by monthly data set from 1981 to 2019 shows that the oil price shock has a negative relationship or impact on economic growth, import, investment, inflation, and the exchange rate. In Indian, Sarmah and Bal (2021) carried out a study on the whether or not crude oil prices affects inflation rate and economic growth while applying structural VAR and monthly data from 1997 to 2016. By so doing, the findings revealed that crude oil prices have a positive relationship with inflation but on the contrary when compared to growth. More so, subsequent test was further conducted by decomposing crude oil price into positive and negative partial sum of oil prices via nonlinear and asymmetric autoregressive lag but same results. The study concluded that crude oil prices significantly affects inflation and economic growth.

Abu-Bakar and Masih (2018) examined whether is there a pass through between oil prices and domestic prices India. By so doing, ARDL and NARDL methods was employed and the findings depicts that the ARDL results shows no relationship between oil prices and inflation. But on the contrary, the NARDL depicts that the inflation rate increase with an increase in global oil price but not vice versa. However, the contrasting results of both ARDL and NARDL models testify the significance of using non-linear framework, especially for a country that is skewed towards oil dependence.

Apere (2017) carried out a study in Nigeria on the relationship between crude oil prices and inflation by employing quarterly data from 1980 to 2015 and VAR model. By so doing the findings revealed that inflation is responds to oil prices fluctuation because as oil prices increases, inflation rate also increases but if the oil price is stable and positive then its relationship to inflation becomes an inverse. Also, Nokoro and Uko (2016) employed GARCH model using quarterly data from 1986 to 2012 in examining the relationship between exchange rate, inflation volatility and stock prices volatility. Findings shows that there is an inverse and a long run relationship among the variables. By so doing, the study concluded that the outcome is consistent with literatures that emerging markets are influenced by their local indicators. Chen, Gummi, Lu, and Mu'azu (2020) while employing the Fully Modified and Dynamic Ordinary Least Squares techniques discovered an inverse relationship between oil and food prices in the long run and they moved together in the long term for low-income nations.

However, empirical findings have also been focused specifically on the relationship between exchange rate and inflation. Obidekwe and Osabuohien (2016) examined the nexus between exchange rate volatility and inflation rate in Nigeria while employing GARCH model and secondary monthly data from 2006 to 2015. Findings revealed that parallel exchange rate has a short run pass through to inflation whereas official exchange rate possessed a long run passthrough to inflation in the long run. The study concluded that exchange rate volatility recorded a significant positive effect on inflation under in period considered. Also, Umar and Umar (2022) while using a non-linear ARDL model show a significant and asymmetric connection in both the short and long run between exchange rate and food inflation.

Musa (2021) in his study assessed the impact of exchange rate on inflation in Nigeria while adopting a generalized autoregressive conditional heteroskedasticity (GARCH) and vector error correction model (VECM) concluded that there exists a long-run relationship between the variables and that money supply and exchange rate has a positive and significant effect on inflation. Similar findings were obtained in the works of Akighir and Zakari (2020) that interrogates the determinants of foreign exchange pressure in Nigeria while employing ARDL model reveal that there exists a linear relationship between foreign exchange market pressure on inflation, government expenditure and foreign debt in both short and long run.

Additionally, there exist empirical studies that have examined specifically the relationship between insecurity and inflation among which include Siry and Traore (2023) in Burkina Faso carried out a study on effects of insecurity on Inflation ARDL model and a monthly data from Jan2019- April2022. Key variables employed insecurity which was estimated by humanitarian crisis (IDPs) and Rainfall condition which and inflation which serves as the dependent and independent variable. As a result, the findings show that influx of IDPs and deteriorating climate condition spur inflations both in the short and long run conditions.

More so, Oriakhi and Osemwengie (2012) in a study on the nexus between inflation and foreign direct investment in Nigeria argue that the increase in government expenditure due to rising insecurity especially like Nigeria may likely result in the sales of foreign reserves and espionage, as a consequence, inflation in those countries will rise. Abubakar, Sule and Tijjani (2023) while using structural vector autoregressive (SVAR) model in their study carried out in Nigeria revealed that insecurity accounts for more than 50 per cent variations to economic development.

Therefore, the study has reviewed various works focusing on exchange rate, energy prices and inflation with different methodological approaches and variables but out of these works, little have been documented to establish a combined impact of insecurity, exchange rate and energy prices on inflation in Nigeria. The study will also be an addition to existing literature by adopting annual set of data that is up to date which captures recent changes in the variables.

3. METHODOLOGY

3.1 Theoretical Framework

This study's theoretical foundation is based on purchasing power parity (PPP) and Keynes' theory of demand-pull inflation, which is further supported by the theoretical models of Dornbusch (1976), Olawale and Lukman (2020), and Okereke and Obinna (2022), which investigate the relationship between price changes in petroleum products, exchange rates, and food prices. They used prices of premium motor spirit (PMS), Automotive Gas Oil (AGO), exchange rate and crude oil in explaining their relationship with food price changes. This was expressed as $PrFI = f(PMS, AGO, EXCH, COIL)$ ….....3.1

Subsequently, building on the root theory of Keynes theory of demand-pull inflation, Siry and Traore (2023) explain how insecurity affects inflation and applied concepts such as internally displaced persons (IDPs) and agro-climatic shocks proxied by rainfall in explaining inflation as thus: $Infl = f(IDPs, Rainfall)$ ……3.2

Consequently, these theoretical models are applicable to the Nigerian economy owing to its current insecurity challenges couple the fact that its refined petroleum products are imported, an increase in the exchange rate will invariably affect the refined products, which will directly affect the price level. Therefore, this study modified the various theoretical models and summarized as thus: $INFL = f(CRPR, EXCH, PMS, INSEC)$ ……3.3

3.2. Sources of Data

The study used time series data for 38 years (i.e., 1985-2022). The period was chosen due to data availability and couple with the fact that it captures major changes reflected in the variables. The data were sourced from World Bank, Central Bank of Nigeria, and National Bureau of Statistics databases. Other sources of data or information included related textbooks, journals, magazines, and websites.

3.3 The Method of Data Analysis

The study employed descriptive statistics and ARDL model. Key variables used include the inflation rate, crude oil prices, exchange rate, premium motor spirit (PMS) prices and insecurity. This was adapted from the works of Okereke and Obinna (2022) Olawale and Lukman (2020) and Siry and Traore (2023).

The functional form specification in written as thus

INFL = f (CRPR, EXCH, PMS, INSEC)……3.4

Where:

INFL = Inflation rate (It is measured in percentages), EXCH= Exchange rate (it is measured as the rate of naira to the dollar), PMS = Premium motor spirit (PMS) price [Measured in Naira], CRPR = Price of international Crude oil (It is measured in dollars) as adopted from Okereke and Obinna (2023), while INSEC = Insecurity (proxied by security spending, which was adapted from the works of Owolabi and Ayenakin 2015).

3.4 Model Specification

The ARDL model is utilized for describing the cointegration relations between series containing different degrees of root causes. The ARDL model is used in the bound test of Pesaran, Shin and Smith (2001), thus enabling the analysis of short and long-term relationships without requiring the series in the model to be stationary. Consequently, the generalized ARDL model can be specified as thus;

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta i \Delta Y_{t-1} + \sum_{i=0}^{n} \lambda \Delta X_{t-1} + \theta_1 Y_{t-1} + \theta_2 X_{t-1} + \mu_t \quad \ldots\ldots 3.5$$

Thus, the ARDL can be re-written as:

$$\Delta LINFL_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta(LINFL)_{t-1} + \sum_{i=1}^{n} \beta_2 \Delta(LCRPR)_{t-1} + \sum_{i=1}^{n} \beta_3 \Delta(LEXCH)_{t-1} + \sum_{i=1}^{n} \beta_4 \Delta(LPMS)_{t-1} + \sum_{i=0}^{n} \beta_5 \Delta(LINSEC)_{t-1} + \theta_1 INFL_{t-1} + \theta_2 (LCRPR)_{t-1} + \theta_3 (LEXCHR)_{t-1} + \theta_4 (LPMS)_{t-1} + \theta_5 (LINSEC)_{t-1} + \psi_1 ECM_{t-1} \quad \ldots\ldots 3.6$$

Where*: βi, λi*: Short-run coefficients, *θ_1, θ_2*: ARDL long-run Coefficients. The coefficient of the error correction (ECM_{t-1}) depicts the percentage of the error corrected each year that is, the speed of adjustment. In equation 3.6 the signs of β_2, to β_5 are expected to have positive relationship with inflation. This study employed the ARDL model because the outcome of the pre-estimation test (Unit root) conducted are in mixed order of integration 1(0) and 1(1).

4. RESULTS AND DISCUSSION OF FINDINGS

4.1 Pre-estimation Test

4.1.1 Lag Selection

Table 4.1: Optimal Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-146.2727	NA	0.003906	8.644156	8.866349	8.720857
1	-7.51306	229.9446	5.97e-06	2.143603	3.476759*	2.603809
2	24.83775	44.36683*	4.30e-06*	1.723557*	4.167675	2.567266*
3	46.83243	23.87993	6.60e-06	1.895290	5.450371	3.122503

Source: Eviews 10 * indicates lag order selected by the criterion

Table 4.1 shows the various optimal lag selection criterion which includes LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion. However, there optimal lag 2 because AIC was selected for the study because it has the minimum value as buttressed by Asteriou and Hall (2011).

4.1.2 Unit Root Test

The Augmented Dickey Fuller (ADF) and the Philip Perron unit root test was conducted to determine the order of integration which is presented in Table 4.2

Table 4.2: Unit Root Test Result

Variable	ADF		PP		Order of Integration	Decision
	Level	**First Diff**	**Level**	**First Diff**		
LINFL	-	-3.131 0.0032**	-	-3.065 0.0038**	I(0)	Stationary
LCRPR	-	-5.034 0.0002**	-	-6.675 0.0000**	I(1)	Stationary
LEXCH	-	-3.475 0.0144**	-	-3.812 0.0061**	I(0)	Stationary
PMS	-	-4.431 0.0012**	-	-4.332 0.0015**	I(1)	Stationary
INSEC	-	-6.188 0.0000**	-	-6.329 0.0000**	I(1)	Stationary

Source: Eviews 10

Table 4.3 depicts the results of unit root test for ADF and PP conducted, at 5% level of significance. It reveals that all the series (i.e., LCRPR, LPMS and LINSEC) are stationary at first difference 1(1) which in other words implies that they are stationary at the same level and are integrated of order one I (1) whereas LINFL and LEXCH is stationary at levels (I(0). By this outcome, which depicts a mixture of order of integration i.e., I(0) and I(1), thus, satisfies the condition for the adoption of Autoregressive Distributive Lag (ARDL) model as supported in the works of Pesaran, Shin and Smith (2001). Having established the variables are stationary at different levels [1(0) and 1(I)], it is cogent to ascertain whether or not there exist a long-run relationship among the variables. Thus, the ARDL bound test for integration was conducted as shown in table 4.5.

4.2 Descriptive Statistics

This test is conducted to present a summary statistic of the variables under consideration which include inflation, crude oil price, premium motor spirit prices, exchange rate**.**

Table 4.2: Descriptive Statistics

	LINFL	LCRPR	LEXCH	LINSEC	LPMS
Mean	2.677280	3.576471	4.078810	-0.139711	2.782966
Median	2.542763	3.460338	4.813528	-0.151906	3.610114
Maximum	4.288204	4.695468	6.054439	1.497388	5.328798
Minimum	1.684176	2.507972	-0.112302	-1.771957	-1.609438
Std. Dev.	0.688616	0.708475	1.607823	0.898873	2.137858
Skewness	0.928336	0.166929	-0.896523	-0.20809	-0.767179
Kurtosis	3.001943	1.575722	2.848013	1.961400	2.198399
Jarque-Bera	5.458117	3.388379	5.127010	1.982169	4.744963
Probability	0.065281	0.183748	0.077034	0.371174	0.093249
Observations	38	38	38	38	38

Source: Eviews 10

Table 4.2 reveals that the summary of the descriptive statistics of the series. LINFL and LCRPR have a positively skewed. The positive skewness shows that the data spread from the right-hand side of the normal curve where as LEXCH, LINSEC and LPMS are negatively skewed to the left. On the kurtosis, INFL is mesokurtic because it has Kurtosis value of 3.0 while LCRPR, LEXCH, LPMS and LINSEC are platykurtic because its kurtosis values are less than 3 respectively. Jarque-Bera test for normality, shows that all the variables are normally distributed because their respective p-values are greater than 5 per cent (Asteriou and Hall, 2011).

4.3. ARDL Bound Test for Co-integration

This test was conducted to determine whether or not there is cointegration or long-run relationship among the series or variables as shown in Table 4.3.

Table 4.3: ARDL Bound Test for Cointegration Test Results

Test Statistic	**Value**	**K**
F-statistic	9.03	4
Critical Value Bounds		
Significance	**I(0) Bound**	**I(1) Bound**
10%	2.427	3.39
5%	2.88	4
1%	3.96	5.45

Source: Eviews 10 Output

Table 4.3 shows the ARDL co-integration test of whether there exists a long run relationship among the series. However, the result depicts that there is a long-run relationship under the period review. This is because F-statistic (9.03) is greater than both the lower critical bounds values of I (0) and higher critical bound values I (1) at 5 per cent level of significance.

Table 4.4: Short and Long run Estimates

Short Run Coefficients			**Long Run Coefficients**		
Variable	**Coefficient/-Stat**	**Prob**	**Variable**	**Coefficient/t-Stat**	**Prob**
D(LINFL(-1))	0.629494 (4.9017)	0.0001	LCRPR	-0.4738 (-2.6300)	0.0147
D(LEXCH)	-1.009386 (-3.2976)	0.0030	LEXCH	0.4169 (1.6145)	0.1195
D(LEXCH(-1))	-0.608774 (-2.4300)	0.0229	LINSEC	0.4781 (2.0256)	0.0541
D(LINSEC)	0.133838 (0.6345)	0.5317	LPMS	-0.5258 (-2.2990)	0.0305
D(LPMS)	0.225303 (0.9438)	0.3547	C	4.3253 (6.6538)	0.0000
D(LPMS(-1))	0.740016 (2.7197)	0.0120		Akaike info criterion	1.030335
CointEq(-1)*	-1.237391 (-8.0945)	0.0000		Schwarz criterion	1.338241
R-squared	0.7222			Hannan-Quinn criter.	1.137803
Adjusted R-squared	0.6649			Durbin-Watson stat	2.099

Source: Eviews 10

Table 4.4 shows both short and long run coefficients of the series. The coefficient of current exchange rate (LEXCH), and its lag in the short run, has a negative relationship with the inflation rate and is statistically significant because the p-value is less than 5 per cent. This means that a rise in inflation rate will cause the exchange rate to fall and vice versa. In other words, as inflation increases, the value of money falls, requiring more local currency for exchange, weakening it and suppressing investment, which has a negative impact on the exchange rate. But, in the long run, there is a positive link because a dollar increase will result to 42 per cent increase in inflation rate, although it is not statistically significant. This has exposed the implications of an import-dependent economy like Nigeria, where there is a significant degree of sensitivity of exchange rate movements to the level of general prices. More so, the outcome is consistent with the works of Musa (2021), Akighir and Zakari (2020), Obiekwe and Osabunhien (2016), and Adeniji (2013) as they have reported that inflation and exchange rate has a positive relationship in the long-run.

The coefficient of insecurity (LINSEC) shows a positive link with inflation in both the short and long run. In the short run, increased insecurity leads to a 13% increase in inflation, but it is not statistically significant, but in the long run it demonstrates a weak positive association or influence on inflation as it has a t-value greater than 2, which is consistent with the rule of thumb. In other words, an increase in insecurity will leads to 48 per cent increase in inflation. This is because when there is a high level of insecurity, the supply side is significantly affected because economic activities involving production and distribution are distorted, there is increase in internally displaced persons, increased spending in the security sector, among other things, and as demand rises, prices of goods and services increases by default because aggregate demand exceeds aggregate supply. This is line with Siry and Traore (2023), Abubakar, Sule and Tijjani (2023) Oriakhi and Osemwengie (2012) which stress that insecurity spur inflation which invariably affects economic development.

In addition, the premium motor spirit (LPMS) coefficient shows a positive relationship with inflation as well as a lag effect and it is statistically significant in the short run. This shows that the lag of LPMS has a large impact on inflation because a naira increase in the price of LPMS will result to 74% rise in inflation rate, which is supported by a p-value of less than 5 per cent. This is largely attributed to the role PMS plays in the activity of economic agents. For example, an increase in LPMS will induce inflation since enterprises throughout the value chains of production and distribution will incorporate the increase as part of the cost of production, prices of goods and services will undoubtedly rise. This agrees with the findings of Okereke and Obinna (2022) Sakanko, Adejor and Adeniji (2021), Olawale and Lukman (2020), Wale-Awe and Sulieman (2020), Olayungbo (2021), Eregha *et al* (2015) and Bobai (2012) as they stressed that PMS has a positive relationship to inflation in the short run.

However, in the long run, the association between LPMS and inflation is negative, and statistically significant, with a p-value of less than 5 per cent. This finding contradicts the works of Sakanko, Adejor and Adeniji (2021), and Olawale and Lukman (2020) but although, the outcome is still valid because, in the long run, the market and its players must have adjusted, the government must have invested in critical sectors, more investors are attracted, and palliatives distributed, among other things. By doing so, a Naira rise in the price of LPMS will results to 52% decline in inflation rate.

Crude oil prices (LCRPR) have a long-run negative association with inflation (LINFL), which is statistically significant because the p-value is less than 5 per cent. This means that a dollar increase in the price of LCRPR will result to 47 per cent fall in INFL rate and vice versa. This outcome is in tandem with the works of Chen, Gummi, Lu and Mu'azu (2020), Adeete and Bankole (2020), Nokoro and Uko (2016) Apere (2017), which stressed that there is an inverse relationship between crude oil prices and inflation. However, this reveals that an increase in crude oil prices suggests greater revenue to the government's coffers to support the development of important industries and the economy as a whole. As a result, jobs would be created, output would be expanded in order to compete with demand, and general prices for products and services would be reduced.

Furthermore, the negative relationship holds true as it contradicts other studies like Abu-Bakar and Masih (2018) because households and firms, particularly local types, are not direct beneficiaries of crude oil price fluctuations when compared to derivatives such as Premium Motor Spirit, kerosene, and Diesel, but rather the government because it directly serves as a good or product that is traded or exported across borders. According to Olusegun (2008), the finding is not surprising because inflation is evaluated using the Consumer Price Index, which does not account for oil prices in Nigeria.

Additionally, the adjusted R-squared is 0.72, implying that the explanatory variables account for 72 percent of the variation in LINFL. The DW-statistic is 2.1, confirming that there is no autocorrelation. This is against the backdrop of the rule of thumb which state, DW test statistic values in the range of 1.5 to 2.5 are relatively normal. But values outside this range could be cause for concern. Field (2019) suggests that values under 1 or more than 3 are a definite cause for concern. Also, the ECM satisfies the criteria that the CointEq (-1) must be NEGATIVE and statistically significant as evident. CointEq(-1) is -1.23 and has a p-value of less than 5%. This implies that the dependent variable (LINFL) has a speed of adjustment of 123% to return to equilibrium if there are deviations from the explanatory variables.

4.4. Diagnostic Testing

The following diagnostic test was conducted for check for heteroscedasticity and serial correlation of the model.

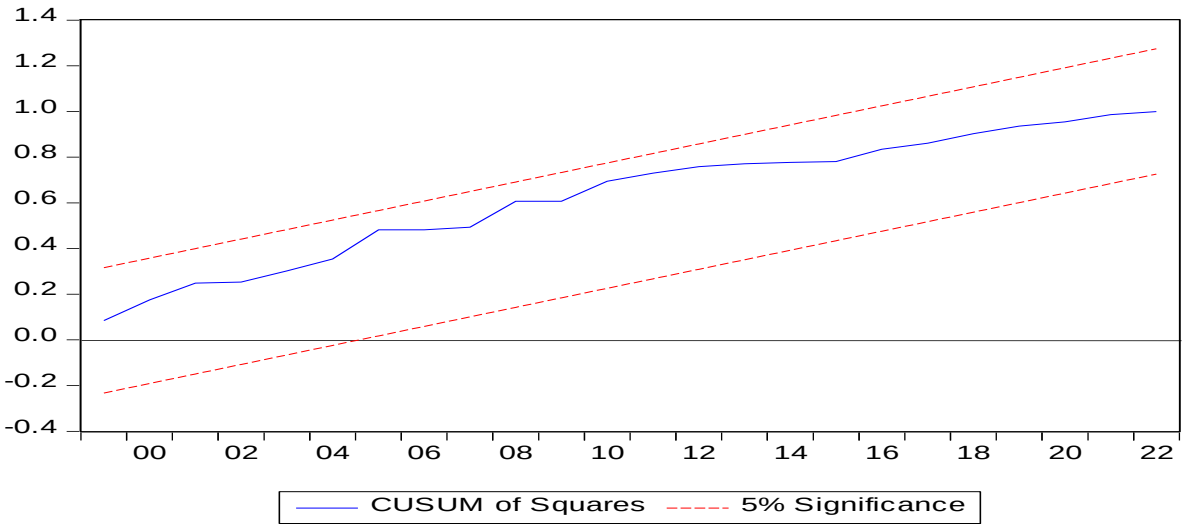
Table 4.5: ARDL Diagnostic Results

Test Statistic	Result
Serial Correlationχ2(2):	1.094 [0.352]
Heteroskedasticity	1.083 [0.413]

Source: EViews 10

The result revealed that the ARDL model is free from serial-correlation, and heteroskedasticity because all these tests conducted have their p-value(s) greater than 0.05, which implies the acceptance of null hypothesis. Furthermore, to check the stability of the model, the cumulative sum of recursive residuals sum of Squares test was conducted as displayed in figure 4.1.

Figure 4.1: CUSUM of Square Test



Source: EViews 10

From the figure 4.1, it clearly shows that the model is stable since the CUSUM sum of Squares plots is within the lower and upper bounds as against a scenario if the plots of the CUSUM break in the lower or upper bounds, then such a parameter is said to be unstable (Tang and Lean, 2007).

Table 4.6: Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
LCRPR does not Granger Cause LINFL	36	1.92797	0.1625
LINFL does not Granger Cause LCRPR		0.15214	0.8595
LEXCH does not Granger Cause LINFL	36	2.19761	0.1281
LINFL does not Granger Cause LEXCH		6.49305	0.0044
LINSEC does not Granger Cause LINFL	36	3.33854	0.0486
LINFL does not Granger Cause LINSEC		1.35882	0.2718
LPMS does not Granger Cause LINFL	36	4.25857	0.0232
LINFL does not Granger Cause LPMS		2.70940	0.0823
LEXCH does not Granger Cause LCRPR	36	2.79233	0.0767
LCRPR does not Granger Cause LEXCH		5.19165	0.0114
LINSEC does not Granger Cause LCRPR	36	1.47045	0.2454
LCRPR does not Granger Cause LINSEC		3.50800	0.0423
LPMS does not Granger Cause LCRPR	36	2.83357	0.0741
LCRPR does not Granger Cause LPMS		0.44413	0.6454
LINSEC does not Granger Cause LEXCH	36	3.10314	0.0591

LEXCH does not Granger Cause LINSEC		8.71487	0.001
LPMS does not Granger Cause LEXCH	36	2.00860	0.1513
LEXCH does not Granger Cause LPMS		4.72805	0.0161
LPMS does not Granger Cause LINSEC	36	7.40301	0.0024
LINSEC does not Granger Cause LPMS		3.51523	0.0421

Source: Eviews 10 output

Table 4.6 depicts the granger causality test. It revealed that crude oil prices (LCRPR) and inflation (LINFL) neither granger caused each other as their p-value is greater than 5 per cent. Exchange rate (LEXCH) has a unidirectional relationship to Inflation (INFL) which implies that its INFL that granger cause LEXCH which is supported by a p-value of less than 5 per cent. Also, insecurity (LINSEC) and premium motor spirit (LPMS) prices possessed a unidirectional relationship to inflation as the former granger cause the latter which is supported by a p-value less than 5 per cent. More so, LCRPR granger cause LEXCH and INSEC as their relationship is unidirectional as they have a p-value of less than 5per cent. Same relationship is also found between LEXCH versus INSEC and LPMS where as LPMS and INSEC has a bidirectional relationship as they both granger cause each other owing to the fact that their value is less than 5 percent.

5. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings, in the short run, insecurity and premium motor spirit have a positive relationship to inflation whereas exchange rate is on the contrary. Also, in the long run, crude oil prices and premium motor spirit possesses a negative while exchange rate and insecurity have a positive relationship to inflation. More so, insecurity, exchange rate and premium motor spirit has a unidirectional relationship to inflation whereas crude oil price does not granger cause inflation. Therefore, it can be concluded that all the variables insecurity, exchange rate, crude oil prices and premium motor spirit have significant influence with varying magnitude on inflation under the period considered.

Consequently, the following recommendations were suggested for implementation. The Nigerian government at all levels (i.e., federal, state and local) must aggressively diversify her economy away from the oil sector, with a focus on mechanized and commercial agriculture, industrial or manufacturing sector, and the ICT sector, as this will go a long way toward reducing over-reliance on the oil sector and to boast local production. This will go a long way to boost output, create jobs, and revenue. Thus, resulting to less import and more export and by extension lowering pressure on the exchange rate. Security operatives, the public and well as those in government must develop the political will aimed at devising a Marshallian strategies and plan towards bringing the insecurity situation to a halt so that peace and stability can be restored, as this will attract additional investment and other activities. The Federal Government should create a conducive environment to attract more players in the petroleum industry so that new refineries can be built or revamping the existing ones as this will douse the pressure on importing refined premium motor spirit as well as the exchange rate.

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