

Impact Assessment of Inflation on Prices of Selected Food and Cash Crops in Nigeria: 1980-2015

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Abstract: *The impact assessment of inflation on prices of selected food and cash crops in Nigeria from 1980 to 2015 was carried out. Data for the study were sourced from the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS) and Food and Agriculture Organization (FAO). Inferential statistics such as Augmented Dickey Fuller (ADF) test, Co-integration analysis, Error Correction Model (ECM) and Granger Causality test were employed for the analysis of data. The result of the study indicates that inflation has a positive effect both on prices of food and cash crops in the long run. On the other hand, inflation was not significant in affecting prices of food and cash crops in the short run. The study based on its findings recommends that trend of inflation in Nigeria be well monitored by monitoring authorities and policies that will ensure a single digit inflation rate should be enacted and enactment of policies that will protect the agricultural sector from the effects of inflation.*

Keywords: *Inflation; Prices; Food crop; Cash crop and Co-integration*

Date of Submission: 21-02-2019

Date of acceptance:08-03-2019

I. Introduction

Inflation is one of the frequently used terms in economic discussions, yet the concept is variously misconstrued. There are various schools of thought on inflation, but there is a general consensus among economists that inflation is the continued rise in prices of goods and services. According to Obasi (2008), Nigerian farmers experienced increased risk and uncertainty in their production during the periods of inflation. He further stated that general inflation affects the farm economy most directly through the cost of inputs. Compared with any other major sector in the economy, because it is highly competitive and most of the outputs are perishable, agriculture is the least able to pass input cost increases into higher output prices. When relative prices within agriculture vary because of inflation, such movement may decrease economic welfare for society as a whole and the agricultural sector in particular. Farmers may suffer loss of real income due to inflation. According to the National Council of Applied and Economic Research (NCAER, 2008), as inflation increases, prices paid by farmers for various inputs increase faster than the prices they receive for their products, thereby, the term of trade for farmers deteriorate as the rate of inflation rises.

David (2008) noted that, the biggest cost increase for agricultural production is from fertilizer and seeds. Farmers face high risk since any cost declines in inputs could be accompanied by greater downward pressure on crop prices. On the other hand, there has been a slow growth in world agricultural production as well as rising farm production cost. In recent years, adverse weather cut supplies of agricultural commodities while government policies compounded shortages in some areas. Increased cost of inputs, most notably fertilizer and energy/transport costs are limiting factors to agricultural growth. In April 2008, the fertilizer price peaked than in 2007 and according to the Cambodian Centre for Study and Development in Agriculture, approximately 50 per cent of Cambodia's estimated 2million farmers have been adversely affected by the price rise, therefore, most farmers are also paying higher food prices for the majority of their consumption (United Nation Children Education Fund [UNICEF], 2009).

According to Chinkook (2002), input price increase arises from several sources, including general inflation; weather-related supply problems (particularly in the case of farm products) and/or energy-related crisis spirals; national monetary and fiscal policies and also excess demand, resulting in higher prices (including higher interest rates and wages) for items purchased by food producers. As high agricultural commodity price level and macroeconomic imbalances are of global concern, several studies have attempted to address the underlying causes of the price rises. Although, there is dispute about their relative importance, the major causes are identified as: rapid rising demand in emerging economies; poor harvest in some major commodities producing countries; increases in the cost of production due to higher fuel and fertilizer prices; higher transportation cost; diversion of food crops into bio-fuels production and export by some countries (Josef, *et al.*, 2009).

Inflation raises prices of farm inputs as well as farm products resulting in uncertain effects on the current net incomes of farmers. Therefore, input price inflation creates cash flow problem for farmers and increases the necessity for high level of operational management and conservative financial strategies (Zyl, 2010). Olajide *et al.* (2012) also opined that low agricultural output has a negative effect on the Nigerian economy as a whole. Several factors have been identified to enhance or retard growth in the agricultural sectors. These factors include education, infrastructure and inflation. Furthermore, studies conducted by NCAER (2008) showed that the impact of inflation on agriculture is multi – facet. Firstly, it raises the sector’s cost of production through increased cost of material inputs. Secondly, higher production cost may be shifted to consumers, but this possibility is limited by the competitive import of agricultural commodities, thus reducing farmers’ rate of returns. It further stated that inflation may benefit people with flexible money income, but not those whose money incomes are fixed. Farmers have flexible money incomes, therefore, theoretically, at least they should benefit from an unanticipated increase in the rate of inflation. Empirical studies however, have not found this connection.

The main objective of this study is to assess the impact of inflation on prices of selected food and cash crops in Nigeria from 1987 – 2017. The study covers a period of 30 years, that is, from 1987 to 2017. A total of ten crops; four cash crops and six food crops were used for this study. The cash crops considered in the research include palm oil, cocoa, coffee and soya beans; while food crops studied are cowpea, maize, sorghum, millet, rice and yam.

II. Literature Review

Persistent inflation is perhaps the second most serious macroeconomic problem confronting the world economy today, second only to hunger and poverty in the third world countries. It is the dominant economic problem in modern times (Dwivedi, 2006). Therefore, various authors and researchers have attempted to air their views on the concept of inflation. Ewa (2009) defined inflation as a condition in which supply persistently fails to keep pace with the expansion of demand. Aminu and Anono (2012) viewed inflation as the generalized increase in the level of price sustained over a long period in an economy, while Samuelson (1995) simplified the definition of inflation as the rise in the general level of prices. According to Anyaele (2003), inflation is the continuous rise in prices of goods and services as a result of large volume of money in circulation used in exchange of the few available goods and services. In his opinion, Jhingan (2010) described inflation as a state where too much money is chasing too few goods. An examination of trends in prices paid and prices received by farmers over time lends empirical support to the theoretical arguments that national inflation does, in fact have a real effect in the farming industry (Quance and Tweeten, 1971). Indeed, average inflation during the periods of early 1960s up to the year 1972 which has been relatively low, Nigeria’s historical average rate being 5.01 per cent (Inflation Rate for Nigeria (IRN), 2009). Findings by Obasi (2008) revealed that inflation had had a rising trend from 1971 to 1996, fluctuating greatly with peak values in 1975, 1981, 1989 and 1995, which are 33.96, 20.81, 50.47 and 72.84 per cents respectively and slowed down from 1996 to 2003. IRN (2009) also confirmed that inflationary trend has been cyclical since mid – 1970s and peaking at various times. Therefore, the major factor which is responsible for inflation in Nigeria is poor fiscal management by government.

The surge in global agricultural commodity prices has been driven by various factors including rapid increases in demand, low global stock and high oil prices. As high food prices continue, vulnerable group are forced to reduce their food intake or to consume cheaper and less nutritious food products which reduces general health and wellbeing, exposing families to illness and rendering them less productive and economically more vulnerable (UNICEF, 2009). Findings by Annex (2008) revealed that food price inflation is currently running at a high level. It further stated that typically, food inflation has lagged behind general inflation, but since 2006 the two have been similar and in recent months food inflation has moved ahead to an annual rate of 6 per cent or more.

According to Chandrasekhar (2010), while inflation is not restricted to food alone, it has been substantially driven by food articles, which are more prone to speculative influences. He also noted that within food articles, inflation has at different points in time affected different commodities, such as cereals, pulses, vegetables, eggs, meat and milk. Not all these commodities are weather – dependent and the prices of some are influenced by where administered prices are set. Therefore, the impact that global food inflation has on fiscal balances – but also external balances, macroeconomic stability, growth and welfare will critically depend on each country’s position as net importer or net exporter of such commodities (Octaviano, 2011). Chinkook (2002) in his study noted that agricultural products are not easily substitutable in most food production processes and changes in agricultural output prices will eventually have an effect on food prices. Consequently, signaling consumers to anticipate food price increase.

III. Methodology

The study was carried out in Nigeria, a West African country lying between Longitudes 20^o and 15^oE and Latitudes 5^o and 15^oN. The present capital is Abuja which is geopolitically located at the North central part of the country. Nigeria which is the most populous country in Africa has an estimated population of 180 million people (NPC, 2006). It is situated in the Gulf of Guinea and bordered by Benin in the West; Cameroon and Chad in the East and Niger in the North. The lower course of the Niger River flows South wards of the country into the Gulf of Guinea while swamps and mangrove forests bordering the southern part.

3.1 Data Sources

The research made use of secondary data which were obtained from Central Bank of Nigeria (CBN) Publications and Annual Reports, National Bureau of Statistics (NBS), Federal Ministry of Agriculture and Water Resources and Food and Agriculture Organization (FAO). Variables for which data were obtained include annual inflation rates; annual prices of agricultural cash crops such as coffee, cocoa, palm oil and soya beans; annual prices of agricultural food crops such as maize, rice, cowpea, millet, yam and sorghum. Data for all variables cover a period of 35 years (1980 – 2015). The choice of this period is because it marks the sharp decline in agricultural contribution to Gross Domestic Products (GDP) of the nation due to the oil boom of the 1970s. Therefore, agricultural commodity prices assumed a rising trend during this period in parallel with increases in the rate of inflation (Obasi, 2007).

3.2 Data Analysis

Inferential statistics such as Augmented Dickey Fuller test (ADF), Co- integration test, Error Correction Model (ECM) and Short run Granger Causality based on Waldtest were employed to analyze the objective of this study. The ADF was used to ascertain the time series properties of all the variables so as to avoid spurious regression which results from the regression of two or more non-stationary time series. Johansen procedure was used to assess the existence of long run equilibrium relationship among the variables. Subsequently, the ECM was employed to model the relationship between the co integrated variables. Granger causality was used to test for short run causal relationships among the variables. All the series in this study were tested for the presence of unit roots using the ADF test.

3.3 Model Specification

To analyze objective (i), the pair wise Granger causality test is modeled as a multivariate vector autoregressive (VAR) model as follows:

$$PCC_t = \beta_0 + \sum_{i=1}^p \beta_i PCC_{t-i} + \sum_{j=1}^p \mu_j INF_{t-j} + \epsilon_{2t} \quad (1)$$

$$PFC_t = \beta_0 + \sum_{i=1}^p \beta_i PFC_{t-i} + \sum_{j=1}^p \mu_j INF_{t-j} + \epsilon_{2t} \quad (2)$$

Where

INF_t = rate of inflation (%)

PCC_t = price of cash crops (N)

PFC_t = price of food crops (N)

$\epsilon_{1t}, \epsilon_{2t}$ = Gaussian white noise error terms

p = optimal lag length

β_0 = constant

β_i, μ_j (where $i, j = 1, 2, \dots, p$) = parameter coefficients to be estimated

IV. Results And Discussion

Unit Root Test for all Variables

Due to the time series nature of data for this study, there was need to test for the presence of unit roots. This is because series with unit roots could give spurious results. Therefore, Table 1 gives the unit test results for inflation, prices of food crops (maize, sorghum, millet, yam and cowpea), cash crops (soya beans, palm oil, cocoa and coffee), The result of the Augmented Dickey Fuller test indicates that all the series were found to become stationary at differencing. This implies that all the variables contain non-stationary time trend or unit roots which necessitated the application of the Error Correction Model (ECM).

Table1: Unit Root Tests for All Variables

Variables	ADF		Critical Value (5%)	
	Level	1 st Difference	Level	1 st Difference
Inflation	-3.0847	-5.2735*	3.5731	-1.9535
Sorghum	1.4322	-4.0436*	-1.9530	-1.9535
Millet	-2.2510	-6.6242*	-2.9665	-1.9535

Yam	0.8033	-3.9504*	-1.5930	-1.9535
Soybeans	-1.5975	-3.9465*	-2.9665	-1.9535
Palm oil	-1.4145	-4.3515*	-2.9665	-3.5796
Cocoa	-0.9404	-5.4624*	-2.9665	-1.9535
Coffee	-1.5268	-3.3970*	-2.9665	-1.9535
Cowpea	-0.4055	-5.1165*	-2.9665	-1.9535
Maize	-0.6359	-5.6257*	-2.9665	-1.9535
Rice	-0.4832	-4.1328*	-2.9665	-1.9535

Source: Field Survey 2018. * indicates significance at 5% level.

Co-integration Rank Test for Inflation, Prices of Food and Cash Crops

Further investigation into the series properties of the 1 (1) variables through the use of Johansen Co-integration mechanism indicates that co-integration exists among the variables. The Johansen Co-integration result is shown in Table 2. Thus, based on the decision rule, the Likelihood Ratio of 65.13491 is greater than the critical value of 42.44 at the 5 % level of significance, therefore, co-integration exists. On this basis, the null hypothesis of none of the hypothesized number of equation(s) is rejected. Thus, the likelihood ratio test indicates 1 co-integration equation at 5 % level of significance.

Table 2: Co-Integration Rank Test

Hypothesize no of CE(s)	Eigen Value	L.R.	Critical Value (5%)	
None**		0.794387	65.13491	42.44
At most 1		0.391963	24.00912	25.32
At most 2		0.346824	11.07361	12.25

Source: Field Survey 2018. Likelihood Ratio (L.R) tests indicates 1 Co-integration Equation (CE) at 5 %.

Error Correction Result of Effect of Inflation on Prices of FoodCrops

The existence of co-integration among the dependent variables and their fundamentals necessitated the specification of the Error Correction Model (ECM) for this study. The result of ECM as shown in Table 3 indicates that in the long run, the coefficient of inflation (INF) is rightly signed as expected and statistically significant at 10 % probability level. Thus, this implies that a unit increase in inflation will result in an increase of 1.0048 in the prices of food crops (PFC). This result shows that inflation has a significant impact on prices of food crops which corresponds to findings by Obasi (2007); Ukoha (2007) and Akpan and Udoh (2009). This result, which meets a priori expectation, shows that since food is a basic necessity of life, general inflation will drive up the prices of food commodities. The coefficient of price of cash crop (PCC) was found to have a significant positive relationship with PFC, which is 1.99. This implies that a unit increase in the prices of cash crops will result in an increase of 1.99 in prices of food crops in the long run in Nigeria. Thus, food prices increase faster than cash crop prices, probably owing to the fact that food is a basic human need; therefore, demand for it is higher. The result of the short run Error Correction Model (ECM) in Table 4 indicates that the Error Correction Term [ECM (-1)] is negative (-0.3304) as expected, indicating a quick speed of adjustment (that is, the speed at which the deviation from long run equilibrium is adjusted quickly where 0.3304 of the disequilibrium is removed immediately in each period). This shows that the speed of adjustment where inflation will equilibrate the prices of food crops in Nigeria is at the rate of 33 %. More so, the Coefficient of multiple determinations (R^2) is 66 %. This implies that the independent variables (INF and PCC) were found to jointly explain 66 % of the movement of the dependent variable (PFC). The remaining 34 % can be attributed to the influence of omitted variables such as weather, hectares of land cultivated, etc. The low Akaike Information Criteria (AIC) of 4.89 also indicates the goodness of fit of the model. Also, the result indicates that there is no significant relationship between inflation and prices of food crops in the short run from the first to the forth lags.

Table 3: Long Run Effect of Inflation on Prices of Food Crop

Variable	Coefficient	Standard Error	t-statistics
PFC	1.0000	-	-
PCC	1.9909	0.7181	2.7728**
INF	1.0048	0.0748	2.1407**
CONSTANT	4.4632	-	-

Source: Field Survey 2018. ** (*) indicate 5 % (10 %)

PFC= Price of food crop; PCC= Price of cash crop; INF= Inflation

Table 4: Short Run Relationship between Inflation and Prices of Food Crops

ECT	ΔPFC MODEL	ΔPCC MODEL	ΔINF MODEL
CointEq1	-0.3304(-1.5384)	0.1068(0.5585)	-0.9147(-2.5475) **
ΔPFC _{t-1}	0.1119(0.2240)	-0.0570(-0.3872)	0.0442(0.2657)
ΔPFC _{t-2}	-0.0549(-0.0955)	-0.0159(0.1142)	0.2013(1.2833)
ΔPFC _{t-3}	-0.3206(-0.3717)	0.0938(0.8541)	-0.0274(-0.2212)
ΔPFC _{t-4}	0.5211(0.7072)	0.1649(1.5526)	-0.0073(-0.0612)
ΔPCC _{t-1}	1.4886(1.7284)*	-0.2219(-0.8387)	-0.4033(-1.3495)
ΔPCC _{t-2}	1.2319(1.6892)	-0.8835(-2.8982) **	-0.1924(-0.5588)
ΔPCC _{t-3}	0.9666(1.4369)	-0.8169(-1.7891) *	0.0268(0.0520)
ΔPCC _{t-4}	0.3576(0.5185)	-0.1575(-0.4038)	0.1752(0.3976)
ΔINF _{t-1}	0.4193(1.5077)	-0.4289(-0.9408)	0.7631(1.4814)
ΔINF _{t-2}	-0.1084(-0.4132)	-0.3218(-0.8334)	0.1833(0.4203)
ΔINF _{t-3}	0.0515(0.2483)	-0.5885(-1.6526)	0.4223(1.0497)
ΔINF _{t-4}	-0.2377(-1.1845)	-0.6591(-1.8049) *	0.3026(0.7336)
C	-0.3844(-1.1947)	0.0495(0.2574)	0.4404(2.5859) **

R-Squared=0.6607; Adjusted R-Squared=0.2930; F-statistics=1.7971; Akaike Information Criterion=4.8916; Log likelihood=-17.5904; Schwarz Criterion=7.1174

Source: Field Survey 2018. Values outside parenthesis are coefficients; values in parenthesis are t-values. ***(**) * indicate 1% (5%) 10% significance levels. ECT=Error Correction Term.

Error Correction Result of the Effect of Inflation on Prices of Cash Crops

Table 5 shows the long run effect of inflation (INF) on the prices of cash crops (PCC) in Nigeria. The result indicates that INF is rightly signed as expected and statistically significant at 1 % probability level. This implies that in the long run, a unit increase in INF will result in 0.505 increase in PCC. This result also conforms to findings by Obasi (2007) and Mesike *et al.* (2010) who reported that inflation has a significant positive impact on prices of cash crops in the long run.

Table 6 presents the short run ECM result of the impact of inflation (INF) on the prices of cash crops (PCC). Here, the Error Correction Term [ECM (-1)] is 0.2114 indicating a low speed of adjustment of variables. This implies that the speed of adjustment where INF will equilibrate PCC is 0.2114. The Coefficient of determination R² is 64 % which means that the independent variables (INF and PFC) were found to jointly explain 64 % of the movement of the dependent variable (PCC). The low AIC of 4.89 also shows the goodness of fit of the model. The short run Error Correction Result also reveals that there is no short run relationship between inflation and prices of cash crops.

Table 5: Long Run Effect of Inflation on Prices of CashCrops

Variable	Coefficient	Standard Error	t-statistics
PCC	1.0000	-	-
PFC	0.5026	0.1811	2.7728**
INF	0.5047	0.0841	5.9998***
CONSTANT	2.2417	-	-

Source: Field Survey 2018. *** (**) indicates 1% (5%)\

Table 6: Short Run Relationship between Inflation andPrices of CashCrop

ECT	ΔPCC MODEL	ΔPFC MODEL	ΔINF MODEL
CointEq1	0.2114(0.5585)	-0.6577(-1.5384)	-1.8211(-2.5475) **
ΔPCC _{t-1}	-0.4289(-0.9408)	0.7631(1.4814)	1.4886(1.7284) *
ΔPCC _{t-2}	-0.3218(-0.8334)	0.1833(0.4203)	1.2319(1.6892) *
ΔPCC _{t-3}	-0.5885(-1.5526)	0.4223(1.0497)	0.9666(1.4369)
ΔPCC _{t-4}	-0.6591(-1.8049) *	0.3026(0.7336)	0.3576(0.5185)
ΔPFC _{t-1}	-0.2219(-0.8387)	-0.4033(-1.3495)	0.1119(0.2241)
ΔPFC _{t-2}	-0.8835(-2.8982) **	-0.1924(-0.5588)	-0.0549(-0.0955)
ΔPFC _{t-3}	-0.8169(-1.7891)	0.0268(-0.3206)	-0.3206(-0.3717)
ΔPFC _{t-4}	-0.1575(-0.4038)	0.1752(0.3976)	0.5211(0.7072)
ΔINF _{t-1}	-0.0570(-0.3872)	0.0442(0.2657)	0.4193(1.5077)
ΔINF _{t-2}	-0.0159(-0.1142)	0.2013(0.2833)	-0.1084(-0.4132)
ΔINF _{t-3}	0.0938(0.8541)	-0.0274(-0.2212)	0.0515(0.2483)
ΔINF _{t-4}	0.1649(1.5526)	-0.0073(-0.0612)	-0.2377(-1.1843)

C	0.4404(2.5859) **	0.0495(0.2574)	0.3844(-1.1947)
R-Squared=0.6414; Adjusted R-Squared=0.2529; F-statistics=1.6512; Akaike Information Criterion =4.8916; Log likelihood=-17.5904; Schwarz Criterion=7.1174			

Source: Data Analysis 2018. Values outside parenthesis are coefficients; values in parenthesis are t-values. *** (***) * indicate 1 % (5 %) 10 % significance level. ECT=Error Correction Term.

Short Run Granger Causality Test

The result of the granger causality based on the Wald procedure which uses chi square statistics is shown in Table 7 below. The test was carried out using a lag length of 4 and at 5 % level of significance. The result from the table shows that there is no causality among the variables in the short run, although they were found to be co-integrated with 1 co-integrating equation. Therefore, based on the result of granger causality, the null hypothesis of no causality between variables is accepted for all variables.

Table 7: Short Run Granger Causality Test

Null Hypothesis	X _{2cal}	X _{2tab} (5%)	Decision
PFC does not granger cause INF	0.6975	15.5070	Accept
PCC does not granger cause INF	8.1745	15.5070	Accept
INF does not granger cause PCC	1.7701	15.5070	Accept
PCC does not granger cause PFC	4.0112	15.5070	Accept
INF does not granger cause PCC	3.3031	15.5070	Accept
PFC does not granger cause PCC	4.1512	15.5070	Accept

Source: Field Survey 2019. PFC=Price of Food Crop; INF=Inflation; PCC=Price of Cash Crops.

V. Conclusion And Recommendations

The study investigated the impact assessment of inflation on prices of food and cash crops. Findings from this study reveal that inflation exerts a positive significant effect on the prices of food and cash crops in the long run. In the short run, inflation neither affects prices of cash nor food crops. The research also discovered that prices of food crops increase faster than prices of cash crops during inflationary period in the long run. The short run Causality test based on Wald statistics shows that there is no causality among the three variables; inflation, prices of food crops and cash crops.

The study recommended that:

1. Monetary authority in Nigeria should carefully monitor the trend of inflation and pursue policies that will ensure a single digit inflation rate as the inflationary pressure of the economy exerts significant effect on agricultural production.
2. Agriculture should be given priority in terms of budget allocation, funds disbursed should be properly monitored for effective utilization as this would increase production and make agricultural commodities available at cheaper prices.
3. Enactment of policies that will buffer the agricultural sector from the effect of inflation in the long and short run.
4. Improvement in resource and development investment in agricultural research in order to provide access to farmers to improved technologies and boost production.
5. Improvement in markets, infrastructures and institutions is required to make access to both inputs and food at reasonable prices by poor Nigerian farmers easier.
- 6.

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