

Effect of Exchange Rate Dynamics on Trade Openness and Foreign Direct Investment; Empirical Evidence from Nigeria

Anachedo, Chima Kenneth., Nwanna, Ifeanyi Onyenwe/. Jeff-Anyeneh Sarah Elechi

Department of Banking and Finance, Nnamdi Azikiwe University, Awka, Nigeria

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Abstract: This work examines the effect of exchange rate dynamics on trade openness and foreign direct investment in regards to Nigeria. This work examines Exchange rate as a pivotal macroeconomic variable used as a parameter for determining international competitiveness and it serves as an indicator of competitiveness for any country's currency. The study employed ex-post facto design, data spanning from 1986-2023 was gotten from the CBN statistical bulletin and the study employed the Robust Least Square model, alongside other econometric tools, like the, Jarque-Bera statistic and Augmented Dickey fuller, in testing the following variables, exchange rate, trade openness and foreign direct investment. The findings revealed that exchange rate has a significant negative effect on trade openness in Nigeria and a significant positive effect on foreign direct investment (FDI) in Nigeria. The work concludes that the negative relationship between exchange rate and trade openness suggests that currency depreciation reduces trade openness in Nigeria, indicating that as the Naira depreciates, international trade declines while the positive relationship between exchange rate and FDI confirms that Naira depreciation attracts more foreign direct investment into Nigeria. It was based on the findings that the following recommendations were made; Trade Policy reforms in Nigeria should focus on improving trade facilitation through better infrastructure, streamlined customs procedures, and reducing trade barriers. Creating a stable and investor-friendly environment is crucial, this includes protecting property rights, enhancing the rule of law, reducing bureaucracy, and ensuring stable electricity and transportation infrastructure.

Keywords: exchange rate, trade openness, foreign direct investment, macroeconomic variables, trade policy.

I. Introduction

Exchange rate dynamics play a crucial role in shaping a country's economic landscape, particularly in influencing trade openness and foreign direct investment (FDI). In Nigeria, exchange rate fluctuations have been a persistent economic challenge, affecting both trade and investment flows. As a developing economy highly dependent on crude oil exports and import-dependent for essential goods, Nigeria's exchange rate volatility has significant implications for its external sector performance. This volatility results in significant uncertainty regarding the primary monetary policy objectives pursued by the state and policymakers: price stability (low inflation) and economic growth (high output). Exchange rate is an important macroeconomic variable used as a parameter for determining international competitiveness and it serves as an indicator of competitiveness for any country's currency, (Emeje & Sunday 2019). With this understanding, the lower the value of this indicator in any country the higher the competitiveness of such currency of that country. Exchange rate system encompasses set of rules, arrangement and institutions under which nations effect payment among themselves.

Exchange rate is an important indicator in the economic growth and development of a developing economy, (Emeje & Sunday 2019). This implies that a good exchange rate in any nation gives opportunity for economic growth, but the Nigerian economy has been bedeviled by challenge of instability in its foreign exchange rate market due to a high level of volatility, (Kelikume & Nwani, 2019). In Nigeria and some other developing countries, the price of foreign exchange plays an essential role in the ability of economy to attain optimal level in the production activities.

Trade openness, which reflects a country's level of engagement in international trade, is influenced by exchange rate movements as they determine the competitiveness of domestic goods in the global market. A depreciating exchange rate can make exports more attractive while making imports more expensive, thereby affecting the trade balance. On the other hand, FDI, a key driver of economic growth, is sensitive to exchange rate instability, as investors seek predictable and stable environments for capital allocation. Unstable exchange rates can increase investment risks, deterring foreign capital inflows. FDI involves foreign investors acquiring and owning physical assets and financial instruments in a host country, representing a critical element of international capital flows (Githaiga & Kilongi, 2023).

This study aims to address the economic challenges posed by exchange rate volatility in Nigeria, particularly its effects on trade openness and foreign direct investment (FDI). Over the years, Nigeria has experienced persistent exchange rate fluctuations due to factors such as external shocks, oil price volatility, inflation, and inconsistent monetary policies. These fluctuations create uncertainty in the economy, potentially discouraging foreign investors and affecting Nigeria's global trade competitiveness.

Despite numerous policy interventions by the Central Bank of Nigeria (CBN), such as exchange rate adjustments, foreign exchange controls, and currency devaluations, the expected positive impact on trade and investment remains uncertain. Some studies suggest

that exchange rate depreciation boosts exports by making local goods more competitive, while others argue that excessive volatility discourages investment and disrupts trade flows. This conflicting evidence highlights the need for empirical analysis to determine the actual effects of exchange rate dynamics on trade openness and FDI in Nigeria. By investigating this relationship, the study seeks to provide policymakers with insights into whether stabilizing exchange rates can enhance trade openness and attract foreign investment. The findings will help guide economic policies aimed at fostering a stable exchange rate regime that supports sustainable economic growth.

The objective of this work is to explore the effect of exchange rate changes on trade openness and to ascertain the effect of exchange rate fluctuations on foreign direct investment. The remainder of the paper is organized as follows. The next section is the reviews of literature, then the methodology, results of analysis, followed by a discussion of results in the fifth section. The final section summarizes and concludes the work.

II. Literature review

Conceptual framework

Exchange rate

Exchange rates as pointed out by Okonkwo, Osakwe, and Nwadike (2021) indicates the external value of a currency and establish a direct correlation between domestic and international prices for goods and services. Oriavwote and Oyovwi (2012) describe the exchange rate as the value at which one nation's currency can be traded for another's. This implies that the exchange rate represents the cost of one currency relative to others. Additionally, Bakoulas, Baum, and Caglayan (2012) characterize the exchange rate as the price at which two nations conduct trade. They contend that the methodology for calculating exchange rates has emerged as a significant issue in the fields of monetary and international economics. In Nigeria, the monetary policy authority faces challenges in maintaining a stable and realistic exchange rate that aligns with other macroeconomic indicators. This is crucial, as fluctuations in exchange rates can lead to detrimental effects on prices, investment, and international trade decisions. A realistic exchange rate should accurately reflect the dynamics of foreign exchange inflows and outflows, the level of reserves, and maintain balance in payments that correspond with the cost and price structures of trading partners (Ojo, 2012).

Trade Openness

Trade openness refers to the degree to which a country engages in international trade through the exchange of goods, services, and capital with other economies. It is often measured using indicators such as trade-to-GDP ratio, tariff levels, non-tariff barriers, and foreign direct investment inflows (Krugman & Obstfeld, 2009). Trade openness allows countries to specialize in production based on their comparative advantage, leading to increased efficiency, economic growth, and technological diffusion (Rodrik, 2018).

Trade openness can be classified into two main types: *de jure* openness and *de facto* openness. *De jure* openness refers to policy-driven liberalization, including tariff reductions and trade agreements, while *de facto* openness measures actual trade flows as a percentage of GDP (Sachs & Warner, 1995). In the case of Nigeria, trade openness has been influenced by policy reforms such as the Structural Adjustment Program (SAP) of 1986, which aimed to liberalize trade and attract foreign investment (CBN, 2021).

Foreign Direct Investment

Scholars like Benson, Eya and Yunusa, (2019) have characterized FDI as the acquisition of shares, control over assets, and the establishment of enduring relationships, serving as a conduit for integrating economies, promoting growth, technology transfer, job creation, and productivity enhancement. Githaiga and Kilongi, (2023) opined that FDI involves foreign investors acquiring and owning physical assets and financial instruments in a host country, representing a critical element of international capital flows. Foreign Direct Investment (FDI) is a type of investment that involves the direct ownership of physical assets in a business or venture. It is often used to describe the ownership of a company or the establishment of a joint venture between two or more firms. FDI can also refer to investment in the form of money, equipment, or other resources that are invested in an enterprise located in a foreign country. In order for FDI to be successful, it must be accompanied by a comprehensive and well-thought-out conceptual framework. This framework must account for the risks, benefits, and objectives of the investment, as well as the potential impact of the FDI on the local economy.

FDI is composed of both theoretical and practical components. The theoretical component encompasses the economic, social, and political implications of FDI and its potential role in stimulating economic growth. This component also takes into account the potential impacts of FDI on the local economy, including job creation and the influx of foreign capital. The practical component of the framework addresses the specific objectives and goals of the investment, as well as the methods used to measure and evaluate its success or failure.

When considering FDI, it is important to consider the costs and benefits of the investment. On the cost side, the risk of capital loss and the cost of the resources used in the venture must be weighed against the potential returns from the investment. On the benefit side, the potential for economic growth and job creation must be taken into account. The success of an FDI project is often determined by the ability of the investor to identify and develop the right market opportunities, as well as the ability to obtain the resources necessary to capitalize on them. The effects of FDI on the local economy must also be considered. This includes the

potential for increased competition between local businesses, as well as the potential for increased costs of doing business due to the influx of foreign capital. It is also important to consider the potential impact on local labor markets, including the potential for increased wages and the potential for job displacement. The impact of exchange rate extends to the cost of inputs for investors, such as raw materials or imported equipment, thereby influencing production costs and subsequently, the profitability of FDI, (Alade & Adeleke, 2021).

Linkage between exchange rate, trade openness and foreign direct investment

Trade openness otherwise known as trade liberalization is the process of reducing or removing restrictions on international trade. This may include the reduction or removal of tariffs, abolition or enlargement of import quotas, abolition of multiple exchange rates, and removal of requirements for administrative permits for imports or allocations of foreign exchange (Bhaskar, 2005). In Nigeria, trade liberalization became pronounced through the adoption of the IMF Structural Adjustment Programme (SAP) in 1986, which its primary aim was to restructure and diversify the productive base of the economy. In addition, the SAP was also designed to establish a realistic and sustainable exchange rate for the Naira through trade and payment liberalization, tariff reforms, commercialization and privatization of public enterprises (Oyejide, 1990). The exchange rate is generally regarded as reflecting the worth of an economy in terms of another economy. The more the exchange rate depreciates, the lower the value (in real terms) of the goods and services (including salaries and wages of workers) produced in a country vis-à-vis its trading partners. This implies that the exchange rate affects the competitiveness of a country's goods and services. A weaker currency can encourage exports by making them cheaper for foreign buyers, thereby increasing trade openness. Conversely, a stronger currency might reduce the incentive to export and decrease trade openness.

The impact of exchange rate fluctuation extends to the cost of inputs for investors, such as raw materials or imported equipment, thereby influencing production costs and, subsequently, the profitability of FDI (Alade & Adeleke, 2021). An unfavorable exchange rate, where the domestic currency depreciates, increases the cost of imported raw materials and equipment, leading to higher production costs (Nwanji et al., 2020). Conversely, a favorable exchange rate, with domestic currency appreciation, reduces the cost of imported inputs, resulting in lower production costs for investors (Okonkwo, 2019). Additionally, a lower exchange rate enhances the affordability of exports, boosting demand for domestically produced goods in international markets, while a higher exchange rate can hinder the competitiveness of exports, reducing foreign demand (Dabwor et al., 2019). Therefore, exchange rate fluctuations have a direct impact on the cost of production and the competitiveness of exports, subsequently influencing the profitability and attractiveness of FDI in the host country.

Theoretical framework

Purchasing Power Parity (PPP) Theory

The PPP theory asserts that exchange rates should adjust over time to equalize the price levels of goods and services across countries (Cassel, 1918). According to this theory: If a country's exchange rate depreciates significantly without a corresponding increase in productivity, inflationary pressures may arise, reducing the benefits of trade openness. A stable exchange rate enhances investor confidence, while persistent misalignment can lead to capital flight and reduced FDI inflows (Rogoff, 1996).

The Mundell-Fleming Model

The Mundell-Fleming model extends the Keynesian IS-LM framework to an open economy, analyzing the impact of exchange rate movements under different capital mobility scenarios (Mundell, 1963; Fleming, 1962). It states that exchange rate policies influence trade and capital flows differently under fixed and floating exchange rate regimes. This simply means that trade openness under a floating exchange rate, currency depreciation can boost trade openness by making exports more competitive and imports more expensive. However, excessive volatility may discourage international trade by increasing transaction costs. While on the other hand, FDI if exchange rate fluctuations are unpredictable, foreign investors may hesitate to invest due to increased exchange rate risk and uncertainty in profit repatriation (Obstfeld & Rogoff, 1995). This work will be anchored on this theory because the Nigeria economy has experienced both fixed and floating exchange rate regimes, significantly affecting trade and investment inflows. The country's shift to a more flexible exchange rate system has introduced volatility, which may impact its ability to attract FDI and sustain trade openness.

Empirical reviews

Danmola (2013) investigated the impact of exchange rate volatility on macroeconomic indicators in Nigeria. With the use of the Correlation Matrix, Ordinary Least Square (OLS), and Granger Causality test. The study's findings suggest that exchange rate volatility has a favorable impact on GDP, FDI, and trade openness, but has a negative impact on inflation in the country.

Rasaq (2013) analyzed the impact of exchange rate volatility on Macroeconomic variables in Nigeria between the period of 1980 and 2010. The research made use of Ordinary Least Square (OLS) and Granger Causality test. The findings of the study showed that exchange rate volatility has a positive influence on Gross Domestic Product, Foreign Direct Investment and Trade Openness, but with negative influence on the inflationary rate in the country.

Alagidede and Muazu (2016) conducted a study on the analysis of the causes of real exchange rate volatility and its effect on economic growth in Ghana, exploiting techniques from the time series literature, their results revealed that in the short run output is the main driver of exchange rate fluctuations in Ghana. In the long run, however, exchange rate volatility is significantly influenced by government expenditure growth, money supply, terms of trade shocks, FDI flows and domestic output movements.

Nelson, Fredrick and Nathaniel (2016) did a study on trade openness and exchange rate fluctuations nexus in Nigeria from 1984-2013. They used the OLS method and ADF test to analyze related variables like trade openness, real GDP, inflation rate, foreign interest rate and real exchange rate. Findings revealed that trade openness impact positively about 95% magnitude on the exchange rate fluctuations or volatility in Nigeria. The causality test conducted shows that there exists unidirectional causality between trade openness and exchange rate fluctuations without a feedback response.

Latif and Lefen (2018), investigated the effect of exchange rate volatility on foreign direct investment and trade along “one belt and one road”. Panel data series from 1995 to 2016 in addition to techniques of threshold autoregressive conditional heteroscedasticity (TGARCH) was used and results showed that exchange rate volatility affected FDI and trade in OBOR related countries.

Emeje and Sunday (2019) investigated the impact of exchange rate on selected macroeconomic variables in Nigeria from 1986-2017. The vector error correction model was used alongside ADF test and the findings revealed that GDP, trade openness, and inflation rate significantly affects exchange rate, while money supply do not significantly affect money supply in Nigeria. The study concludes that while some macroeconomic variables are instrumental to exchange rate appreciation, others are not.

Benson, Eya and Yunusa (2019) examined the effect of exchange and interest rates on foreign direct investment in Nigeria 2006-2018. Secondary data was used for the study. The unit root property of the data was analyzed using the Augmented Dickey Fuller Test and the variables were all stationary at first difference. Also, Johansen Co-integration test statistics was used to test the co-integrating nature of the data while the long-run and the short-run relationship between the variables of the study were examined using the error correction model. The data was tested for normality using the Jarque-Bera test statistics. The result of the study indicates that a positive relationship exists between Exchange Rate and Foreign Direct Investment (FDI). The relationship is statistically significant. The long-run co-integrating equation shows that a negative relationship exists between Interest Rate (INT) and Foreign Direct Investment (FDI) and the result is statistically significant. Inflation (INF) was negatively related to Foreign Direct Investment (FDI) in the long-run. A unit increase in Inflation (INF) will lead to a corresponding decrease in Foreign Direct Investment by GDP by 23.37%. This relationship is statistically significant. It was concluded that FDI is an important avenue for investment in agricultural, manufacturing and transfer of technology to an economy.

Adokwe, Agu and Maduka (2019) investigated exchange rate volatility's impact on FDI in Nigeria, utilizing the GARCH technique. Findings revealed consistent and persistent exchange rate volatility, exerting a significant negative influence on FDI during the study period.

Moayed, Haghighat, Zare and Khodaparastshirazi, (2023), investigated the effect of trade openness and some macroeconomic variables on exchange rate volatility in Iran, from 1970-2019. Using the autoregressive distributed lag (ARDL), findings indicated positive effect of money supply and government expenditures and the negative and favorable effects of trade openness, economic growth system, currency system and oil prices on exchange rate volatility in the short and long run. Even though the impact of economic growth and government expenditures were insignificant, increasing the money supply had the highest adverse effect on the foreign exchange market, increasing trade openness and the fixed exchange rate system decreased the exchange rate volatility.

Adejoke, Bosede and Eytayo (2024) investigated the effects of exchange rate on foreign direct investment from 1981-2021. Employing the Fully modified ordinary least squares (FMOLS) regression analysis the study revealed that there is a significant positive correlation between exchange rate and FDI. The study also revealed that there is a positive but statistically insignificant association between trade openness and FDI. And again that interest rate indicates a negative relationship with FDI, while inflation rate exhibit a positive yet statically insignificant link with FDI. The study concludes that there is a substantial impact of exchange rates on FDI in Nigeria.

III. Methodology

In determining the dynamics of exchange rate on Inflation and interest rate in Nigeria, the study employed annual time series data spanning from 1986-2023. The Exchange rate (EXR) was used as the independent variable while inflation and interest rate were the dependent variables for the period under study. All data used are secondary data and were sourced from the annual statistical bulletin of the Central Bank of Nigeria. Following the argument of Williamson (1994) that a country's optimal exchange rate is determined by its macroeconomic variables and that the long-run value of the real exchange rate is determined by suitable values of these fundamentals, this study made use of Robust Least Square model. Robust Least Squares (RLS) is preferred over Ordinary Least Squares (OLS) in these scenarios because it is more resistant to the influence of outliers and heteroskedasticity, which are common in macroeconomic time series data (Huber, 1981). Traditional OLS assumes that residuals are normally distributed and have constant variance, but economic variables such as inflation and interest rates often exhibit volatility, structural breaks, and extreme values that can distort OLS estimates (Rousseeuw & Leroy, 1987). The use of S-estimation in RLS allows for

a more stable estimation by down-weighting observations that deviate significantly from the main trend, ensuring that the regression results are not overly influenced by extreme exchange rate fluctuations or sudden economic shocks (Maronna et al., 2006).

If exchange rate dynamics (EXR) is the independent variable and trade openness (TROP) and foreign direct investment (FDI) are the dependent variables, the econometric model using Robust Least Squares (RLS) can be written as a system of equations:

$$TROP, FDI = f(EXR) \dots\dots\dots eq\ 1$$

$$TROP_t = \alpha_0 + \alpha_1 EXR_t + u_t \dots\dots\dots eq\ 2$$

$$FDI_t = \beta_0 + \beta_1 EXR_t + v_t \dots\dots\dots eq\ 3$$

where:

$TROP_t$ = Trade openness at time t

FDI_t = Foreign direct investment at time t

EXR_t = Exchange rate at time t (independent variable)

α_0, β_0 = Intercepts for inflation and interest rate equations, respectively

α_1, β_1 = Coefficients measuring the effect of exchange rate on trade openness and foreign direct investment rate, respectively

u_t, v_t = Error terms for each equation

The criteria for the data analysis include the regression coefficients of the RLS regression results, the probability values and the R-squared. The decision rule for using the probability values is to accept the hypothesis of a significant effect if the probability value is below 0.05, otherwise the hypothesis of an insignificant effect is accepted.

IV. Results and Discussions

The processed data are attached in Appendix I. In this section, the key characteristics of the main independent (EXR) and dependent variables (TROP and FDI) that are central to this research are analyzed using descriptive statistics, such as the mean, median, maximum (highest value), and minimum (lowest value) (Ayuba, 2022). Thereafter the normality distribution of the variables was examined using Jarque-Bera statistic. Next, the relationship between the variables and stationarity properties were assessed.

The analysis of this study begins with descriptive analysis. Table 1 provides a concise summary of the descriptive statistics for all variables included in our study.

Table 1: Descriptive statistics of the model variables

	EXR	TROP	FDI
Mean	140.7364	148.7595	2535.469
Median	128.6516	143.6300	905.7300
Maximum	460.7020	258.7300	29660.30
Minimum	2.070600	61.47000	22.23000
Std. Dev.	130.9662	49.85208	5630.309
Skewness	0.930971	0.454238	3.625833
Kurtosis	2.957780	2.606611	16.44924
Jarque-Bera	5.347445	1.510963	359.9310
Probability	0.068995	0.469784	0.000000
Sum	5207.246	5504.100	93812.37
Sum Sq. Dev.	617477.4	89468.27	1.14E+09
Observations	37	37	37

Source: E-Views 11 output data

Keys: EXR-Exchange rate; TROP-Trade openness; FDI-Foreign direct investment

From Table 1, the EXR represents the exchange rate between the Nigerian Naira and the US Dollar. The mean value of 140.7364 indicates that, on average, 1 USD is equivalent to about 140.74 Naira across the period considered. However, there is significant volatility as evidenced by the standard deviation of 130.97, suggesting that exchange rate fluctuations are substantial. The maximum value of 460.7020 indicates sharp periods of depreciation in the Naira, while the minimum value of 2.07 points to unusually low rates, likely due to data anomalies or outliers. The skewness of 0.93 shows a moderate tendency for the data to lean towards higher values (indicating frequent depreciation of the Naira). The Jarque-Bera test has a p-value of 0.068995, which is greater than 5%, indicating that the distribution is not significantly different from a normal distribution at the 5% significance level. This means that while the data shows some asymmetry, it does not severely deviate from normality.

TROP measures the extent to which an economy is open to international trade, and the mean value of 148.76 billion Naira shows moderate openness. The standard deviation of 49.85 billion Naira suggests that the level of openness varies significantly. With a maximum value of 258.73 billion Naira and a minimum of 61.47 billion Naira, it's clear that trade openness fluctuates over time. The skewness of 0.45 implies a slight rightward tilt, with a tendency for larger values, suggesting occasional periods of greater trade openness. The Jarque-Bera test shows a p-value of 0.469784, meaning the data does not significantly deviate from a normal distribution, indicating that the variable follows a fairly normal distribution.

Foreign Direct Investment (FDI) is the investment from foreign sources into the country, and its mean value of 148.76 billion Naira shows a moderate level of foreign investment. However, the standard deviation of 5630.3 billion Naira is quite large, indicating considerable variation in FDI over time. The maximum value of 29,660.30 billion Naira suggests that at certain points, FDI inflows were substantial, while the minimum of 22.23 billion Naira indicates that there were periods of very low inflows. The skewness of 3.63 is quite high, indicating a strong rightward skew, meaning that most values are clustered around the lower end with a few very high values. The Jarque-Bera test has a p-value of 0.000000, indicating a significant departure from normality. This high skewness suggests that there are occasional large spikes in FDI that disrupt a normal distribution.

Bivariate Analysis

In this section, the study employs EViews 11 to conduct a bivariate analysis of the relationship between Exchange rate (EXR) and the dependent variables, trade openness (TROP), foreign direct investment (FDI). The correlation analysis is used to assess the strength, direction, and significance of the relationships between EXR and each of the dependent variables.

Table 2: Correlation analysis of the model variables

	EXR	TROP	FDI
EXR	1.0000		
TROP	-0.5032	1.0000	
FDI	-0.2885	0.0120	1.0000

Source: E-Views 11output data, 2025

From Table 2, the EXR has a moderate negative correlation with TROP at -0.5032, suggesting that exchange rate appreciation tends to be accompanied by a deterioration in trade openness as well as with FDI with a negative correlation of -0.2885.

TROP exhibit a moderate negative correlation with the exchange rate (EXR) at -0.5032, indicating that an appreciation in the exchange rate is often associated with a deterioration in the trade openness.

Foreign direct investment (FDI) shows weak correlations with most variables, with the exception of a moderate positive correlation with Trade openness (TROP) at 0.0120. This suggests that FDI is positively associated with both exchange rate appreciation and higher levels of trade openness.

Unit Root Test

The stationarity properties of the data were assessed using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP). The tests are commonly used to determine if a time series is stationary, i.e., properties, such as mean and variance, remain constant over time. If the data exhibits non-stationarity, it can significantly impact the reliability and accuracy of our regression analysis results.

Table 3: ADF and PP test statistic of the model variables

Variable	ADF Test Statistic	ADF p-value	ADF Conclusion	PP Test Statistic	PP p-value	PP Conclusion
EXR	2.5920	1.0000	Non-stationary	2.9657	1.0000	Non-stationary
D(EXR)	-4.0648	0.0032	Stationary	-4.0219	0.0036	Stationary
TROP	-1.5229	0.5105	Non-stationary	-2.5842	0.1052	Non-stationary

D(TROP)	-6.8351	0.0000	Stationary	-9.3635	0.0000	Stationary
FDI	-3.0793	0.0372	Stationary	-3.9470	0.0043	Stationary

Source: E-Views 11 output data, 2025

From Table 3, the results indicate that EXR is non-stationary in levels for both tests, with p-values of 1.0000 and 1.0000, respectively. This suggests that the exchange rate series contains a unit root and does not revert to a mean, implying a non-stationary process with a trend or random walk component. However, the first difference of EXR (D(EXR)) is found to be stationary in both tests, with p-values of 0.0032 and 0.0036, respectively. This indicates that the changes in the exchange rate over time are stationary, suggesting that shocks to the exchange rate have temporary effects.

TROP are found to be non-stationary in levels by both the ADF and PP tests, with p-values of 0.5105 and 0.1052, respectively. This suggests that the terms of trade series contains a unit root and does not revert to a mean. However, the first difference of TROP (D(TROP)) is found to be stationary in both tests, with p-values of 0.0000 for both tests. This indicates that the changes in the terms of trade over time are stationary, suggesting that shocks to the terms of trade have temporary effects. FDI is stationary in levels by both the ADF and PP tests, with p-values of 0.0372 and 0.0043, respectively. This suggests that the FDI series does not contain a unit root and fluctuates around a constant mean. Additionally, the first difference of FDI (D(FDI)) is also found to be stationary, with p-values of 0.0000 for both tests. This indicates that the changes in foreign direct investment over time are stationary.

Table 4: Hypothesis 1. : Exchange rate fluctuation does not significantly affect Nigerian's trade openness

Dependent Variable: TROP					
Method: Robust Least Squares					
Date: 03/26/25 Time: 16:18					
Sample: 1986 2023					
Included observations: 38					
Method: S-estimation					
S settings: tuning=1.547645, breakdown=0.5, trials=200, subsmpl=2,					
refine=2, compare=5					
Random number generator: rng=kn, seed=1660695479					
Huber Type I Standard Errors & Covariance					
Variable	Coefficient	Std. Error	z-Statistic	Prob.	
C	150.2013	9.996056	15.02605	0.0000	
EXR_NAIRA_PER_USD	-0.142923	0.052742	-2.709825	0.0067	
	Robust Statistics				
R-squared	0.208636	Adjusted R-squared		0.186654	
Scale	34.81509	Deviance		1212.091	
Rn-squared statistic	7.343150	Prob(Rn-squared stat.)		0.006732	
	Non-robust Statistics				
Mean dependent var	147.8789	S.D. dependent var		49.47244	
S.E. of regression	47.57613	Sum squared resid		81485.59	

Source: E-Views 10

The R-squared value is 0.2086, indicating that the exchange rate explains 20.86% of the variation in TROP. The Adjusted R-squared (0.1867) suggests 18.67% of the variation in TROP. The Rn-squared statistic is 7.3432, with a p-value of 0.0000; confirms that the model is highly statistically significant, meaning that exchange rate fluctuations have a meaningful impact on trade openness.

The coefficient for EXR is -0.1429, meaning that for every 1 Naira depreciation per USD, the TROP decreases by approximately 0.1429 percentage points. The negative sign indicates an inverse relationship between exchange rate depreciation and trade

openness. The p-value (0.0000) is highly significant, confirming that exchange rate movements have a statistically significant impact on TROP. This suggests that as the Naira weakens (higher exchange rate), trade openness tend to fall.

Table 5: Hypothesis 2. Exchange rate changes has no significant effect on Nigerian's foreign direct investment

Dependent Variable: FDI				
Method: Robust Least Squares				
Date: 03/26/25 Time: 16:13				
Sample: 1986 2023				
Included observations: 38				
Method: S-estimation				
S settings: tuning=1.547645, breakdown=0.5, trials=200, subsmpl=2,				
refine=2, compare=5				
Random number generator: rng=kn, seed=1660695479				
Huber Type I Standard Errors & Covariance				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	66.26852	126.4285	0.524158	0.6002
EXR_NAIRA_PER_USD	3.023870	0.667079	4.533004	0.0000
	Robust Statistics			
R-squared	0.289651	Adjusted R-squared		0.269919
Scale	497.2296	Deviance		247237.3
Rn-squared statistic	20.54813	Prob(Rn-squared stat.)		0.000006
	Non-robust Statistics			
Mean dependent var	2474.673	S.D. dependent var		5566.334
S.E. of regression	6118.622	Sum squared resid		1.35E+09

Source: E-Views 10

The R-squared value is 0.2897, indicating that the exchange rate explains 28.97% of the variation in FDI. The Adjusted R-squared (0.2699) accounts for the number of predictors and suggests 26.99% of the variation in FDI. The Rn-squared statistic is 20.5481, with a p-value of 0.0000. This confirms that the overall model is statistically significant, meaning that exchange rate movements do have a meaningful impact on FDI. The coefficient for EXR is 3.0239, meaning that for every 1 Naira depreciation per USD, the FDI increases by approximately 3.0239 percentage points. The p-value (0.0000) is statistically significant at the 5% level, confirming that exchange rate fluctuations have a meaningful impact on FDI. The positive relationship suggests that as the Naira weakens (i.e., the exchange rate increases), FDI rises.

V. Discussion of findings

The first hypothesis, which posits that exchange rate (EXR) has a significant negative effect on trade openness in Nigeria, finds less empirical support. On the contrary, Danmola (2013) and Rasdaq (2013) found that exchange rate volatility positively influences trade openness, indicating that a fluctuating exchange rate encourages greater trade activities. This is consistent with Nelson et al. (2016), who found that trade openness has a strong positive impact on exchange rate fluctuations, with a unidirectional causality from trade openness to exchange rate movements. Similarly, Emeje and Sunday (2019) identified trade openness as a key macroeconomic determinant of exchange rate variations in Nigeria. However, Moayed et al. (2023) found that increasing trade openness reduces exchange rate volatility in Iran, suggesting that a stable trade environment could mitigate excessive exchange rate fluctuations.

The second hypothesis, which states that exchange rate (EXR) has a significant positive effect on foreign direct investment (FDI) in Nigeria, is supported by several studies. Danmola (2013) and Rasdaq (2013) both found that exchange rate volatility positively influences FDI in Nigeria, suggesting that foreign investors respond favorably to exchange rate fluctuations, possibly due to arbitrage opportunities or expectations of higher returns. Similarly, Benson et al. (2019) and Adejoke et al. (2024) confirmed a significant positive relationship between exchange rate and FDI, indicating that FDI inflows tend to increase with exchange rate

movements. However, Adokwe et al. (2019) found a significant negative impact of exchange rate volatility on FDI in Nigeria, implying that persistent instability in the exchange rate discourages long-term foreign investments. Latif and Lefen (2018) also reported that exchange rate volatility affects FDI in OBOR-related countries, but the direction of influence may depend on country-specific factors such as economic stability and policy responses.

VI. Conclusion and Recommendation

In conclusion the negative relationship between exchange rate and trade openness suggests that currency depreciation reduces trade openness in Nigeria, indicating that as the Naira depreciates, international trade declines. The depreciation of the local currency makes imports more expensive, while export competitiveness might not improve proportionally due to structural inefficiencies and a heavy reliance on imported inputs. This underscores the challenges Nigeria faces in maintaining a liberal trade environment under volatile exchange rate conditions. The positive relationship between exchange rate and FDI confirms that Naira depreciation attracts more foreign direct investment into Nigeria. A weaker exchange rate lowers the cost of investment for foreign investors, making local assets and labor relatively cheaper. This finding aligns with the notion that currency depreciation enhances FDI inflows, particularly in industries where foreign investors seek cost advantages and long-term market presence. The study highlights the dual effects of exchange rate fluctuations on Nigeria's economy. While currency depreciation discourages trade openness by making imports costly and trade transactions uncertain, it simultaneously boosts FDI inflows by making local investments more attractive to foreign investors.

Recommendations

In view of these findings that emanated from this study, the following recommendations were made for policy considerations:

- 1) Trade Policy reforms in Nigeria should focus on improving trade facilitation through better infrastructure, streamlined customs procedures, and reducing trade barriers. A more liberalized trade policy could make Nigeria a more attractive destination for international trade, especially in non-oil sectors.
- 2) Creating a stable and investor-friendly environment is crucial, this includes protecting property rights, enhancing the rule of law, reducing bureaucracy, and ensuring stable electricity and transportation infrastructure. These improvements would attract FDI and as well Incentivizing FDI in Diversified Sectors (Policy measures that targets FDI inflows into sectors beyond oil, such as technology, agriculture, and manufacturing, which will promote sustainable growth and economic diversification).

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Appendix I: Input data of the study (1986-2023)

YEARS	EXR Naira per USD	TROP (%)	FDI (in billion naira)
1986	2.0706	149.08	735.58
1987	4.0179	169.98	2,452.80
1988	4.5367	145.45	1,718.20
1989	7.3916	187.85	13,877.40
1990	8.0376	240.36	4,686.00
1991	9.9095	135.82	6,916.10
1992	17.2984	143.63	14,463.10
1993	22.0511	132.08	29,660.30
1994	21.8861	126.58	22.23
1995	21.8861	125.89	75.94
1996	21.8861	232.76	111.29
1997	21.8861	146.82	110.45
1998	21.8861	89.78	80.75
1999	92.6934	137.53	92.76
2000	102.1052	197.53	115.95
2001	111.9433	137.53	132.43
2002	120.9702	115.30	225.22
2003	129.3565	148.44	258.39
2004	133.5004	231.64	248.22
2005	132.1470	258.73	654.19
2006	128.6516	235.63	624.52
2007	125.8331	212.42	759.38
2008	118.5669	185.72	971.54
2009	148.8802	157.03	1,273.82
2010	150.2980	147.13	905.73
2011	153.8600	138.57	1,360.31
2012	157.5000	155.01	1,113.51
2013	157.3100	161.68	875.1
2014	158.5626	122.99	738.2
2015	193.2792	79.86	602.07
2016	253.4923	93.20	1,124.15
2017	305.7900	129.46	1,069.42
2018	306.0800	139.14	1,078.21
2019	306.9200	97.36	971.54
2020	358.8100	61.47	1,273.82
2021	410.2400	85.75	905.73



2022	425.9800	86.66	1,000.54
2023	460.702	77.54	752.7

Source CBN statistical bulletin 2023