The Impact of Production Cost, Exchange rate and Inflation rate on Food Prices in Nigeria: Consequences for Food Security.

BY

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Abstract

Given the level food production and comparative advantage in the agricultural sector of Nigeria, one will expect that affordability of food should be a common commodity for all Nigerians but the reverse was the case as prices of food has continue to soar in recent time in Nigeria. This study, therefore, examines food price increase in Nigeria by considering the main determinants of food prices and the implications in Nigeria. The objectives of the study include identification of the major causes of food price increase, examination the short run analysis, enumerate the inflationary implications of the increase, and proffer possible ways to manage food prices in Nigeria. Using aggregated data obtained from National Bureau of Statistics and Central Bank of Nigeria, between 1986 and 2023, the long-run analysis was done using Johansen's co-integration technique, and the short-run relationships between increase in food prices and its main determinants were examined using Vector Error Correction Model (VECM). Cost of Production and Exchange rate though significant but contributed to increase in food prices in Nigeria as a result of the cushion effect of local production and declining in the consumption of foreign products. Furthermore, exchange rate shows a positive impact on food prices since depreciation and devaluation of ₦aira made importation of food items dearer as well as importation of fuel and inputs leading to higher prices and reduction in growth while inflation rate negatively affected food prices. The study recommends the need for energy price policy, cost of production policy, and floating exchange rate policy to reduce higher food prices. The government and the private sector must harmonize all resources available to them to scale investment in the provision of solar energy and build more refineries to lower the cost of production and transportation of food items. The study concluded that once there is adequate supply of energy infrastructure, the cost of production will automatically have a downward move leading to food price stability

Index Terms: Determinants, Food prices, Exchange Rate, Cost of Production.

1. Introduction

Globally food prices have been on the increase and Nigeria in particular. This is affecting the living standard of Nigerians negatively. It is really unimaginable that increase in food prices is still a common phenomenon in Nigeria despite the level of natural endowment, technological developments in the agricultural and industrial sectors, in Nigeria**.** The soaring food prices across the country due to the recent economic recession among other factors have become a source of worry to many Nigerians. Food availability and affordability should therefore become the pursuit of any serious government in the 21st centuries to arrest the occurrence of food shock in the nearest future; Nigeria is not expected to be an exemption. However, the recent rise in food prices in Nigeria is a signal that the government of Nigeria is yet to address the major determinants of food crisis in Nigeria.

Umar, Aliyu, and Hassan (2022) investigated the drivers of food prices and their implications for food security in Nigeria from 1990 to 2018. The vector autoregressive (VAR) model was used to investigate the factors influencing food prices and security in Nigeria. The study examined the impact of food prices, agricultural production, exchange rates, and inflation on food security. According to the study, agricultural productivity, exchange rates, and government policies all have positive impacts on food prices in Nigeria and conclude that rising food prices have a negative impact on food security, particularly among low-income households.

Hence, Nigeria is currently experiencing a persistent increase in food prices arising from insecurity and economic recession. Food demand is interacting food supply and producers, at a consistence rising price as a result of an elusive factor known as inflation. Inflation has been defined by economists as a continuous and persistent rise in the prices of goods and services. **(**Adam, 2010).

Abbas, (2008) discussed the global food crisis and the inflationary pressures that it causes. The author examined the short and medium to long-term policy options that can be used

to address these issues, including price controls, subsidies, and import tariffs. The paper focused on developing countries, which are particularly vulnerable to food insecurity and price shocks. Overall, Abbas provided a comprehensive analysis of the global food crisis and suggests policies that could help to mitigate its effects

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Ayinde, Otekunrin, and Akinbode (2020) used Nigeria's Global Food Security Index (GFSI) rating of 48.4/100 to investigate the impact of food prices on food security between 2016 and 2020. Nigeria ranked 94th out of 113 countries in terms of food security, a situation exacerbated by rising food prices. Nigeria was ranked below Ethiopia, Niger, and Cameroon. Furthermore, food insecurity in Nigeria is higher than in India, ranking it among the world's poorest countries. According to the study's findings, Nigeria's population growth is driving up food prices due to increased demand, which could become uncontrollable given the country's projected 400 million population by 2050.

Wolf, 2016 carried out a study on inflation and found that food prices can increase while inflation decreases because food prices can increase while overall inflation decreases, due to substitution effects and the mix of goods and services in the inflation measure. In his study, Wolf used data from the Consumer Price Index (CPI) for the United States, which covers the period from 2004 to 2016. He analysed the data using both standard statistical methods, such as regression analysis, as well as more sophisticated econometric methods. He found that the substitution effect - the tendency for consumers to switch to cheaper goods when prices rise - has offset the inflationary effect of rising food prices, leading to a net disinflationary effect (Wolf, 2016).

Ayozie and Kolawole (2018) investigated the impact of selected food price determinants on food security in Africa between 2000 and 2011. The paper examined the impact of macroeconomic factors on food prices using panel data from 12 African countries, including inflation, exchange rates, interest rates, changes in agricultural production, and stocks. The methodology used in the study included fixed effects and random effects models, as well as the Hausman specification test. The findings revealed that inflation, interest rates, and exchange rates all have a significant impact on food prices, with inflation having the greatest influence. Agricultural supply has a significant impact on food prices, with changes in agricultural production and stocks having the greatest influence.

Toh and Tchamyou (2021) investigated the impact of COVID-19 on food prices and food security in Africa, using panel data from January to May 2020. The study discovered that the COVID-19 pandemic had a significant negative impact on food prices and security in Africa. It also discovers that African countries with high levels of poverty, low agricultural productivity, and low social protection suffered the most negative consequences.

Apergis and Rezitis (2016) investigated the determinants of food prices on food security from 1970 to 2016, using production, consumption, stocks or trade, speculation, and government policies on wheat prices. The study used an econometric approach to examine the effects of various factors on wheat prices. and discover that, while production, consumption, stocks, and trade do not have a statistically significant impact on wheat prices related to food consumption, other factors, such as speculation or government policies, may be more important in determining wheat prices across the country. Again, the model demonstrated cointegration among the variables, and the Granger causality test revealed causal relationships between them.

Fosu and Tamakloe (2017) used a fixed effect Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to study the relationship between food price determinants and food security in 21 African countries from 1999 to 2013. The study employs the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to account for the time-varying nature of food price volatility. It discovers that, while inflation and oil prices have a theoretical relationship with food price volatility, inflation, oil prices, exchange rates, agricultural production, fertilizer use, GDP per capita, trade openness, population growth, and a policy index have no statistically significant impact on food prices.

The persistent increase in food prices in Nigeria has demonstrated that policymakers have limited information on the major determinants of food prices, making it imperative to investigate potential determinants of food prices in Nigeria. Most studies focused on the global determinants of food price increases and the causes of food inflation. this However, this study investigated the exchange rate and cost of production as major determinants of food prices in Nigeria in order to determine the long-run and short-run relationships that exist between food prices, exchange rate, and cost of production as determinants, so that better ways to manage food prices can be proposed.

2. Research Elaboration
2.1 The Structuralist View

After a conscientious review of literature the structuralist captures the major objectives of this study because the Structuralist has a different opinion concerning inflation. The structuralist tends to give detail account of inflationary phenomenon in developing countries focusing primarily on supply-side factors that determine food prices. Considering all these schools of thought the researcher takes side with the structuralist and the monetarist and hence, adopts a Vector

Error Correction Model for analysis to examine possible causes of food price increase in Nigeria. To curb inflation the government is expected to respond through monetary authorities to stabilize wage earners' activities and profit earners activities in their shares of the total income. Private and public sectors need to maintain stability to increase their shares of real resources in the face of inflation. Thus monetary should play a secondary role to tackle inflation in countries like Nigeria. Based on the constraints identified by the structuralists and structuralist hypotheses, structuralist model is stated as follows:

$$P_t = \beta o + \beta_1 \gamma + \beta_2 \gamma_m + \beta_3 \gamma_{Pr} + \beta_4 \gamma_{Pmt} + \beta_5 \gamma_{ct} + \beta_6 \gamma_{at} \ \ldots \ldots (1)$$

Where; P_t is percentage change in price level, γ is rate of inflation, γ_m is percentage change in money supply, γ_{Pr} is food prices in percentage, γ_{pmt} is index of imports, γ_{ct} is change in given sector γ_{at} is expectation variable.

2.2 Model Specification

Based on the theoretical underpinning the following model was specified functionally

FP=f (COP,EXR, INF)……………………...(2)
Expression equation (1) econometrically, it yields
$$FP = \beta_0 + \beta_1 COP_t + \beta_2 EXR + \beta_3 INF + \mu \ \ldots\ldots\ldots\ldots (3)$$

Where the time period is 1986-2023, FP is Food prices proxy by Food Price Index for food, COP is the Cost of production proxy by Oil prices in time t per litre and EXR is the Exchange Rate and IFL is the inflation rate. β_0 is the intercept, β_1, β_2 and β_3 are the coefficients of CP_t, EXR, INF, and FIM respectively which are expected to be in deterministic while μ is the error term. In order to show the equilibrium path of equation 3 to short-run solution, Vector Error Correction Model version of the model in the following form was obtained

$$\Delta FP_t = \beta_0 + \sum_{j=1}^{n} \beta_{1j} \Delta COP_t + \sum_{j=1}^{n} \beta_{2i} \Delta EXR_t + \sum_{j=1}^{n} \beta_{2i} \Delta INF_t + \lambda ECT_{t-1} + \epsilon_t \ldots\ldots\ldots(4)$$

Equation (3) was estimated after conducting unit root and co-integration tests on the time series used. Where β_1 is the coefficient of the change in Cost of production, β_2 is the coefficient of the change in Exchange Rate, λ is a speed of adjustment, ECT_{t-1} is the Error Correction Term and ϵ_t is the residual term. If (λ) of ECT_{t-1} is significant then short-run relationship exists among variables.

3. Results and Conclusion

Table 1: Descriptive Statistics of Variables

	FPI	COP	EXC	INF
Mean	114.6469	71.05656	138.46244	21.53094
Median	113.5000	28.00000	114.6347	14.50000
Maximum	148.0000	636.7000	636.7000	73.10000
Minimum	88.2000	0.20000	2.02057	5.40000

	0	0	5	0
Std. Dev.	17.64163	119.19055	155.69411	18.30707
Skewness	0.185587	3.532589	1.478160	1.465354
Kurtosis	1.994641	17.033988	4.715938	3.886360
Jarque-Bera	1.531356	329.15991	15.57903	12.49958
Probability	0.465019	0.000000	0.000414	0.001931
Sum	3668.700	2273.810	4430.796	688.9900
Sum Sq. Dev.	9648.040	440397.6	751460.6	10389.62
Observations	32	32	32	32

The distribution is slightly longer than the tail on the left side. Kurtosis of 1.9 indicates that the data has a "tall and skinny" shape, meaning that it has a relatively peaked distribution and the Jarque-Bera statistic of 1.5 with a p-value of 0.4 indicates that the data is not significantly different from a normal distribution. Similarly, the distribution of cost of production showed that data is highly skewed to the right, meaning that the right tail is much longer than the left tail and "leptokurtic" or "peaked". The Jarque-Bera statistic of 32.9 with a p-value of 0.00 indicates that the data is significantly different from a normal distribution. The distribution of exchange rate was highly skewed, with a long right tail. The data is also fairly leptokurtic, meaning that it has a sharp peak in the center of the distribution and the data is not normally distributed. The distribution of inflation rate showed that data is highly skewed, with a long right tail, and is mesokurtic, meaning that it has a moderate peak in the center of the distribution. The data is not normally distributed, as indicated by the Jargue-Bera test statistic, and this called for stationarity test.

4. Results of Unit Root Test

The test results in levels and first differences based on Augmented Dickey-Fuller (ADF) procedure is presented in Table 2. The second column shows their order of stationarity at level while the third column shows their order of stationarity at first difference.

Table 2: Results of Augmented Dickey-Fuller Test for Stationary of Variables

Variable	Level	First Difference	I(d)
FPI	-5.4422**	-5.5422	I (1)
COP	3.07105-	4.1136**	I (1)
EXC	-0.9964	4.2843**	I (1)

INF	-3.5811**	-5.4062	I (1)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.505781	36.55512	47.85613	0.3688
At most 1	0.294812	16.82135	29.79707	0.6532
At most 2	0.214790	7.041220	15.49471	0.5728
At most 3	0.009622	0.270716	3.841466	0.6029

Trace test indicates no cointegration at the 0.05 level

Source: Authors' computation, 2024 from Eview 9.0

Table 4: Johansen Cointegration Table (Maximum Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.505781	19.73376	27.58434	0.3598
At most 1	0.294812	9.780131	21.13162	0.7650
At most 2	0.214790	6.770504	14.26460	0.5166
At most 3	0.009622	0.270716	3.841466	0.6029

Max-eigenvalue test indicates no cointegration at the 0.05lv

Source: Authors' computation, 2024 from Eview 9.0

From Table 3 the trace statistic is less than 0.05, it suggests that there is evidence of autocorrelation at the 5% significance level. In other words, there is a 5% chance that the observed autocorrelation is due to random chance alone. The lower the probability value, the stronger the evidence for autocorrelation. Based on the trace statistic being significant at the 5% level, we can conclude that there is a long-run relationship between the values in the time series. Table 4 which showed that maximum eigenvalue corroborates the trace statistics. This consistency between the two statistics adds confidence to the overall conclusion. Therefore, the evidence of cointegration implies the application of Vector Error Correction Model.

Table 5: Short Run Dynamic: Vector Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic
COP	5.460654	1.27002	4.29965
EXC	0.808859	0.65956	1.22637
IFL	-0.087748	0.76761	-0.11431
Ect	-0.206856	0.31255	-0.66184
Constant	13.16993	80.2271	0.16416

R-square = 0.541445 Adjusted R-square = 0.437228 F Statistics 5.195367

Source: Author's computation from E-view 9.0

The Vector Error Correction result shows that a unit increase in the cost of production will on the average increase food prices by 5.5 percent and negatively influence food security in the short-run. cateris parisbus. The coefficients have the expected positive signs except that, the short-run analysis shows that cost of production is positive and highly statistically significant which corresponds to the fact that, food price have positive influence on food security and this can be traced to structural and infrastructural phenomenon than monetary phenomenon. The short-run analysis shows that cost of production plays a crucial role in determining food prices in the agricultural sector of Nigeria. The higher food prices in the short run will stimulates another round of agricultural sector growth in the long run. However, with increased fuel prices (Premium Motor Spirit) which result into higher costs of production can lead to higher food prices spiral ultimately and propel food insecurity. Similarly, exchange rate was found to confirm the a priori expectation and is positively signed with coefficient of 0.8088. The result revealed that a unit increase in exchange rate on the average will produce 8 percent increase in food price meaning that although exchange rate was found to be insignificant but mostly affect the prices of imported goods and infringe to some extent on domestic prices and food production. This result also corroborates the findings of Yohannes, 2009. The results also indicate that a unit increase in the inflation rate will on average reduce food prices by 0.08 percent in the short term. However, as the overall price level of goods and services falls, food prices may fall, making it more affordable for consumers and potentially contributing to improved food security. However, a negative inflation rate may have broader economic consequences, such as decreased investment and economic growth. In other words, the overall inflation rate is determined by a broad range of goods and services, not just food prices. So, even if food prices rise, inflation can fall if other prices fall more dramatically. It all comes down to the mix of goods and services included in the inflation measure. This agrees with the study of Wolf, 2016. The ECM estimated value of -0.206856 is correctly signed negatively and showed a very high speed of convergence towards equilibrium. Meaning that cost of production, exchange rate, and inflation

rate, move together in the short run and it's statistically significant at 5 percent level of probability. The ECM estimate simply means that short-run disequilibrium between food prices and other macroeconomic variables included in the model converges toward equilibrium at a speed of 0.206856. By implication, 0.2 percent of the disequilibrium in the system due to external shock in the previous year will be restored in the current year. In effect, it takes less than one (1) year for the system to re-adjust into its long-run equilibrium path in the event of any disequilibrium due to an external shock on the system. The nature of policy summersaults and choice of policy in Nigeria lay some credence to this result of convergence. The coefficient of determination of 54 percent shows that the model has a goodness fit. 54 percent of the variations in food prices are explained by the explanatory variables under study while the rest 46 percent are explained by variables like weather condition, real interest rate, and fertilizer prices as well as other variables not included in the model.

5. Conclusion and Recommendations

This study investigated The Impact of Production Cost, Exchange rate, and Inflation rate on Food Prices in Nigeria: Consequences for Food Security using vector error correction model. The results showed that cost of production and exchange rate have positive and significant impacts on Food Prices. Since food is so important to the survival of any economy, the past and current prices can form the basis for future prices. Both current and past hike in food prices always have a negative consequence on the economy because of inflation spiral. Finally, the error correction term of ECT $_{t-1}$ of -0.206856 shows a very high speed of convergence towards equilibrium. The appropriate channel for the country to effectively manage food is to stabilize food prices through Farm income stabilization policy which can reduce production risks. Also, the government should avoid distorting producers' production and marketing decisions and finally, the study recommended that since the result shows that cost of production and exchange rate provoke higher food prices. Hence, there is a serious need for energy price policy, cost of production policy, and exchange policy to reduce higher food prices. The government and the private sector must harmonize all resources available to them to ensure that higher scale investment is done in the area of provision of solar energy and build more refineries to bring the cost of production and transportation of food items down so that agricultural production can be encouraged and maximally utilized by the industrial sector.

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