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DETERMINANTS OF COCOA EXPORT EARNINGS IN NIGERIA (1980-2019)

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Abstract

This study investigated the determinants of cocoa export earnings in Nigeria between 1980 and 2019. Secondary data spanning between 1980 and 2019 were collected from reputable sources such as Food and Agriculture Organisation Statistical Database (FAOSTAT), National Bureau of Statistics (NBS) and Central bank of Nigeria (CBN). Descriptive Statistics, Augment Dickey Fuller Johnson co- integration, and vector error correction (VECM) were the analytical tools employed in the study. Results indicated that variables of the model were stationary after first difference and were co- integrated. VECM results shows that domestic production of cocoa negatively influences cocoa export earnings in the short run, while cocoa output and gross domestic product (GDP) had direct relationship with cocoa export values in the long run, but exchange and interest rates had negative effect on cocoa export values over the study period. It is concluded that domestic production, GDP, exchange and interest rates were the variables determining the cocoa export earnings over the study period. It is recommended that policy reforms on coco production and value chain, flexible exchange and a single digit interest rates would improve cocoa earnings and its contribution to GDP.

Key words**:** *factors, trend, cocoa, output, vector error correction (VECM)*

INTRODUCTION

The role of agricultural exports is so significant in its contribution to economic growth in Nigeria [5]. Cocoa (*Theobroma cacao*) is crucial in its immense values to the world economy at large. In West Africa, cocoa has features of smallholder cultivation; planted on farm population of about 1.5 million with an average farm size ranging from 1.2 to 2.8 hectares and employment capacity of about 10 million labour force [4]; [10]. In Nigeria, cocoa has been a major export crop in the years back, contributing about 37.9% of agricultural volume of exports [12]; [15]. Cocoa is the main agricultural subsector in its great contribution to Nigeria's Gross Domestic Product (GDP) of about 15% to the total Nigerian export [15] prior oil discovery. At the inception of crude oil discovery and exploration in Nigeria in the late sixties, there was a sudden shift from agriculture which was the backbone of Nigeria economy to crude oil production. The role of cocoa to most developing countries of the world cannot be doubted as cocoa is cultivated by more than fifty developing countries across Asia, Africa, and Latin America, all of which are found in the tropical or sub-tropical regions [7]. In Nigeria, Cocoa is cultivated in fourteen of the thirty-six states. The main regions in Nigeria in which cocoa is produced is found in the South West and South-East with an exception of Cross River. However, the highest cocoa producing states in these regions that account 80% of total production include Ekiti, Ogun, Ondo, Osun and Edo [4]. Cocoa is prominent in provision of raw materials, as well as source of income to governments of cocoa producing states [17]. Nigeria was placed at second position of world exporter of cocoa [1] decade ago. Recently, Nigeria is the fourth world cocoa exporter after Cote D'ivoire, Ghana and Indonesia in the share of 12% of total world production [10]. Regards local production, the South West is considered as the cocoa region of Nigeria based on contribution of 70% of

Nigeria's annual cocoa output. Cocoa farmers in the whole world survive on on cocoa for their livelihood, with an average of annual world ouput of three million tonnes [3].

Cocoa is recognized as one the main agricultural export in Nigeria though its production is small accounting for only 0.3% of the agricultural GDP [13]. The production of cocoa is not impressive in Nigeria which has manifested in decline and instability in its output owing to problem of poor management practices adopted by cocoa farmers. Cocoa has been identified as one crucial source of renewable energy that has a high potential for power generation and foreign exchange earnings. Increased demand for alternative use of cocoa beans as a renewable energy supply is germane to increased output and economic stability owing to the fact that an increasing use of the renewable resource has potential of positive impact on sustainable environment. Cocoa shell is useful in conversion to biofuel and chocolate waste products are also components of additional sources of fuel. In addition, cocoa pod husk is a renewable source of green energy as well as ingredients that contains bioactive components of pharmaceutical industries in the production of drugs. Crude oil is incomparable with cocoa as non-renewable and faces price instability in the world market, cocoa has a strong economic multiplier effect in job creation and employment generation for many stake-holders in cocoa value chains and thus provide a good linkage to the economy at large [9].

At the world production level, cocoa is largely produced by most developing countries across Asia, Africa, and Latin America, all of which are found in tropical or semi-tropical ecological zones [14]. The production data in the period 1980 and 2017 revealed that Nigeria is the World's fourth largest cocoa producer after Ivory Coast, Ghana, and Indonesia, producing an average of 296.72 thousand tonnes over the period which accounts for about 9 per cent of the World's average output over the same period. Cocoa production is crucial in its contribution to the economic growth of Nigeria, contributing an average of US$313.33 million to the annual Gross Domestic Product of Nigeria. Also, it added a mean annual growth rate of 2 per cent in its contribution to the economy in Nigeria between 1980 and 2017. In the consideration of foreign exchange earnings, it has been estimated that the value of the Nigerian exports of cocoa rose from 243.39 million dollars in 1980 to 598.19 million dollars in 2017 [16]. Therefore, an inference can be drawn that cocoa is a strategic agricultural export product with high value of investment and export potentials for income generation, foreign exchange revenue diversification from diverse manufactured and semi-manufactured products of the commodity that include finished products such as cocoa butter, cocoa cake, cocoa powder, chocolates and cosmetic products. Cocoa has an organized world market which makes it to stand out of all agricultural exports besides its crucial role as raw material for local industries. The countries of the world that import cocoa in large quantities include Great Britain, France, Uruguay, Germany and Holland [2].

The fact still remains that the sustainable growth and export potentials of cocoa are still underutilized nationally, income generation, industrial development, and generation of increased foreign exchange earnings. This is as a result of outcome of global restriction of Nigeria in the foreign trade due to low quality of cocoa beans and infrastructure deficit. Infrastructure deficit restrains processing capacity cocoa infant industries for increased value addition. Also, the infrastructure deficit in the country affects the efficiency in linkages of cocoa-based processing firms to the global markets which hinders the export competitiveness of cocoa-based products and other crucial agricultural products in Nigeria. [15]. Nigeria government in the recent time has made concerted efforts at improving export earnings through implementation of policies such as project made in Nigeria for export (MINE) which was targeted at unlocking the potential of special economic zones (SEZs) based on their comparative advantage. The policy aimed at increasing the manufacturing's share of GDP which remained at an average of 9 per cent over the period 2013 to 2017, wealth and income

generation through an improvement in export earnings [18]. Other policies include overhauling and revitalization of Bank of Industry (BOI) for easy accessibility of loans to Medium and Small-Scale Enterprises (MSMEs) at single interest rate. Government actions also felt in roads links from rural areas to towns and cities by opening of new feeder roads and re-construction of old roads in order to ameliorate the transportation problem of agricultural products. Therefore, this study investigated the determinants of cocoa export earnings in Nigeria between the period of 1980 and 2019. The major objective of the study is to examine the determinants of cocoa export earnings in Nigeria between 1980 and 2019. Specifically, the objectives of the study are to: evaluate the trend in output and export supply of cocoa in Nigeria, examine the trend in cocoa export earnings in Nigeria and analyze the effect of significant factors on cocoa export earnings in Nigeria.

MATERIALS AND METHODS

Study area

The study area for this research is Nigeria. Nigeria is situated in the West African region and lies between latitudes 40^0N to 140^0N and longitudes 30^0E to 150^0E (National Bureau of Statistics, NBS, 2020) [11] It has a wide expanse of land of 923,768 sq.km. It shares boundary in the north by Niger Republic, in the west by Benin Republic and in the east by Cameroon Republic. The country's topography characterises by lowlands along the coast and in the lower Niger Valley to high plateaus in the north and mountainous along the eastern border. Much of the country is laced with productive rivers. Nigeria's ecology varies from tropical forest in the south to dry savanna in the far north, yielding a diverse mix of plant and animal life.

Data analysis

Data employed in the study were national annual aggregates obtained from secondary sources such as include publications of the Central Bank of Nigeria (CBN) [6], the National Bureau of Statistics (NBS) [11] and Food and Agriculture Organization (FAO) Statistics (FAOSTAT) [8]. Data were specifically collected on Nigerian cocoa production and export supply quantity, value of cocoa export quantity, producer prices of cocoa, gross domestic product (GDP), interest rates, inflation rates and exchange rate for the period under study (1980-2019). This study employed a number of analytical methods based on the objectives of the study. These include; means, standard deviation, coefficients of variation, percentages and average growth rate. These statistical tools (means, standard deviation, coefficients of variation, percentages and average growth rate) were used to describe trend in cocoa production, export supply and export earnings in Nigeria.

The Augmented Dickey-Fuller statistics was used to examine the stationarity of time series data. The Johansen's method was employed in verifying co- integration among the variables of the model. The error correction mechanism (ECM) was used to isolate the de1terminants of cocoa export earnings for the period covered by the study. The implicit model employed in this study is given as:

$$\Delta LnY_t = \alpha_1+\alpha_2\Delta lnY_{t-1}+ \alpha_3\Delta lnX_{2t-1}+ \alpha_4\Delta lnX_{3t-1} +\alpha_5\Delta lnX_{4t-1}+\alpha_6\Delta lnX_{5t-1}+\lambda_1 ECT_{t-1}+ u_{t1}\ldots..(1)$$

where:

Y is the cocoa export earnings valued in thousand USD

X_1 is the cocoa export supply in metric tonnes

X_2 is the cocoa production quantity in metric tonnes

X_3 is the GDP valued in United States dollars

X_4 is the exchange rates was measured as amount of Naira exchanged for United States Dollar

X_5 is the interest rate in the economy measured in percentage

X_6 is the inflation rate in the economy measured in percentage

ECMt is the error correction factor.

Δ is the difference operator

$_{t-1}$ is the lagged values of variables

Ln is the logarithm operator

U_{ts} are stochastic random errors

α_1, α_2, α_3, α_4, α_5, α_6 and λ_1 are parameters to be estimated.

RESULTS AND DISCUSSIONS

Trend in domestic cocoa production in Nigeria (tonnes)

Trend in cocoa production in Nigeria between 1980 and 2019 is presented in Table 1. The table shows an increasing, but fluctuating trend in average cocoa production across the sub-periods over the study period. It fluctuated from 175,080.00 tonnes in the 1980-1989 sub period to 348,531.10 in 2000-2019 sub-period, with the mean of 299,055.30 during the study period. Annual growth rate in the production of cocoa recorded a negative growth rate in 1990-1999 and 2010-2019 sub periods, but a positive growth rate1980-1989 and 2000-2009 sub periods respectively, with an average annual growth rate of 128.83% over the study period.

Table 1. Trend in Cocoa Production in Nigeria (1980-2019)

Sub-periods	Mean (tonnes)	Annual Growth rate (%)	Coefficients of variation
1980-1989	175,080	67.30	408.94
1990-1999	287,200	-7.79	556.88
2000-2009	385,410	185.24	7,817.41
2010-2019	348,531.1	-12.29	971.36
Total	299,055.30	123.83	28.69

Source: Computed from CBN, NBS and FAOSTAT, 2021 [6, 11, 8].

Trend in cocoa export supply (tonnes) in Nigeria (1980-2019)

The average cocoa export supply in Nigeria between 1980 -2019 is shown in Table 2. From the table, average export supply of cocoa fluctuated over the study period, decreasing and increasing alternately between the sub-periods, with an average of 47,462.43 tonnes during the study period. Similarly, annual growth of export supply of cocoa decrease and increase alternately over the study period, reaching its peak values (197.98%) in 2010-2019 sub -period.

The average annual growth rate of cocoa export supply stood at 56.75% between 1980 and 2019.

The coefficients of variation show high degree of instability varying from 152.36% in 2000-2018 sub-period to 611.67% in the 1990-1999 sub period, with an average of 211.54% between 1980 and 2019.

The coefficient of variations reflected a high degree of instability in cocoa production varying from 408.94% in the 1980 to 1989 sub-period to 971.36% in the 2010-2019 sub-period, with a mean of 28.69% over the study period.

Table 2. Trend in cocoa export supply in Nigeria (1980-2019) in tonnes

Sub-period	Mean (tonnes)	Annual Growth rate (%)	Coefficients of variation
1980-89	149,993.10	3.79	366.56
1990-99	147,323.40	32.76	`611.67
2000-09	208,695.80	77.69	429.13
2010-19	232,810.80	32.31	519.36
Total	330,102.20	197.98	152.36

Source: Computed from CBN, NBS and FAOSTAT, 2021 [6, 11, 8].

Trend in cocoa export earnings (000,000' US$) in Nigeria (1980-2019)

Table 3 presents the trend in cocoa export earnings between 1980 and 2019 in Nigeria.

Table 3. Trend in cocoa export earnings in Nigeria (1980-2019) in tonnes.

Sub-periods	Mean (000,000' US$)	Annual % Growth rate	Coefficients of variation
1980-1989	244,311	-45.10	395.69
1990-1999	173,361	117.40	333.45
2000-2009	353,175	185.24	271.96
2010-2019	552,735	8.68	660.73
Total	474,624	56.75	211.54

Source: Computed from CBN, NBS and FAOSTAT, 2021 [6, 11, 8].

The table reveals that cocoa export earning fluctuated over the study period; reaching its peak (US$552.735. million) in 2000-2019 sub-period and its lowest (US$173.361 million) in the 1990 to 1999 sub-period, averaging US$474.624 million between 1980 and 2019.

A negative annual growth rate (-45.10%) was recorded 1980 and 1989 sub-period, but it improved significantly between 1990 to 2009 period.

The average annual growth rate of cocoa export earnings stood at 56.75% between 1980 and 2019. High level of disequilibrium as reflected by coefficient of the variation which ranges from 271.96% in 2000-2009 sub-period to 660.73% in the 2010 to 2019 sub-period with an average of 211.54% for the entire period of 1980 - 2019

Unit root test

One of the major step to be taken in the analysis of a time series data set is to take a critical look at the behaviour of the data set over the period of the analysis. This is to affirm that the time series data set are either stationary or non-stationary over time. Time series is adequate for regression analysis using the ordinary least squares (OLS) if it is not unit root and thus stationary over time. However, if the series exhibit unit root that depicts non-stationary over time which makes the data set unsuitable for regression analysis by applying the ordinary least squares (OLS) method as this will end in spurious results that cannot be used for statistical inference and policies recommendation.

Unit root test for variables of the model for the study (original values)

The unit root test results for initial values of the variables of the model using the Augmented Dickey-Fuller (ADF) technique is presented in Table 4.

Table 4. Result of ADF Unit Root for Variables (Original values)

Variables	ADF value	Mackinnon critical values		
		1%	5%	10%
lnY	-3.02	-3.67	-2.97	-2.62
lnX_1	-1.61	-3.67	-2.97	-2.62
lnX_2	-2.30	-3.75	-3.00	-2.63
lnX_3	-2.11	-3.75	-3.00	-2.63
lnX_4	-3.13	-3.75	-3.00	-2.63
lnX_5	-3.47	-3.75	-3.00	-2.63
lnX_6	-2.30	-3.75	-3.00	-2.63

Source: Author Computation 2021.

The table reveals that the ADF statistics is less than critical values at 1%, 5% and 10% respectively, indicating that the variables of the model are not stationary in their original values, hence, the null hypothesis of presence of unit root in the variables of the model cannot be rejected under this condition.

These imply that the variables of the model cannot be used for regression analysis using their original values because the results will be spurious and unsuitable for statistical inference and policy recommendations.

Unit Root Test for Variables of the Study (First Difference)

The ADF unit root tests of the first difference of the variables of the model is presented in Table 5. From the table, the ADF statistics have values that are more than the critical values at 1%, 5% and 10% respectively. Therefore, the null hypothesis of presence of unit root in the variables of the model can be rejected, implying that the variables in their first difference form is suitable for regression analysis because the results of such analysis will be valid for statistical inference and policy formulation.

Table 5. Result of ADF Unit Root for Variables (First difference values)

Variables	ADF value	Mackinnon critical values		
		1%	5%	10%
DlnY	-7.88	-3.68	-2.97	-2.62
$dlnX_1$	-5.03	-3.68	-2.97	-2.62
$dlnX_2$	-4.45	-3.68	-2.97	-2.62
$dlnX_3$	-5.02	-3.68	-2.97	-2.62
$dlnX_4$	-6.10	-3.68	-2.97	-2.62
$dlnX_5$	-4.62	-3.68	-2.97	-2.62

Source: Author Computation 2021.

Lag length selection

Table 6 presents the lag selection-order criteria for the variables of the model.

The table reveals that based on LR, FPE, AIC, HQIC and SBIC criterion a lag order of 4 is recommended for co-integration and vector error correction regression analysis.

Co-integration test

Table 7 presents the results of Johansen co-integration analysis of the variables of the model. Results in the Table reveals that there is 1 co-integrating equation among the variables of the model, establishing a long run relationship among the variables of the model, affirming that the suitability of vector error correction (VECM) regression analysis for the model.

Table 6. Selection-order criteria for lag length of the variables

LAG	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-2,184.45				5.7e+45	125.226	125.537	
1	-2,014.9	339.11	49	0.000	6.2e+42	118.337	119.196	120.826
2	31,969.75	90.289	49	0.000	1.1e+43	118.557	120.168	123.223
3	-1,904.68	130.14	49	0.000	1.4e+43	117.639	120.001	124.482
4	-1,178.3	1452.8*	49	0.000	6.5e+27*	78.9312*	82.0452*	87.9522*

Source: Data Analysis, 2021.
Endogenous: Y, lnX_1, lnX_2, lnX_3, lnX_4, lnX_5, lnX_6
Exogenous: _cons

Table 7. Result of Johansen tests for co-integration

Max. rank	Parms	LL	Trace Eigen value	Critical statistic	Value
0	56	--2,152.661		132.5689	124.24
1	69	-2,130.8891	0.69175	89.0252*	94.15
2	80	-2,116.5041	0.54048	60.2552	68.52
3	89	-2,104.1511	0.48713	35.5493	47.21
4	96	-2,096.6297	0.33407	20.5065	29.68
5	101	-2,090.25	0.29167	7.7471	15.41
6	104	-2,086.9222	0.16463	1.0914	3.76
7	105	-2,086.3765	0.02907		

Source: Author Computation 2021.

Results of short run vector error correction model regression analysis

The results of short run Vector error correction model (VECM) regression analysis is presented in Table 8.

Results in the Table shows that the value of R^2 is 0.65 and is statistically significant at 5% level. This shows that the estimated model has a good fit. The error correction factor (-0.920) is negative and statistically significant at 10% level as expected. In the short run, the coefficient of cocoa output (X_2) is negative and statistically significant at 10% level, showing an inverse relationship between cocoa output and cocoa export earnings (Y).

Table 8. Short run vector error correlation model regression analysis results

Variables	Coefficients	St. error
Ce_1	-0.191	0.118
Cocoa export earnings (Y)	-0.067	0.230
Cocoa export supply (X_1)	-0.246	0.528
Cocoa production quantity (X_2)	-0.529	0.291
GDP valued in United State dollars (X_3)	-0.349	0.522
Exchange rate (X_4)	0.146	1,392.850
Interest rate (X_5)	0.565	4,423.033
Inflation rate (X_6)	-859.742	942.431
Constant	7,474.423	18,874.210
R^2	0.650	
Chi-square	42.171	
p-value	0.000*	
AIC	118.913	

Source: Author computation 2021.
* mean significant at 1% level; ** mean significant at 5% level; *** mean significant at 10% level

Results of long run vector error correction model regression analysis

Table 9. Long run vector error correction model regression analysis results

Variables	Coefficients	Standard error	z-value	p-value
Cocoa export (Y)	1	-	-	-
Cocoa export supply (X_1)	0.148	0.721	0.200	0.838
Cocoa production quantity (X_2)	2.977	0.519	5.73	0.000*
GDP valued in United State dollars(X_3)	1.136	0.192	5.93	0.000*
Exchange rate (X_4)	2,223.765	1,027.476	2.16	0.030**
Interest rate (X_5)	19,854.140	5,953.362	3.330	0.001*
Inflation rate (X_6)	1,214.928	1,732.173	0.700	-0.483
Constant	292,671.500			

Source: Author computation 2021.
* significant at 1% level; ** significant at 5% level; *** significant at 10% level

Table 9 presents the long run results of the VECM regression analysis. Results in the Table reveals that in the long run, agricultural land area (X_1), cocoa production (X_2) and inflation rate (X_5) negatively affect the export supply of cocoa, while exchange rate (X_3) positively affects export supply of cocoa in the study area.

CONCLUSIONS

The study analyzed the determinants of cocoa export earnings in Nigeria between the year 1980 and 2019. The study concludes that an annual growth rate in the production of cocoa recorded a negative growth rate in 1990-1999 and 2010-2019 sub periods, but a positive growth rate1980-1989 and 2000-2009 sub

periods respectively. Also, annual growth of export supply of cocoa decrease and increase alternately over the study period, reaching its peak values (197.98%) in 2010-2019 subs - period. There is a high degree of instability in cocoa export earnings during the period of the study as reflected by the coefficient of the variation. Cocoa production (X_2), GDP (X_3) exchange rate (X_4) and interest rate (X_5) significantly influence cocoa export earnings in Nigeria over the study period. Based on the study findings, it is recommended that policy measures on domestic production and processing of cocoa into high quality cocoa beans that will command premium price in the international market should be taken. Also, there is need for provision of macro-economic friendly environment that will promote agricultural exports through effective and efficient monetary policies on macro-economic variables such as exchange rate and interest rate to improve earnings from agricultural exports.

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