

Re-Examining the External Drivers of Inflation in Nigeria (1986 to 2020)

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Abstract - The study is a re-examination of the external drivers of inflation in Nigeria within the period 1986 to 2020 using a Vector Autoregressive Model. The finding of the study revealed that there is a moderate relationship between inflation and its external drivers, given the significant relationship that exist between inflation, exchange rate, oil price, and wheat price. This exposes the level of vulnerability of the domestic prices to the selected variables. Therefore, the study recommended amongst others, that there is need for the government to develop infrastructure and capital that would create domestic production of major import items in the country including oil and wheat.

Keywords: Inflation, Exchange rate, Vector Autoregressive Model

I Introduction

The build-up of inflationary pressures in an economy is deeply rooted in the fundamental economic activities of market players, institutions, and intuition of other economic agents across every sector in the economy and by extension, in the trading-partner economies, for most countries whose economies are open for international trade. This has prompted the need to re-assess the main drivers of inflation, especially for developing countries such as Nigeria whose trade position as compared with its trading partners have been more inimical to its economic fundamentals.

The dynamics of Inflation in advanced and emerging market and developing economies is uniquely different, for example, the advanced economies countries maintain very low and stable single-digit figures as opposed to developing economies of sub-Saharan Africa (SSA) with high and double-digit figures. (see Adeleye, Ogundipe, Ogunrinola, and Oluwasogo, 2021). Double-digit inflation is highly inimical to an economy due to its impact on real income, purchasing power, consumer's expectation which leads to higher wage and profit bargains in the labour and money market, respectively. Therefore, the negative impact of inflation in developed and emerging economies particularly in Nigeria, especially from the 1970s has occupied public discussion and has been of prime concern to all policymakers and stakeholders. (Inim, Samuel, & Prince, 2020)

Generally, the advent of high inflationary pressures in the Nigerian economy can be traced back to the 1970s, during the oil boom, when accruing government receipts from oil resources rose sharply. With the growth in fiscal expenditure outlay, stimulated by oil revenues, aggregate demand especially for foreign goods was also exerting pressure on the exchange rate. However, the failure of domestic inelastic output supply to keep up with the growth in domestic demand saw inflation inevitably becoming an economic issue (Egwaikhide et al., 1994).

The passthrough of exchange rate and oil price to inflation at the time reflects significantly, how external factors could drive domestic prices in Nigeria. As originally proscribed as part of the economic measures embedded in the Structural Adjustment Programme (SAP) in 1986, there have been several intervals of naira devaluation. The democratic regime, which began in 1999, led to a further devaluation of Naira from N21.8/US\$ to N101.7 in 2001 representing 380 per cent devaluation; also, inflation rose from 6.6 to 18.3 per cent in the same period. In addition, consistent devaluation which followed resulted in higher inflation. (Aladejare, 2017).

In other emerging markets such as Ghana, most early empirical studies on monetary growth, inflation and exchange rates focus their studies on the patterns of prices of tradable goods to changes in exchange rates. (Magee, 1973 & 1974; and Dunn, 1970). Bawumia et al. (2003) and Dennis & Samuel (2015) established the existence of long run relationship between inflation, exchange rates, and real income in Ghana. Alternatively, Peóna and Brindis (2014) found that an analysis of the exchange rate pass-through mechanism for the Mexican economy after the formal adoption of inflation targeting policy showed a minimal exchange rate pass-through to consumer prices. With these contrasting views, it is very vital to assess the effect of external factors on the Nigerian economy, given the level of import-dominated trade activities in the country.

The major objective of this paper is to re-examine the main drivers of inflation in Nigeria, specifically, the study will examine the impact of external variables on inflation in Nigeria and examine if there exist a long-run relationship between inflation and its selected external drivers.

II Literature review

There are several studies on the subject of inflation and other domestic and external drivers. Nguyen, Dridi, Unsal, & Williams (2015) found that inflation dynamics in Sub-Saharan Africa (SSA) are driven by supply shocks, and this limits role for monetary policy in influencing inflation in the short run. The Global VAR model which was used incorporated trade and financial linkages among economies, as well as the role of regional and global demand and inflationary Spillovers. Domestic supply shocks and shocks to exchange rate and monetary variables were reported as the main drivers of inflation in the region. In the overall, the study revealed that vulnerability to weather shocks, economic importance of agriculture, trade openness and policy regime, among others, help in explaining the role of shocks. Kantur, Özcan (2021) identified labour share of income, prices of imported inputs, and consumption goods as the major components of the cost channel in Turkey's inflation.

Al-Mutairi, Al-Abduljader, & Naser (2020) identified the determinants of inflation in Kuwait to include changes in interest rate spreads, imports of goods and services and money supply. Prowd (2020) showed that the rate of inflation in Liberia was largely influenced by the unauthorized printing and infusion of new banknotes into the economy by the Central Bank of Liberia. In addendum, the results showed that Customs taxes, currency depreciation arising from balance of payment deficits, international oil price, and import were also key determinants.

Bawa, Abdullahi, & Ibrahim (2016) examined the dynamics of inflationary process in Nigeria over the period 1981 – 2015, using the bounds testing approach to cointegration. The Empirical results indicated that inflation in Nigeria proxied by CPI exhibited a strong degree of inertia. The econometric results showed that past inflation and average rainfall appeared to have been the main determinants of inflationary process in Nigeria over the study period. We also found strong evidence of the importance of money supply in the inflation process, lending credence to the dominance of the monetarist proposition on inflation dynamics in Nigeria. Thus, the paper recommended among others, the continuous moderation of growth in money supply by the central bank and adopting consumers' expectations of inflation as an input into the monetary policy process.

Asekunowo (2016) used Autoregressive Distributed Lag (ARDL) bounds test to show that there exists a long run co-movement among the variables. Also, the ordinary least squares estimate showed that Real Effective Exchange Rate, Lagged Consumer Price Index, Real Broad Money and Real Profits influenced Consumer Price Index. The study therefore concluded that inflation in Nigeria, during the was driven by the pass-through of import prices to domestic prices via markup pricing by firms. This was domestically produced products of good quality and adequate quantity must be substituted for imported ones and a monetary policy stance that does not easily deviate from the set monetary target should be adopted by the Nigerian monetary authorities if persistent inflation is to be curbed in the country. Aladejare (2017) evaluated the monetary, fiscal and external inflationary sources in Nigeria using an Auto-Regressive Distributive Lag estimation technique to capture these effects. The empirical findings of the study showed that overall, the main determining cause of inflation in both short run and long run periods in Nigeria, are more of monetary and external factors and less of fiscal. Specifically, inflation in Nigeria appeared to be more of a structural phenomenon than monetary in the short run. However, in the long run, combinations of monetary and external factors tend to be the major cause of inflation.

Tabash & Adedokun (2022) noted the alarming trend of food insecurity malnutrition globally and in Africa and thus, investigated the influence of domestic and external factors on aggregated food inflation and disaggregated food prices in Nigeria. Applying the Variable Augmented Autoregressive- Extended Generalised Autoregressive Conditional Heteroskedasticity (AR(1)-GARCH-X) and panel regression models, it was found that global food and crude oil prices have a significant effect on domestic food prices. In addition, exchange rate and domestic petrol prices have a positive and significant effect on food price volatility. The major implication of the findings is that food prices in Nigeria are linked with activities in the global food and oil market with high import dependence on grains to augment local consumption demands. Therefore, it was recommended in the study that to reduce the exacerbating effects of import-dependence, there is a need for massive investment in domestic agriculture to boost local production and meet local demands.

2.1 Theoretical Framework

The impact of external factors on inflation is well illustrated in the purchasing power theory, otherwise known as the law of one price. The origin of this theory is from far and can be traced to the 16th-century writings of scholars from the University of Salamanca in Spain. The term "purchasing power parity" was originated by Cassel (1918), but he presented

his PPP theory nearly three years earlier using the equivalent term “theoretical rate of exchange” (1916). While many credit Cassel as the originator of the PPP theory, some observers consider the founders to be the English economists writing at the time of the floating pound during the so-called Bank Restriction Period, 1797–1821. Specifically, they credit Wheatley, writing in 1803, with the earliest complete formulation of the theory. Other writers assert that the theory was anticipated even earlier. Brisman (1933, p. 72) claims that the PPP theory appeared first in Sweden more than 20 years prior to the Bank Restriction Period. Einzig (1970, pp. 145–46) traces the origins of the theory to Spanish writers in the sixteenth and seventeenth centuries.

The modern definition of PPP, usually credited to Cassel (1918), is quite intuitive: when measured in the same unit, the monies of different countries should have the same purchasing power and command the same basket of goods. Otherwise, international arbitrage should bring about adjustments in prices, exchange rates, or both, which will ultimately restore parity. Another way to interpret the parity condition is that the exchange rate between two currencies should equal the ratio of the countries’ price levels.

Despite its simplicity, the parity condition is the subject of many empirical studies, driven mainly by its significant implications for the global economy. For instance, PPP is a major building block of most models in international economics. The relevance of these models and their policy implications thus depends critically on the validity of PPP. Another application of PPP is the comparison of national income levels. Some economists believe that a meaningful comparison of income across countries should be based on, instead of market exchange rates, PPP exchange rates that control for price differentials of same goods across countries.

The use of PPP goes beyond academic interest, however. In the context of the global economy, exchange rate misalignment is a main source of imbalances in trade and capital accounts. These imbalances, if left unchecked, can create intense stresses for both individual economies and the global system. The PPP condition describes the relationship between exchange rates and national price levels and is commonly used as a benchmark for evaluating exchange rate misalignment. The absolute and the relative PPP conditions are the two commonly discussed versions of PPP. The absolute PPP is given by

$$s = p - p^* \dots \dots \dots (1)$$

where s is the exchange rate expressed as the domestic price of the foreign currency, p is the domestic price index, and p^* is the corresponding foreign price index. The relationship between global factors and domestic inflation in Nigeria would be examined as modelled above to ascertain how external factors such as the exchange rate and prices of selected commodities impact of domestic prices in Nigeria.

III Methodology

Theoretical foundation is anchored on Purchasing Power Parity (PPP) theory of one price. Given that the absolute PPP is given by

$$s = p - p^* \dots \dots \dots (2)$$

where s is the exchange rate expressed as the domestic price of the foreign currency, p is the domestic price index, and p^* is the corresponding foreign price index. The relationship between global factors and domestic inflation in Nigeria would be examined as modelled above to ascertain how external factors such as the exchange rate and prices of selected commodities impact of domestic prices in Nigeria.

The study uses secondary time series data for the period 1986 to 2020. The data are sourced from the CBN statistical bulletin and the National Bureau of Statistic annual abstract of Statistics.

In this study, we develop an equation to examine the impact of external factors on inflation in Nigeria as follows:

$$Inf_t = \alpha_0 + \sum_{i=1}^k \alpha_i Inf_{t-i} + \sum_{j=1}^k \alpha_j X_{t-j} + u_{1t} \dots \dots \dots (3)$$

Where,

Inf_t = the current values of Inflation

Inf_{t-i} = the previous values of Inflation

X_{i-j} = a vector of independent external side variables as highlighted in the study.

To further expand the model, X represents external factor variables such as exchange rate, wheat price, oil price, global inflation, and remittances. Exchange rate was selected to have an impact on inflation for countries such as Nigeria whose major commodities in the consumption basket are imported, wheat price was selected based on the weight of bread and cereals in food price index in Nigeria. Oil is a major trading commodity in Nigeria and a major source of for the government, therefore, an increase in oil price should affect inflation through government expenditure. Global inflation was selected based on high engagement in international trade in Nigeria. Remittances seems to have some inflationary effect in developing countries (see Narayan, and Sagarika, 2011). Therefore, the fundamental form of the model is stated thus:

$$Inf = \alpha_1 \text{ exr} + \alpha_2 \text{ wht} + \alpha_3 \text{ oil} + \alpha_4 \text{ Ginf} + \alpha_5 \text{ rem} \dots \dots \dots (4)$$

(+) (+) (+) (+) (+)

To examine the Statistical Properties of the data several tests are conducted, they include, Stationarity test using Augmented Dickey Fuller and Phillips Perron, and Lag Order Selection criteria tests.

Hypotheses of the Study

H₀₁: External factors do not significantly impact on inflation in Nigeria.

H₀₂: There exist no long-run relationship between external factors and inflation in Nigeria.

The achieve the first objective of the study, the paper employs the Vector Autoregressive Statistical technique which was originally developed by Blanchard and Watson (1986) and Bernanke (1986). The VAR technique contains procedures of analysing a model to deduce the level of Impulse Response and Vector Error Decomposition between the endogenous variables in the model (see equation 2).

IV Data Analysis

4.1 Descriptive Statistics

Table 1: Descriptive Statistics of Inflation and Remittances.

Inflation					Remittances				
Percentiles		Smallest			Percentiles		Smallest		
1%	5.39	5.39			1%	0	0		
5%	5.72	5.72			5%	0.01	0.01		
10%	6.93	6.62	Obs	36	10%	0.02	0.01	Obs	36
25%	8.505	6.93	Sum of Wgt.	36	25%	0.7	0.02	Sum of Wgt.	36
50%	12.385	Mean	19.31		50%	2.525	Mean	3.10	
	Largest	Std. Dev.	17.66			Largest	Std. Dev.	2.55	
75%	17.84	54.51			75%	5.385	6.48		
90%	54.51	57.03	Variance	311.79	90%	6.48	6.54	Variance	6.50
95%	57.17	57.17	Skewness	1.73	95%	7.17	7.17	Skewness	0.27
99%	72.84	72.84	Kurtosis	4.67	99%	8.31	8.31	Kurtosis	1.70

Source: Author’s computation

The table above reveals that Inflation is above the 3.0 acceptable value for a normal distribution. This is supported by a large variance of 311.79 and 1.73 skewness of inflation, this is expected given the smallest and largest values of inflation at 5.39 and 72.84 per cent, respectively within the review period.

Table 2: Descriptive Statistics of oil Price and Global inflation.

Oil Price					Global Inflation				
Percentiles		Smallest			Percentiles		Smallest		
1%	14.39	14.39			1%	1.43	1.43		
5%	15.04	15.04			5%	1.55	1.55		
10%	17.19	15.96	Obs	36	10%	2.19	1.91	Obs	36
25%	20.075	17.19	Sum of Wgt.	36	25%	2.885	2.19	Sum of Wgt.	36
50%	35.185	Mean	44.71111		50%	4.195	Mean	4.860833	
	Largest	Std. Dev.	28.1059			Largest	Std. Dev.	2.470047	
75%	65.52	94.2			75%	6.93	8.95		
90%	94.2	95.08	Variance	789.94	90%	8.95	9	Variance	6.10
95%	97.94	97.94	Skewness	0.68	95%	9.15	9.15	Skewness	0.53
99%	99.57	99.57	Kurtosis	2.11	99%	10.32	10.32	Kurtosis	2.14

Source: Author's computation

Oil price and global inflation were near-normal distribution with kurtosis values of 2.11 and 2.14 values, respectively. This is also indicated by a low value of the standard deviation for oil price and global inflation at 28.1059 and 6.10. The highest value of global inflation (10.32) is very low compared to 72.84 per cent recorded in Nigeria. This may not show any meaningful correlation with Nigeria's inflation.

Table 3: Descriptive Statistics of Exchange rate and Wheat Price.

Exchange Rate					Wheat Price				
Percentiles		Smallest			Percentiles		Smallest		
1%	0.89	0.89			1%	98.26	98.26		
5%	1.75	1.75			5%	100.74	100.74		
10%	4.54	4.02	Obs	36	10%	114.46	106.37	Obs	36
25%	28.91	4.54	Sum of Wgt.	36	25%	130.80	114.46	Sum of Wgt.	36
50%	119.57	Mean	120.25		50%	150.47	Mean	170.6353	
	Largest	Std. Dev.	101.87			Largest	Std. Dev.	54.21911	
75%	155.585	305.79			75%	193.67	265.69		
90%	305.79	306.08	Variance	10377.12	90%	265.69	276.33	Variance	2939.71
95%	306.92	306.92	Skewness	1.09	95%	280.28	280.28	Skewness	0.85
99%	435	435	Kurtosis	4.17	99%	292.97	292.97	Kurtosis	2.68

Source: Author's computation

Exchange rate had a kurtosis value of 4.17 which is above the 3.0 benchmark indicating that the series is not normally distributed, however, wheat price is somewhat normally distributed due to its kurtosis value of 2.68 which is approximately 3.00.

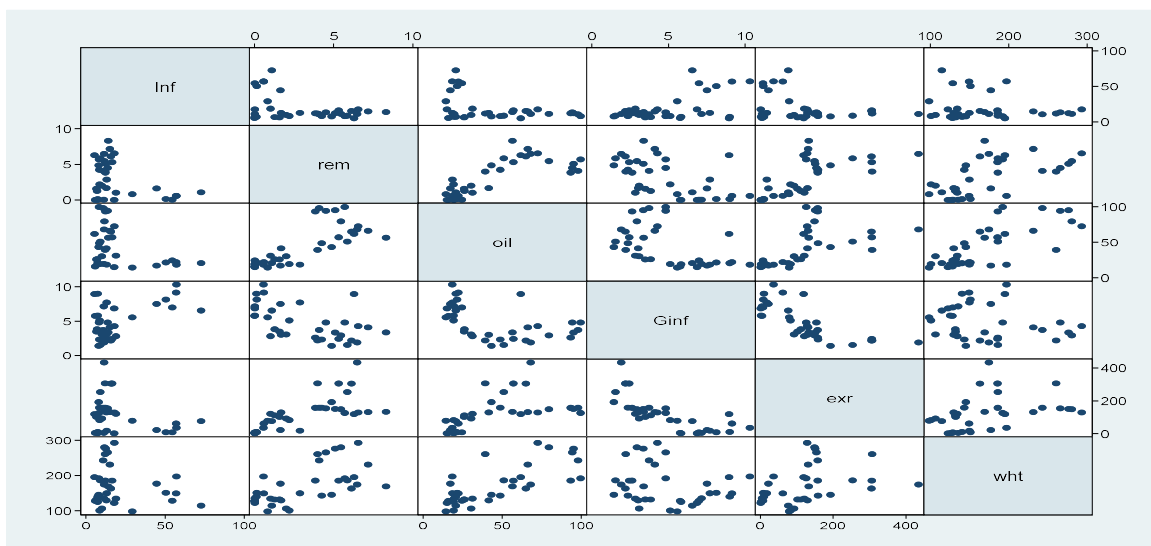


Fig.1. Scatterplot Matrix of Variables

Source: Author’s computation

The scatter plot matrix is a grid of scatter plots used to visualize bivariate relationships between combination of the variables in the study. The first row and column of the table reveals a clear pattern of relationship between the explanatory variables and inflation, only a more robust analysis would identify the relationship that exist between them.

4.2 Stationarity Test

A stationarity test was carried out to ascertain the order of integration of the variables, since an autoregressive model allows for analysis of variables that are both integrated at level and at first difference (I~(0) and I~(1) variables). Given the low power of the ADF test in the presence of structural breaks, it is augmented with the Phillip-Perron test.

Table 4: Result of Unit Root Test Based on Augmented Dickey Fuller (ADF)

Variable	τ ADF I(0)	τ ADF I(1)	5% critical value (*)	Order of integration
Inf	-3.39	-5.93	-3.60	I~(1)
rem	-2.96	-5.94	-3.60	I~(1)
oil	-3.24	-6.04	-3.60	I~(1)
Ginf	-3.24	-5.99	-3.60	I~(1)
exr	-3.03	-4.08	-3.60	I~(1)
wht	-2.61	-5.44	-3.60	I~(1)

Source: Authors’ computation using eviews (2022)

Table 4 presents the result of the unit root test based on Augmented Dickey Fuller. The result reveals that all the variables were not stationary at level, however, they were stationary at first difference. This is based on the condition that when the computed ADF (τ) statistic is higher than the tabulated values, it suggests that there is no unit root in the variable.

Table 5: Result of Unit Root Test Based on Phillips Perron (PP)

Variable	τ PP I(0)	τ PP I(1)	5% critical value (*)	Order of integration
Inf	-2.62	-7.55	-3.60	I~(1)
rem	-2.97	-8.65	-3.60	I~(1)
oil	-2.18	-6.08	-3.60	I~(1)
Ginf	-3.23	-7.36	-3.60	I~(1)
exr	-3.88	-3.97	-3.60	I~(0)
wht	-2.51	-4.61	-3.60	I~(1)

Source: Authors' computation using eviews (2022)

Table 5 presents the result of the unit root test based on Phillips Perron. The result reveals that every variable but the exchange rate was stationary at first difference. Therefore, the exchange rate was stationary at level. This is based on the Schwarz Information Criterion (SIC) which suggests whether the variables contain unit root or are absent of unit root.

Table 6: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-429.4305	NA	26562.74	27.21440	27.48923	27.30550
1	-294.7978	210.3636	58.30652	21.04986	22.97364	21.68754
2	-251.0668	51.93053*	46.42111	20.56668	22.13941*	21.75094
3	-204.3121	37.98823	51.59886	19.89450	25.11619	21.62534
4	-120.6497	36.60228	22.11356*	16.91561*	23.78624	19.19303*

Source: Authors' computation using eviews (2022)

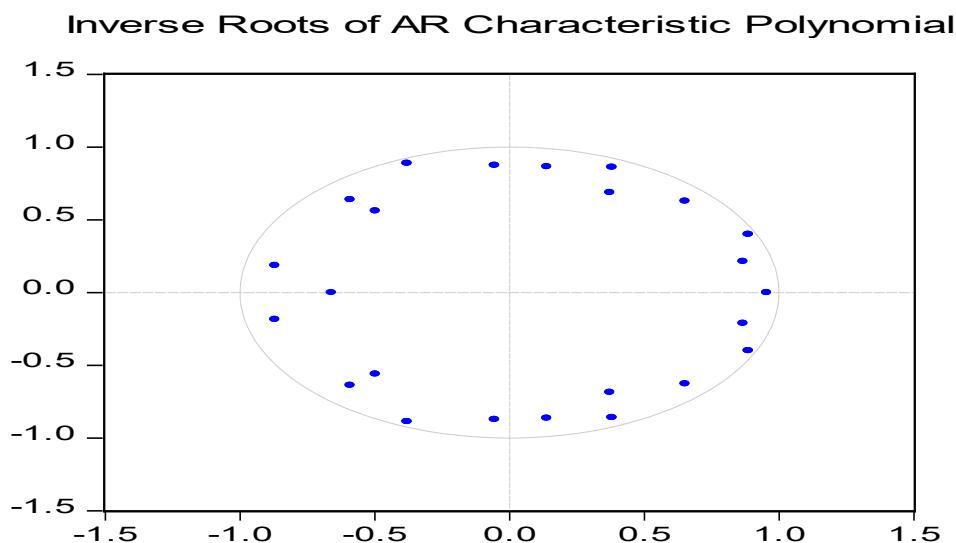


Fig.2. Autoregressive Characteristic Polynomial Graph

Source: Authors' computation using eviews (2022)

Figure 2 reveals the AR roots graph, and the graph reveals that all polynomial fall within the unit circle implying that the VAR model is stable and suitable for analysis.

Table 6: VAR Output of Inflation and its Regressors

	Coefficients	Standard Error	T statistic	Critical Values (0.05)
Inf (-2)	0.50	-0.21	2.35	1.684
Rem (-2)	-1.03	-1.65	-0.62	1.684
Oil (-2)	0.35	0.17	2.14	1.684
Ginf (-2)	3.24	-2.64	-1.23	1.684
Wht (-2)	0.13	-0.07	1.88	1.684
Exr (-2)	0.25	-0.04	-5.94	1.684
R-squared	0.68	F-statistic	6.02	2.49
Adj. R-squared	0.56	Schwarz SC	8.48	

Source: Authors' computation using EViews (2022)

The result of the VAR analysis revealed that there is a moderately strong relationship between inflation and its external factors. Furthermore, it was shown that a unit increase in the past values of inflation would cause inflation to increase by 0.50 units, a unit increase in oil price would cause inflation to increase by 0.35 units, a unit increase in the price of wheat causes inflation in Nigeria to increase by 0.13 units, a unit increase in exchange rate causes inflation to increase by 0.25 units. On the other hand, remittances and global inflation do not have any significant impact on inflation.

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.

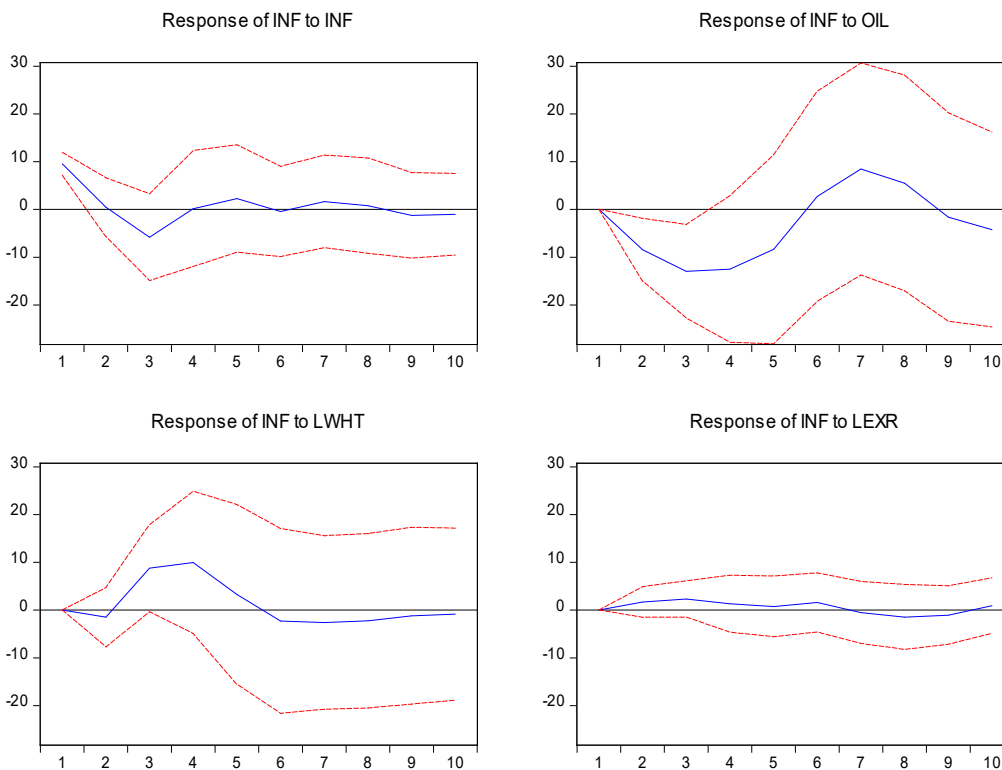


Fig.3. Result of Impulse Response Function

Source: Authors' computation using EViews (2022)

The result of the impulse response function showed that inflation responded positively the most to innovations from exchange rate, the past values of inflation, change in price of wheat. Inflation responded least to the change in oil price.

V Findings and Discussion

The findings of the study reveal the impact that external factors have on inflation in Nigeria, most especially oil price. It was further revealed that increase in oil price had the highest effect on inflation in Nigeria within the review period, this reveals the double impact that increase in oil price has on inflation through the increase in revenue which drives government expenditure. Alternatively, given the level of resources committed into the payment of subsidy on refined petroleum products this further widens fiscal deficit which exerts upward pressure on domestic prices. The changes in exchange rate equally exerted high pressure on inflation in Nigeria, this was expected given the level of importation of consumer goods and the speculative behaviour of economic agents in the money market, given the size of the parallel. The price of wheat impacts significantly on food prices in Nigeria given the weight of bread and cereals in the consumers' food basket. Thus, an increase in the price of wheat affects the price of flour which is a major ingredient of bread and other confectioneries consumed as staples in Nigeria which affects headline inflation via food inflation.

VI Conclusion

The study sought to re-examine the external drivers of inflation in Nigeria within the period 1986 to 2021. This was motivated by the persistent surge in domestic prices in Nigeria and the inability to tame inflation within its threshold limits. The study used exchange rate, oil price, wheat price, remittances, and global inflation to represent the selected external drivers of inflation in Nigeria. The finding of the study revealed that there is a moderate relationship between inflation and its external drivers, given the significant relationship that exist between inflation, exchange rate, oil price, and wheat price. This exposes the level of vulnerability of the domestic prices to the selected variables. Therefore, the study recommends amongst others, that there is need for the government to develop infrastructure and capital that would create domestic production of refined petroleum product. In the short-term, this can be achieved by revamping the existing refineries that are currently shut down. In addition, considering the impact of wheat on domestic prices, there is need for the government to deliberately develop measures that would curb insecurity in major wheat producing areas such as in Borno and Zamfara states. Afterwards, there should be adequate capital and infrastructure that would aid the farming and transportation of the wheat product across the country. If this can be achieved, the global increase in the price of wheat would be more beneficial to the Nigerian economy as net producers of wheat rather than as net consumers. The exchange rate is more like an indicator of the true position of the external sector and could only be improved if the current account balance is consistently in a surplus, and a surplus current account can be achieved when the real sector is very vibrant in terms of its production activities.

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