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The Impact of Exchange Rate Uncertainty on Coca Export Prices in Nigeria

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Abstract
The paper examined the impact of exchange rate on coca export in Nigeria. The Augmented Dickey Fuller Unit root, Johansen co-integration, ordinary least square, and diagnostic tests as well as error correction mechanism were adopted to analyzed the secondary time series data, between 1980 and 2019, generated from Food and Agricultural Organization (FAO), World Bank and the Central Bank of Nigeria (CBN). The ADF unit root test results showed that none of the variables was stationary at level I (0), whereas all the variables – cocoa export, agricultural export, exchange rate trade openness and world cocoa price became stationary after first difference or order one I(1). The Johansen co-integration test of the long run relationship revealed that both trace statistics and maximum eign value had two co-integrating equations at 5% whereas the trace statistics alone had 1 co-integrating equation at 1%; implying the existence of long run relationship between coca export, agricultural export, exchange rate, trade openness and world price of cocoa. The positive sign of the error correction mechanism of 0.07 suggested that deviation from the long run equilibrium is adjusted over the following time period by 7%. The t-test showed direct relationship between cocoa export and Exchange rate cum agricultural export prices, but inverse relationship with trade openness and world cocoa price. The diagnostic test revealed non existence of heteroskedasticity and serial correlation in the error term. The paper concluded that agricultural export, exchange rate, trade openness and world price of cocoa taken together affected cocoa export in Nigeria. The study recommended free market determination of exchange rate and accessibility of farmers to facilities provided by government to increase cocoa output and hence export.
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1.0 Introduction

Export earnings assume very important for Nigeria in its bid to chase and achieve economic growth and development. Agricultural commodity export represents an important canal through which developmental strides can be achieved if carefully harnessed. This is because; a lot of revenue accrues to nations in the process of international trade comes from oil and non oil product like Agriculture export trade. Agriculture sector has consistently evolved over time ranging products such as cocoa, rubber, groundnuts, palm kernel, palm oil, cotton, coffee, and others in the 1960's to products of light manufacturing industries (Alalade, Adekunle and Joseph,2014).

At independent, the major export commodity was cocoa and the leading sector in the economy was agricultural sector, but today the major export commodity is crude oil and the leading sector in the economy is the petroleum sector (Adesoji and Sotubo 2013). The nation used to produce about 15% of world cocoa and was second largest producer of the crop in the world in the 60s. Painfully Nigeria that ranked second to Ghana in cocoa in the world in the 1960s is now far behind the New World major producers such as cote d Ivoire, Ghana, and Indonesia (Abolagba, Onyekwere, Agbonkpolor and Umar 2010).

(Malchau 2002) noted that diversification and expansion of the nation's export sector which for over three decades now is dominated by the oil sector is one of the main challenges in the management of Nigeria's economy presently since Crude oil export account for 90-95% of Nigeria's foreign exchange earnings and around 80% of government revenue

However, the spiteful neglect of the agricultural sector over the decades, its contribution especially cocoa to non-oil exports before the 1990s is hurtful to the growth and development of the nation. Aigbokhan (2001) who posited that of non-oil exports cocoa has been dominant; it accounts for over 50 percent in 1970s, for much of the 1980s it account for over 60 percent as an evident. Thus, since the 1990s its share has steadily declined from 49 percent in 1989 to less than 22 currently.

The oil shocks of 1973/74 and 1997 in Nigeria led to the inflow of huge hot money into the country as in the case of the Dutch disease with the discovery of natural gas in Northern Holland, which over valued the currency of Netherlands. The implication of this in Nigeria, is cheaper imports, increase food import bill and reduction in Agricultural export especially cocoa, which led to the adoption of the Structural Adjustment Programme (SAP). This position is justified by Imimole and Enoma (2011) who asserted that the exchange rate over-valuation prior to deregulation led to cheaper imports of competing food items as well as agro-based and industrial raw materials and the result was rapid expansion in the importation of these good to the detriment of local production of similar goods. Equally Talabi (2014) posited that the food import rose from a mere ₦14,

112.88 million annually, during 1970-74 to ₦19, 648 million in 1991. Also Abiodun and Solomon (2010) opined that prior to the oil boom, of the early 1970 when the contribution of agricultural export (cocoa, rubber, palm oil, palm kennel, and cotton) etc fell to 35% of the Gross Domestic Product (GDP) from an average of 72% between 1955 and 1969.

Exchange rate inconsistency has indescribable effect on export prices, especially agricultural export specifically cocoa. Essie (2011) opined that between 1978 and 1982, there was an upsurge of exchange rate which was due to the introduction of both managed float and dollar pegged systems of exchange policies in the country. The instability therefore reduced the quantity of cocoa export.

The function of exchange rate uncertainties and its effects on macroeconomic performance has steadily to create concern among economists and policy makers. Economists were of the view that exchange rate firmness facilitates production activities and economic growth. They are also of the opinion that uncertainties in real exchange rate could deform production activities and consequently hinders exports growth and cause macroeconomic instability (Mamta, 1999). Mordi (2006) argued that the exchange rate movements have effects on inflation, prices incentives, fiscal viability, and competitiveness of export, efficiency in resource allocation, international confidence and balance of payments equilibrium.

From the above one can adduce that the price of foreign exchange plays a critical role in the ability of the economy of developing countries, including Nigerian to attain optimal levels in production activities.

Between 1970 and 1977, there was stability in both prices and exchange rate of cocoa export in Nigeria. This was as a result of controlled export prices by the Nigeria commodity board. Between 1978 and 1982 there was an increase of exchange rate which was due to the introduction of both managed float and dollar pegged systems of exchange rate policies in the country. The variation, therefore, reduced the quantity of cocoa export. Between 1982 and 1985 (pre-SAP era) there was stability in both managed float and dollar pegged systems of exchange rate relative to prices of cocoa. Failure of the Breton Woods system to maintain exchange rate policies affected African countries including Nigeria. The country had since 1986 experienced erratic changes in her exchange rates partly due to fluctuations in the major currencies of developed countries such as dollars, pound and Swiss franc. This has become a major source of internal economic shock since Nigeria has strong links with developed countries in trade and payments as well as monetary arrangements.

At present, Nigeria has lost its role as one of the world's leading exporters of agricultural commodities. In addition, the country is currently suffering from a declining as well as fluctuating income from its heavy dependence on oil exports (Abolagba, Onyekwere, Agbonkpolor and Umar 2010)..

Aigbohkan (2001) noted that trade deregulation in SAP and post SAP periods boosted producer prices, which in turn led to increase in values of non-oil exports. Similarly Arize, Osang, and Slottje (2000) provide evidence in support of negative relationship between exchange rate and volume of trade. Most of the empirical work in this area is generally unable to establish a statistically significant link between exchange rate fluctuations and agricultural export. In a developing economy like Nigeria, where export price fluctuates as a result of currency devaluation which is expected to be an incentive for export growth, the primary concern is the nature and magnitude of risk introduced by the price and exchange rate movements on agricultural exports. Many researchers who conducted researches on the effects of price and exchange rate movements on agricultural tradable had inconclusive results, leaving a gap in this area.

Arising from non-consensus evidence and conflicting results from studies as presented above, in addition to lack of specificity in the studies on exchange rate and agricultural export, amounting to dearth of information on exchange rate uncertainties and cocoa export, and since cocoa is the leading agricultural export in Nigeria, and in the face of the declining crude oil price, calling for the diversification of the economy. Against this background, the paper therefore seeks to examine the exchange rate uncertainties on cocoa export prices in Nigeria. The specific objectives include, to identify the effect of Agricultural export on cocoa export in Nigeria, to ascertain the impact of world price of cocoa on cocoa export in Nigeria and to determine the effect of trade openness on cocoa export in Nigeria. Error correction model was adopted, covering a period of 1980 through 2019.

2. BRIEF LITERATURE REVIEW

Exchange rate is the price of one currency in terms of another currency or other currencies. This rate or price/parity is determined by the market forces, which indicates the trust and confidence in the economic situation of a country. It appreciates if the amount of domestic currency required to buy a foreign currency or currencies reduce(s), while it depreciates if the amount of domestic currency required to buy a foreign currency or currencies increase(s). Due to depreciation of the exchange rates in Nigeria, some reforms were introduced in the foreign exchange market in 1994. These include the formal pegging of the naira exchange rate, the centralization of foreign exchange in the central bank of Nigerian (CBN), the restriction of Bureaux de change to buy foreign exchange as agents of the CBN, the reaffirmation of the illegality of the parallel market and the discontinuation of open accounts and bills for collection as means of payments (CBN 2000)

Exchange rate uncertainties refers to the swings or fluctuations in the exchange rates over a period of time

or the deviations from a benchmark or equilibrium exchange rate (Mordi, 2006). Exchange rate fluctuations involve constant shifts of labour and other resources between production for export, such shifts may be costly and disturbing. They tend to create frictional unemployment or at best cause employment to shrink and are obviously wasteful, if the exchange rate market conditions that call for them are temporary. Exchange rate system includes set of rules, arrangement and institutions under which nations effect payments among themselves. Traditionally, gold exchange standard, the Bretton-woods i.e. the flexible rating system is currently being used in Nigeria. The flexible exchange rate is largely determined by market mechanism i.e use of forces of demand and supply. According to Jhigan (2005), the variables that influence the exchange rate includes a country's exports, imports and structural influences. If a country's exports exceed imports, the demand for its currency rises and consequently, it has a positive impact on the exchange rate. On the other hand, if imports exceed exports, the desire for foreign currency rises and hence, exchange rate for such country move-up. Undoubtedly, any measure that tends to increase the volume of exports more than the rate of importation, will definitely raise the value of the domestic currency vis-à-vis other foreign currencies.

Cocoa is a perennial tree crop grown in tropical climate, to buttress this point Institute of International Tropical Agriculture (IITA)(2009) posited that cocoa production requires annual rainfall levels of about(1250 – 3000mm) although levels of 1500 – 300mm, are preferred. Equally adequate temperature levels range from a minimum of 18 – 21^{o}C and a maximum of 30 -32^{o}C.Specifically cocoa production typically flourishes in the rain forest zone.

Cocoa theobroma cocoa linn is important as a foreign exchange earner in Nigeria and some parts of the west African sub region. The beans are very useful in the production of cocoa beverage, chocolate candies and cocoa butter which are very rich in proteins, fats, carbohydrates, and vitamin B complex (Arene and Nwachukwu 2013)

Cocoa is one of the major agricultural exports from Nigeria in terms of annual production size, the eight largest producing countries, which are cote d ivoire, Ghana, Indonesia, Nigeria, Cameroon, Brazil, Ecuador and Malaysia, represent 90% of the world production. Currently Nigeria contributes 6% to the world market (Lundsted and parssinen 2009). Unlike larger industrialized agri-business, the vast majority of cocoa still comes from family –run small farms which are often confronted with out dated farming practices and limited organizational leverage (World Cocoa Foundation 2010).

2.2 Theoretical Literature

The theory of export otherwise known as the international trade theory as it is known today sprang from the work of Adam Smith, precisely from his "An enquiry into the Nature and causes of Wealth of Nations", published in 1776. However the independent works of two Swedish economists: Eli Heckscher and Bertil Ohlin remains one of the bases of the export supply theory, it states: "A capital abundant country will export the capital intensive good, while the labour abundant country will export the labour intensive good (Appleyard, Field and Cobb 2006). The H-O model anchors on David Ricardo's theory of comparative advantage which is built on the Adam Smith's absolute advantage theory. The model essentially states that the main determinants, of the pattern of production, specialization and export among countries is the relative availability of factors supplies, as countries have different factor endowments. The critical assumption of the Heckscher – Ohlin Model is that the two countries are identical, expect for the difference in resource endowments. This also implies that the aggregate preferences are the same. The relative abundance of capital will cause the capital abundant country to produce the capital intensive good cheaper than the labour-abundant country and vice-versa (Arene 2008).

Osang and Slottje(2000) posited that higher exchange rate volatility leads to higher cost for risk-adverse traders and to less foreign trade, to them if changes in exchange rates becomes unpredictable this creates uncertainty about the profits to be made by firms and hence reduces the benefits of international trade.

As a result of the procedures and processes involved in the international trade the incorporation of payment lags by trade contracts to permit time for delivery or to provide trade credit, creates room for uncertainty over future price of foreign currency and importers' profits. Hence the producers may prefer the possibility of more certain profit to the possibility of uncertain ones. Uncertain revenue will encourage producers to switch away from foreign market to domestic ones, which in turn will cause a reduction in the level of exports (Serenis and Serenis 2008).

Theoretically, Dornbusch(1993) observed that the effect of an appreciated exchange rate on trade would be to make production of tradable unprofitable, and non-tradable more profitable. In other words import will be high, while exports will tend to be discouraged.

Bakare (2011) supports the replacement of the floating exchange regime while adopting purchasing power parity which has been considered by past studies to be more appropriate in determining realistic exchange rate for naira and contribute positively to macroeconomic performances in Nigeria. Devaluation of the naira can stimulate cocoa export derive directly but indirectly through forest conversion, increase in temperature, increase in precipitation, increase in cocoa production and by implication increase on cocoa export supply (Arene and

Nwachukwu 2013). Fung (2008) posited that exchange rate uncertainty will affect a firm's decision concerning exports and domestic sales. Arene and Okafor (2001) opined that the pass devaluation of the naira increased the relative prices of tradable creating strong price incentives for export.

Aside the contrary views of the traditionalist and the structuralist on exchange rate and trade, extant of literature from the above, reveal that theory of exchange rate – trade links is ambiguous. This is in line with Baldwin, Skudely, and Taglioni(2005).

2.3 Empirical Literature

Many scholars have conducted empirical researches in order to examine the effects of exchange rate on trade, as presented below. According to Mustafa and Firat (2011) found that while exchange rate volatility affects productivity negatively, having access to foreign or domestic equity, or debt market does not alleviate these effects in Turkey. These results indicate that while export oriented firms are affected less by exchange rate appreciation, they are more sensitive to exchange rate volatility. However, the empirical findings of Tang (2011) emphasize a positive and significant impact of exchange rate volatility on region's production networks and exports in South Asia. Equally, Anubha (2013) pointed out that real exchanged rate movement has a significant impact on Indian firms' performance through the cost as well as revenue channel. The impact depends upon the share 'of imports and exports along with the degree of market power.

According to Essien (2011) in their study: Effects of price and exchange rate uncertainties on Agricultural exports in Nigeria using the ordinary least square regression, they observed that exchange rate fluctuations and agricultural credits positively affect cocoa exports in Nigeria and that the relative prices of cocoa are insignificantly related to the quantity of export, however it has a negative sign which is in line with the apriori expectation. In the study determinants of Agricultural exports by Abolagba (2010) using ordinary least squares regression, the result of their finding revealed that cocoa output, domestic consumption and rainfall significantly influence cocoa export. The positive sign for the cocoa production implies that an increase in production will lead to an increase in export; conversely, a reduction in domestic consumption of cocoa will lead to an increase in the export of cocoa.

However, Nyeach and Alogenzoya (2004) in the study of the impact of exchange rate movement on export: Empirical evidence from Ghana, using OLS found that exchange rate has no impact on the export of goods and services in Ghana, contrary to many findings. They recommended that policy should not concentrate on exchange rate pegging or inflation targeting, since these do not have any impact on export of Ghana. Rather more attention should be how to increase the GDP to enhance export industry.

In the study of price, exchange rate volatility and Nigeria agricultural trade. Adubi and Okunmadewa (1999) used the Entranced Vector Autoregressive (EVAR) model and the result of the study showed that exchange rate volatility has negative effect on agricultural exports while price volatility has positive effect on the level of agricultural exports. Thus the more volatile the exchange rate the lower the income earnings of farmers, which subsequently leads to decline in output production and reduction in agricultural exports.

In another work, Omojimite and Akpokodje (2010) investigated the effect of exchange rate reforms on Nigeria's trade performance during the period 1986-2007. The study found a minimal positive effect of exchange rate reforms on non-oil exports through the depreciation of the value of the country's currency. It was also found that the structure of imports which is pro-consumer goods remained unchanged even after the adoption of exchange rate reforms. Exchange rate reforms were found not to constrain imports as anticipated. Rather, they stimulate imports, albeit insignificantly. These authors suggest that exchange rate reforms are not sufficient to diversify the economy and change the structure of imports

2.4 Exchange Rate Regime and Management in Nigeria

With the view of stabilizing exchange rate for the naira, various techniques have been introduced by the Nigerian monetary authorities in the management of foreign exchange rate. Okafor (2011) averred that the determination of the monetary authorities to contain persistent depreciation and fluctuations of the naira informed the frequency with which the management techniques were introduced. Numerous variants of market determined exchange rates have been adopted since 1986 in a bid to stabilize the rates as well as ensure a single exchange rate for the naira. CBN (2013) noted that in 1986, the Second-tier Foreign Exchange Market (SFEM) was instituted, in 1987, the Unified Official Market was introduced, and in 1999, the Inter-bank Foreign Exchange Market (IFEM) was introduced. According to this CBN report, in a quest to enhance access to foreign exchange to small users and to enlarge the foreign exchange market in Nigeria, the monetary authorities licensed the Bureaux de Change in 1989. Okafor (2011) pointed out that scarcity and bureaucratic procedures in the official sector enhanced the development and growth of the parallel market sector. Also, the increasingly demand for foreign exchange at a period when the supply of foreign exchange was dwindling enhanced the development of the foreign exchange parallel market.

CBN (2013) noted that the changing pattern of international trade, institutional changes in the economy and

structural shifts in production are the chiefly factors that have influenced the development of the Nigeria foreign exchange market. Access to foreign exchange by the private sector before the establishment of the Central Bank of Nigeria (CBN) in 1958 and the consequent enactment of the Exchange Control Act of 1962 were made possible by commercial banks which maintain balances abroad and acted as agents for local exporters. In this era, agricultural exports especially cocoa contributed the bulk of foreign exchange receipts. This scenario was operational because of the convertibility ease accorded to the Nigerian pound by Britain, given that the Nigerian pound was tied to the British pound sterling at par. This process actually delayed the development of an active foreign exchange market in Nigeria but with the establishment of the Central Bank of Nigeria (CBN) in 1958 and the subsequent centralization of foreign exchange authority in the CBN, the need to develop a local foreign exchange market was ignited.

CBN (2013) noted that the Foreign Exchange Market reform of 1994 include the formal pegging of the naira exchange rate, the centralization of foreign exchange in the CBN, the restriction of Bureaux de Change to buy foreign exchange as agents of the CBN, the reaffirmation of the illegality of the parallel market and the discontinuation of open accounts and bills for collection as means of payments. Further reforms narrowed down to the liberalization of the Foreign Exchange Market in 1995 with the consequent introduction of an Autonomous Foreign Exchange Market (AFEM) for the sale of foreign exchange to end-users by the monetary authority through selected authorized dealers at market determined exchange rate.

Additionally, Bureaux de Change institutions were once more accorded the status of authorized buyers and sellers of foreign exchange. The Foreign Exchange Market was further liberalized in October, 1999 with the introduction of an Inter-bank Foreign Exchange Market (IFEM) (CBN, 2013). Furthermore the retail Dutch Applied System (DAS) was introduced. Under this system, end users made bids through authorized dealers who acted as intermediaries in the bidding process. Again in 2006, the wholesale DAS was introduced. This system recognized authorized dealers as principal and not agents. They were then expected to sell to their customers at a permitted margin.

3.1 Methodology

To investigate the impact of exchange rate on cocoa export, the study performed some regression analyses using the Augmented Dickey fuller(ADF) unit root, the Johansen co-integration, ordinary least square and diagnostic tests as well as error correction mechanism. The data used in the analyses were obtained from Food and Agricultural Organization (FAOSTAT), World Bank and Central Bank of Nigeria (CBN)

3.2 Model Specification

According to Koutsoyiannis (2003), model specification involves the determination of the dependent and explanatory variables which will be included in the model, as well as the theoretical expectations about the sign and the size of the parameters of the function. To examine the impact of exchange rate uncertainty on cocoa export in Nigeria, key determinants of agricultural exports were identified and modeled in multiple linear regression form and specified in the symbolic form as:

$Cex = f(agx, exr, top, wpc,)$ ----------(1)

where

Cex = Nigeria's export quantity of cocoa (tonnes)
agx = Volume of Agricultural Export
exr = Exchange rate (#/$)
top = Trade openness
wpc = world price of cocoa
e_t = stochastic error term
t = Time Period

Furthermore, the static form of model is

$Cex = \beta_o + \beta_1 agx_t + \beta_2 exr_t + \beta_3 top_t + \beta_4 wpc_t + e_t$ ---------- (2)

For econometric computation equation 1 turns into equation 2

Again, for the purpose of numerical accuracy, equation 2 was linearised to obtain the model in log form.

$InCex = \beta_0 + \beta_1 Inagx_t + \beta_2 Inexr_t + \beta_3 Intop_t + \beta_4 Inwpc_t + e_t$-------- (3)

The study, assumed that all variables are well behaved that is stationary at their level form.

Nevertheless, literature has shown that most macroeconomic variables are not mean reversing as a result of their time sensitiveness (Granger and Newbold, 1974, Dickey and Fuller 1981, Pindyek and Rubinfeld, 1998) hence they are not stationary at their level form that is not integrated of order zero. Therefore, they shall be subjected to unit root stationary test using Augmented Dickey – Fuller (ADF) test. Following this test, equation 3 transforms to

$\Delta InCex_t = \beta_0 + \beta_1 \Delta InCex_{t-1} + \sum_{i=1}^{n} \beta_i \Delta Inx_{t-1} + e_t$ ---------- (4)

Where:

Δ = first difference operator
Bo = intercept
B_1, βi = parameter to be estimated
X_{t-1} = other explanatory variable
e_t = error term

If there is presence of unit root and evidence of co-integration our equation 4 will be transformed into error correction model (ECM) as specified below.

$\Delta InCex_t = \beta_0 + \beta_1 (\Delta Inagx_{t-1}) + \beta_2 (\Delta Inexr_{t-1}) + \beta_3 (\Delta Intop_{t-1}) + \beta_4 (\Delta Inwpc_{t-1}) + \beta_5 (\Delta InCex_{t-1}) + ECM_{t-1} + e_t$ ----------(5)

Where ECM is the error correction mechanism and indicates the speed of adjustment to equilibrium.

4.1 Unit Root

Time series data are often assumed to be non stationary and thus, it is necessary to perform unit root test to ensure that there is stationarity of data. The test is required to avoid the problem of spurious regression. The summary of the unit root test result is presented in table 1 below:

Table 1 Summary of Augmented Dickey Fuller Unit Root Test Result

Variable	At Levels	1st Diff	1% critical value	5% critical value	10% critical value	Status	Prob*
CEX	-3.29	-9.98	-3.65	-2.96	-2.62	1(1)	0.00
AGX	-3.07	-5.22	-3.65	-2.96	-2.62	1(1)	0.00
EXR	0.45	-5.26	-3.65	-2.96	-2.62	1(1)	0.00
TOP	-3.38	-4.88	-3.66	-2.96	-2.62	1(1)	0.00
WPC	-1.35	-7.74	-3.65	-2.96	-2.62	1(1)	0.00

Source: Author's regression output

Table 1 shows that the Augmented Dickey Fuller test result for all the variables - cocoa export, agricultural export, exchange rate, trade openness and world price of cocoa have unit root in their level I (0), since their ADF statistics values were lesser than the test critical values in absolute term. Consequently the null hypothesis of unit root at level was not rejected. However, the results of the unit root test at first difference I(1), showed that all the variables were stationary, since the ADF statistics values in absolute term, exceeded the test critical values at 1%, 5% and 10%, with the probability value of less than 5%. Therefore the null hypothesis of unit root at first difference was rejected meaning that the variables are stationary at first difference 1(1).

Having ascertained the stationarity properties of the variables, it is necessary to proceed to determine the long run relationship between the variables , as shown in table 2.

Table 2 Johansen Cointegration Result

Sample (adjusted): 1982 2013				
Series: AGX CEX WPC				
Unrestricted Cointegration Rank Test				
Hypothesized No. of CE(s)	eigenvalue	Trace statistic	5percent critical value	1 percent critical value
None**	0.53	40.70	29.68	35.65
At most 1*	0.38	16.66	15.41	20.04
At most 2	0.43	1.40	3.76	6.65
*(**) denotes rejection of the hypothesis at the 5% (1%) level				
Trace test indicates 2 cointegrating eguation(s) at the 5% level				
Trace test indicates 1 cointegrating eguation(s) at the 1% level				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen statistic	5percent critical value	1 percent critical value
None*	0.53	24.04	20.97	25.52
At most 1*	0.38	15.26	14.07	18.63
At most 2	0.43	1.40	3.76	6.65
*(**) denotes rejection of the hypothesis at the 5% (1%) level				
Max-Eigenvalue test indicates 2 cointegrating eguation(s) at the 5% level				
Max-Eigenvalue test indicates no cointegrating eguation(s) at the 1% level				

Source: Author's regression output

The above table is the summary of the Johansen Maximum likelihood co-integration test. The test relations were estimated with intercept and logged deterministic trend. The results, based on both the trace and maximum Eigen value tests indicated that the series had two co-integrating equations at 5%, whereas the trace test alone showed the existence of one co-intergrating equation at 1%. Thus the rejection of the null hypothesis (there is no co-integration r=0). Since the trace statistics and maximum eigen value exceeded the critical values at 5%(1%) level, there is unique long run relationship between the variables – InCEX, InAGX, InEXR, InTOP and InWPC. This shows that Johansen's technique is capable of detecting multiple co-integrating relationship among the variables Asafu-Adjaye (2000) and Pradhan (2010), reported by (Abogan, Akinola and Baruwu 2013). The maximum Eigen value are consistent in suggesting that there are two co-integrating series among the variables. This implies that the explanatory variables are co-integrated and have short run and long run relationships with the dependent variable (Obayelu and Salau 2010).

The existence of co-integration among the dependent variable and the fundamentals (the controlled and intervening variables) necessitate proceeding to estimate the overparameterize and the parsimonious ECM models.

Table 3. Summary of Overparameterized ECM Result

Dependent variable: CEX Method: Least Squares Sample (adjusted) 1983 2013				
Variable	Coefficient	Std.Error	t-Statistic	prob.
AGX	-201.83	234.74	-0.859	0.41
AGX(-1)	-452.18	304.14	-1.49	0.16
AGX(-2)	-616.90	330.23	-1.87	0.08
AGX(-3)	374.93	231.12	1.62	0.12
TOP	10928.94	4540.26	2.41	0.03
TOP(-1)	-12373.33	4390.60	-2.82	0.01
TOP(-2)	-304.12	4387.59	-0.07	0.95
TOP(-3)	-6196.60	4494.61	-1.38	0.19
WPC	-0.20	0.15	-1.31	0.21
WPC(-1)	0.16	0.15	1.08	0.30
WPC(-2)	0.11	0.14	0.80	0.44
WPC(-3)	-0.02	0.15	-0.08	0.93
EXR	1173.59	338.00	3.47	0.00
EXR(-1)	-1197.00	440.03	-2.72	0.01
EXR(-2)	188.56	494.26	0.38	0.70
EXR(-3)	544.61	311.06	1.75	0.10
ECM(-1)	0.16	0.144	1.14	0.28
C	263744.1	52965. 02	4.98	0.00
R-squared	0.92	Prob(F-statistic)	0.00	
Adjusted R-squared	0.82	Durbin- Watson stat	2.40	
F-statistic	8.94			

Source: Author's regression output

The error correction mechanism is the speed of Adjustment which means the rate at which the dependent variable adjusts to changes in the independent variable. Since a log run equilibrium relationship has been established, the next step is to test for the speed of adjustment using the short run dynamic (parsimonious ECM).

The overparameterized ECM result is made up of three lags of the independent variables as shown in the table above. The parsimonious ECM was gotten by deleting the in significant variables from the overparameterized ECM result. As a tradition the overparameterized model was reduced to achieve a parsimonious model which is data admissible, theory consistent and interpretable. parsimony maximizes the goodness of fit of the model with minimum numbers of explanatory variables. The reduction process is mostly guided by statistical consideration, economic theory and interpretability of the estimate (Adams, 1992). The Akaike information criterion, Schwarz criterion and Lag likelihood ratio were used to select the appropriate lag length. The summary of the parsimony ECM result is shown in table 4.

Table 4. Summary of Parsimonious ECM Result

Dependent variable: CEX Method: Least Squares Sample (adjusted) 1983 2013				
Variable	Coefficient	Std.Error	t-Statistic	prob.
AGX(-2)	-395.07	233.20	-1.69	0.10
TOP	6346.789	4558.69	1.39	0.17
TOP(-1)	-7482.87	4151.78	-1.80	0.08
EXR	386.53	298.54	1.29	0.21
EXR(-2)	246.95	309.72	0.80	0.43
ECM(-1)	0.07	0.17	0.45	0.66
C	181903.7	29883.60	6.09	0.00
R-squared	0.66	Prob(F-statistic)	0.00	
Adjusted R-squared	0.58	Durbin- Watson stat	1.68	
F-statistic	7.91			

Source: Author's regression output

The result of Parsimonious error correction mechanism (ECM) indicates that volume of Agricultural exports from lag 2 is not significant and equally has negative impact on quantity of cocoa export in Nigerian. The implication of this result is that the total government expenditure on Agriculture is not lager enough to transform the economy with regard to cocoa export. This may be due to high level of corruption in the Agricultural sector. Situations were loans and other facilities are granted non famers may equally be major factors. The result also revealed that exchange rate from lag 2 is not statistically significantly, but has positive impact on the equatity of cocoa export in Nigerian.

The statistical significance of the ECM is an indication of satisfactory speed of adjustment. The result indicates that 7% of the errors are corrected each period. The R^2 of 0.66 indicates that about 66% of the variation in cocoa export is explained by the final variables that entered the parsimonious model.

Table 5 Summary of OLS Result.

Dependent variable: LOG (CEX) Sample: 1980 - 2013				
Variable	Coefficient	Std Error	T-Stat	prob
LOG(AGX)	0.09	0.17	0.49	0.62
LOG(TOP)	-0.14	0.13	-0.05	0.30
LOG(WPC)	-0.08	0.08	-0.94	0.36
LOG(EXR)	0.16	0.08	2.15	0.04
C	12.2	0.94	12.97	0.00
R-squared	0.69		Prob(F-statistic)	0.00
Adjusted R-squared	0.67		Durbin- Watson stat	4.59
F-statistic	2.20			

Source: Author's regression output

The ordinary least squared (OLS) result shows that 69 percent of the total changes in Nigeria's export quantity of cocoa is explained by volume of agricultural export, exchange rate, trade openness and world prices of cocoa taken together. This is a nice fit as unexplained variation is 31% ie 1-0.69.

The F-test with a value of 4.59 and probability of 0.00 suggests that the volume of agricultural export, exchange rate, trade openness and world price of cocoa are significant factors to be taken into consideration when explaining the charges in the level of cocoa export in Nigerian economy. This indicates a rejection of the hypothesis which states that there is no significant relationship between exchange rate and cocoa export in Nigerian economy and acceptances of the alternative hypothesis, that there is significant relationship between exchange rate and cocoa export in Nigeria.

The t-test suggests that exchange rate (EXR) with a value of 2.15 and probability of (0.04) is statistically significant in explaining the changes in quantity of cocoa exports in Nigeria. The implication of this result is that the rate of exchange of the naira to the US dollar has untold impact on cocoa export in Nigeria. this result is in line with Verter and Becvarova (2014), Essien,Akpan and Etim (2011) but contrary to Abolagba et al 2010.

The t-test equally suggests that Agricultural export (AGX), trade openness (TOP) and world prices of Cocoa (WPC) with values of 0.50, -1.05 and -0.94 respectively are not statistical significantly in explaining the changes in the level of cocoa export in Nigeria. The non-significance of the world price of cocoa is in line with Abolagba et al 2010, while the non significance of trade openness is contrary to Verter and Becvarova (2014).

The coefficient of determination R^{-2} for the model is 0.67, which indicates that there is positive relationship between the dependent variables (CEX) and the explanatory variables EXR, AGX,TOP and WPC as the

explanatory variables accounted for 67% of the variations in cocoa export while the remaining 33% variation in quantity of cocoa export is explained by the error term.

The Durbin Watson (DW) test with a value of 2.20 did not show support for the existences of first order serial correlation in the model.

5.1 Conclusion

The growth rate of cocoa export is affected by exchange rate uncertainties, agricultural export, trade openness and world price of cocoa taken together. And there is a long run relationship between cocoa export and exchange rate, agricultural export, trade openness as well as world price of cocoa. Specifically exchange rate uncertainties and Agricultural export are directly related to cocoa export while trade openness and world price of cocoa are inversely related to cocoa export

Policy makers should appreciate the effect of trade liberalization and ensure that the SAP enunciated package with references to trade liberalization are brought to bear. Also, they should note that there is urgent need to rehabilitate existing cocoa plantations, by way of replanting with hybrid varieties as in the case of Ghana. In addition cultivation of new plantations should be encouraged. By extension, this will create employment, increase level of output and export of cocoa.

There should be free market determination of exchange rate especially for cocoa export.

Farmers should have access to facilities provided by government to increase the level of their output and volume of cocoa export. Small holder cocoa farmers should enjoy input subsidy, in addition, affordable loans should be provided for them to ensure increase cocoa production and export.

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