SUPPLY RESPONSE OF SELECTED AGRICULTURAL EXPORT COMMODITIES IN NIGERIA (1970-2010)

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Abstract

This study estimates export commodities supply in Nigeria from 1970 to 2010 in the context of co-integration and error correction modeling approach using data from the Central Bank of Nigeria (CBN), Food and Agriculture Organization (FAO) of the United Nations and the International Financial Statistics (IFS) of the International Monetary Fund (IMF). Results reveal that the error correction mechanism (ECM) shows that any disequibria away from the long-run steady-state equilibrium of export commodities is corrected within one year. Specifically, the speed at which export commodities supply adjusts to changes in crude oil price, exchange rate and real export price in an effort to achieve long-run static equilibrium is 55.2%. In the short-run, crude oil price has significant but negative effect on selected export commodities supply. However, in the long-run, the effect of crude price on export commodities supply is significant, negative and inelastic.

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INTRODUCTION

Before the crude oil era of the 1970s, Nigeria's agriculture sector contributed significantly to the country's economy. During this period (1961–1970), agriculture accounted for an average of 56.6% of the nation's foreign exchange and more than half of the gross domestic product (GDP) (Idachaba, 1994; CBN, 2000). Given this substantial contribution, agriculture to a large extent dictated the pace of growth and development of Nigeria's economy. There is consensus that the sector was a source of economic stability during this period because of its positive contributions to foreign exchange earnings, rural employment and urban development (Oyejide, 1990; Kwanashie *et al*., 1998). The sector was also the main source of income for farmers, favorable world markets for the main cash crops (cocoa, rubber, groundnut, palm oil and coffee) activated local production and marketing, which helped to maintain a large measure of rural-urban equilibrium and provided the bulk of the capital Nigeria needed for development.

The main capital contributions were taxes imposed on export crops and the accumulated surpluses of the state-run marketing boards. Perhaps more important to national development was the contribution of the sector to the supply of foreign exchange needed for acquisition of capital goods for industrial and general infrastructure development. The sector was a major source of support for Nigeria's early attempts at industrialization via provision of raw materials for processing. The positive role of agriculture was not sustained in the 1970s and early 1980s because of the emergence of a virile petroleum sector. Thus the agricultural sector saw its share of foreign exchange earnings shrink to less than 15% annually between 1971 and 1985 (Evbuomwan, 1996; CBN, 2002;). Two major danger signals of the decline were the inability to meet the raw material needs of primary processing industries and the loss of competitive position in the production and export of the commodities.

The agricultural products of Nigeria can be divided into two main groups: food crops, produced for home consumption, and export products. The most important food crops are yams and manioc (cassava) in the south and sorghum (Guinea corn) and millet in the north. In 1999, production of yams was 25.1 million tons (67% of world production); manioc, 33.1 million tons (highest in the world and 20% of global production); coco yams (taro), 3.3 million tons; and sweet potatoes, 1,560,000 tons. The 1999 production estimates for major crops were as follows

(in thousands of tons): sorghum, 8,443; millet, 5,457; corn, 5,777; rice, 3,399; peanuts, 2,783; palm oil, 842; sugar cane, 675; palm kernel, 565; soybeans, 405; and cotton lint, 57. Many fruits and vegetables are also grown by Nigerian farmers (CBN, 2000).

Although cocoa is the leading non-oil foreign exchange earner, growth in the sector has been slow since the abolition of the Nigerian Cocoa Board. The dominance of smallholders in the cocoa sector and the lack of farm labor due to urbanization hold back production. Nigeria has the potential to produce over 300,000 tons of cocoa beans per year, but production only amounted to 145,000 tons in 1999. Rubber is the second-largest non-oil foreign exchange earner. Despite favorable prices, production has fallen from 155,000 tons in 1991 to 90,000 tons in 1999. Low yield, aging trees, and lack of proper equipment have inhibited production (Bello, 2004)

Agricultural exports (including manufactured food and agricultural products) decreased in quantity after 1970, partly because of the discouraging effect of low world prices. In 1979, the importing of many foods was banned, including fresh milk, vegetables, roots and tubers, fruits, and poultry. The exporting of milk, sugar, flour, and hides and skins was also banned. During 1985–87, imports of wheat, corn, rice, and vegetable oil were banned as declining income from oil encouraged greater attention to the agricultural sector. In 1986, government marketing boards were closed down, and a free market in all agricultural products was established. In 2001, agricultural exports totaled $323.5 million. Exports of cocoa beans that year totaled $210.4 million; cotton lint, $21 million (CBN, 2002).

Agricultural supply response has remained a fundamental issue for sustainable economic development in Nigeria. It dominates economic developmental policies and its positive response is crucial for economic growth. The role of agriculture in the Nigeria's economy cannot be overemphasized given that 70% of the population derives their livelihood and other related activities. It is also a major source of raw materials for the agro-allied industries and a potent source of the much-needed foreign exchange (Okumadewa, 1997; World Bank, 1998). A significant and positive response from agricultural is justified as a means of improving the overall performance of the economy. Nigeria agricultural system like elsewhere in the region is characterized by structural rigidities, low private investment, large government regulations, weak

support services and institutional frame work. These innate features, inconsistent and unfocussed government policies have been described as the fatal perturbations that rocked the boat of food security in Nigeria (Okuneye, 2001). The structural problems in food production system and the shrinking oil revenue (upon which the imports depend) led to agricultural reform policies in the mid 70s that aimed to boost food production through various agricultural programmes such as Operation Feed the Nations (OFN), Green Revolution (GR) and many others.

Today the producers of traditional agricultural commodities in Nigeria face the world market directly. They reap profits when prices are good but absorb shocks and suffer losses when prices fall. Consequently, the producer's price of these commodities has become unstable and this create dis-incentive for production thus making output and exports to suffer (Mesike *et al*., 2008). This could have negative implications for the agricultural industry and for the national income. Consequently, the prices at which cash crops farmers in Nigeria are able to sell their production to a large extent now depend on how they respond to both local and global demand.

Over the years, in Nigeria, there have been occasional food supply shortfalls and high food prices in all or some parts of the country. This was often due to seasonal and cyclical food supply fluctuations, drought and /or poor rainfall in parts of the country. Market imperfections also create local food supply shortfalls in some parts of the country while there are surpluses in some other parts. Empirical evidence revealed that agriculture in Nigeria is characterized by poor yield per hectare, low producer prices, subsistence agriculture, distorted distribution of fertilizer and irregular rainfall (Agbo; 2002; Ogiji and Akpan, 2004; Uji, 2007; Jato, 2007)

A significant part of the literature on the policy response of agriculture has focused on the short- and long-run supply responses of individual crops to changes in output and input prices. A number of supply response functions have been estimated for individual crops in Nigeria (Oni, 1969a; 1969b; Herdt, 1970; French and Mathews, 1971;). Most of these studies focus on price elasticities. The studies are important to agricultural response analysis because prices are the conduit through which structural adjustment policies were expected to affect agricultural variables (output, supply, exports and income). For example, the emphasis on market forces, the

elimination of marketing boards and the withdrawal of government from direct production all aim for an environment in which agricultural output is responsive to market conditions.

An analysis of agricultural supply responses to changing prices is, therefore, a crucial element in assessing the effects of structural adjustment policies on agriculture. Non-price incentives are also key complements to the SAP in Nigeria. For example, the Directorate of Foods, Roads and Rural Infrastructures (DFRRI), whose activities are enabled by fiscal allocations, aims to provide roads and rural infrastructure to complement the price incentives in SAP. Therefore, a study of the response of agriculture to adjustment policies would estimate price and non-price elasticities. The evaluation of supply or output responsiveness of agriculture to adjustment policies faces a key methodological problem: which estimates are more appropriate.

Previous studies of Nigerian agricultural markets have tended to model supply response based on the assumption of perfect knowledge and information about price and production (Kwanashie *et al*., 1998). Less attention has been paid to capturing the impact of risks and uncertainty on agricultural production and supply response in Nigerian agriculture. Since the nature of market and non-market incentives is adding to risk and uncertainty in export commodities supply response. This study set to estimate the supply response of agricultural export in Nigeria from 1970 to 2010.

METHODOLOGY

Nigeria is one of the sub-Saharan Africa (SSA) nations located in the western part of Africa. The country has 36 states with federal capital territory FCT-Abuja. Nigeria shares its boundary with republic of Benin to the west, Niger republic to the north, republic of Cameroon and Chad republic to east, and the Atlantic oceans. The ocean forms a coastline of about 92,377,000 hectare, out of which about 91,077,000 hectare are solid land area. The National Population Commission (NPC) put the country population to be over 140 million Nigerians in 2006 (FRN, 2009). Nigeria is extensive within the tropical zone. It extends Northwards from the coastline for over 104km. Nigeria's area of land is about 98 million hectares, with about 75% suitable for cultivation of almost all types of crops out of which only 14% is under cultivation in any form.

Nigeria has five main vegetation belts; these are the Mangrove forest around the estuaries along the southern coastline, equatorial deciduous forests, savannah grasslands and the semi desert scrublands in extreme north of the country. The country has a wide range of climatic conditions but as a tropic country, it is generally hot and humid. We have two discernible seasons; the wet and the dry season. The wet season falls between April-may to November and the prevailing wind blows from southwest. The dry season is between December to march when the harmattan blows from 400mm in the south eastern parts of the country to 500mm in the north eastern part of the country thereby giving Nigeria diversity, This is reflected in large quantity of crops produced. The average temperature for the most of the country is between 24 0c to 27 0c in the eastern highlands of Jos plateau, the average annual temperature is around 21 0c in the extreme north, the average low annual temperatures are about 430c and 100c respectively. Nigeria has about 140 million people with more than 60% of the population widely engaged in agricultural production.

The data for this study were obtained from secondary sources including the local and international agencies. The local agencies included the Central Bank of Nigeria (CBN) (data computed from CBN Statistical Bulletin - 2010, various issues of CBN Economic and Financial Review and CBN Annual Report and Statement of Account) and the National Bureau of Statistics (NBS – various issues). The Food and Agriculture Organization (FAO various issues) and the International Financial Statistics (IFS-2010) served as the main international agencies. The empirical analysis covers the period from 1970 to 2010.

In the light of new developments of econometric techniques that can estimate distinct short-run and long-run elasticities, it is worth answering some of the methodological questions raised in the early literature on aggregate agricultural supply response. The data obtained were subjected to inferential analysis. This study estimates the selected agricultural export commodities supply response to price changes by applying appropriate time series techniques and using data spanning different pricing regimes. The study used co-integration analysis, which only requires a co-movement of agricultural export commodities supply and price in the long run. The Johansen procedure deals with this problem, it presupposes that the order of integration of all the variables is the same and known with certainty. The data where however tested for their time series characteristics using ADF tests. This study also used the error correction model

(ECM) which has been developed to address the problem associated with the non-stationary nature of time series.

Engle and Granger (1987) provided appropriate test for stationarity of individual series specifically the test procedure includes the estimation of the Dickey fuller (DF) and the Augmented Dickey fuller (ADF) statistics the DF and ADF are test for the null hypothesis that the variable of interest is non stationary. Thus

H_O: The variables are not stationary at their level i.e I (i)

H_a: The variables are stationary at their levels i.e I (o)

The test procedure is usually indicated in the following types of equation for DF test.

$\Delta x_t = \alpha_0 + \square x_{t-1}$ ..... (1)

For ADF test

$\Delta x_t = \alpha_0 + \square x_{t-1} + \Sigma^{k}_{t=1} \Delta x_{t-1} + e_t$ ..... (2)

H_O: is rejected if the t-statistic one is negative and statistically significant when compared to appropriate critical value established for stationarity tests. In order to generate an error correction model, there is the need to examine the existence of any meaningful long-run relationship between variables (i.e. co-integration). A test of co-integration is thus carried out using the Engle and Granger method (Engle and Granger, 1987).

Co-integration is said to exist between non-stationary variable if their linear combination namely the residuals of the co-integration regression are stationary (Granger, 1986 and Hendry, 1986) thus, spuriousness can only be avoided if a stationary co-integration relationship is established between the variables.

In testing for co-integration DF and ADF where used and applied to the residuals of the co-integrating regression rather than the levels of the series because the residuals of the bivariate co-integrating regressions were found to be stationary implying co-integration.

This study was guided towards specifying an error correction mechanism which is the second step of the Engle Granger two step methods. Following Engle and Granger (1987), the co-integration regression can be specified as.

$$Y_t=\alpha_o+\alpha_1 z_t+\sum_t \quad \text{..... (3)}$$

The residuals of the equation $\sum t= (Y_t-\alpha_o-\alpha,z_x)$ are simply a linear difference of the non stationary series [i.e $Y_t - Z_t$] consequently a number of bivariate co-integrating regression were run between the regression and each of the explanatory variables except the dummy.

Finally in stage two the residual of the valid co-integrating regressions were included in the model as explanatory variables before estimating the model via Ordinary Least Square (OLS).

Form equation 3 the error correction model can be specified thus.

$$\Delta Y_t= \alpha_o+\Delta z_t -\alpha_2(Y-z_t)_{t-1}\sum_t \quad \text{..... (4)}$$

Where $\sum_t$ the sector of explanatory variables Y and Z = the co-integrating variable α is a vector of long run elasticity values, x_2 = the error correction mechanism (ECM)

Static long- run model supply response.

$$LQ_t = \beta_1 + \beta_2 LEX_t + \beta_3 LPeo_{xi} + \beta_4 Lpc_t + \beta_5 LPm_e + \beta_6 LPo + \beta_7 SAP + \beta_8 T + \mu \quad \text{..... (5)}$$

Error correction model (ECM) for the supply response models is given below

$$\Delta LQ_t = \beta_0 \sum_{i=1}^{z} \beta_1 \Delta LA_{t-1} + \sum_{I=1}^{J} \beta_2 \Delta LEX_{t-j} + \sum_{i=1}^{k} \beta_3 \Delta LPeo_i + \sum_{i=1}^{m} \beta_4 \Delta Lpc_{t-1} + \sum_{i=1}^{n} \beta_5 \Delta LPm_{t-1} + \beta_6 LPo + \sum_{i=1}^{o} \beta_7 \Delta SAP_{t-1} + \beta_8 T + \mu_t$$

$-\lambda$ ECM…… …….. (6)

ECMa = $LQ_t - \gamma_1 - \gamma_2 LEX_t - \gamma_3 LPeo_t - \gamma_4 LPc_t - \gamma_5 Lpm_t - \gamma_6 LPo_t - \gamma_7 SAP - \gamma_8 T + \mu$ ……(7)

Where Δ represents first differencing, λ measures the extent of correction of errors by adjusting in independent variable, β_2 measures the long-run price elasticities while γ_2 measures the short-run price elasticities. General – to – specific modeling technique of Hendry and Erricson (1991) is followed in selecting the preferred ECM. This procedure first estimate the ECM with different lag lengths for the difference terms and, then, simplify the representation by eliminating the lags with insignificant parameters.

Where,

$LPeo_t$ = Real export price for Cocoa (index of Price)

LEX_t = Real exchange rate

$LPct$ = Represents the cassava price.

$LPmt$ = Represents the locally produced maize price.

LPo_t = Crude oil price

LQ_t = Output of export commodities cultivated (tonnes)

T = Time trend. The variable T, which represents technology, was modeled with the series as represented by the time variable serving as a proxy for the impact of technology change on output, i.e. to capture technical progress, productivity, high-yielding varieties, etc.

SAP_t = Structural Adjustment Programme.

μ = Other unobserved variables which is due to error term

RESULT AND DISCUSSION

Unit Roots Tests

Table 1 showed the results of the Augmented Dickey-Fuller (ADF) classes of unit root tests, the tests were applied to each variable over the period of 1970-2010 with a time trend at the variables level and at their first difference. The ADF tests strongly support the null hypothesis that all the variables were not stationary at their level. This indicates that the variable are I (1) and any attempt to specify the dynamic function of the variable in the level of the series will be inappropriate and may lead to problems of spurious regression. In essence, the econometric results of the model in that level of series may not be ideal for policy making. The null hypothesis of the presence of a unit root (non- stationary) was tested against the alternative hypothesis of the absence of a unit root (stationary). All the variable tested contain unit root processes, however, they all become stationary after first differencing, hence the variable are integrated of order 1 that is are I(1), and hence their suitability for use in co-integration analysis.

Co integration requires the variables to be integrated of the same order. Therefore, the first step in empirical analysis is to identify the order of integration of each single time-series. Only if the variables are integrated of the same order (usually of the order 1, denoted by I (1), a linear combination of them may be stationary so we tested the variables for unit roots to verify their order of integration.

The results of the unit-root test are shown in table1. The null hypothesis of the presence of a unit-root (non-stationary) was tested against the alternative hypothesis of the indicated non-

stationary, however they all became stationary after first differencing hence the variables are integrated of order 1 that are I (1) hence their suitability for use in co-integration analysis. The results imply that there is evidence of non-stationarity in our data series.

Co-Integration Test Results

Table 2 shows the summary results of the Johansen's Maximum Likelihood co-integration test. The test relations were estimated with intercept and linear stochastic trend. From the results, it is evident that both the trace test and maximum Eigen value test indicate one co-integrating equation as the null hypothesis of r = 0 is rejected. Thus, there is a unique long-run equilibrium relationship between the selected variable. Where only one co-integrating equation exists, its parameters can be interpreted as estimate of long-run co-integrating relationship between the selected variables (Hallam and Zanoli, 1993). The co-integration coefficients normalize on export commodities supply is presented as long-run estimates. It shows the Johansen test for existence of co-integration relationship among selected variables. On application of the test, the results of the maximum-Eigen value statistics and trace statistics from the table II show that there is at least one co-integration relation. This indicates that there exists a long-run relationship between all the explanatory variables and the explained variable, since co-integration has been established, the regression results were analyzed and diagnosed.

After establishing the order of integration of time-series, then test for co-integration was conducted. Co-integration techniques are used to establish valid long-run relationships between variables. There are two co-integration methodologies suggested by Engle and Granger (1987) and Johansen and Juselius (1990) for the study Johansen's approach was applied which provides likelihood ratio test for the presence of number of co-integrating vectors among the series and produces Long-run elasticties. The error correction model was then used to estimate short-run elasticties.

Long and Short-Run Error Correction Results and Diagnostics

The solved static long-run equation for export commodities in Nigeria as well as its short-run equation is given in table 3 and 4. The R^2 value of 0.692 for the ECM in table 4 shows that the overall goodness of fit of the ECM is satisfactory. However, a number of other diagnostic tests were also carried out in order to test the validity of the estimates and their suitability for policy discussion.

The autoregressive conditional heteroscedasticity (ARCH) test for testing heteroscedasticity in the Error process in the model has an F-statistic of 0.651 which is statistically insignificant. This attests to the absence of heteroscedasticity in the model. The Breusch-Godfrey serial correlation of Langrage Quantifier (LQ) test for higher order-serial correlation with calculated F-statistic of 2.273 could not reject the null of absence of serial correlation in the residuals. The Jacque-Bera $^{-}x^2$- statistic of 0.312 for the normality in the distribution of the error process shows that the error process is normal distribution from the battery of diagnostic test presents and discussed below, this study concludes that the model is well estimated and that the observed data fits the model specification adequately, thus the residuals are expected to be distributed as white noise and the coefficient valid for policy discussions.

It could be observed from the result in table 4 that the co-efficient of error-correction model (ECM) carries the expected negative sign and it is significant at 1%. The significance of the ECM supports co-integration and suggests the existence of long-run steady state equilibrium between export commodities and other determining factors in the specified model. The coefficient of -0.835 indicates that the deviation of export commodities from the long-run equilibrium level is corrected by about 83.5% in the current period.

The co-efficient of real exchange rate is 0.011 in the long-run and 0.083 on the short-run. The result suggests that a unit increase in the real exchange in the long-run increase the quantity of cocoa export by 0.011 units. This result is not in line with the theoretical expectation, as the devaluation of the nation's currency which was one of the major components of SAP is expected to increase cocoa export of the country. This result is further corroborated by the coefficients of SAP which is positive (although insignificant) in the long-run. A proper implementation of the

SAP policy will increase the cocoa export in the long-run and encourage local production of cocoa through liberalization of input and output market.

The co-efficient for relative price elasticity for cassava and maize have positive impact on cocoa export. The co-efficient for relative price elasticity for cassava is 0.118 on the long-run and 0.099 on the short-run and it is insignificant in both short-run and long-run. The results suggest that a 100% rise in price of cassava in Nigeria will result in 0.099% increase in cocoa export in the short-run. However since the long-run elasticity of price of cassava is very low and it is insignificant in both short and long run, it means that cocoa export does not so much depend on the price of cassava meaning that Nigeria will continue to export cocoa irrespective of the price of cassava.

Similarly the co-efficient for relative price elasticity for maize locally produced is 0.186 in the long-run and -0.027% in the short-run and also insignificant at both long-run and short-run. This also suggests that a 100% rise in price of maize locally produced in Nigeria will result in 0.027% decrease in cocoa export in the short-run. However since the long-run elasticity of price of maize locally produced is very low and it is insignificant, It means that cocoa export does not so much depend on the price of maize locally produced meaning that Nigeria will continue to export cocoa irrespective of the price of maize locally produced.

Similarly the co-efficient for crude oil price is -0.290 in the long-run and -0.199 in the short-run and also significant at 1%. This also suggests that a 100% rise in crude oil price in Nigeria will result in 0.199% decrease in cocoa export in the short-run. However since the long-run elasticity of crude oil price is not very low, It means that cocoa export so much depend on the crude oil price meaning that Nigeria will continue to export crude oil at the expense of cocoa that is the negative sign carries the expected theory that increase in crude oil export will result to decrease in the cocoa export and vice-versa.

The coefficient for relative price elasticity on the long-run is -0.001. It therefore supports the expectation that cocoa price relative to domestic price will be negatively related to cocoa export.

CONCLUSION AND RECOMMENDATION

The elastic nature of domestic cocoa production in the long – run suggests that policies geared towards increase cocoa export by increasing domestic cocoa production significantly achieve its objective in the long term. Thus, there is need for government to implement policies that will favor increased domestic cocoa production in Nigeria possibly by encouraging the farmers through provision of incentives, provision of subsidy and favorable price policies. Cocoa export in Nigeria will continue to decrease even in the face of increased demand as long as there is an increase in exchange rate. Since increased exchange rate is likely to affect local cocoa production as a result of costly and scarce inputs (e.g fertilizers, chemicals, improved coca varieties e.t.c.) thereby leading to a decline in domestic cocoa production and which would discourage cocoa export and vice-versa

In view of the findings of this study, the government should put more effort and interest on export commodities production in Nigeria. Doing this, by organizing more programmes to support the structural Adjustment Programmes (SAP) in order to optimize and boost the production of export commodities. They should call on extension programmes and instruct them to go and be encouraging the small and large scale farmer to cultivate export commodities irrespective of the returns envisaged, subsidy to enhance productivity which will result to improved income.

Overall, with increased domestic production, increase in domestic industrial utilization will increase the income and price elasticities of its manufactured exports compared with the primary products.

These are some recommendation for government, farmers and all stake holders on export commodities production to enhancing improved and increased production.

1. Area cultivated of land should be maintained also land reclamation programs should be intensified.

2. The study recommends that government should enact price legislation that would encourage farmers to produce more export commodities

3. There should be policy intervention that facilitates farmer access to improved export commodities varieties to enhance competitiveness in production in international market

4. There should be provision for adequate trained and equipped extension workers for disseminating extension messages which has the potential for raising production

5. There should be more institutional support for agricultural development, such as credit facilities and agricultural insurance in case of risk and uncertainties.

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Table 1: Unit root test result for selected variables (trend and constant included)

Variable	Level	First difference
LQ	-3.492	-8.840**
LEX	- 2.075	- 4.428**
Lpeo	- 0.775	- 4.266**
Lpc	- 1.978	- 5.476**
Lpm	- 2.362	- 4.316**
LQm	- 2.625	- 6.853**
LPo	-3.041	-8.557**
Sap	- 1.625	- 5.700**

*** denotes statistic significance at the 5%*
**** denotes statistic significance at the 1%*
Critical values: 5% = -3.551, 1%= -4.26

Table 2: Result of the Johansen's maximum Eigen – value and trace statistic co – integration test

	Trace- statics test		**Max EIGEN value stat test**	
	Trace- stat	Critical –value at 5%	Max EIGEN value stat	Max EIGEN value (critical value at 5%)
P ≥0	184.8**	146.8	56.37**	49.4
P ≥1	128.4**	114.9	47.24*	44.0
P≥2	81.16	87.3	31.78	37.5
P≥3	49.37	63.0	21.02	12.61
P≥4	*28.35*	42.4	12.27	7.363
P≥5	16.08	25.3	11.89	7.134
P≥6	4.19	12.3	4.19	2.513

** denotes statistic significance at the 5%*
*** denotes statistic significance at the 1%*

Table 3: Static Long-Run Error Correction Modeling Results on export commodities Supply Response in Nigeria.

Variable	Coefficient	Standard Error	t-value
Constant	4.720	0.941	5.016***
LEX	0.011	0.159	0.071
Lpeo	-0.001	0.088	-0.017
Lpc	0.118	0.107	1.096
LPm	0.186	0.123	1.511
LPo	-0.290	0.089	-3.244***
SAP	-0.462	0.182	-2.546***
TREND	0.050	0.022	2.304**

*** denotes statistic significance at the 5%*
**** denotes statistic significance at the 1%*

ECM = LQ-4.720−0.011*LEX+ 0.001*LPeo−0.118*LPc-0.186*LPm+0.290*LPo+0.462*SAP-0.050*Trend

R^2= 0.552

F (7, 29) = 5.108 (0.001)

Sigma = 0.188

DW= 1.15

Sc = -2.810

Table 4: Short-Run Error Correction Modeling Results On export commodities Supply Response in Nigeria

Variable	Coefficient	Standard Error	t-value
Constant	0.028	0.028	1.004
DLQ_1	0.109	0.152	0.712
DLEX	0.084	0.105	0.796
DLPeo	0.069	0.063	1.094
DLPc	0.099	0.084	1.177
DLPm	-0.027	0.074	-0.362
DLPo	- 0.199	0.059	-3.375***
DLPo_1	0.135	0.064	2.106**
DSAP	-0.606	0.174	-3.492***
ECM_1	- 0.835	0.176	-4.737 ***

*** denotes statistic significance at the 5%*
**** denotes statistic significance at the 1%*

Diagnostics

ARCH test F-stat= 0.651[0.428]
R^2 = 0.692;
Normality=0.312(0.855)
AR 1-2 F(2, 23)= 2.273
Sigma = 0.129;
DW stat. = 2.09;
F (1,23) = 3.8263[0.0038]
AIC = -3.868;
SC = -3.424