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An Empirical Analysis of the Demand for Maize in Nigeria using Co-integration and Error Correction Models

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Abstract

Maize is a staple crop in Nigeria that contributes to the diet of the majority of the population. Several programmes have been designed to help stabilize prices in order to enhance the demand for maize. This study sought to determine the relationships among factors that influence the demand for maize in Nigeria from 1990-2013. The Co-integration technique and error correction model (ECM) were used to analyse these long-run and short-run relationships. The results suggest that the error correction term (ECT-1) was negative and statistically significant at 5 percent level with a coefficient of -0.249. This suggests that about 25% of the total deviation in the demand for maize from the long-run equilibrium position could be corrected in any given year within the study period. Further, the results seem to suggest that in the long- and short-terms, the demand for maize is significantly influenced by prices and income. As price is a significant factor in the demand for maize, it might be imperative to provide some level of subsidy to vulnerable groups who are likely to be affected by increase in the price of maize. To enhance the availability of maize in particular and cereals in general, emphasis should be

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placed on increasing government stocks in the national grain reserve to ensure price stability.

Keywords: Co-integration, Maize, Demand, Error Correction Model, Nigeria

1.0 Introduction

Maize (*Zea mays*) is a primary staple food crop for the majority of the Nigerian population in addition to being a major feed grain for livestock. Maize supplies between 30-60% of the calories in the diet of most Nigerians (Fakorede, Badu-Apraku, Kamara, Menkir and Ajala, 2003). Maize contains about 72% starch, 10% protein, and 4% fat, supplying energy value of 365 kcal/100g (Nuss and Tanumihardjo (2010) and is the major energy source in monogastric animal feeds (Dafwang, 2006). According to Onuk, Ogara, Yahaya and Nannim (2010), maize is one of the most abundant food crops in Nigeria, with about 80% being consumed by man and animals while 20% is used in different industrial processes for the production of starch, oil, high fructose, corn sweetener and ethanol. The per capita consumption of maize in Nigeria in 2013 is estimated at 32.72 kg/year (Food and Agriculture Organization Statistics, FAOSTAT, 2017). Production figures from FAOSTAT (2017) show that the total maize area planted in Nigeria increased from 5,104,000 hectare in 1990 to 5,762,700 hectare in 2013 with concomitant increase in production from 5,768,000 tons to 8,422,670 tons during the same period. Maize yield also increased from 1.13 ton/hectare in 1990 to 1.46 ton/hectare in 2013. Consequently, the area devoted to maize cultivation and production continues to expand as a result of technological breakthroughs (National Agricultural Extension Research Liaison Services, NAERLS, 2014).

However, over 90% of maize produced is dependent on subsistence agriculture with simple farm system, low capitalization and low yield per hectare (Ogundari *et al*, 2006). According to NAERLS (2014), maize constitutes about 70% of annual grains stock in silos and 40% of the grains in food aids in Nigeria. The demand for maize exceeds supply as a result of its additional uses as livestock feeds, baking and brewing industries (Akande, 1994; Adebowale, 2004). Maize is the most distributed and cultivated crop in Nigeria with cultivation from wet evergreen forest zone to dry ecology of the Sudan savanna (Abubakar *et al.*, 2001). Although the Federal Government of Nigeria had developed different programmes such as strategic grain reserve (Famine Early Warning System Network, FEWSNET, 2007) and maize transformation plan (Federal Ministry of Agriculture and Rural Development, FMARD, 2011) to help stabilize the price of maize and enhance its production and consumption, the country is still experiencing price fluctuations. Notwithstanding the economic importance of maize, Nigeria has not been able to produce enough to meet the food and industrial need of the country (Onuk *et al.*, 2010). With increasing population, the domestic maize production remains insufficient to meet the needs of the population. Hence to ensure food security the county has to supplement with importation.

Agricultural policies in developing countries tend to focus on the supply side with little or no focus on demand side (Mukhtar and llyas, 2009). On the demand side, food policy decision, require knowledge of price and income elasticity (Mukhtar and llyas, 2009). In Nigeria for instance studies (Onuk *et al.*, 2010; Oladejo *et al.*, 2012 and Ezekiel, 2016) on maize focused on production at micro level. According to Mukhtar and llyas (2009), policy for a country's agricultural sector requires an all-inclusive approach, which requires information on both supply and demand. Thus, given the importance of maize in the dietary wellbeing of the population, there is the need to look at the demand for maize in Nigeria at macro level. Dependable demand parameters aids policy analysis for meeting basic food needs of the population (Mukhtar and llyas, 2009). This information is required to assess the impacts of different price and associated policy on food utilization.

In view of the fact that maize plays an important role in the nation's diet, estimating maize demand factors are essential for informed policy formulation. This study examines the long-run and short-run relationships that exist in the demand for maize in

Nigeria. Using co-integration and error correction models, the long-run and short-run elasticities were compared. This will offer insights concerning the performance of the maize market and the possible impact of appropriate policy change.

2.0 Literature Review

Demand analysis refers to the study of commodity demands by consumer, most usually based on aggregate data but occasionally on cross-sections or even panels of households (Deaton and Muellbauer, 1980). Expansion policy for a countries food sector entails an all-inclusive approach, which requires information on both demand and supply. In general, agricultural policies in developing countries tend to focus on the supply side and not the demand side, the knowledge about price and income elasticities is required for food policy decision on the demand side (Tahir and llyas, 2009). Reliable demand parameters smooth the progress of policy analysis for meeting the basic food needs of the population.

Various studies have been carried out to examine the issue of food demand in different countries and in Nigeria. Many authors had used the Almost Ideal Demand System (AIDS) model to determine household demand pattern. Aromolaran (2004) examined intra household redistribution of income and calories consumption in south western Nigeria. The results show that calorie income elasticity is small and close to zero meaning that income policies may not be the most effective way to achieve considerable improvements in calorie consumption. Adejobi (2004) studied the demand structure of rural household food pattern in relationship with poverty. Results revealed that 72.0% of household expenditure was on food; out of this, 56.0% was cereals, while 22.0%, 7.0%, 5.0%, 5.0%, 4.0% and 1.0% respectively was on animal protein, fruits, vegetables, legumes, roots and tubers, fats and oils other food items.

Rahaman and Mohammed (2014) analyzed Ghanaian households' demand for cereals and cereal products with the objective of determining consumption patterns across expenditure (income) groups and estimating price and expenditure elasticities using the Linear Approximate Almost

Ideal Demand System (LA/AIDS). They found that the various expenditure items, rice, maize, guinea corn, sorghum and bread – are price and expenditure (income) inelastic, with significant cross price effects. Oyinbo *et al*, (2013) analyse the demand for rice in Kaduna State, to find out the determinants of rice consumption and the compensated as well as the uncompensated demand for rice using LA-AIDS model. Result of the data analysis showed that the price of rice, price of beans, price of maize, price of yam, food expenditure, age of household head, household income and number of household income earners were all significant in influencing the households demand for rice. Gbadu and Abu (2016) analysed urban household demand for cereal grains in Nasarawa State Nigeria using LA-AIDS model. Result showed that maize was the most preferred cereal grains among the selected cereals.

Even though the Almost Ideal Demand System is commonly used for demand analysis, error correction model is now popular because of its ability to handle long and short-run elasticities at the same time. Tahir and llyas (2009) examined wheat consumption in Pakistan using cointegration analysis and error correction model. Findings show that the estimated long and short-run elasticities suggest that income was the most significant determinants of wheat consumption in the long-run while price was the major factor in the short-run. Error correction model (ECM) is an effort to integrate economic theory useful in characterizing a long-term equilibrium with an observed disequilibrium by building a model that clearly incorporates behaviour that would reinstate the equilibrium.

3.0 Methodology

3.1 Data

This study used annual time series data on per capita consumption of maize (PCCM) taken as proxy of demand for maize, domestic price of maize (DPM), domestic price of sorghum (DPS), domestic price of rice (DPR) and per capita income (PCI) for the period 1990-2013. Data were obtained from the FAOSTAT database. All variables are expressed in logarithms.

3.2 Theoretical Framework

The traditional demand theory states that own price, income and prices of related goods (substitutes) are the major determinants of demand. Thus, given a fixed income, the demand schedule is a function of own price, income and price of substitutes. Following Tahir and llyas (2009), this study assumes that demand for maize is a linear function of its own price, per capita income and price of substitutes. This can be written as:

$$PCCM_t = f(P_m, I, P_s) \quad \text{..(1)}$$

Where *PCCM* is per capita consumption of maize, which is the dependent variable and a proxy for maize demand, P_m is the domestic price of maize, I is per capita income and P_s is the domestic price of substitutes (rice and sorghum).

3.3 Estimation Techniques

The use of time series data for analysis requires the investigation of presence of unit root in the data. This is to ensure that the variables used in the regressions are not subject to spurious regression. For this reason, Unit Root Test was carried on the variables. The Johansen co-integration test and vector error correction model (VECM) were employed to determine the long and short run relationship that is present in the demand for maize in Nigeria. The following estimation procedures were employed:

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3.3.1 Unit Root Test

Augmented Dickey-fuller (ADF) test was used to check for unit root for the variables used for this study. A series is said to be stationary if the means and variances stay constant over time. It is denoted as I(0), meaning integrated of order zero. Non-stationary stochastic series have changing mean or time varying variance. All the variables used in this study were first tested for stationarity. The rationale was to overcome the problems of spurious regression. According to Gujarati (2003), the Augmented Dickey Fuller (ADF) test entails running a regression of the form:

$$\Delta Z_t = \beta_1 + \beta_2 t + \delta Z_{t-1} + \sum_{t-1}^{m} \alpha_1 \Delta Z_{t-1} + \varepsilon_t \qquad \text{..........................(2)}$$

Where D = the change operator; Z_t= variable series (per capita consumption of maize (PCCM), domestic price of maize (DPM), domestic price of sorghum (DPS), domestic price of rice (DPR) and per capita income (PCI) being investigated for stationarity); Z_{t-i}= past values of variables; $\Delta Z_{t-1} = (Z_{t-1} - Z_{t-2}), \Delta Z_{t-2} = (Z_{t-2} - Z_{t-3})$, and so on; t = time variable and is the white noise error. The null hypothesis that $\delta = 0$ shows the presence unit root in Z_t or that the time series is non-stationary. The decision rule is that if the calculated ADF statistics is larger than the critical values at the specified level of significance, the hull hypothesis of unit root is established or else it is rejected. In other words, if the value of the ADF statistics is less than the critical values, it is concluded that Z_t is stationary that is $Z_t \sim$ I(0). Once a series is found to be non-stationary, it is first-differenced (that is, the series $DZ_t = Z_t - Z_t - 1$) is obtained and the ADF test is repeated on the first-differenced series. If the null hypothesis of the ADF test can be rejected for the first-differenced series, it is concluded that $Z_t \sim I(1)$.

3.3.2 Co-integration Test

The Johansen Maximum Likelihood procedure (Johansen, 1995) was employed for this study because it allows for all possible co-integration relationship and the number of co-integrating vectors to be verified practically. The starting point for Johansen co-integration test is the vector auto regression (VAR) of order p given by: $Z_t + \lambda + A_1 Z_{t-1} + ... + A_p Z_{t-p} + \varepsilon_t$. This VAR can be re-written as:

$$\Delta Z_t = \lambda + \sum_{i=1}^{n} \Gamma_i \Delta Z_{t-1} + \Pi Z_{t-1} + \varepsilon_t \qquad \text{....................................(3)}$$

Where, $\Pi = \sum_{i=1}^{p} A_i - I, \Gamma_i = -\sum_{j=i+1}^{p} A_j$ and Z_t(*lnPCCM, lnDPM, lnDPR, lnDPS and lnPCI*) is a (n x 1) vector of all the non-stationary *l(1)* variables in the study, λ is a (n x 1) vector of parameters (intercepts), is an kx1 vector of innovations or random shocks. Γ_I and Π are (n x n) matrices of parameters, were Γ_I is a (n x 1) vector of coefficients of lagged Z_t variables. The is a *(n x 1)* is a long-run impact matrix which is product of two *(n x 1)* matrices. If the coefficient matrix Π has reduced rank $r<n$, subsequently there exist $(n x r)$ matrices α and β each one with rank r such that $\Pi = \alpha\beta'$ and β' *Zt* is stationary. The r is the number of co integrating relationships, the elements of α is known as the adjustment parameters in the vector error correction model and each column of β is a co-integrating vector. It can be revealed that for a known r, the maximum likelihood estimator of β defines the combination of *Zt-1* that yields the r largest canonical correlations of D*Zt* with *Zt-1* after correcting for lagged differences and deterministic variables once present. There are two different likelihood ratio tests, the trace test which tests the null hypothesis of r co-integrating vectors against the alternative hypothesis of k co-ntegrating vectors and maximum eigen value test, which tests the null hypothesis of r co-integrating vectors against the alternative hypothesis of $r + 1$ co-integrating vectors (Johansen, 1995) .

3.3.3 Vector Error Correction Model (VECM)

The VECM is a restricted vector auto regression (VAR) intended for use with non- stationary series that are known to be co-integrated. The VECM has co-integrating relations built into the design to make sure that it restricts the long run behaviours of the descriptive variables to congregate to their co-integrating relations at the same time allowing for short run adjustment dynamics. The vector error correction model is useful for the evaluation of a short-term adjustment, which adjusts towards the long-run equilibrium in each time period and allows an equilibrium interpretation of the estimates. If the variables are found to be co-integrated, a vector error correction model (VECM) is estimated because a co-integrating relationship deals only with long-run relationship without considering the short-run dynamics. Thus, if the series *lnPCCM, lnDPM, lnDPR, lnDPS and lnPCI* are found to be *I(1)* and co-integrated, then the ECM model is represented by the following equations:

$$\Delta \ln PCCM_t = \varphi_1 + \sum_{i=1}^{n} \beta_{1i} \Delta \ln PCCM_{t-1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPM_{t=1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPR_{t-1} + \sum_{i-1}^{n} \Delta \ln DPS_{t-1} + \sum \Delta \ln PCI_{t-1} + \alpha ECT_{t-1} + \varepsilon_t \quad \text{.........(4)}$$

$$\Delta \ln PCI_t = \varphi_1 + \sum_{i=1}^{n} \beta_{1i} \Delta \ln PCCM_{t-1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPM_{t=1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPR_{t-1} + \sum_{i-1}^{n} \Delta \ln DPS_{t-1} + \sum \Delta \ln PCI_{t-1} + \alpha ECT_{t-1} + \varepsilon_t \quad \text{.........(5)}$$

$$\Delta \ln PPM_t = \varphi_1 + \sum_{i=1}^{n} \beta_{1i} \Delta \ln PCCM_{t-1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPM_{t=1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPR_{t-1} + \sum_{i-1}^{n} \Delta \ln DPS_{t-1} + \sum \Delta \ln PCI_{t-1} + \alpha ECT_{t-1} + \varepsilon_t \quad \text{.........(6)}$$

$$\Delta \ln PPR_t = \varphi_1 + \sum_{i=1}^{n} \beta_{1i} \Delta \ln PCCM_{t-1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPM_{t=1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPR_{t-1} + \sum_{i-1}^{n} \Delta \ln DPS_{t-1} + \sum \Delta \ln PCI_{t-1} + \alpha ECT_{t-1} + \varepsilon_t \quad \text{.........(7)}$$

$$\Delta \ln PPS_t = \varphi_1 + \sum_{i=1}^{n} \beta_{1i} \Delta \ln PCCM_{t-1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPM_{t=1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln DPR_{t-1} + \sum_{i-1}^{n} \Delta \ln DPS_{t-1} + \sum \Delta \ln PCI_{t-1} + \alpha ECT_{t-1} + \varepsilon_t \quad \text{.........(8)}$$

Where *lnPCCM* is logarithm of per capita consumption of maize, *lnPCI* is per capita income, *lnDPM* is logarithm of domestic price of maize, *lnDPR* is the logarithm of domestic price of rice, *lnDPS is* the domestic price of sorghum, *ECT* is the error correction term, D is the difference operator and is the error term which takes care of other variables that might have influence on the demand for maize but not specified in the model and while *n* is the optimal lag length order of the variables.

4.0 Results and Discussion

4.1 Unit Root Tests

The results of the ADF unit root tests for levels as well as for first difference of the variables used in the analysis are presented in Table 1. All the variables are non-stationary at levels. However, after first difference, the non-stationary variables became stationary at 1% significance level. This confirms that the variables used were integrated of order one [that is *l(1)*].

Table 1: Results of Augmented Dickey Fuller (ADF) Unit Root Test

Variables	Test	ADF Stat		Critical Values	
			1%	5%	10%
lnPCCM	Level	-1.329058 (0.5972)	-3.769597	-3.004861	-2.642242
	1st difference	-4.590808 (0.0017)I***	-3.788030	-3.012363	-2.646119
lnPCI	Level	0.529518 (0.9838)	-3.769597	-3.004861	-2.642242
	1st difference	-6.968987 (0.0000)I***	-3.808546	-3.020686	-2.650413
lnDPM	Level	-2.346259 (0.1679)	-3.788030	-3.012363	-2.646119
	1st difference	-6.709158 (0.0000)I***	-3.788030	-3.012363	-2.646119
lnDPR	Level	-1.987482 (0.2895)	-3.788030	-3.012363	-2.646119
	1st difference	-6.690253 (0.0000)I***	-3.788030	-3.012363	-2.646119
lnDPS	Level	-2.792819 (0.0771)	-3.808546	-3.020686	-2.650413
	1st difference	-5.035336 (0.0007)I***	-3.808546	-3.020686	-2.650413

*Figures in parentheses are p- values; 'I***' indicate variable is integrated of order I(1) at 1% level of significance; Lag selection is automatic based on Schwartz Bayesian Criterion (SBC)*
Source: Author's computations using E-views software

4.2 Co-integration Test Results

The Johansen co-integration rank test results are presented in Table 2. Both the Trace statistics and Eigen value statistics show that there is a unique long-run relationship among the variables at 5 percent level of significance. This implies that the dependent variable per capita consumption of maize (*lnPCCM*) is co-integrated with per capita income (*lnPCI*), domestic price of maize (*lnDPM*), domestic price of rice (*lnDPR*) and domestic price of sorghum (*lnDPS*). Consequently, the test statistics strongly reject the null hypothesis of zero co-integrating vectors in support of the alternative hypothesis that there are at least one co-integrating vectors.

Table 2: Co-integration Test Results

Hypothesized		Trace	0.05		Max-Eigen	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**	Statistic	Critical Value	Prob.**
None *	0.907863	97.50835	79.34145	0.0012	50.07415	37.16359	0.0010
At most 1	0.650506	47.43420	55.24578	0.2031	22.07664	30.81507	0.3924
At most 2	0.530103	25.35757	35.01090	0.3629	15.86009	24.25202	0.4248
At most 3	0.229593	9.497473	18.39771	0.5297	5.477570	17.14769	0.8643
At most 4 *	0.174218	4.019902	3.841466	0.0450	4.019902	3.841466	0.0450

*Trace test and Max-eigen value test indicates 1 cointegrating equation(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values*
Source: Author's computations using E-views software

4.3 Vector Error Correction Estimates

Following the existence of a co-integrating relationship between the dependent and independent variables as shown by the Johansen co-integration test, a vector error correction model approach (VECM) was estimated. The VECM approach is helpful for the formulation of a short-term modification, which adjusts towards the long-run equilibrium in each time period. The short-run dynamics amongst these variables can be evaluated by examining the significance and sign of the estimated coefficients, which are presented in Table 3. These coefficients are interpreted as elasticities of demand.

The error correction term (ECT-1) represents the rate at which divergences from the long-run equilibrium are reinstated (speed of adjustment). The results revealed that the coefficient of the error correction term (ECT-1) was negative and statistically significant at 5 percent with a coefficient of -0.249 (Table 3), meaning that roughly 25% of the total deviation in the demand for maize from the long-run equilibrium position could be corrected in a given year. The negative sign on the ECT-1 makes sure that any adjustment made or observed in the short-run is guided by and in line with the long-run equilibrium relationship (Boansi, 2014). This result thus confirms the existence of the long-run relationship given that the negative coefficient is significant. The combined effects of all the variables included in the analysis explain the about 53% variation in maize demand in Nigeria, as shown by R^2 value of 0.532.

The empirical result for income elasticity of demand for maize is presented in Table 2. Results show that income had a positive coefficient of 0.917 and 0.207 respectively in the long-run and short-run (Table 3). The coefficient observed for long-run is significant at 1% level while that of the short-run is significant at 5% level. These imply that in the long-run and short-run the quantity of maize demanded increases as income increases given the significant positive coefficients of income, suggesting that maize is a normal good. This result conforms to the findings of Mukhtar and llyas (2009) who found related results for wheat consumption in Pakistan and Chongela, Nandala and Korabandi (2014) who found similar results for aggregate demand for food in Tanzania.

The results for the long-run and short-run coefficients (own price elasticity) for own price of maize are -0.307 and -0.210 respectively and significant at 1% and 5% level. These values fall between negative one and zero ($-1 < ep < 0$), implying that it is inelastic demand. This implies that a 1% increase in the price of maize will lead to a 0.31% decrease in the demand for maize in the long-run and 0.21% decrease in the short-run. This finding is in line with Tahir and Ilyas (2009) and Chung and Tan (2015) who found similar results for demand for wheat in Pakistan and demand for rice in Malaysia respectively. Theory postulates that an increase in a good's own price decreases the quantity of the good demanded. Therefore, the negative sign of the coefficients estimate provide support for the theory, thus, suggesting that an increase in the price of maize decreases the quantity of maize demanded. Consequently, this result supports the downward slopping theory.

The price elasticity of demand with respect to rice and sorghum were 0.916 and 0.127 in the long-run and 0.145 and 0.341 in the short-run respectively and were significant at 1%. These coefficients suggest that rice and sorghum are substitute for maize in Nigeria given their positive signs. This implies that when the prices of the substitutes increase, maize becomes more attractive and its demand increases. Thus, a 1% increase in the prices of rice and sorghum will lead to 0.92% and 0.13% increase in demand for maize in the long-run while in the short-run it will lead to 0.15% and 0.34% respectively.

Table 3: VECM Estimates for Maize Demand in Nigeria

Long-run estimates			
	Coefficient	Standard Error	t statistics
lnPCCM(-1)	1.0000	-	-
lnPCI(-1)	0.9166***	0.1209	7.5779
lnDPM(-1)	-0.3076***	0.0773	-3.9793
lnDPR(-1)	0.9159***	0.2189	4.1831
lnDPS(-1)	0.1275***	0.0187	6.8181
Constant	-5.4449	-	-
Short-run estimates			
ECT-1	-0.2488**	0.1211	-2.0545
Δ *(lnPCCM(-1))*	-0.3775**	0.1147	-3.2911
Δ *(lnPCI(-1))*	0.2066**	0.0754	2.7400
Δ *(lnDPM(-1))*	-0.2103**	0.0828	-2.5390
Δ *(lnDPR(-1))*	0.1453***	0.0407	3.6230
Δ *(lnDPS(-1))*	0.3412***	0.0910	3.7490
Constant	0.1446	0.1048	1.3794
Diagnostic Statistics			
R-squared	0.5319	-	
Adj. R squared	0.3313		

*The asterisk ** and *** indicate significance at the 5% and 1% levels, respectively.*

Source: Author's computations using E-views software

5.0 Conclusion

This study employed annual time series data for the period 1990-2013 to examine the long and short-run relationships present in the demand for maize in Nigeria. Using the co-integration technique, the results suggested that the variables were co-integrated. The coefficient of the error correction term (ECT-1), which measures the adjustment towards long-run equilibrium, was negative and statistically significant at 5 percent level. Furthermore, a coefficient of -0.249, is an indication that about 25% of the total deviation in the demand for maize from the long-run equilibrium position was corrected in a given year. About 53% of the deviation in maize demand in Nigeria was explained by the combined effects of all the variables included in the analysis. In the long- and short-run, the demand for maize was dependent on income, own price of maize, prices of rice and sorghum, an indication that the demand for maize in Nigeria is significantly responsive to prices and income. Findings also showed that rice and sorghum, given their positive signs were substitutes for maize in Nigeria.

Owing to the importance of maize to the nation as a food security crop, the need to boost its consumption cannot be overstated. To enhance availability of maize in particular and cereal in general, emphasis should be placed on government stocks to ensure price stability. Since price is a significant factor in the demand for maize, it is important that some level of subsidies be put in place for consumers in the low-income group and other vulnerable groups who are likely to be affected by high prices of food. On the other hand, increasing the income of workers is necessary, as increases in income for the poor can have a large effect on demand and nutrition given that the poor spend a high percentage of their budget on food.

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