

Innovations

Effect of Exchange Rate and Trade Openness on Economic Growth in Nigeria

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Abstract: *This study investigates the effect of Exchange rate and Trade Openness on Economic Growth in Nigeria from 1981-2023. The objectives of the study were as follows; investigate the impact of the real exchange rate on Nigeria's gross domestic product; Assess the influence of balance of payment on Nigeria's gross domestic product; Analyze the relationship between trade openness and Nigeria's gross domestic product. Gross Domestic Product (GDP) is the dependent variable, while the real exchange rate, trade openness and foreign direct investment are the independent variables. All the variables were secondary sources from central bank of Nigeria (CBN) statistical bulletin vol 2023. The study conducted unit root test, cointegration test and error correction model. From the study it was found that, there is significant effect of the real exchange rate on gross domestic product in Nigeria. Foreign direct investment has significantly affect gross domestic product in Nigeria. Trade openness has significantly affect gross domestic product in Nigeria. It was recommended that encouraging manufacturing firms to utilize locally made capital goods during periods of depreciating exchange rates is a practical approach to mitigate the negative impact on economic growth. It not only supports domestic industries but also stabilizes the economy by reducing reliance on foreign goods. Implementing effective foreign exchange control policies can indeed aid in determining a more accurate and stable value for the national currency. However, it's crucial to strike a balance between control measures and maintaining a conducive environment for international trade and investment. Disincentivizing high dependence on imports through tariffs can promote domestic production and reduce trade deficits. However, policymakers must consider the potential consequences such as increased costs for consumers and the need to ensure the competitiveness of domestic industries. Additionally, focusing on improving domestic productivity and competitiveness can complement tariff measures.*

Keywords: *Exchange rate, Trade Openness, Economic Growth, foreign direct investment*

1.1 Introduction

Exchange rate movements have significant implications for the Nigerian economy, influencing a wide range of economic activities. These movements are crucial in shaping Nigeria's economic landscape, impacting everything from trade to investment flows. As a result, managing the exchange rate becomes a critical task for policymakers. Their goal is to strike a balance between promoting economic growth, controlling inflation, and maintaining external stability (Uche & Nwami, 2021; Ohwojero & Onyeoma, 2022). To achieve this balance, the Nigerian government and the Central Bank of Nigeria often implement various policies aimed at managing exchange rates. These policies are designed to mitigate potential adverse effects on the economy. For example, measures might include adjusting interest rates, intervening in foreign exchange markets, or implementing capital controls.

The effectiveness of these policies is essential for ensuring economic stability and fostering an environment conducive to growth (Bahmani-Oskooee, & Arize, (2019). Understanding the nexus between exchange rate volatility and economic growth in Nigeria requires a comprehensive analysis of several factors. Exchange rate volatility refers to the degree of variation in the currency's exchange rate over a specific period, which can be influenced by global market trends, geopolitical events, and domestic economic conditions. Economic growth, on the other hand, is typically measured by changes in the Gross Domestic Product (GDP) and reflects the overall health of the economy. Several key points are critical when examining the relationship between exchange rate volatility and economic growth in Nigeria. These include the country's heavy reliance on oil exports, vulnerability to external shocks, and significant import dependency. Additionally, factors such as foreign direct investment, monetary policy, and exchange rate management play vital roles. Efforts towards economic diversification, alongside government policies and reforms, are also essential components (Uche & Nwami, 2021; Ohwojero & Onyeoma, 2022; Barguelli, Ben-Salha, & Zmami, 2018).

Nigeria's economy is heavily dependent on oil exports, making it particularly vulnerable to fluctuations in global oil prices. Exchange rate volatility is often influenced by changes in oil prices since oil revenue significantly contributes to the country's foreign exchange earnings. This dependence on oil creates a direct link between global oil market dynamics and Nigeria's economic stability. As oil prices fluctuate, so too does the value of the Nigerian naira, affecting various sectors of the economy. Additionally, Nigeria is susceptible to external shocks such as global economic shifts, geopolitical events, and commodity price changes. These external factors can lead to increased exchange rate volatility, which in turn impacts

economic growth (Ajayi-Ojo & Iyoha, 2022; Ewubare, & Ushie, 2022). The country's reliance on imports for essential goods further exacerbates this issue. Exchange rate fluctuations can lead to higher import costs, which contribute to inflationary pressures. High inflation erodes consumer purchasing power, dampens overall demand, and can significantly hinder economic growth. Moreover, exchange rate stability is crucial for attracting foreign direct investment (FDI). High exchange rate volatility can deter foreign investors due to the increased uncertainty and perceived risk (Abdu, Umar, Mohammed & Ajannah, 2021; Edoko, Nwagbala, & Okpala, 2018). A stable exchange rate regime, on the other hand, can create a more favorable investment climate, encouraging foreign investment and fostering economic growth. Stability in the exchange rate thus becomes a key factor in maintaining investor confidence and supporting sustained economic development. The effectiveness of Nigeria's monetary policy in managing exchange rates is critical to mitigating these challenges. The Central Bank of Nigeria often intervenes to stabilize exchange rates, but the success of these interventions depends on a combination of factors including sound fiscal policies, adequate foreign exchange reserves, and favorable global economic conditions (Ajayi-Ojo & Iyoha, 2022; Abdu, Umar, Mohammed & Ajannah, 2021; Farouq, & Sambo, 2022).

Nigeria has been actively working to diversify its economy away from an overreliance on oil. By promoting non-oil sectors such as agriculture, manufacturing, and services, the country aims to build economic resilience and reduce its sensitivity to oil price fluctuations and exchange rate volatility. These diversification efforts are intended to create a more stable economic environment that can withstand external shocks better than an oil-dependent economy. Successful diversification would help insulate Nigeria from the volatility associated with global oil markets and foster a more sustainable economic growth trajectory (Ajayi-Ojo & Iyoha, 2022). The effectiveness of government policies and structural reforms in tackling economic challenges plays a crucial role in this diversification process. Policies that promote macroeconomic stability, fiscal discipline, and a business-friendly environment are essential for enhancing exchange rate stability and stimulating economic growth. For instance, measures to improve the regulatory framework, reduce corruption, and enhance infrastructure can make the business environment more attractive to both domestic and foreign investors. These policies need to be well-designed and consistently implemented to achieve the desired outcomes (Iheanachor, & Ozegbe, (2021). Oyovwi, 2012). Empirical studies and data analysis are vital for understanding the specific relationships between exchange rate volatility and economic growth in Nigeria. Time-series econometric methods can be employed to examine causal relationships and assess the impact of various factors on economic patterns. Such analyses provide insights into how

fluctuations in the exchange rate influence economic activities and vice versa. They also help policymakers to design targeted interventions that address the root causes of economic volatility and support sustained growth (Ajayi-Ojo & Iyoha, 2022). The nexus between exchange rate volatility and economic growth in Nigeria is complex and multifaceted. It requires considering the country's heavy reliance on oil exports, susceptibility to external shocks, significant import dependency, attractiveness to foreign direct investment, and the effectiveness of monetary and fiscal policies. Additionally, the success of diversification efforts and overall economic resilience must be taken into account. Comprehensive analysis of these factors demands a combination of economic theory, empirical research, and an understanding of the specific conditions prevailing in Nigeria at any given time.

1.2 Objectives of the Study

The primary aim of this study is to explore the effect of Exchange rate and Trade Openness on Economic Growth in Nigeria. Specifically, the study aims to achieve the following objectives:

- i. Investigate the impact of the real exchange rate on Nigeria's gross domestic product.
- ii. Assess the influence of balance of payment on Nigeria's gross domestic product.
- iii. Analyze the relationship between trade openness and Nigeria's gross domestic product.

1.3 Hypotheses

HO₁: There is no significant effect of the real exchange rate on gross domestic product in Nigeria.

HO₂: Balance of payment does not significantly affect gross domestic product in Nigeria.

HO₃: Trade openness does not significantly affect gross domestic product in Nigeria.

Literature Review

2.1 Theoretical Review

2.1.1 The Purchasing Power Parity (PPP) Theory.

This work is anchored on the purchasing power parity theory was propounded by Professor Gustav Cassel of Sweden. According to this theory, rate of exchange between two countries depends upon the relative purchasing power of their respective currencies. Such will be the rate which equates the two purchasing powers. For example, if a certain assortment of goods can be had for £1 in Britain and a similar assortment with Rs. 80 in India, then it is clear that the purchasing power of £ 1 in Britain is equal to the purchasing power of Rs. 80 in India. Thus, the rate of exchange, according to purchasing power parity theory, will be £1 = Rs. 80.

Let us take another example. Suppose in the USA one \$ purchases a given collection of commodities. In India, same collection of goods cost 60 rupees. Then rate of exchange will tend to be \$ 1 = 60 rupees. Now, suppose the price levels in the two countries remain the same but somehow exchange rate moves to \$1=61 rupees.

This means that one US\$ can purchase commodities worth more than 46 rupees. It will pay people to convert dollars into rupees at this rate, (\$1 = Rs. 61), purchase the given collection of commodities in India for 60 rupees and sell them in U.S.A. for one dollar again, making a profit of 1 rupee per dollar worth of transactions. This will create a large demand for rupees in the USA while supply thereof will be less because very few people would export commodities from USA to India. The value of the rupee in terms of the dollar will move up until it will reach \$1 = 60 rupees. At that point, imports from India will not give abnormal profits. \$ 1 = 60 rupees and is called the purchasing power parity between the two countries. Thus, while the value of the unit of one currency in terms of another currency is determined at any particular time by the market conditions of demand and supply, in the long run the exchange rate is determined by the relative values of the two currencies as indicated by their respective purchasing powers over goods and services. In other words, the rate of exchange tends to rest at the point which expresses equality between the respective purchasing powers of the two currencies. This point is called the purchasing power parity. Thus, under a system of autonomous paper standards the external value of a currency is said to depend ultimately on the domestic purchasing power of that currency relative to that of another currency. In other words, exchange rates, under such a system, tend to be determined by the relative purchasing power parities of different currencies in different countries.

The PPP Theory holds that equilibrium exchange rate between two currencies is determined by the ratio of their respective purchasing powers measured in terms of basket of goods that can be bought by each of the currency units (Denis, 2013; Thomas, 1994; and Wheatley, 1807). This theory implicitly considers domestic price level in the two countries such that higher inflation will lead to downward adjustment in value of a country's currency relative to the other. Accordingly, changes in exchange rate happen only to cancel inflation differentials. However certain defects are identifiable with this framework: namely lack of distinction between international and non- tradable goods in price level measures as well as certain transactions or items in the balance of payments account, e.g. dividend remittances, debt repayments and other capital flows. Perhaps, it is the attempt to fill the gap in the PPP theory that interest Rate parity approach was used to account for impact of capital flow on variation of exchange rates. The movement of short term capital for purpose of interest rate arbitrage, in the absence of capital controls, determines

changes in exchange rates as capital flows from low interest to high interest economies

2.2 Empirical Literature Review

Padonu, Obi, and Elesho (2023) conducted a study to analyze the influence of exchange rates, inflation, and interest rates on the economic growth of Nigeria. The researchers utilized secondary data obtained from various sources including the Central Bank of Nigeria (CBN) publications, the National Bureau of Statistics, and the World Development Index (WDI). Employing descriptive statistics such as mean, standard deviation, skewness, and kurtosis, the study aimed to derive reliable insights into how independent variables impact Nigeria's economic growth. The researchers employed ordinary least squares (OLS) regression analysis to assess the effects of inflation, interest rates, and exchange rates on GDP. The findings of the research indicated that monetary policies exert a significant influence on economic growth in Nigeria.

Agbaeze, Alamba, and Ejelonu (2023) investigated the impact of exchange rate volatility and import volume on Nigeria's economic reliance between 1981 and 2020. Employing the autoregressive distributive lag model (ARDL), the study analyzed ordinary time series data encompassing non-oil imports, trade openness, inflation rate, and exchange rate volatility. The results revealed that non-oil imports and trade openness inherently contribute more to Nigeria's import volume than the volatility of the official exchange rate. Consequently, the study concluded that, amidst other internal and external macroeconomic fluctuations, the economic influence of official exchange rate volatility (EXRVT) on Nigeria's import levels is relatively minimal.

Odoh, Ugwoke, and Onyeanu (2023) conducted a study to explore the ramifications of exchange rate fluctuations on economic development in Nigeria. They employed econometric regression techniques to model various facets including price stability, balance of payments, employment, income distribution, and overall growth. The research findings unveiled that exchange rate fluctuations exhibited a statistically significant negative impact on gross domestic product in Nigeria ($R = .852$, $P = 0.000$ at $P < 0.05$). Furthermore, the study indicated that exchange rate fluctuations significantly affected export value in Nigeria ($R = .484$, $P = 0.036$ at $P < 0.05$). Notably, the regression coefficients (β) of -1.115 and -1.658 illustrated that relative changes in exchange rates in Nigeria would result in adverse contributions to both gross domestic product and export value.

Idris and Shuyur (2023) investigated the influence of exchange rate fluctuations on economic growth in Nigeria. Their study delved into the impact of exchange rate fluctuations on Nigeria's economic growth from 1986 to 2022, covering the period when the monetary authority transitioned from a fixed exchange rate regime to a flexible one until 2019. Utilizing correlation and regression analyses based on ordinary least squares (OLS), the data was analyzed. The findings revealed a positive but statistically insignificant effect of exchange rates on economic growth ($\beta=0.014$, $t=1.783$, Pns), aligning with prior research suggesting that developing countries may benefit relatively more from flexible exchange rate regimes. Additionally, the results indicated that interest rates and inflation rates negatively impacted economic growth, albeit insignificantly, with coefficients of ($\beta=0.002$, $t=0.015$, Pns) and ($\beta=0.023$, $t=0.716$, Pns) respectively.

Odoh, Ugwoke, and Onyeanu (2023) delved into the correlation between exchange rate fluctuations and economic development in Nigeria. Their study sought to understand the relationship between these fluctuations and economic development, with the aim of advocating for the adoption of flexible exchange rates to enhance economic growth and stability. The research examined the impact of exchange rate fluctuations on various aspects of Nigeria's economic development, including price stability, balance of payments, employment, income distribution, and overall growth. The findings revealed that relative changes in exchange rates in Nigeria would exert a negative influence on both gross domestic product and export value. Umoru and Tedunjaiye (2023) conducted a study on savings behavior in the presence of volatilities in interest rates and exchange rate devaluation within the Economic Community of West African States (ECOWAS). They employed a panel group of grouped means (PMG) estimator to analyze exchange rates, interest rates, savings, and household consumption. Additionally, GARCH/ARCH (1,1) models were utilized to assess volatility in interest rates across the countries.

The study revealed that in Burkina Faso, Cabo Verde, Guinea, Ghana, Niger, Senegal, and Togo, maintaining bank savings accounts in the form of demand and time deposits acted as a buffer against higher volatility in interest rates. This observation may be attributed to the increase in the yearly percentage yield on certificate of deposits for savings account holders. Conversely, in Liberia, Guinea-Bissau, Gambia, Mali, Nigeria, Sierra Leone, Cote d'Ivoire, and the Republic of Benin, holding bank savings accounts in the form of demand and time deposits did not serve as a buffer against higher volatility in interest rates compared to acquiring stocks and securities. Furthermore, the study found that exchange rate devaluation had a negative impact on aggregate savings in all countries except Niger. This was attributed to the underdeveloped export sectors in these countries, highlighting the

adverse effects of exchange rate devaluation on savings behavior. Overall, the research underscores the significance of considering volatilities in interest rates and exchange rate devaluation when examining savings behavior, as well as the varying impacts across different countries within the ECOWAS region.

Okogor, Orubu, and Ezi (2023) conducted a study on exchange rate volatility and its implications for Nigeria's exports, employing an Autoregressive Distributed Lag (ARDL) analysis based on the standard demand function. Their research investigated the effect of exchange rate volatility on Nigeria's exports to its top five export destinations spanning from 1995 to 2020. The empirical findings revealed that exchange rate volatility, gross domestic product (GDP), and population emerged as robust determinants of real exports in Nigeria, exhibiting significance both in the short and long run. Additionally, the depreciation of the Nigerian naira was observed to stimulate exports to France and Spain in the short term, while in the long term, it facilitated exports to France, India, and Spain. Conversely, the depreciation led to a short-term decline in exports to China and the USA, with its long-term impact proving insignificant for India. Furthermore, relative prices exerted an adverse effect on exports across most countries, persisting in both the short and long run.

Iloegbu, & Atueyi, (2020).investigated the effect of government expenditure on economic growth in Nigeria within a period of 33years spanning (1987-2019). Data collected were from the Central Bank of Nigeria(CBN) Statistical Bulletin, where government expenditure on agriculture, government expenditure on health, government expenditure on education as the independent variables and real gross domestic product as the dependent variable. Multivariate model was developed in this analysis and Ordinary Least Square (OLS) regression analyze was used for the analysis, The Unit root test, co-integration approach and error corrections model were used for the analysis. It was also revealed from the result of our estimated model that government expenditure on education has a positive and insignificant impact on the Nigerian economy. It was also discovered that government expenditure on health has a positive and significant impact on the Nigerian economy. It was also discovered that government expenditure on agriculture has a positive and significant impact on the Nigerian economy. The study recommend that CBN should do more to encourage borrowing by bringing the lending rate to single digit to boost agricultural production in the rural settings.

Methodology

3.1 Model Specification

The essence of economic modeling lies in its ability to quantitatively represent the phenomenon under investigation. Building upon the theoretical framework provided

earlier, this study aims to explore the impact of exchange rates on economic growth in Nigeria through a modified equation:

The model is $RGDP = (RER, FDI, TOP)$

Where

RGDP=Real Gross Domestic Product

RER=Real exchange rate

FDI=Foreign direct investment

TOP=Trade openness

The econometric form of the model can be expressed as;

$$RGDP = B_0 + B_1RER + B_2 FDI + B_3TOP + \mu$$

Where; B_0 is the constant intercept

B_1 =coefficient of parameter RER

B_2 = coefficient of parameter FDI

B_3 =coefficient of parameter TOP

ECM-1 = Error correction model

μ = the stochastic error term or disturbance variable.

3.2 Estimation Technique and Procedure

This study follows unit root test, co-integration analysis and error correction modeling techniques. These method are believed to overcome the problem of spurious regression while at the same time provide consistent and good estimates of both long-run and short-run elasticities that satisfy the properties of the classical linear regression method. The techniques are also unique and preferred to the traditional Adaptive Expectation and Partial adjustment models because the latter are associated with the problems of spurious regression, inconsistent and indistinct short run and long-run elasticity estimates. This delayed impact is essential to understanding the intricate interdependencies within an economy.

To ensure the validity of its results, the ECM model operates under several key assumptions:

1. Absence of autocorrelation: One fundamental requirement is the absence of autocorrelation in the error terms. This implies that the errors should not exhibit any systematic pattern of correlation with each other, ensuring the reliability of the model's estimates.
2. Homoscedasticity: Another crucial assumption is the absence of heteroscedasticity in the data. Put simply, this means that the variance of the error terms should remain constant across the entire dataset, maintaining a stable relationship between the mean and variance.
3. Normal distribution: The data should adhere to a normal distribution, ensuring that the statistical properties of the model hold true. This assumption facilitates accurate estimation and interpretation of the model parameters.

4. **Stationarity:** The data should exhibit stationarity, typically categorized as either $I(0)$ or $I(1)$ (integrated of order zero or one). Stationarity implies that the statistical properties of the data remain constant over time, essential for reliable inference. However, if any variable in the dataset displays stationarity at a higher order (e.g., $I(2)$), the ARDL model cannot be applied, as it requires stationarity at most up to $I(1)$.

By adhering to these assumptions, the ECM model provides a robust framework for analyzing the dynamic relationships between economic variables, allowing policymakers and researchers to make informed decisions based on reliable statistical evidence.

3.3 Evaluation of Estimates

The evaluation of estimates derived from the model encompasses three key criteria, each serving distinct purposes in assessing the validity and reliability of the results:

1. **Economic a priori criteria:** This criterion evaluates the estimated coefficients in light of economic theory and prior knowledge. It entails assessing whether the signs and magnitudes of the coefficients align with theoretical expectations and economic intuition. For example, if an increase in one variable is expected to lead to a corresponding increase in another variable, the estimated coefficient should reflect this positive relationship. Economic a priori criteria serve as a qualitative check to ensure that the estimated relationships conform to theoretical expectations.
2. **Statistical criteria - First Order Test:** This criterion involves assessing the statistical significance of the estimated coefficients using appropriate hypothesis tests, such as t-tests or F-tests. The first order test examines whether the coefficients are significantly different from zero, indicating whether the variables included in the model have a statistically significant impact on the dependent variable. Significance tests provide quantitative evidence of the strength and reliability of the estimated relationships, helping to determine which variables are statistically significant predictors of the outcome variable.
3. **Econometric criteria - Second Order Test:** The second order test evaluates the overall goodness-of-fit of the model and the appropriateness of its functional form. This criterion goes beyond individual coefficient estimation to assess the model's overall explanatory power and the adequacy of its specification. Common measures used in second order tests include the adjusted R-squared, Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC). These metrics provide insights into how well the model fits the data and whether it strikes an appropriate balance between complexity and explanatory power. A high adjusted R-squared and relatively

low AIC or BIC values indicate a well-fitting model with strong explanatory capabilities.

By evaluating estimates against these three criteria - economic a priori, statistical first order, and econometric second order tests - researchers can comprehensively assess the robustness and validity of the estimated relationships and draw reliable conclusions from their econometric analysis.

Data Presentations, Analyses and Discussions of Finding

4.1 Presentation of Result

The data are subjected to analysis through the ECM employing E-views version 10.0. A summary of this, along with other preliminary tests discussed in Chapter Three, is presented in the tables below.

4.1.1 Stationary Test

Ensuring stationarity is crucial because without it, data processing may yield biased results, leading to unreliable interpretations and conclusions. The study conducts stationarity tests using Augmented Dickey-Fuller (ADF) tests on the data. These tests are performed on level series as well as first order differenced series. The decision criterion is to reject the null hypothesis if the ADF statistic value exceeds the critical value at a selected level of significance (in absolute terms). The regression results are detailed in Appendix 2-7, and a summary is provided in Table 4.1 below.

Table 4.1 Unit Root Test

Variable	Level	First Diff	Integration
RGDP	-2.310158	-4.987735	1(1)
RER	-2.095082	-4.253090	1(1)
FDI	-2.345872	-7.438884	1(1)
TOP	-0.837813	-5.849092	1(1)

Source: Author’s computation using E-view 9.1

The unit root table above indicates that none of the study or model variables are stationary at their original levels, but they are stationary at the first difference. Following the decision rule, which suggests rejecting the null hypothesis if the ADF statistic value exceeds the critical value at a chosen level of significance (in absolute terms), and accepting stationarity when the ADF statistic is greater than the critical value, it is observed that the absolute ADF values of each variable exceed the 1%, 5%, and 10% critical values at their first difference, but fall below the 5% critical value in their original level form (refer to appendices 2-7). Consequently, the study concludes that economic growth, represented by gross domestic product, exchange

rate, foreign direct investment, trade openness all exhibit stationarity at their first difference integration level I(1).

4.2 Co-integration analysis

The aim of co-integration analysis is to determine the long-run equilibrium relationship between the variables. Co-integration exists among the variables if they are integrated of the same order. The implication of this analysis is that deviation or drift may occur between the variables but this is temporary as equilibrium hold in the long run for them. In this study we used the Johansen co integration approach to examine the existence of long-run relationship between the variables of interest. Below is the summary of co integration results

Table 4.2 co-integration result test

Unrestricted Co-Integration Rank Test (Trace)

Hypothesized No of CE(s)	Eigen value	Trace static	0.05 critical value	Prob**
None *	0.536876	59.15214	54.07904	0.0165
At most 1*	0.352830	28.36173	35.19275	0.2255
At most 2*	0.202412	10.95588	20.26184	0.5463
At most 3*	0.046612	1.909351	9.164546	0.7957

Source: Author’s computation using e-view version 12

Trace test indicates 1 co-integrating equ(s) as the 0.05 level* denotes rejection of the hypothesis at the 0.05 level ** mackinnon-Haug-Michelis (1999) P – value

Unrestricted co-integration Rank Test (Maximum Eigen value)

Hypothesized No of CE(s)	Eigen value	Trace static	0.05 critical value	Prob
None *	0.536876	30.79041	28.58808	0.0257
At most 1*	0.352830	17.40585	22.29962	0.2098
At most 2*	0.202412	9.046526	15.89210	0.4289
At most 3*	0.046612	1.909351	9.164546	0.7957

Source: Author’s computation using e-view version 12

Max-Eigen value test indicates 1 co-integrating equ(s) at the 0.5 level* denotes rejection of the hypothesis at the 0.05 level **mackinnon-Haug-michelis (1999) P-values. Max-Eigen value and trace test indicates 4 & 5 co-integrating equations respectively at the 0.05 level. This suggests a long run equilibrium relationship among the variables. Co-integration is a pre-requisite for error correction mechanism following the result of co-integration, there is a long-run equilibrium

relationship among the variables, hence, we can move over to error correction mechanism.

4.3 Presentation of Regression Result

Table 4.3 Error Correction Model Result

Dependent Variable: LRGDP				
Method: Least Squares				
Date: 10/22/24 Time: 08:16				
Sample (adjusted): 1982 2023				
Included observations: 42 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.582562	0.073460	6.118334	0.0097
RER	-0.001929	0.000177	-4.089511	0.0040
LFDI	0.149892	0.009404	5.193840	0.0023
TOP	0.022623	0.116972	3.193405	0.0077
ECM(-1)	-0.843232	0.093503	-9.018191	0.0000
R-squared	0.785134	Mean dependent var		10.39303
Adjusted R-squared	0.773527	S.D. dependent var		0.600595
S.E. of regression	0.077085	Akaike info criterion		-2.176470
Sum squared resid	0.219858	Schwarz criterion		-1.969604
Log likelihood	50.70586	Hannan-Quinn criter.		-2.100645
F-statistic	61.29728	Durbin-Watson stat		1.844209
Prob(F-statistic)	0.000000			

Interpretation of the Regression Result

The value of the R-square and the adjusted R-square in table 4.3 show that the explanatory variables are robust in explaining variation in the dependent variables (LRGDP), given their values as 0.785134 and 0.773527 respectively.

The F-statistics measures the overall significance of the explanatory parameter. From the result report in table 4.3 above, our computed value of f-statistics is 61.29728, while its probability is 0.0000, given this value we reject the null hypothesis and accept the alternative hypothesis which state that there is a significant relationship between the variance of estimated regression model.

A' priori criteria which is used to determine the existing economic theories and indicates the sign of the economic parameter under consideration. From the estimated regression model it was obtained from the coefficient Column that all the variables (RER, LFDI, TOP) conform to a' priori expectation all have positive sign as expected. This further suggests that increase in foreign direct investment and trade openness increase the real gross domestic output while decrease in real exchange rate would lead to a increase in real gross domestic output, all at a given percentage respectively.

T-statistics, this is the measure used to determine the individual statistical significance of the variables in the model. From the model it was obtained that the real exchange rate and foreign direct investment in Nigeria were statistically significant at 5%, however, this implies that the real exchange rate and foreign direct investment contribute significantly to real gross domestic output in Nigeria.

The Durbin-Watson statistics is used to test for the presence or otherwise of autocorrelation in our model. When the value of Durbin-Watson is closer or a little bit above 2, it means the absence of autocorrelation amongst the explanatory parameter (Koutsoyannis 1997) from the table 4.3 above, it was obtained that our Durbin-Watson result is (1.8), this satisfy the above stated condition. This means the absence of autocorrelation among the explanatory variables.

The error correction model term ECM (-1) of about -0.84% is significant with the expected negative sign. A significant error term with the right sign indicates strong feedback effect of deviation of real gross domestic output from its long-run growth path. The coefficient of the error term is -0.843232 this shows that about 84% of the discrepancies between the actual and the equilibrium value of the real gross domestic output is corrected in each period (annually)

4.4 Post-Estimation Test

4.4.1 Breusch-Godfrey Serial Correlation Lm Test

This serial correlation test was used to check for the serial relationship between the variables. The null hypothesis stated absence of serial correlation while the alternative hypothesis states the presence of serial correlation. The prob.chi square if less than 5% level of significance signifies the acceptance of the alternative and rejection of null hypothesis while the prob chi square greater than 5% level of significance signifies the acceptance of the null hypothesis and rejection of the alternative hypothesis.

Tables 4.4 Interpretation of Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.100106	Prob. F(2,35)	0.1376
Obs*R-squared	4.500202	Prob. Chi-Square(2)	0.1054

Sources: Authors Computation

The results above showed the prob. (chi-square) having a value of 0.1054 which is greater than the 5% level of significance, therefore we accepted the null hypothesis which stated that there is no serial correlation

Table 4.5 Tabular Representation of Heteroscedasticity Result

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	12.24577	Prob. F(4,38)	0.0000
Obs*R-squared	24.21474	Prob. Chi-Square(4)	0.0001
Scaled explained SS	15.08397	Prob. Chi-Square(4)	0.0045

Source: Authors Computation from E-view 12

Hypothesis

H0: homoskedasticity

H1: heteroskedasticity

At 5% significant level, probability level is 0.0000 which is less than 0.05. Therefore, alternative hypothesis is accepted. This means that the variance for the residuals is uniform (homoscedasticity).

4.5 Hypothesis Testing

The researcher in this study formulated hypotheses and this has to be verifying in order to find out the validity of otherwise of such proposition. The research hypothesis is based on relevant statistics from the regression result. We use the null hypothesis for this analysis

Hypothesis One

Ho: There is no significant effect of the real exchange rate on gross domestic product in Nigeria.

From the regression result we discovered that in the t-statistics inflation is -4.089511 while its probability is 0.0040. Since its probability is greater than 0.05 desired level of significance we reject the alternative hypothesis and accept the null hypothesis, we therefore conclude in favor of alternative hypothesis which states that there is significant effect of the real exchange rate on gross domestic product in Nigeria.

Hypothesis Two

Ho: Foreign direct investment does not significantly affect gross domestic product in Nigeria.

From the regression result we discovered that in the t-statistics interest rate is 5.193840 while its probability is 0.0023. Since its probability is less than 0.05 desired level of significance, we reject the null hypothesis and accept the alternative hypothesis, we therefore conclude in favour of alternative hypothesis which states that Foreign direct investment has significantly affect gross domestic product in Nigeria.

Hypothesis Three

Ho: Trade openness does not significantly affect gross domestic product in Nigeria.

From the regression result we discovered that in the t-statistics money supply is 3.193405 while its probability is 0.0077. Since its probability is less than 0.05 desired level of significance, we reject the null hypothesis and accept the alternative hypothesis, we therefore conclude in favour of alternative hypothesis which states that Trade openness has significantly affect gross domestic product in Nigeria.

Conclusion and Policy Recommendations

The study's findings revealed several significant insights regarding the relationship between exchange rates, purchasing power parity, trade openness, and economic growth in Nigeria. Firstly, in the long run, the real exchange rate was found to exert a negative and statistically significant effect on economic growth, albeit with a small magnitude. This suggests that prolonged declines in the value of the Naira due to exchange rate fluctuations adversely impact economic growth in Nigeria.

Similarly, in the short run, the exchange rate was observed to have a negative and statistically significant impact on economic growth, further highlighting the detrimental effects of currency depreciation on the country's economic performance. Moreover, aside from exchange rates, both purchasing power parity

and trade openness were found to have significant positive effects on economic growth in the long run. This underscores the importance of maintaining purchasing power parity and fostering trade openness as drivers of economic growth in Nigeria. Furthermore, the coefficient of the Error Correction term was noted to be negative and significant at a 5% level, indicating the model's ability to correct deviations from the long-run equilibrium in the dependent variable. This suggests that economic forces work to restore equilibrium between variables over time. In conclusion, the study concludes that there exists a negative and significant relationship between exchange rates and economic growth, both in the short and long terms, in Nigeria. These findings underscore the importance of implementing policies aimed at stabilizing exchange rates, promoting purchasing power parity, and enhancing trade openness to support sustainable economic growth in the country. Based on the findings of the study, the following recommendations were made: Encouraging manufacturing firms to utilize locally made capital goods during periods of depreciating exchange rates is a practical approach to mitigate the negative impact on economic growth. It not only supports domestic industries but also stabilizes the economy by reducing reliance on foreign goods. Implementing effective foreign exchange control policies can indeed aid in determining a more accurate and stable value for the national currency. However, it's crucial to strike a balance between control measures and maintaining a conducive environment for international trade and investment. Disincentivizing high dependence on imports through tariffs can promote domestic production and reduce trade deficits. However, policymakers must consider the potential consequences such as increased costs for consumers and the need to ensure the competitiveness of domestic industries. Additionally, focusing on improving domestic productivity and competitiveness can complement tariff measures.

References:

1. Abdu, M., Umar, M. R., Mohammed, B. & Ajannah, J. M. (2021). Exchange rate fluctuations and economic growth nexus: An Empirical Evidence from Nigeria. *Asian Journal of Economics, Finance and Management*, 3(1), 491-498.
2. Agbaeze, C. C., Alamba, S. C. & Ejelonu, H. O. (2023). Exchange rate volatility and import volume: x-raying Nigeria's economic dependence. *Nigerian Journal of Management Sciences*, 24(1), 321-333.
3. Ajayi-Ojo, V. O. & Iyoha, M. A. (2022). Oil price volatility, exchange rate instability and economic growth in Nigeria: A Var study. *West African Financial and Economic Review*, 22(2), 1-22.
4. Anigbogu, T. U., Okoye, P.V.C., Anyanwu, N.K., & Okoli, M.I. (2014). Real exchange rate movement-misalignment and volatility- and the agricultural

- sector: Evidence from Nigeria. *American International Journal of Contemporary Research*, 4(7), 133-141.
5. Bahmani-Oskooee, M. & Arize, A. C. (2019). On the asymmetric effects of exchange rate volatility on trade flows: Evidence from Africa. *Emerging Markets Finance and Trade*, 1-28.
 6. Barguelli, A., Ben-Salha, O. & Zmami, M. (2018). Exchange rate volatility and economic growth. *Journal of Economic Integration*, 33(2), 1302~1336.
 7. Edoko, T. D., Nwagbala, S. C., Okpala, N. E. (2018). Impact of exchange rate on the performance of small and medium enterprises in Nigeria. *International Journal of Trend in Scientific Research and Development*. 2(4), 1553-1559.
 8. Ewubare, D. B. & Ushie, U. A. (2022). Exchange rate fluctuations and economic growth in Nigeria (1981 - 2020). *International Journal of Development and Economic Sustainability*, 10(1), 41-55,
 9. Farouq, I. S. & Sambo, N. U. (2022). Real exchange rate and economic growth: the interacting role of financial development in Nigeria. *Iranian Economic Review*, 26(4), 905-921
 10. Idris, M. & Shuyur, I. (2023). Impact of exchange rate fluctuation on economic growth in Nigeria. *Asian Journal of Economics and Finance*. 5(1), 39-60.
 11. Iheanachor, N. & Ozegbe, A. E. (2021). The consequences of exchange rate fluctuations on Nigeria's economic performance: An autoregressive distributed lag (ARDL) approach, *International Journal of Management, Economics and Social Sciences*, 10(3), 68-87.
 12. Ijirshar, V. U., Ushie, H. E., Agya, A. A., Bundepuun, F. D. & Udoji, U. (undated). Nexus between exchange rate volatility and trade flows in Nigeria nexus between exchange rate volatility and trade flows in Nigeria. Available at: ssrn.com.
 13. Iloegbu, K.A. & Atueyi, C.L (2020). Government expenditure and economic growth in Nigeria: A Disaggregated Analysis. *International Academic Journal of Business School* 13 (8) 45-60
 14. Odoh, C., Ugwoke, O. V. & Onyeonu, E. O. (2023). Exchange rate fluctuations and economic development in Nigeria. *International Journal of Mechanical Engineering and Technology (IJMET)*. 14(3), 46-61.
 15. Odoh, Cletus; Ugwoke, Obioma Vivian and Onyeonu, Edith Ogomegbunam (2023). Exchange rate fluctuations and economic development in Nigeria, *International Journal of Mechanical Engineering and Technology (IJMET)*, 14(03), 46-61.
 16. Ohwojoro, P. E. & Onyeoma, S. (2022). The influence of exchange rate fluctuation on economic growth in Nigeria. www.researchgate.net.

17. Okogor, C., Orubu, C. O. & Ezi, C. T. (2023). Exchange rate volatility and its impact on Nigeria's exports: An Autoregressive Distributed Lag (ARDL) Analysis. *Acta Universitatis Danubius*, 19(5), 152-175.
18. Padonu, N., Obi, J. U. & Elesho, Y. A. (2023). The impact of exchange rate, inflation and interest rate on economic growth of Nigeria. *Global Scientific Journal*, 11(6), 2994-3016.
19. Uche, E & Nwami, S. I. (2021). Dynamic effects of exchange rate movements on productivity levels: New Evidence From Nigeria Based on NARDL. *Journal of Development Policy and Practice*, 7(1) 96–111.

Appendix

Null Hypothesis: LRGDP has a unit root

Exogenous: None

Lag Length: 1 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.310158	0.9941
Test critical values:		
1% level	-2.622585	
5% level	-1.949097	
10% level	-1.611824	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LRGDP)

Method: Least Squares

Date: 10/22/24 Time: 08:07

Sample (adjusted): 1983 2023

Included observations: 41 after adjustments

	Coefficie			
Variable	nt	Std. Error	t-Statistic	Prob.
LRGDP(-1)	0.001636	0.000708	2.310158	0.0263
D(LRGDP(-1))	0.558328	0.131823	4.235435	0.0001
R-squared	0.311708	Mean dependent var		0.038426
Adjusted R-	0.294059	S.D. dependent var		0.040876

squared -
 S.E. of regression 0.034344 Akaike info criterion 3.857206
 Sum squared -
 resid 0.046002 Schwarz criterion 3.773618
 -
 Log likelihood 81.07273 Hannan-Quinn criter. 3.826768
 Durbin-Watson
 stat 1.975368

Null Hypothesis: RER has a unit root
 Exogenous: None
 Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.095082	0.9993
Test critical values:		
1% level	-2.621185	
5% level	-1.948886	
10% level	-1.611932	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(RER)
 Method: Least Squares
 Date: 10/22/24 Time: 08:08
 Sample (adjusted): 1982 2023
 Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RER(-1)	0.054589	0.017637	3.095082	0.0035
R-squared	0.001238	Mean dependent var	8.670238	
Adjusted R-squared	0.001238	S.D. dependent var	18.21409	

S.E. of regression 18.20282 Akaike info criterion 8.664551
 Sum squared
 resid 13585.04 Schwarz criterion 8.705924
 Log likelihood -180.9556 Hannan-Quinn criter. 8.679716
 Durbin-Watson
 stat 1.624249

Null Hypothesis: LFDI has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.345872	0.9946
Test critical		
values:		
1% level	-2.621185	
5% level	-1.948886	
10% level	-1.611932	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LFDI)

Method: Least Squares

Date: 10/22/24 Time: 08:08

Sample (adjusted): 1982 2023

Included observations: 42 after adjustments

Variable	Coefficie	nt	Std. Error	t-Statistic	Prob.
LFDI(-1)	0.013660	0.005823	2.345872	0.0239	
R-squared	-0.060371	Mean dependent var	0.174925		
Adjusted R-					
squared	-0.060371	S.D. dependent var	0.393242		
S.E. of regression	0.404939	Akaike info criterion	1.053359		
Sum squared					
resid	6.722987	Schwarz criterion	1.094732		
Log likelihood	-21.12054	Hannan-Quinn criter.	1.068524		

Durbin-Watson

stat 2.090286

Null Hypothesis: TOP has a unit root

Exogenous: None

Lag Length: 7 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.837813	0.8875
Test critical values:		
1% level	-2.632688	
5% level	-1.950687	
10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(TOP)

Method: Least Squares

Date: 10/22/24 Time: 08:09

Sample (adjusted): 1989 2023

Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TOP(-1)	0.024931	0.029757	0.837813	0.4095
D(TOP(-1))	-0.529130	0.170699	-3.099784	0.0045
D(TOP(-2))	-0.216721	0.196803	-1.101209	0.2805
D(TOP(-3))	-0.222948	0.199492	-1.117582	0.2736
D(TOP(-4))	0.030447	0.200367	0.151954	0.8804
D(TOP(-5))	0.149793	0.183979	0.814184	0.4227
D(TOP(-6))	-0.046743	0.172758	-0.270568	0.7888
D(TOP(-7))	-0.369355	0.152901	-2.415648	0.0227
R-squared	0.481719	Mean dependent var	0.007429	
Adjusted R-squared	0.347349	S.D. dependent var	0.119049	
S.E. of regression	0.096176	Akaike info criterion	-	

			1.647649
Sum squared			-
resid	0.249743	Schwarz criterion	1.292141
			-
Log likelihood	36.83386	Hannan-Quinn criter.	1.524928
Durbin-Watson			
stat	1.934456		

2ND

Null Hypothesis: D(LRGDP) has a unit root

Exogenous: None

Lag Length: 1 (Automatic - based on HQ, maxlag=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.987735	0.0000
Test critical		
values:	1% level	-2.624057
	5% level	-1.949319
	10% level	-1.611711

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LRGDP,2)

Method: Least Squares

Date: 10/22/24 Time: 08:10

Sample (adjusted): 1984 2023

Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LRGDP(-1))	-0.208002	0.104643	-1.987735	0.0541
D(LRGDP(-1),2)	-0.148908	0.153437	-0.970483	0.3379
R-squared	0.153289	Mean dependent var		0.001985
Adjusted R-squared	0.131007	S.D. dependent var		0.037689
S.E. of regression	0.035133	Akaike info criterion		-

			3.810633
Sum squared			-
resid	0.046905	Schwarz criterion	3.726189
			-
Log likelihood	78.21265	Hannan-Quinn criter.	3.780100
Durbin-Watson			
stat	1.877597		

Null Hypothesis: D(RER) has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on HQ, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.253090	0.0001
Test critical			
values:	1% level	-2.622585	
	5% level	-1.949097	
	10% level	-1.611824	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RER,2)

Method: Least Squares

Date: 10/22/24 Time: 08:11

Sample (adjusted): 1983 2023

Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RER(-1))	-0.622833	0.146442	-4.253090	0.0001
R-squared	0.311398	Mean dependent var		0.025122
Adjusted R-squared	0.311398	S.D. dependent var		22.84512
S.E. of regression	18.95735	Akaike info criterion		8.746348
Sum squared	14375.24	Schwarz criterion		8.788143

resid
 Log likelihood -178.3001 Hannan-Quinn criter. 8.761567
 Durbin-Watson
 stat 2.036665

+

Null Hypothesis: D(LFDI) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on HQ, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.438884	0.0000
Test critical values:		
1% level	-3.600987	
5% level	-2.935001	
10% level	-2.605836	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LFDI,2)
 Method: Least Squares
 Date: 10/22/24 Time: 08:12
 Sample (adjusted): 1983 2023
 Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFDI(-1))	-1.134891	0.152562	-7.438884	0.0000
C	0.216120	0.065794	3.284809	0.0022
R-squared	0.586589	Mean dependent var	0.012736	
Adjusted R-squared	0.575988	S.D. dependent var	0.588469	
S.E. of regression	0.383189	Akaike info criterion	0.966973	
Sum squared resid	5.726514	Schwarz criterion	1.050562	
Log likelihood	-17.82295	Hannan-Quinn criter.	0.997411	
F-statistic	55.33700	Durbin-Watson stat	1.906881	

Prob(F-statistic) 0.000000

Null Hypothesis: D(TOP) has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on HQ, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.849092	0.0000
Test critical values:		
1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(TOP,2)

Method: Least Squares

Date: 10/22/24 Time: 08:12

Sample (adjusted): 1985 2023

Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TOP(-1))	-2.088697	0.357098	-5.849092	0.0000
D(TOP(-1),2)	0.558271	0.274527	2.033572	0.0496
D(TOP(-2),2)	0.306908	0.154502	1.986431	0.0549
C	0.017885	0.016860	1.060788	0.2961
R-squared	0.760476	Mean dependent var		0.002308
Adjusted R-squared	0.739945	S.D. dependent var		0.204649
S.E. of regression	0.104362	Akaike info criterion		1.584985
Sum squared resid	0.381201	Schwarz criterion		1.414364
Log likelihood	34.90721	Hannan-Quinn criter.		1.523768

F-statistic 37.04102 Durbin-Watson stat 2.053901
 Prob(F-statistic) 0.000000

Date: 10/22/24 Time: 08:13
 Sample (adjusted): 1984 2023
 Included observations: 40 after adjustments
 Trend assumption: No deterministic trend (restricted constant)
 Series: LRGDP RER LFDI TOP
 Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesize		Trace	0.05 Critical Value	Prob.**
d	Eigenvalue			
No. of CE(s)		Statistic		
None *	0.536876	59.15214	54.07904	0.0165
At most 1	0.352830	28.36173	35.19275	0.2255
At most 2	0.202412	10.95588	20.26184	0.5463
At most 3	0.046612	1.909351	9.164546	0.7957

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesize		Max-Eigen	0.05 Critical Value	Prob.**
d	Eigenvalue			
No. of CE(s)		Statistic		
None *	0.536876	30.79041	28.58808	0.0257
At most 1	0.352830	17.40585	22.29962	0.2098
At most 2	0.202412	9.046526	15.89210	0.4289
At most 3	0.046612	1.909351	9.164546	0.7957

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

****MacKinnon-Haug-Michelis (1999) p-valu**

**Unrestricted Cointegrating Coefficients (normalized by
b'S11*b=I):**

LRGDP	RER	LFDI	TOP	C
-10.16054	0.006350	2.941097	-19.49450	86.78590
1.051186	0.005294	-0.514927	0.055575	-8.315183
1.429146	-0.008601	0.302196	3.462265	-19.06087
-6.365919	0.011680	0.779411	4.378651	53.93120

Unrestricted Adjustment Coefficients (alpha):

D(LRGDP)	0.010959	-0.009986	-0.005051	0.003751
D(RER)	-3.569045	-7.157335	4.803626	-1.119530
D(LFDI)	-0.063790	-0.072046	-0.149912	-0.016293
D(TOP)	0.057741	0.012884	0.001755	-0.011187

**1 Cointegrating
Equation(s):** **Log
likelihood** -49.44318

**Normalized cointegrating coefficients (standard error in
parentheses)**

LRGDP	RER	LFDI	TOP	C
1.000000	-0.000625 (0.00036)	-0.289463 (0.02107)	1.918648 (0.23772)	-8.541463 (0.12111)

**Adjustment coefficients (standard error in
parentheses)**

D(LRGDP)	-0.111345 (0.05207)
D(RER)	36.26344 (31.4531)
D(LFDI)	0.648144 (0.67037)
D(TOP)	-0.586679 (0.14190)

2 Cointegrating Log
Equation(s): likelihood -40.74026

Normalized cointegrating coefficients (standard error in parentheses)

LRGDP	RER	LFDI	TOP	C
1.000000	0.000000	-0.311583 (0.02141)	1.712693 (0.39327)	-8.471790 (0.17007)
0.000000	1.000000	-35.39687 (29.8101)	-329.5695 (547.688)	111.4908 (236.842)

Dependent Variable: LRGDP

Method: Least Squares

Date: 10/22/24 Time: 08:16

Sample (adjusted): 1982 2023

Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.582562	0.073460	116.8334	0.0000
RER	-0.001929	0.000177	-4.089511	0.0040
LFDI	0.149892	0.009404	5.193840	0.0023
TOP	0.022623	0.116972	3.193405	0.0077
ECM(-1)	-0.843232	0.093503	-9.018191	0.0000
R-squared	0.785134	Mean dependent var	10.39303	
Adjusted R-squared	0.773527	S.D. dependent var	0.600595	
S.E. of regression	0.077085	Akaike info criterion	2.176470	
Sum squared resid	0.219858	Schwarz criterion	1.969604	
Log likelihood	50.70586	Hannan-Quinn criter.	2.100645	
F-statistic	61.29728	Durbin-Watson stat	1.844209	
Prob(F-statistic)	0.000000			

Breusch-Godfrey Serial Correlation LM Test:

F-statistic 2.100106 Prob. F(2,35) 0.1376
 Obs*R-squared 4.500202 Prob. Chi-Square(2) 0.1054

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 10/22/24 Time: 08:18

Sample: 1982 2023

Included observations: 42

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.013786	0.071696	0.192280	0.8486
RER	6.16E-05	0.000176	0.350670	0.7279
LFDI	-0.003961	0.009540	-0.415235	0.6805
TOP	0.036153	0.118731	0.304495	0.7626
ECM(-1)	-0.142407	0.121404	-1.172998	0.2487
RESID(-1)	0.200025	0.208227	0.960607	0.3433
RESID(-2)	0.370086	0.184775	2.002903	0.0530
R-squared	0.107148	Mean dependent var	1.05E-15	
Adjusted R-squared	-0.045913	S.D. dependent var	0.073228	
				-
S.E. of regression	0.074891	Akaike info criterion	2.194566	
Sum squared resid				-
	0.196301	Schwarz criterion	1.904954	
				-
Log likelihood	53.08588	Hannan-Quinn criter.	2.088411	
F-statistic	0.700035	Durbin-Watson stat	1.885605	
Prob(F-statistic)	0.651369			

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic 12.24577 Prob. F(4,38) 0.0000
 Obs*R-squared 24.21474 Prob. Chi-Square(4) 0.0001
 Scaled explained 15.08397 Prob. Chi-Square(4) 0.0045

SS

Test Equation:
 Dependent Variable: RESID^2
 Method: Least Squares
 Date: 10/22/24 Time: 08:19
 Sample: 1981 2023
 Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.68E-27	2.69E-28	6.228867	0.0000
RER	5.43E-31	6.71E-31	0.808966	0.4236
LFDI	-9.92E-29	3.45E-29	-2.870726	0.0067
TOP	-6.44E-28	4.31E-28	-1.494709	0.1432
ECM	1.13E-27	3.44E-28	3.291501	0.0022
R-squared	0.563133	Mean dependent var	3.33E-28	
Adjusted R-squared	0.517147	S.D. dependent var	4.25E-28	
S.E. of regression	2.95E-28	Sum squared resid	3.32E-54	
F-statistic	12.24577	Durbin-Watson stat	0.761941	
Prob(F-statistic)	0.000002			

Data for the Model

	LRGDP	RER	LFDI	TOP	ECM
1981	9.632859	0.61	5.837147	0.47	0.173135
1982	9.614810	0.67	5.314191	0.5	0.241193
1983	9.536021	0.72	5.708106	0.39	0.074250
1984	9.530920	0.76	5.511006	0.31	0.077439
1985	9.612728	0.89	6.208791	0.27	0.043922
1986	9.631547	2.02	6.313729	0.28	0.047298
1987	9.633248	4.02	7.674153	0.22	-0.174757
1988	9.693715	4.54	7.922043	0.46	-0.089084
1989	9.758154	7.39	7.991051	0.38	-0.062098
1990	9.868152	8.04	8.089360	0.41	0.039742
1991	9.862617	9.91	8.450476	0.58	0.021129
1992	9.884314	17.3	8.349437	0.68	0.068870

1993	9.899881	22.05	8.515452	0.65	0.041682
1994	9.902443	21.89	8.584665	0.56	0.010435
1995	9.920993	21.89	10.04742	0.41	-0.229677
1996	9.960714	21.89	10.05739	0.88	-0.067259
1997	9.989165	21.89	10.28067	0.69	-0.122446
1998	10.01381	21.89	10.43618	0.74	-0.107870
1999	10.01902	92.69	9.877806	0.59	-0.207283
2000	10.07274	102.11	10.11952	0.64	-0.196320
2001	10.13728	111.94	10.24027	0.64	-0.170490
2002	10.27359	120.97	11.45881	0.68	-0.225016
2003	10.36437	129.36	11.45928	0.47	-0.207406
2004	10.46369	133.5	11.63788	0.61	-0.106525
2005	10.53143	132.15	11.57078	0.58	-0.033834
2006	10.59652	128.65	11.80257	0.69	0.032964
2007	10.66715	125.83	12.20236	0.56	0.015297
2008	10.73667	118.57	12.44076	0.59	0.072282
2009	10.81690	148.88	12.60046	0.63	0.075553
2010	10.90801	150.3	12.91375	0.54	0.092998
2011	10.95973	153.86	13.11757	0.56	0.112011
2012	11.00093	157.5	13.07341	0.65	0.175964
2013	11.05436	157.31	13.11543	0.68	0.231423
2014	11.11473	158.55	13.11543	0.69	0.291832
2015	11.14221	193.28	13.12571	0.62	0.226390
2016	11.12625	253.49	13.14539	0.63	0.083762
2017	11.13446	305.79	13.14718	0.65	-0.012781
2018	11.15339	306.08	13.14887	0.66	0.007931
2019	11.17588	306.92	13.16267	0.68	0.031881
2020	11.17679	358.81	13.17870	0.69	-0.075869
2021	11.18805	360.45	13.17012	0.7	-0.064127
2022	11.18967	363.67	13.18475	0.71	-0.068817
2023	11.19029	364.76	13.18398	0.72	-0.067725