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Impact of Foreign Direct Investment on the Nigerian Agricultural Sector

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Abstract: Adequate investment in the agricultural has been touted to be responsible for food security in the developed emerging economies. One substantial source of investment in the sectors is the Foreign Direct Investment. However, it is uncertain the level of Foreign Direct Investment in the Nigeria Agricultural as the country still records food demand and supply gap orchestrated by the rising population growth in the country. Consequently, to address the food demand and supply gap scenario this study examines the Impact of Foreign Direct Investment on the Nigerian Agricultural Sector using secondary time series data obtained from various issues of the statistical bulletin of the Central Bank of Nigeria (CBN). Data collected were analyzed using econometric regression technique of the Ordinary Least Square (OLS). Results showed that foreign direct investment, export earnings, market size, government expenditure in agricultural sector, employment generation, exchange rate has a positive relationship with Nigerian agricultural sector development. This means that as foreign direct investment, export earnings, market size, government expenditure in agricultural sector, employment generation, exchange rate are increasing, it will bring about improvement in the Nigerian agricultural sector. On the other hand, agricultural produce prices and inflation rate has a negative impact on agricultural sector performance. This means that as agricultural produce prices and inflation rate falls, agricultural sector performance will improve. The study recommends that government should provide adequate infrastructure and policy framework that will be conducive for doing business in Nigeria, so as to attract the inflow of FDI. Given the causal link among exchange rate – export growth economically at the Nigerian economy, favourable exchange rate policies should be formulated and implemented. Therefore, there is need to have a stable political and economic environment and improve on the critical infrastructure, level of security at all levels in the country. Again, the government should enforce a guiding principles or laws that will be regulating and monitoring the foreign sector activities to curb corrupted practices which are a bane for growth.

Keywords: FDI, agricultural sector, export earnings, market size, agricultural produce price, employment growth rate, exchange rate, inflation rate.

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1. INTRODUCTION

Nigeria indeed possesses significant potential to attract foreign direct investment (FDI) due to its abundant natural resources, including oil, and a large market size with a population of approximately 220 million people (*Akinwalere & Chang, 2023;* Djokoto, Gidiglo, Srofenyoh, Agyei-Henaku, Prah & Arthur, 2022*)*. Historically, Nigeria has been one of the top recipients of FDI in Africa, consistently ranking among the leading African countries for FDI inflow over the past decade. However, the FDI attracted to the agricultural sector in Nigeria has been relatively small compared to its resource base and potential. There is a stark contrast between the overall FDI inflow to Nigeria and the FDI allocated to the agricultural sector (Aderemi, Omitogun & Osisanwo, 2022 Ogbanje & Salami, 2022; Alugbuo, Eze & Osuji, 2023). Specifically, between 1976 and 2007, Nigeria's share of FDI inflow to Africa averaged around 20.68%. Still, the percentage of FDI inflow to the agricultural sector in Nigeria during the same period was less than 1%. This suggests that most foreign investment has been directed towards other sectors of the Nigerian economy, such as oil and gas, manufacturing, and services. There are several reasons for the relatively low FDI inflow into Nigeria's agricultural sector: Oil Dominance, Infrastructure Challenges, Land Tenure and Ownership Issues, Regulatory and Policy Issues, Market Access and Value Chain Constraints (Mbiakop, Khobai & Fani, 2023).

Nigeria's economy has historically been heavily reliant on oil exports, which has attracted significant foreign investment. This has led to an imbalance in FDI distribution, with much of the investment going into the oil and gas sector. On Infrastructure Challenges**,** Nigeria faces infrastructure challenges that can deter investment in the agricultural sector. Issues like inadequate transportation and storage facilities, inconsistent power supply, and poor road networks can make it less attractive for investors to enter the agricultural value chain. For land tenure and ownership issues, land tenure and ownership problems can be a significant obstacle to agricultural investment in Nigeria. Ambiguities in land ownership and the potential for land disputes can discourage investors. Again, regulatory and policy issues shows Inconsistent or unclear agricultural policies, regulatory hurdles, and bureaucratic red tape can be barriers to foreign investment in agriculture. Investors often seek stable and predictable regulatory environments. Another challenge is market access and value chain constraints: Access to markets and value chain constraints can hinder the potential for return on investment in the agricultural sector. Investors may be deterred by the challenges in getting products to market or processing them efficiently (Manasseh, Nwakoby, Okanya, Ifediora & Nzidee, 2023; Uteh, Yisa, Ojo & Ibrahim, 2022).

To attract more FDI to the agricultural sector and tap into its enormous potential, Nigeria may need to address these challenges and create a more conducive investment climate. This could involve developing and implementing policies that support agricultural modernization, improving infrastructure, clarifying land tenure and ownership, streamlining regulations, and facilitating access to markets. By addressing these issues, Nigeria could make its agricultural sector more attractive to both domestic and foreign investors, helping to unlock its full potential for economic growth and food security (Gunasekera & Newth, 2015; Edeh, Eze & Ugwuanyi, 2020). The potential of Nigeria as a nation due to its abundant human and natural resources suggests that Nigeria could consistently become the largest economy in Africa and a major global player by utilizing these resources to build a prosperous economy, reduce poverty, and provide better healthcare for its citizens. However, this potential has not been fully realized because of the overreliance on oil, which has led to shrinkage of other productive sectors, particularly agriculture. Foreign Direct Investment (FDI) can be a valuable source of capital and expertise for reviving the agricultural sector in Nigeria. It can bring in much-needed investment in technology, infrastructure, and market access, which can boost agricultural productivity and contribute to economic growth. Nigeria's government and policymakers would need to create a conducive environment for FDI, such as

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implementing business-friendly policies, improving infrastructure, and ensuring legal and regulatory stability. Additionally, there should be a focus on improving the skills and knowledge of local farmers to take advantage of modern farming techniques and technologies. In summary, Nigeria indeed has the potential to become a major economic player in Africa and globally, but this potential can only be fully realized by diversifying its economy away from over-dependence on oil and by reviving and investing in sectors like agriculture through strategies like FDI (Akinwale, Oludayo & Busayo, 2018; Owutuamor & Arene, 2018; Parallangaj, 2023)

Statement of the Problem

This study was informed by the rising food demand and supply shortage in Nigeria despite the presence of FDI in the agricultural sector. The food supply shortage tends to undermine the level of investment in the agricultural sector, and this issue is exacerbated by the country's rapidly growing population. Several macroeconomic variables like export earnings, government expenditure on agricultural sector, market size for agricultural produce, agricultural produce price, employment growth rate, exchange rate and inflation rate are believed to influence FDI in the agricultural sector. Despite having received Foreign Direct Investment (FDI) in the agricultural sector, the country is still grappling with food security issues. Consequently, uncertainty about fdi levels which points out that the exact level of FDI in Nigeria's agricultural sector is uncertain. This uncertainty may be due to data limitations, reporting issues, or other factors (Ennin & Wiafe, 2023; Epaphra & Mwakalasya, 2017). A lack of clarity on FDI levels suggests a need for further investigation. Again, the revenue generated from exporting agricultural products is an important factor. High export earnings can attract more FDI. The level of government investment in the agricultural sector is crucial. Government spending can have a significant impact on the development of the sector and, in turn, FDI. Another issue is market size for agricultural produce **(**Edeh, Eze & Ugwuanyi, 2020)**.** A larger domestic market for agricultural products is attractive to foreign investors. A sizable market indicates potential for profit. Agricultural produce prices are also important. The prices of agricultural products can significantly affect FDI. High prices may encourage investment. A strong employment growth rate in the agricultural sector can be a positive indicator for FDI. It suggests the potential for a skilled and growing workforce (Ugwuegbe, Okore & Onoh, 2013; *Akinwalere & Chang, 2023;* Djokoto, Gidiglo, Srofenyoh, Agyei-Henaku, Prah & Arthur, 2022). The exchange rate can influence the attractiveness of FDI. A favourable exchange rate may make investment more appealing and i**nflation rate.** The inflation rate can affect investment decisions. Low and stable inflation rates are generally more attractive to investors (Epaphra & Mwakalasya, 2017; Djokoto, Gidiglo, Srofenyoh, Agyei-Henaku, Prah & Arthur, 2022). The study aims to explore how these macroeconomic factors interplay with FDI in Nigeria's agricultural sector to gain insights into why food demand and supply imbalances persist despite FDI. This knowledge can help policymakers and stakeholders make informed decisions to address these challenges and foster agricultural sector growth.

Objective of the Study

The main objective of this study is to evaluate the impact of foreign direct investment on the Nigerian Agricultural sector. However, the specific objectives are:

1. Ascertain the effect of foreign direct investment in agricultural sector on agricultural production in Nigeria
2. Determine the effect of export earnings in agricultural product export on agricultural production in Nigeria
3. Examine the effect of government expenditure on agricultural sector on agricultural production in Nigeria

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4. Evaluate the effect the effect market size for agricultural produce on agricultural production in Nigeria
5. Ascertain the effect of agricultural produce price on agricultural production in Nigeria
6. Examine the effect employment generation on agricultural production in Nigeria
7. Evaluate the effect of exchange rate on agricultural production in Nigeria
8. Ascertain the effect of Inflation rate on agricultural production in Nigeria

Research Hypotheses

Ho_1: Foreign direct investment in agricultural sector has no significant effect on agricultural production in Nigeria

Ho_2: Export earnings in agricultural product export no significant effect on agricultural production in Nigeria

Ho_3: Government expenditure on agricultural sector effect on agricultural production in Nigeria

Ho_4: Market size for agricultural produce effect on agricultural production in Nigeria

Ho_5: Agricultural produce price effect on agricultural production in Nigeria

Ho_6: Employment generation effect on agricultural production in Nigeria

Ho_7: Exchange rate effect on agricultural production in Nigeria

Ho_8: Inflation rate effect on agricultural production in Nigeria

2. METHODOLOGY

Model Specification

The model for this study is stated as followed:

The structural form of the model is

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8)$ … ... … … … (1)

Mathematically, the model is specified as

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8$ … … (2)

The econometric form of the model can be express, thus

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \mu_i$ … (3)

Where Y = Agricultural sector (AGRI) proxy by agricultural sector growth rate

X_1 = Foreign direct investment (FDI) proxy by FDI in agricultural sector

X_2 = Export earnings (XEN) as a result of FDI in agricultural product export

X_3 = Government expenditure (GEX) on agricultural sector

X_4 = Market size (MKT) for agricultural produce

X_5 = Agricultural produce price (APP)

X_6 = Employment generation (EMG) proxied by employment growth rate

X_7 = Exchange rate (EXR)

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X_8 = Inflation rate (INF)

β_0 = Intercept

$\beta_1 - \beta_8$ = Partial slope coefficients or Parameters of the model

μ_i = Stochastic error term, which is normally distributed.

Method of Analysis

The procedure for estimation adopted for this study is the Classical Linear Regression Model and using Ordinary Least Square (OLS) as an estimator. The method of the ordinary least square method is attributed to Carl Friedrich Gauss, a German mathematician. The method is most preferred because it is easy to understand, simple in its computational procedure and parameter estimation. It also possesses the properties of Best Linear Unbiased Estimator (BLUE), which are consistent and sufficient. The regression will be carried out using the economic views (E-views) regression software.

Stationarity (unit root) test

The importance of this test cannot be overemphasized since the data to be used in the estimation are time-series data. In order not to run a spurious regression, it is worthwhile to carry out a stationary test to make sure that all the variables are mean reverting that is, they have constant mean, constant variance and constant covariance. In other words, that they are stationary. The Augmented Dickey-Fuller (ADF) test would be used for this analysis since it adjusts for serial correlation.

Decision rule*:* If the ADF test statistic is greater than the MacKinnon critical value at 5% (all in absolute term), the variable is said to be stationary. Otherwise it is non stationary.

Cointegration test

Econometrically speaking, two variables will be cointegrated if they have a long-term, or equilibrium relationship between them. Cointegration can be thought of as a pre-test to avoid spurious regressions situations (Granger, 1986). As recommended by Gujarati (2004), the ADF test statistic will be employed on the residual.

Decision Rule*:* if the ADF test statistic is greater than the critical value at 5%, then the variables are cointegrated (values are checked in absolute term)

Evaluation of Estimates

Three criteria are adopted in order to evaluate the result obtained from the regression analysis. They are;

1. Evaluation based on economic a priori criteria,
2. Evaluation based on statistical criteria.
3. Evaluation based on econometric criteria.

Evaluation Based on the Economic a priori Criteria

This subsection of this chapter draws inference from economic theory. This is used to examine the economic usefulness of the equation with regards to meeting the a priori expected signs of the parameters.

This could be carried out to show whether each regressor in the model is comparable with the postulations of economic theory; i.e., if the sign and size of the parameters of the economic relationships follow with the expectation of the economic theory.

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Table 1: Economic a priori expectations for the model

Parameters	Variables		Expected Relationships	Expected Coefficients
	Regressand	Regressor		
β_0	AGRI	Intercept	+/-	$0< \beta_0 >0$
β_1	AGRI	FDI	+	$\beta_1 > 0$
β_2	AGRI	XEN	+	$\beta_2 > 0$
β_3	AGRI	GEX	+	$\beta_3 > 0$
β_4	AGRI	MKT	+	$\beta_4 > 0$
β_5	AGRI	APP	-	$\beta_5 < 0$
β_6	AGRI	EMG	+	$\beta_6 >0$
β_7	AGRI	EXR	+/-	$0< \beta_7 >0$
β_8	AGRI	INF	-	$\beta_8 < 0$

Source: Researchers compilation

A positive '+' sign indicate that the relationship between the regressor and regressand is direct and move in the same direction i.e. increase or decrease together. On the other hand, a '-' shows that there is an indirect (inverse) relationship between the regressor and regressand i.e. they move in opposite or different direction.

Statistical Criteria: First Order Test

This aims at the evaluation of the statistical reliability of the estimated parameters of the model. In this case, the F-statistic, Co-efficient of determination (R^2) and the Adjusted R^2 are used.

***The Coefficient of Determination (R^2)/Adjusted R^2*:** The Square of the coefficient of determination R^2 or the measure of goodness of fit is used to judge the explanatory power of the explanatory variables on the dependent variables. The R^2 denotes the percentage of variations in the dependent variable accounted for by the variations in the independent variables. Thus, the higher the R^2, the more the model is able to explain the changes in the dependent variable. Hence, the better the regression based on OLS technique, and this is why the R^2 is called the co-efficient of determination as it shows the amount of variation in the dependent variable explained by explanatory variables.

However, if R^2 equals one, it implies that there is 100% explanation of the variation in the dependent variable by the independent variable and this indicates a perfect fit of regression line. While where R^2 equals zero. It indicates that the explanatory variables could not explain any of the changes in the dependent variable. Therefore, the higher and closer the R^2 is to 1, the better the model fits the data. Note that the above explanation goes for the adjusted R^2.

The F-test: The F-statistics is used to test whether or not, there is a significant impact between the dependent and the independent variables. In the regression equation, if calculated F is greater than the table F table value, then there is a significant impact between the dependent and the independent variables in the regression equation. While if the calculated F is smaller or less than the table F, there is no significant impact between the dependent and the independent variable.

Econometric criteria: Second Order Test

This aims at investigating whether the assumption of the econometric method employed are satisfied or not. It determines the reliability of the statistical criteria and establishes whether the estimates have the desirable properties of unbiasedness and consistency. In the model, autocorrelation, multicolinearity and heteroskedasticity will be tested.

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Test for Autocorrelation

The Durbin-Watson (DW) test is appropriate for the test of second-order autocorrelation and it has the following criteria.

1. If d* is approximately equal to 2 (d* =2), we accept that there is no autocorrelation in the function.
2. If d*= 0, there exist perfect positive auto-correlation. In this case, if 0<d*< 2, that is, if d* is less than two but greater than zero, it denotes that there is some degree of positive autocorrelation, which is stronger the closer d* is to zero.
3. If d* is equal to 4 (d*=4), there exist a perfect negative autocorrelation, while if d* is less than four but greater than two (2<d*< 4), it means that there exist some degree of negative autocorrelation, which is stronger the higher the value of d*.

Test for multicolinearity

This means the existence of an exact linear relationship among the explanatory variable of a regression model. It is use to determine whether there is a correlation among variables.

Decision Rule: From the rule of Thumb, if correlation coefficient is greater than 0.8, we conclude that there is multicolinearity but if the coefficient is less than 0.8 there is no multicolinearity.

Test for heteroscedasticity

The essence of this test is to see whether the error variance of each observation is constant or not. Non-constant variance can cause the estimated model to yield a biased result. White's General Heteroscedasticity test would be adopted for this purpose. This test helps to detect if the variance error term is constant. Homoscedasticity shows equal spread or equal variance, while Heteroscedasticity shows an unequal spread or an unequal variance.

H_0: Homoscedasticity

H_1: Heteroscedasticity

The decision rule is to reject H_0 if $\chi^2_{cal} > \chi^2_{0.05}$ at 5% critical value and accept if otherwise. Or alternatively, we reject H_0 if $n.R^2 > x^2$ tab at 5% critical value.

Test for Research Hypothesis

This study will test the research hypothesis using t-test. The t-statistics test tells us if there is an existence of any significance relationship between the dependent variable and the explanatory variables. The t-test will be conducted at 0.05 or 5% level of significance.

Decision rule: Reject H_0 if $t_{cal} > t_{\alpha/2}$, (n-k). Otherwise, we accept.

Nature and Source of Data

All data used in this research are secondary time series data which are sourced from Central Bank of Nigeria (CBN) Statistical Bulletin and National Bureau of Statistics (NBS) annual publications.

3. PRESENTATION OF EMPIRCAL RESULTS

Summary of Stationary Unit Root Test

Establishing stationarity is essential because if there is no stationarity, the processing of the data may produce biased result. The consequences are unreliable interpretation and conclusions. We test for stationarity using Augmented Dickey-Fuller (ADF) tests on the data. The ADF tests are done on level

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series, first and second order differenced series. The decision rule is to reject stationarity if ADF statistics is less than 5% critical value, otherwise, accept stationarity when ADF statistics is greater than 5% criteria value. The result of regression is presented in table 2 below.

Table 2: Summary of ADF test results

Variables	ADF Statistics	Lagged Difference	1% Critical Value	5% Critical Value	10% Critical Value	Order of Integration
AGRI	-4.916436	1	-3.653730	-2.957110	-2.617434	*I*(1)
FDI	-6.465304	1	-3.661661	-2.960411	-2.619160	*I*(1)
XEN	-5.737051	1	-3.653730	-2.957110	-2.617434	*I*(1)
GEX	-4.864043	1	-3.653730	-2.957110	-2.617434	*I*(1)
MKT	-9.253889	1	-3.653730	-2.957110	-2.617434	*I*(1)
APP	-6.326772	1	-3.653730	-2.957110	-2.617434	*I*(1)
EMG	-6.021423	1	-3.653730	-2.957110	-2.617434	*I(1)*
EXR	-5.230674	1	-3.653730	-2.957110	-2.617434	*I*(1)
INF	-5.245743	1	-3.661661	-2.960411	-2.619160	*I*(1)

Source: Researchers computation

Evidence from unit root table above shows that none of the variables are stationary at level difference, that is, *I*(0), rather all the variables are stationary at first difference, that is, *I*(1). Since the decision rule is to reject stationarity if ADF statistics is less than 5% critical value, and accept stationarity when ADF statistics is greater than 5% criteria value, the ADF absolute value of each of these variables is greater than the 5% critical value at their first difference but less than 5% critical value in their level form. Therefore, they are all stationary at their first difference integration.

Since the ADF absolute value of each of these variables is greater than the 5% critical value, they are all stationary at their first differences as in table 2 above. The parameters are therefore stationary at the order of integration as indicated in the table 2 above. They are also significant at 1%, 5% and 10% respectively.

Since all the variables are integrated at first difference, we go further to carry out the cointegration test. The essence is to show that although all the variables are stationary, whether the variables have a long term relationship or equilibrium among them. That is, the variables are cointegrated and will not produce a spurious regression.

Summary of Johansen Cointegration Test

Cointegration means that there is a correlationship among the variables. Cointegration test is done on the residual of the model. Since the unit root test shows that the some variables are stationary at first difference, *I*(1) while others at second difference *1*(1), we therefore test for cointegration among these variables. The result is presented in tables 3 below for Trace and Maximum Eigen-value cointegration rank test respectively.

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Table 3: Summary of Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.970942	384.1611	197.3709	0.0000
At most 1 *	0.944958	270.9301	159.5297	0.0000
At most 2 *	0.799567	178.1408	125.6154	0.0000
At most 3 *	0.790600	126.7080	95.75366	0.0001
At most 4 *	0.665168	76.67569	69.81889	0.0128
At most 5	0.525106	41.66369	47.85613	0.1684
At most 6	0.251073	17.83448	29.79707	0.5783
At most 7	0.185944	8.582841	15.49471	0.4054
At most 8	0.060575	1.999603	3.841466	0.1573
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.970942	113.2311	58.43354	0.0000
At most 1 *	0.944958	92.78924	52.36261	0.0000
At most 2 *	0.799567	51.43285	46.23142	0.0128
At most 3 *	0.790600	50.03227	40.07757	0.0028
At most 4 *	0.665168	35.01201	33.87687	0.0365
At most 5	0.525106	23.82921	27.58434	0.1408
At most 6	0.251073	9.251640	21.13162	0.8116
At most 7	0.185944	6.583238	14.26460	0.5396
At most 8	0.060575	1.999603	3.841466	0.1573

Source: Researchers computation

Table 3 indicates that trace have 5 cointegrating variables in the model while Maximum Eigen-value indicated 5 cointegrating variables. Both the trace statistics and Eigen value statistics reveal that there is a long run relationship between the variables. That is, the linear combination of these variables cancels out the stochastic trend in the series. This will prevent the generation of spurious regression results. Hence, the implication of this result is a long run relationship between agricultural sector and other macroeconomic variables used in the model.

Presentation of Results

The result of the regression test is presented in table 4 below.

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Table 4: Summary of regression results

Dependent Variable: AGRI

Method: Least Squares

Sample: 1999 2022

Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	30.22383	2.781085	5.228055	0.0000
FDI	1.685001	1.731182	0.291302	0.7732
XEN	0.001963	0.010110	0.194170	0.8476
GEX	2.107073	0.007067	5.000847	0.0000
MKT	0.650129	0.452612	3.436394	0.0003
APP	-0.140062	0.069414	-4.017796	0.0000
EMG	0.078945	0.282528	0.279423	0.7822
EXR	0.050272	0.029900	3.681303	0.0002
INF	-0.030647	0.027676	-1.107350	0.2787
R-squared	0.824011	F-statistic		14.63182
Adjusted R-squared	0.767695	Prob(F-statistic)		0.000000
S.E. of regression	2.204293	Durbin-Watson stat		2.000919

Source: Researchers computation

Evaluation of the Research Hypothesis

To analyze the regression results as presented in table 4. We employ economic a prior criteria, statistical criteria and econometric criteria.

Evaluation based on economic a priori criteria

This subsection is concerned with evaluating the regression results based on a priori (i.e., theoretical) expectations. The sign and magnitude of each variable coefficient is evaluated against theoretical expectations.

From table 4, it is observed that the regression line have a positive intercept as presented by the constant (c) = 30.22383. This means that if all the variables are held constant (zero), AGRI will be valued at 30.22383. Thus, the a-priori expectation is that the intercept could be positive or negative, so it conforms to the theoretical expectation.

From table 4, it is observed that foreign direct investment, export earnings, market size, government expenditure in agricultural sector, employment generation, exchange rate has a positive relationship with Nigerian agricultural sector development. This means that as foreign direct investment, export earnings, market size, government expenditure in agricultural sector, employment generation, exchange rate are increasing, it will bring about improvement in the Nigerian agricultural sector. On the other hand, agricultural produce prices and inflation rate has a negative impact on agricultural sector performance. This means that as agricultural produce prices and inflation rate falls, agricultural sector performance will improve. From the regression analysis, it is observed that all the variables conform to the a priori expectation of the study. Thus, table 5 summarises the a priori test of this study.

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Table 5: Summary of economic a priori test

Parameters	Variables		Expected Relationships	Observed Relationships	Conclusion
	Regressand	Regressor			
β_0	AGRI	Intercept	+/-	+	Conform
β_1	AGRI	FDI	+	+	Conform
β_2	AGRI	XEN	+	+	Conform
β_3	AGRI	GEX	+	+	Conform
β_4	AGRI	MKT	+	+	Conform
β_5	AGRI	APP	-	-	Conform
β_6	AGRI	EMG	+	+	Conform
β_7	AGRI	EXR	+/-	+	Conform
β_8	AGRI	INF	-	-	Conform

Source: Researchers compilation

Evaluation based on statistical criteria

This subsection applies the R^2, adjusted R^2, the S.E, the t–test and the f–test to determine the statistical reliability of the estimated parameters. These tests are performed as follows:

From our regression result, the coefficient of determination (R^2) is given as 0.824011, which shows that the explanatory power of the variables is very high and/or strong. This implies that 82% of the variations in the growth of the FDI, XEN, GEX, MKT, APP, EMG, EXR and INF are being accounted for or explained by the variations in AGRI performance in Nigeria. While other determinants of AGRI not captured in the model explain just 18% of the variation in AGRI performance growth in Nigeria.

The adjusted R^2 supports the claim of the R^2 with a value of 0.767695 indicating that 77% of the total variation in the dependent variable (AGRI performance is explained by the independent variables (the regressors)). Thus, this supports the statement that the explanatory power of the variables is very high and strong.

The standard errors as presented in table 4 show that all the explanatory variables were all low. The low values of the standard errors in the result show that some level of confidence can be placed on the estimates.

The F-statistic: The F-test is applied to check the overall significance of the model. The F-statistic is instrumental in verifying the overall significance of an estimated model. The F-statistic of our estimated model is 14.63182 and the probability of the F-statistic is 0.000000. Since the probability of the F-statistic is less than 0.05, we conclude that the explanatory variables have significant impacts on AGRI performance in Nigeria.

Alternatively, F-statistic can be calculated as:

V_1 / V_2 Degree of freedom (d.f)

V_1 = n-k, V_2 = k-1:

Where; n (number of observation); k (number of parameters)

Where k-1 = 8-1= 7

Thus, df = 34-8 = 26

Therefore, $F_{0.05(7,26)}$ = 2.01 (From the F table) … F-table

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F-statistic = 14.63182 (From regression result) … F-calculated

Since the F-calculated > F-table, we reject H_0 and accept H_1 that the model has goodness of fit and is statistically different from zero. In other words, there is significant impact between the dependent and independent variables in the model.

Evaluation based on econometric criteria

In this subsection, the following econometric tests are used to evaluate the result obtained from our model: autocorrelation, multicolinearity and heteroscedasticity.

Test for Autocorrelation

Using Durbin-Watson (DW) statistics which we obtain from our regression result in table 4, it is observed that DW statistic is 2.000919 or approximately 2. This implies that there is no autocorrelation since d* is approximately equal to two. 2.000919 tend towards two more than it tends towards zero. Therefore, the variables in the model are not autocorrelated and that the model is reliable for predications.

Test for Multicolinearity

This means the existence of an exact linear relationship among the explanatory variable of a regression model. This means the existence of an exact linear relationship among the explanatory variable of a regression model. This will be used to check if collinearity exists among the explanatory variables. The basis for this test is the correlation matrix obtained using the series. The result is presented in table 6.

Table 6: Summary of Multicollinearity test

Variables	Correlation Coefficients	Conclusion
FDI and XEN	0.235978	No multicollinearity
FDI and GEX	0.259868	No multicollinearity
FDI and MKT	0.229830	No multicollinearity
FDI and APP	0.220343	No multicollinearity
FDI and EMG	0.019623	No multicollinearity
FDI and EXR	0.202574	No multicollinearity
FDI and INF	-0.126205	No multicollinearity
XEN and GEX	0.715924	No multicollinearity
XEN and MKT	0.749668	No multicollinearity
XEN and APP	0.787794	No multicollinearity
XEN and EMG	-0.063708	No multicollinearity
XEN and EXR	0.790273	No multicollinearity
XEN and INF	-0.155586	No multicollinearity
GEX and MKT	0.760710	No multicollinearity
GEX and APP	0.792276	No multicollinearity
GEX and EMG	0.086991	No multicollinearity
GEX and EXR	0.769824	No multicollinearity
GEX and INF	-0.258498	No multicollinearity
MKT and APP	0.708606	No multicollinearity
MKT and EMG	-0.154262	No multicollinearity
MKT and EXR	0.771346	No multicollinearity
MKT and INF	-0.175487	No multicollinearity
APP and EMG	-0.299221	No multicollinearity

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APP and EXR	0.709888	No multicollinearity
APP and INF	-0.085541	No multicollinearity
EMG and EXR	0.000397	No multicollinearity
EMG and INF	-0.455102	No multicollinearity
EXR and INF	-0.277248	No multicollinearity

Source: Researchers computation

Decision Rule: From the rule of Thumb, if correlation coefficient is greater than 0.8, we conclude that there is multicolinearity but if the coefficient is less than 0.8 there is no multicolinearity. We therefore, conclude that the explanatory variables are not perfectly linearly correlated.

Test for Heteroscedasticity

This test is conducted using the white's general heteroscedascity test. The hypothesis testing is thus:

H_0: There is a heteroscedasticity in the residuals

H_1: There is no heteroscedasticity in the residuals

Decision rule: Reject H_0 if the computed f-statistics is significant. Otherwise, accept at 5%level of significance. Since the F-calculated > F-table, computed f-statistics is significant. Hence, since the F-calculated is significant, we reject H_0 and accept H_1 that the model has no heteroscedasticity in the residuals and therefore, reliable for predication.

Test of Research Hypotheses

The test is used to know the statistical significance of the individual parameters. Two-tailed tests at 5% significance level are conducted. The Result is shown on table 7 below. Here, we compare the estimated or calculated t-statistic with the tabulated t-statistic at $t_{\alpha/2} = t_{0.025} = t_{0.025}$ (two-tailed test).

Degree of freedom (d.f) = n-k = 34-8 = 26

So, we have:

$T_{0.025(26)}$ = 2.056 ... Tabulated t-statistic

In testing the working hypotheses, which partly satisfies the objectives of this study, we employ a 0.05 level of significance. In so doing, we are to reject the null hypothesis if the t-value is significant at the chosen level of significance; otherwise, the null hypothesis will be accepted. That is,

1. If the calculated t-value > 2.056 (tabulated t-value), we reject the null hypothesis, and accept the alternative hypothesis.
2. If the calculated t-value < 2.056, we do not reject the null hypothesis, and do not accept the alternative hypothesis.

Table 7: Summary of t-statistic

Variable	t-tabulated ($t_{\alpha/2}$)	t-calculated (t_{cal})	Conclusion
Constant	±2.056	5.228055	Statistically Significance
FDI	±2.056	0.291302	Statistically Insignificance
XEN	±2.056	0.194170	Statistically Insignificance
GEX	±2.056	5.000847	Statistically Significance
MKT	±2.056	3.436394	Statistically Significance
APP	±2.056	-4.017796	Statistically Significance

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EMG	±2.056	0.279423	Statistically Insignificance
EXR	±2.056	3.681303	Statistically Significance
INF	±2.056	-1.107350	Statistically Insignificance

Source: Researchers computation

We begin by bringing our working hypothesis to focus in considering the individual hypothesis. From table 4.6, the ***t-test*** result is interpreted below;

For FDI, $t_{\alpha/2} > t_{cal}$, therefore we accept the null hypothesis and reject the alternative hypothesis. This means that FDI do not impact significantly on AGRI.

For XEN, $t_{\alpha/2} > t_{cal}$, therefore we accept the null hypothesis and reject the alternative hypothesis. Thus, XEN have no significant impact on AGRI.

For GEX, $t_{\alpha/2} < t_{cal}$, therefore we reject the null hypothesis and accept the alternative hypothesis. This means that GEX have a significant impact on AGRI.

For MKT, $t_{\alpha/2} < t_{cal}$, therefore we reject the null hypothesis and accept the alternative hypothesis. This means that MKT do has a significant impact on AGRI.

For APP, $t_{\alpha/2} < t_{cal}$, therefore we reject the null hypothesis and accept the alternative hypothesis. This means that APP has a significant impact on AGRI.

For EMG, $t_{\alpha/2} > t_{cal}$, therefore we accept the null hypothesis and reject the alternative hypothesis. Thus, EMG does not have significant effect on AGRI.

For EXR, $t_{\alpha/2} < t_{cal}$, therefore we reject the null hypothesis and accept the alternative hypothesis. This means that EXR do has a significant effect on AGRI.

For INF, $t_{\alpha/2} > t_{cal}$, therefore we accept the null hypothesis and reject the alternative hypothesis. Thus, INT do not have significant impact on AGRI.

4. CONCLUSION AND RECOMMENDATIONS

The study examined the influence of foreign direct investment and its volatility on Nigerian agricultural sector using data ranging from 1999 -2022 on Ordinary least Square (OLS) technique method. All data used are secondary data obtained from the Statistical Bulletin of Central Bank of Nigeria. In executing the study, the OLS techniques was applied after determining stationarity of our variables using the ADF Statistic, as well as the cointegration of variables using the Johansen approach and was discovered that the variables are stationary and have a long run impact/relationship with agricultural sector development or performance in Nigeria.

From the result of the OLS, it is observed that foreign direct investment, export earnings, market size, government expenditure in agricultural sector, employment generation, exchange rate has a positive relationship with Nigerian agricultural sector development. This means that as foreign direct investment, export earnings, market size, government expenditure in agricultural sector, employment generation, exchange rate are increasing, it will bring about improvement in the Nigerian agricultural sector. On the other hand, agricultural produce prices and inflation rate has a negative impact on agricultural sector performance. This means that as agricultural produce prices and inflation rate falls, agricultural sector performance will improve. From the regression analysis, it is observed that all the variables conform to the a priori expectation of the study where foreign direct investment, export earnings, market size, government expenditure in agricultural sector, employment generation, exchange rate has a positive relationship with Nigerian agricultural sector development, agricultural produce prices and inflation rate

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has a negative impact on agricultural sector performance in Nigeria. The F-test conducted in the study shows that the model has a goodness of fit and is statistically different from zero. In other words, there is a significant impact between the dependent and independent variables in the model. Finally, the study shows that there is a long run relationship exists among the variables. Both R^2 and adjusted R^2 show that the explanatory power of the variables is very high or strong. The standard errors show that all the explanatory variables were all low. The low values of the standard errors in the result show that some level of confidence can be placed on the estimates. The study recommends that government should provide adequate infrastructure and policy framework that will be conducive for doing business in Nigeria, so as to attract the inflow of FDI. Given the causal link among exchange rate – export growth economically at the Nigerian economy, favourable exchange rate policies should be formulated and implemented. Therefore, there is need to have a stable political and economic environment and improve on the critical infrastructure, level of security at all levels in the country. Again, the government should enforce a guiding principles or laws that will be regulating and monitoring the foreign sector activities to curb corrupted practices which are a bane for growth.

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