

Impact of Exchange Rate Fluctuations on Agricultural Exports (Crops) In Nigeria

N.M. Gatawa Ph.D¹; A.A. Mahmud²

¹Department of Economics, Faculty of Social Science, Usmanu Danfodiyo University, Sokoto

²Department of Economics, School of Secondary Education, Sa'adatu Rimi College of Education, Kano

ABSTRACT: This paper analyses short and long-run impacts of exchange rate fluctuations on agricultural exports volume in Nigeria. The data are made up of secondary sources obtained from Central Bank of Nigeria Statistical Bulletin, National Bureau of Statistics and International Financial Statistics of the International Monetary Fund (IMF) websites spanning over 34 years(1981-2014). ARDL was used as the method of analysis; the independent variables include official exchange rate, agricultural loans and relative prices of agricultural exports while the dependent variable is agricultural export volume. GARCH was used to estimate the volatility of exchange rates, and other diagnostic tests. The short-run results revealed that official exchange rate and agricultural loans have significant positive impact on agricultural export volumes which has the effect of expanding the dependent variable while, relative prices of agricultural exports has significant negative impact on agricultural exports volume which also has the effect of contracting the dependent variable. The long-run results revealed similar findings with the exception of official exchange rate which has statistically significant negative impact on agricultural exports volume. i.e. contrary to normal expectations. The paper recommends the relevance of stabilizing exchange rate from the present downward trend and providing farm equipment and input on credit basis by the government and private sector institutions rather than loanable fund that can be redirected to other activities other than agriculture.

Keywords: Exchange rate Fluctuations, Agricultural Exports, ARDL

I. INTRODUCTION

Growth in agriculture is essential to provide food for a growing nonagricultural labour force, raw materials for industrial production, savings and tax revenue to support development of the rest of the economy, to earn more foreign exchange (or save foreign exchange when primary products are imported) and provide a growing market for domestic manufactures (Meier, 1998). Nigeria is endowed with large agricultural potentialities with abundant land, rivers, streams, lakes, forests and grasslands, as well as a large active population that can sustain a productive and cultivable agricultural sector. In spite of these endowments, the sector has continuously produced below expectations.

Prior to independence in 1960 up to early 1960s, the economy was characterized by the dominance of exports (mostly agriculture) and commercial activities. In spite of the fluctuations in world commodity prices, agriculture contributed about 65 per cent to GDP and represented almost 70 per cent of total exports. Agriculture provided the foreign exchange that was utilized in importing raw materials and capital goods as the peasant farmers produced enough to feed the entire population, the various Marketing Boards generated much revenue, the surplus of which was used by government to develop the basic infrastructure needed for long term development (Tule, 2015).

Since the emergence of the oil industry in the late 1960s, the role of agriculture in the economy has been on the downward trend especially its contribution to GDP, where its share to GDP fell from 48.23 per cent in 1971 to almost 21 per cent in 1977 (Anyanwu et al 1997). However, according to Mbutor and Al-Hassan (2013) agricultural sector contribution to growth in GDP grew only at 6.9 per cent in 2003. On average, the sector grew at 7.2 per cent between 2005 and 2007. From 2008 to 2011, growth of the agricultural sector began to decline. It grew by 6.3 per cent, 5.9 per cent, 5.8 per cent and 5.7 per cent in 2008, 2009, 2010 and 2011, respectively. By 2012, the growth in the agricultural sector declined to 3.9 per cent. In 2013 agricultural production grew by 4.5 per cent, favorable weather conditions and sustained implementations of the initiatives under the Agricultural Programme (ATAP) were largely responsible for the growth in the sector (CBN, 2014).

Despite its weakness, agriculture is still the dominant sector of the Nigerian economy, contributing about 42.00 per cent from 2000-2007 of the Gross Domestic Products (GDP) which fell to 32.85 per cent in 2008 consequent upon Global Financial Crisis and the upward trend continued in 2009 to 37.05 per cent and again the share fell to 30.33 per cent in 2010 then started to pick up slowly in 2011 and 2012 as 30.99 per cent and 33.08 per cent respectively (CBN, 2012). Countries in the world attempted to accelerate economic growth by designing export-led growth strategy. For example, Mehra (1991) affirmed that the adoption of Structural Adjustment Programme in many African countries has been to encourage the shift to exportable cash crops.

Fanta and Teshale (2014) asserted that a robust economic performance of the “Four Asian Tigers” in the second half of the 20th century has been largely attributed to the performance of the external sector where the export sector was given a greater emphasis.

Viewing the other major variables in the study i.e. exchange markets, the Nigerian foreign exchange market is of recent origin. In fact, prior to 1962, there was no formal foreign exchange market in the country. Linked with a long tie with former colonial master, Britain, the Nigerian pound was tied to the British Pound Sterling with easy convertibility. This scenario contributed largely to late development of an active foreign exchange market in Nigeria. During this period, foreign exchange earned by the private sector (mainly from agriculture) was held in balances abroad by commercial banks which acted as agents for local exporters. Sequel to the establishment of the Central Bank of Nigeria (CBN) in 1958, and the subsequent centralization of foreign exchange market became imperative. This ultimately led to the enactment of the first exchange control law in Nigeria- the Exchange Control Act 1962 (Okororie, 2008).

Owing to the strong link between exchange rate and agricultural export especially during flexible exchange rate regime, a period of decrease in agricultural exports volume where increase in earnings has been experienced. According to Essien (1990) cocoa products of 116.2 million kg earned ₦239.1 million in 1985 but in 1987 cocoa products of 92.4 million kg earned ₦419.5 million and since then the receipt has continued to increase (apart from 1984) despite lower export volume. The monetary value of agricultural exports which stood at an average of ₦725.8 million in 1981-1989 increased to ₦802.7 million in 1990-1999. On the other hand, the rate of agricultural exports to total exports ratio during the same period stand at 0.038, but declined to 0.014. Although the export baskets also expanded with non- traditional export commodities such as tubers, fruits and spices coming on board (Anyanwu, et al 2010).

From the foregoing this paper intends to analyze the impact of foreign exchange on agricultural exports in Nigeria and will be presented in five sections, apart from the introduction, section two is theoretical and empirical reviews of literature while section three research methodology and sections four and five are devoted to data presentation, analysis, results interpretation and conclusions respectively.

II. STATEMENT OF THE PROBLEM AND RESEARCH QUESTIONS

The main objectives of exchange rate policy in Nigeria are to preserve the value of the domestic currency, maintain a favorable external reserves position and ensure external balance without compromise the need for internal balance and the overall goal of macroeconomic stability. The use of the exchange rate as an instrument of control in the Nigerian economy has been rather limited. During the period of fixed exchange rate (1960-1986) the country pegged its currency with the Great Britain Pound (GBP) sterling until the devaluation of sterling pound in 1967. Thereafter, the country's currency maintained parity with U.S dollar up to 1973 when the Nigerian pound was changed to Naira because the exchange rate policy of pegging the Naira to U.S dollar become a drag on its economy, thus depleting external reserve within the periods, the fixed exchange rates were established for both the pound sterling and the U.S dollar at £ 0.5833 and U.S \$1.5200 to ₦=1.00 respectively (CBN 2002).

During the period of fixed exchange rate, Nigerian currency was perceived to have been over-valued, in order to find a realistic value of the naira, a Second-tier Foreign Exchange Market (SFEM) emerged in September, 1986 under the Structural Adjustment Programme which marked the beginning of flexible or floating exchange rate regimes. Various related market-based exchange rate policies have been experienced and different downward exchange rates as; Dual exchange rate system (introduction of SFEM with the initial First-tier Foreign Exchange Market) in September, 1986 the value of naira stands at 2.0206/\$, Dutch Auction System (DAS) of bidding in April, 1987 naira depreciated to 4.0179/\$, single enlarged Foreign Exchange Market with various pricing methods in July, 1987 naira depreciated to 4.2723/\$, creation of Inter-Bank Foreign Exchange Market (IFEM) in January, 1989 naira depreciated to 12.9377/\$, pegged exchange rate system in 1994 naira stands at 21.8861/\$, Autonomous Foreign Exchange Market (AFEM) in 1995 naira remained unchanged at 21.8861/\$, re-introduction of IFEM in October, 1999 naira continued depreciating to 108.000/\$, Retail Dutch Auction System (rDAS) of foreign exchange management in July, 2002 naira depreciated to 130.8500/\$, Wholesale Dutch Auction System (wDAS) in February, 2006 to October, 2013 naira depreciated to 141.7600 and again rDAS in 2013 to date (Omotoso, 2015).

Despite the adopted of these policies at various stages to maintain a stable exchange rates which proved abortive, exchange rate fluctuates widely especially after the Structural Adjustment Programme (post-SAP era). Therefore, the downward trend of the country's currency impacted greatly on agricultural export product.

Consequently, exchange rate fluctuations discourage firms from undertaking investment, innovation and trade, it may also deter firms from entering into export markets, thereby weakening investors' confidence in the sector, and also raises the price of imported inputs such as seeds, fertilizers, pesticides, and capital equipment thereby reducing the agricultural commodities and income of farmers, and exchange rate risk which leads to capital reversal considered unfavorable for the economy at this trying times.

In view of the foregoing this study intends to answer the following research questions:

- (1) What is the level of impact of exchange rate fluctuations on agricultural exports volume in Nigeria in the period under study?
- (2) How had the levels of relative price of agricultural exports on agricultural exports impacted on agricultural exports volume?
- (3) To what extent had agricultural loans impacted on agricultural exports volume in Nigeria in the years under study?

Objectives of the Study

The general objective of the study is to empirically analyze the impact of exchange rate fluctuations on agricultural export volumes in Nigeria.

Specific objectives include:

- (1) To investigate impact of the level of relative price of agricultural exports on the agricultural exports volumes.
- (2) To evaluate the effect of agricultural loan on agricultural exports volume.

Research Hypotheses

The following hypotheses are stated for this study.

H₀₁: Exchange rate fluctuations have no significant Impact on agricultural exports volume.

H₀₂: Agricultural exports prices have no significant impact on agricultural exports volume.

H₀₃: agricultural loans have no significant impact on agricultural exports volume.

Empirical Review of Literature

There are various studies that have investigated the influence of exchange rate fluctuations on agricultural exports. According to Batten and Belongia (1984); Kandilov (2003), and Smith (2003), Mustapha and Nishat (2004), Omojimito and Akpokodje (2010) Nessabian and Naghizadeh (2012), Yanikkaya et al (2013) all assert that there is negative relationship between real exchange rate and agricultural exports from the demand side. And also studies conducted by Bernadina (2004) and Rano (2008) revealed the negative relation between real exchange rate and non-oil export (agricultural export inclusive) for Russia and Nigeria respectively. In other studies carried-out by Kandil et al (2004), Colacelli (2008), Young (2010), Essien et al (2011), Okputu et al (2012) and Umaru et al (2013) further states that unanticipated appreciation of the domestic currency increased agricultural output from the supply side, though it depends on the combined effect of elasticities of demand and supplied. But weak bargaining power of primary goods in developing countries thus the elasticity of supply outweigh that of foreign demand as in line with the study conducted by Mannur (1995). According to Mbutor et al (2013) states that agricultural credit therefore enhances productivity and promotes standard of living by breaking the vicious cycle of poverty among farmers. Essien et al (2011), Abedullah et al (2009) and Saboor et al (2009) as cited in Mbutor et al (2013) stated that timely and easy access to agricultural credit enables farmers to purchase the required input and machinery for carrying out farms operations and increasing production. Agricultural producers' (mostly peasant farmers) have to produce more as the currency depreciates in order to maintain the same level of income. Rahman (1994), Sabouni and Piri (2008), Essien et al (2011) stated that export price is a function of agricultural exports. Therefore, export price has a positive relationship with the agricultural exports. According to Batten and Belongia (1984) stressed that the higher the price of U.S exports relative to those abroad, the smaller would be the demand for U.S agricultural exports.

Yakub (2010) adopted modified IS-LM framework to investigate the effect of exchange rate on output of different (agricultural, manufacturing and services) sectors. Oyinlola et al (2010) employed exports and imports functions to examine the long-run and short-run impacts of exchange rate and price changes on trade flows in Nigeria. Essien et al (2011), Okputu et al (2012) and Umaru et al (2013) used Ordinary Least Square (OLS) regression to investigate the effects of price and exchange rate fluctuations on agricultural exports in Nigeria. Bernardina (2004), Mustapha and Nishat (2004), Hashemi and Akbari (2009), Hasanov and Samadova (2011) and Oyinbo et al (2014) used Vector Error Correction Model (VECM) to examine the causal relationship between exchange rate deregulation and the agricultural share of GDP in Nigeria. Smith (2003) employed two stages least square (2sls) method to analyze the effect of real exchange rate on aggregate exports. Fidan (2008), Silva and Ferreira (2012) and Karimi (2014) adopted VAR model, Impulse response function, and variance decomposition as method of analysis. Kandil (2009) adopted Rational Expectation Model to examine the difference between the effects of unanticipated currency appreciation and depreciation on major components of the trade balance. Goudarzi et al (2012), Mehare and Edriss (2013) employed Autoregression Distributed Lag model (ARDL) to investigate the effect of exchange rate volatility on selected agricultural exports (Pistachio, Saffron and dates) in Iran. Yanikkaya et al (2013) used Gravity equation to investigate the bilateral agricultural exports flows of Turkey to 46 countries. And finally a study conducted by Mastan (2015) the estimation is made

using random effects, difference Generalized Method of Moments (GMM) to examine impact of exchange rate fluctuations on agricultural exports of Sub-Saharan Africa (SSA) countries.

It is evident from the above review that studies on the impact of exchange rate fluctuations on agricultural export have no dominant approach. The choice of a particular approach or methodology and expected outcomes depend on a particular economy and nature, objective of the study and availability of data.

Research Methodology

The study will employ the time-series secondary data, which will be sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and annual economic report, International Financial Statistics (IFS), National Bureau of Statistics (NBS), Journals and other relevant published materials.

Sample and Sampling Technique

Annual data will be used and cover the period of 1981 – 2014 that is, 34 observations. The variables employed in this study include the following: agricultural exports volume, domestic export price, consumer price index and world export price, official exchange rate, and agricultural loans. All variables are expressed in their log form.

Analytical Technique

Autoregressive Distributed Lag (ARDL) model was employed and also used classical unit test (Augmented Dickey Fuller & Phillip-Perron)Bayes Information Criteria (BIC) take into consideration the optimum lag selection to be included in the model. And also Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model are used to obtain uncertainty of the real exchange rate in line with the study conducted by Hashemi & Akbari (2009), Goudarzi et al (2012), Umaru et al (2013) and Karimi (2014).And Breusch-Godfrey test for serial correlation areemployed; the model used Johansen-Juselius cointegration to ascertained long-run relationship among the variables. Other necessary diagnostic tests are carried-out.

Model Specification

The model is given as;

$$AEV = f(OER, REP, AGL) \text{ ----- (1)}$$

$$\ln AEV_t = \beta_0 + \beta_1 \ln AGL_t + \beta_2 \ln OER_t + \beta_3 \ln REP_t + U_t \text{ ----- (2)}$$

$$\beta_1 > 0; \beta_2 > 0; \beta_3 < 0$$

Where;

AEV = agricultural export volume.

REP = relative export price.

OER = official exchange rate.

AGL = agricultural loans.

β_0 = vector of the intercept.

β_1 = vector of the parameter of agricultural loans.

β_2 = vector of the parameter of official exchange rate.

β_3 = vector of the parameter of relative export price.

U = error term.

t = time period.

III. DATA PRESENTATION, ANALYSIS AND RESULTS INTERPRETATION

Unit Root Test

The result of the Augmented Dickey Fuller (ADF) with assumption of trend and intercept and Phillips-Perron test show that all the variables under study were non-stationary at level form (exhibit random walk) and therefore, needed to be differenced so as to avoid spurious result when the variables are used in their non-stationary form. But all the variables are stationary at first difference using both Augmented Dickey Fuller and Phillips-Perron unit root test.

Table 1A ADF tests

Variables	ADF Unit Root (at level)		ADF Unit Root (at first difference)	
	T-Statistic	Probability	T-Statistic	Probability
LAEV	-1.896252	0.6338	-5.601287***	0.0004
LAGL	-3.001138	0.1470	-5.734712***	0.0003
LOER	-0.868079	0.9480	-5.344886***	0.0007
LRPI	-2.146658	0.5021	-5.524745***	0.0004

Note: *** indicate stationary at 1% level of significance. Lag length selection was automatic based on Schwarz Information Criterion.

Source: extracted from estimation output using E-views 9.0

Table 1B PP Unit Root tests

Variables	PP Unit Root (at level)		PP Unit Root (at first difference)	
	T-Statistic	Probability	T-Statistic	Probability
LAEV	-2.022050	0.5682	-5.869886***	0.0002
LAGL	-2.942443	0.1630	-7.957190***	0.0000
LOER	-0.834082	0.9518	-6.196275***	0.0001
LRPI	-2.146658	0.5021	-5.575597***	0.0004

Note: *** indicate stationary at 1% level of significance. Lag length selection was automatic based on Schwarz Information Criterion.

Source: extracted from estimation output using E-views 9.0

As indicated in 4.1A and 4.1B tables, all variables under consideration appear to be of 1(1) variable (i.e. stationary at first difference).

Table 2 Result of Johansen-Juselius Cointegration Tests

Hypothesized	Trace	Max-Eigen	Critical Values (5%)	
			Trace	Max-Eigen
No. of CE(s)	Statistics	Statistics		
None $r = 0$	71.45333***	38.81344***	47.85613	27.58434
At most $r \leq 1$	32.63988**	22.84978**	29.79707	21.13162
At most $r \leq 2$	9.790101	9.245754	15.49471	14.26460
At most $r \leq 3$	0.544347	0.544347	3.841466	3.841466

Note: (***) and (**) indicate 1% and 5% for Trace and Max-Eigenvalue cointegration eqn(s) at the 0.05 level.

The above table shows both Trace test and Max-Eigen test are statistically significant to reject the null hypothesis of $r \leq 1$ and $r \leq 2$ at 1% and 5% significance level respectively. Therefore, this signifies that there are two long-run cointegration relationships between dependent and independent variables. As the model contains cointegration relationship among the variables, then we can proceed to ARDL and the long run equation using the lag at which there is no autocorrelation (i.e. lag 2) based on VAR lag selection.

Table 3A Summary of long-run ARDL results of the computer printout is given in the table below. Regression Results

Dependent Variable: Agricultural Exports Volume	
Independent Variables:	
Agricultural loan	0.053113 (2.042916)*
Official Exchange Rate	0.129145 (9.066228)***
Relative Price Index	0.096552 (4.660558)***
C	8.634484

Note: figures in parenthesis are t-ratio, parameters are significant at 10% (*); 5% (**); 1% (***).

Table above depicted long-run relation which is written as;

Therefore, $\ln aev_t = 8.634484 + 0.053113 \ln a_{t-1} + 0.129145 \ln oer_t + 0.096552 \ln rpi_t$

Se (0.025999) (0.014245) (0.020717)

T-sta [2.042916] [9.066228] [4.660558]

From table 4.3 above Autoregressive Distributed Lag Model $c = 8.634484$ which statistically significant at 1% confirming the existence of long-run relationship among independent and dependent variables. And all the variables are significantly affect agricultural exports volume ($\ln aev$) at 1% and 10% significant level in the long-run. Although relative price index has a wrong sign i.e. contrary to what the economic theory suggests, and contrary to normal expectations.

Table 3B Summary of short-run ARDL results of the computer printout is given in the table below. Regression Results

Dependent Variable: Agricultural Exports Volume	
Independent Variables:	
Agricultural loan	0.031172 (2.088099)***
Official Exchange Rate	0.075290 (3.286094)***
Relative Price Index	-0.064126 (-3.373400)***
R ²	0.95
F	96.87822

Note: the figures in parentheses are the t-ratio, parameters are significant at 1% (***).

Table abovedepicted short-run relation which is written as;

Therefore, $\ln aev_t = 0.031172agl + 0.075290oer - 0.064126rpi$

Se (0.014929) (0.022912) (0.019009)

T-sta [2.088099] [3.286094] [-3.373400]

Results Interpretation:

As expected there is significant positive relationship between agricultural exports volume and agricultural loan. An increase in agricultural loan by one million, on average, agricultural exports volume increases by 0.031%. There is significant positive relationship between agricultural exports volume and official exchange rate. An appreciation of naira by one unit, on average, increases agricultural exports volume by 0.075% which is the normal expectations from the supply side. And finally, there is significant negative relationship between agricultural exports volume and relative price index. Thus a decrease in the relative price by one unit increases agricultural exports volume by 0.064%. All the parameters are statistically significant at 1% level.

The goodness of fit means R^2 value of about 0.95 means that 95 percent of the variation in agricultural exports volume is explained by agricultural loan, official exchange rate and relative price of agricultural exports jointly.

To verify the adequacy of the model, we compare the F-statistic with critical F value at 5% level. F_{df_1, df_2} upper 5% = $(F_{k-1}, F_{n-k}, \alpha = 0.01) = (F_{4-1}, F_{34-4}, \alpha = 0.01) = (F_{3, 30}, \alpha = 0.01) = 4.51$ (one tail) since F calculated (96.87822) is greater than F tabulated (4.51), we conclude that our model is adequate and significant.

IV. CONCLUSION AND RECOMMENDATIONS

The study empirically investigates the contemporaneous relationship among official exchange rate, agricultural credit and relative price of agricultural exports on agricultural exports volume. The findings of the study revealed that the official exchange rate and relative price of agricultural are shown to be key determinants of Nigerian agricultural exports volume thereby have a strong effect, generally in line with the empirical findings of Kandil et al (2004), Young (2010), Essien et al (2011), Okputu et al (2012) and Umaru et al (2013). And the effect of agricultural credit is found to be minimal on agricultural export volume. All the parameters are statistically significant at 1% level.

As for the inter-temporal effect of the aforementioned variables on agricultural exports volume is also similar to contemporaneous effect with the except of relative price of agricultural exports which revealed a positive sign, and is contrary to normal expectations though all the coefficients are statistically significant at 1% level.

With regard to volatility, the analysis indicates that exchange rate volatility is probably not a major concern from the perspective of enhancing agricultural exports output; the effects of lower volatility are indirect and originate from long-term exchange rate commitments such as currency unions and pegged exchange rate rather than short-term exchange rate fluctuations.

In order to address the aforementioned challenges the paper recommends the following

- (1) To strengthen and fully reap the gain of agricultural credit, as the analysis suggest a weak link between agricultural credit and agricultural exports volume, government and private sector institutions such as Banks should focus directly on providing farm implements on credit basis, such as tractors, harvesters etc. and farm input such as improved seedling, pesticide and fertilizer etc. and supportive infrastructure such as power, roads and storage facilities rather than loanable fund that can be redirected to other activities other than agriculture.
- (2) To boost agricultural export volume, policy makers should take measures in stabilizing exchange rate from present downward trend since appreciation of exchange rate stimulate (increase) agricultural export output.
- (3) Government should also reduce price of agricultural exports (mostly cash crop) indirectly through the provision of fiscal incentives examples, tax free on import of agricultural processing equipment and tax holidays for other agriculture related input thereby reduced the cost of production and price of the products.

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