



The Impact of Foreign Exchange Rate Volatility on Economic Growth of Nigeria

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Abstract. The study examined the impact of foreign exchange volatility on economic growth using trade balance and foreign direct investment. Data for this series were assessed from Central Bank of Nigeria Statistics Bulletin covering from 1990-2023. Autoregressive Distributed Lag Model and estimation technique was employed using STATA. The result showed that there is a positive relationship between exchange rate and GDP growth rate. However, Exchange rate volatility, FDI as a percentage of GDP and foreign reserve exhibits a negative but insignificant relationship with the growth rate of GDP. 1 percent increase in Exchange rate volatility, FDI as a percentage of GDP and foreign reserve leads to 19%, 426% and 469% fall in the growth rate of GDP. The R-squared value of 0.680206 indicates that approximately 68% of the variation in the dependent variable, growth rate (GDP), is explained by the variation of the independent variables included in the model. Specifically, Foreign exchange volatility (EVAT) was found to have insignificant impact on economic growth in Nigeria both in the long run and the short run while inflation was found to have significant impact on economic growth both in the long-run and in the short run. In affirmative, the result suggests that FDI, OPN, RES and FTB were all found to have significant impact on economic growth in the short run. The study suggests that it is imperative for policymakers in Nigeria to prioritize measures aimed at addressing the foreign exchange volatility, ensuring the stability of inflation and ensuring the existence of balanced trade if not a surplus balance.

Keywords: Impact, Foreign Exchange rate, Volatility, Economic Growth, and Nigeria

1. Introduction

The Nigerian economy has been bedeviled by the challenge of instability in its foreign exchange rate

market due to a high level of volatility (Kelikume & Nwani, 2019). Exchange rate fluctuation is the continuous gyration in the foreign exchange market of nations which has emerged as the dominant subject of discussion in recent international finance literature owing to its fatal consequences on the economies of developing nations like Nigeria (Alagidede and Ibrahim, 2023). In Nigeria, the formulation and implementation of the infamous Structural Adjustment Programmed (SAP), a component of the Economic Recovery Program (ERP) in 1986, introduced financial sector reforms. Part of the reforms includes the jettisoning of the fixed exchange rates in favor of the free-floating regime in the late 1980s. This transition was conducted based on the assumption that flexible exchange rates would curb the boom-and-bust syndrome and turn the country towards a growth trajectory.

The adverse impact of the global economic and financial crisis on the Nigerian exchange rate was a phenomenon as the Naira exchange rate to the dollar rose dramatically from about ₦120/\$ to more than ₦180/\$ between 2008 and 2009. In 2023, Nigeria witnessed an unprecedented surge in the inflation rate, reaching an 18-year high of 28.9 percent as of December 2023, with an average of 24.5 percent for the year. The enduring inflationary pressures stemmed from global supply chain disruptions resulting from the prolonged Russia-Ukraine conflict, heightened energy prices, and food scarcity. Domestically, challenges such as disrupted planting activities, fuel subsidy removal, exchange rate depreciation, and escalating logistic costs had substantially increased business operating expenses and impeded overall productivity. The non-oil sector retained its role as the primary driver of the economy, exhibiting a growth rate of 3.0 percent and contributing 94.3 percent to the total real GDP in the first three quarters of 2023 (Naseem, 2012). Conversely, the Oil sector remained

in recession, contracting by 6.2 percent due to persistent oil theft, ageing infrastructure, and insufficient investments (Tayo & Aduloju, 2023).

Some factors which cause volatility in the exchange rate are government policy, interaction of demand and supply, activities of the Nigerian Stock Exchange (NSE), international trade oil glut and recession. However, there were inadequacies in the exchange control system as a major control mechanism. This led to the introduction of the Second-Tier foreign exchange market (SFEM) in 1986. The SFEM was a market established by law for the buying and selling of foreign exchange at market determined rates. The aims of the SFEM were to develop a realistic market-oriented exchange rate for the naira, so as to reduce the demand for foreign exchange to the available supply, reduce the pressures on the balance of payments in order to stop further accumulation of trade debts, reduce imports, stimulate export and pave the way to a self-reliant and sustainable growth. Unfortunately, the Nigeria foreign exchange market has not performed maximally, even with the introduction of various institutional reforms like Bureau De Change (1989), the Autonomous Foreign Exchange Market (AFEM) (1995), and the Inter-Bank Foreign Exchange Market (IFEM) (1999). The dividing foreign exchange earnings, according to Obadan (2016) has been as a result of some factors like weak capital market, poor management of diversified risk and weakness on the part of Bureau De Change in earning a stable and efficient exchange volatility rate in the Nigerian economy.

However, fluctuations in exchange rate in Nigeria have been more in the post Structural Adjustment Program (SAP) because of external shock from sharp decline in the international crude oil prices which affects Nigeria's external reserve. This consequence of foreign exchange rate volatility has led the researcher to ask the following questions:

To what extent does foreign exchange rate volatility affect economic growth in Nigeria?

Based on this question, the present study examined foreign exchange volatility and its consequence on economic growth in Nigeria.

1.1 Statement of the Problem

Nigeria's foreign exchange rate has been a theme of discuss between policy makers, concerned monetary authorities and academics because of the recognition of the vital role exchange rate plays in the achievement of sustainable growth. Optimal foreign exchange rate policy is designed to obtain real exchange rate (RER)

that maintains both internal and external balance (Agu, 2015). However, maintaining a realistic exchange rate for the Naira in Nigeria is very crucial, given the peculiar structure of the Nigerian economy. For example, the Naira, be denoted here in after as the Naira sign (N) unless stated otherwise, has continued to depreciate from N0.61 in 1981 to N2.02 in 1986. In addition, towards the end of the year 2022, the naira depreciated to N750 and in February, 2022 the exchange rate of one US dollar (USD) to Naira was over N800 for the official rate while the parallel market rate was about N1,200 and above due to lack of aggregate monetary policy of naira control over exchange rate volatility in Nigeria.

However, since the introduction of Structural Adjustment Programme (SAP) in 1986 till date, Nigeria has adopted various types of foreign exchange rate policies. Worthy of note is that despite the adoption of various types of foreign exchange rate mechanisms over the years, the policy over currency floating might affect exchange rate volatility since it has exhibited the features of continuous depreciation and instability as well as failed to maintain both internal and external balances causing declines in the standard of living in the economy, increased cost of production which also leads to cost push inflation. In addition, this has tended to undermine the international competitiveness of non-oil exports and made planning and projections difficult at both micro and macro levels of the economy. A good number of small and medium scale enterprises have been strangled out as a result of low dollar/ naira exchange rate.

1.2 Objective of the Study

The main objective of this study is to investigate foreign exchange rate volatility and its consequence on economic growth in Nigeria. The specific objectives of the study are to:

- Determine impact of foreign exchange rate volatility on economic growth of Nigeria.

1.3 Research Question

To what extent is the dose foreign exchange rate volatility impact on economic growth of Nigeria?

1.4 Hypothesis

Ho₁: There is no significant impact of foreign exchange volatility and economic growth of Nigeria.

2. Review of Related Literature

2.1 Exchange Rate

According to International Monetary Fund (IMF), cited in Mati, (2014), "Foreign Exchange is " a monetary authorities' holdings of claims on foreigners in the form of bank deposits, treasury bills, short-term and long-term government securities and other claims usable in the events of balance of payment deficits, including non-marketable claims arising from inter-central banks and inter-government arrangements, without regard to whether the claim is denominated in the currency of the debtor or creditor". However, foreign exchange rate market "can be defined as foreign currency or any other financial instruments acceptable as a means of payment or exchange for international transactions (Oduola, 2021). The emphasis here is the rate of exchange of the currencies.

Fixed or Pegged Exchange Rates: The fixed exchange rate is a phenomenon which occurs when the rate of a currency against other currencies is fixed. Under the pegged exchanged rates, all exchange transactions take place at an exchange rate that is determined by the monetary authorities (Adetifa, 2015). This connotes that the exchange rate of a currency to other currencies is stable. This allows for an increase in reserve of the country if there is a favourable balance of trade. International trade is encouraged because prices of goods are more predictable and long-term capital flows in an orderly manner can be encouraged.

Fluctuating Exchange Rates: This occurs when the currency of a country against other currencies is not stable. The rates are determined by market forces. This implies that the market is unpredictable, thus, leading to economic instability, high risk, possibility of incurring loss on investment in foreign exchange. Under this volatility of freely fluctuating exchange rates, if there is an excess supply of a currency, the value of that currency in foreign exchange market will fall. This will lead to depreciation of the exchange rate. For example, like we have in Nigeria at present, where the exchange rate of Nigeria naira to America dollar was N158 to \$1 as at December 2022 but has moved to N168 to \$1 by December 2023 in the open market. This is as a result of high demand for dollar and excess supply of naira. On the other hand, shortage of a currency will lead to the appreciation of exchange rate thereby leading to restoration of equilibrium in the exchange market. These market forces operate automatically without any actions on the part of monetary authorities (Adetifa, 2023). The excessiveness of naira floating caused subsequent implication to foreign exchange volatility which

affects economic growth of the Nigeria today, there is high inflation, interest rate, low foreign direct investment, poor development of small scale and medium business across the country. The absence of the economic factors leads to low inadequate economic growth in Nigeria (Adu, 2024).

Foreign exchange rate volatility is seen as a general phenomenon around the globe which might have adverse effect on trade. Economists are still very much interested in the operations involved in exchange rate especially in developing countries. Exchange rate uncertainty is said to probably have a negative effect on international trade as bilateral trades are threatened with the risks involved. The economic relationship supporting the negative link is the unwillingness of firms to take on risky activity, namely trade (Anderton & Skudely (2021). Exchange rate volatility is a risk associated with unexpected changes in exchange rate. This is caused by some economic factors such as inflation rate, interest rate and balance of payments (Ozturk 2016).

2.2 Concept of Economic Growth

Economic growth involves changes in material production during a relative short period of time, usually one year. In economic theory, under the concept of economic growth implies an annual increase of material production expressed in value, the rate of growth of GDP or national income. Growth can be achieved, for it does not achieve the developmental course of the economy. Therefore, economic growth amounts involve not only an expansion in production resources, but also all the other socioeconomic processes and changes caused by the influence of economic and beyond economic factors (Senadza, 2021). So, we can view economic growth as amounts that involves not only an increase in material production, but also all the other socioeconomic processes and changes caused by the influence of economic and beyond economic factors (Diaba, 2017).

Economic growth refers to an increase in the size of a country's economy over a period of time. The size of an economy is typically measured by the total production of goods and services in the economy, which is called gross domestic product (GDP). Economic growth can be measured in 'nominal' or 'real' terms. Nominal economic growth refers to the increase in the dollar value of production over time. This includes changes in both the volume of production and the prices of goods and services produced. Economists normally talk about real economic growth that is, increases in the volume produced only, which takes away the effect of prices

changing. This is because it better reflects how much a country is producing at a given time, compared with other points in time. Modern economic growth is an incomplete process in its continuation which often changes the dominant trends. Economic growth is characterized by direction, social necessity, and also by government regulation. Scientific sources offer different definitions of “economic growth” category, and a lot of them claim to be a complete reflection of its essence. It is necessary to show two main points: firstly, such conceptions as “economic growth” and “economic development” should be distinguished, and secondly, in a variety of definitions of growth, as a rule, one or another essential characteristic of that category is reflected. An important feature of the development is in improving the welfare of all groups of the population, so that its financial security increases. But economic growth does not mean the equal financial security improvement of all groups of population (Waledele, 2018).

2.3 Impact of foreign exchange rate volatility

The nexus of economic growth and real exchange rate volatility has been well trashed out by existing economic and financial literatures through selected macro-economic variables and identities, such as trade, investment stocks, unemployment, and productivity. In the area of exchange rate volatility and economic growth, Javed and Faoq (2019) using the auto regressive distributed lag model in the study of this relationship in Pakistan discovered that domestic economic performance is very sensitive to exchange rate volatility in the long run. The link between foreign exchange volatility and economic growth is still up for debate. There are three types of studies in this area: those that believe a fixed exchange rate regime can contribute to faster economic growth; those that believe a floating exchange rate regime can contribute to faster economic growth; and those that believe a floating exchange rate regime can contribute to slow economic growth. Moreno (2020), on the other hand, discovered that the foreign exchange system has a beneficial impact on economic growth, with nations with pegged exchange rates growing faster than those with fixed rates. A major goal of macroeconomic policy is rapid economic growth in a country. Economic growth is measured in terms of persistent growth in national income which translates to increase in the amount of goods and services produced in an economy. Production of goods and services involve exports and imports which in turn involves transactions in foreign exchange. Foreign exchange volatility in post Bretton Wood System has been characterized by instability and this has raised concern about its effect on economic growth. The impact of

exchange rate volatility on growth, seen as a comprehensive measure of the benefits and costs of exchange rate stabilization can be x-rayed through international trade (imports/exports), foreign direct investment, credit flow, and asymmetric shock, some of the most important transmission channels from exchange rate volatility on growth (Arratibel, Furceri, Martin and Zdzienicka, 2019). Previous research on the impact of exchange rate stability on growth has tended to find weak evidence in favour of a positive impact of exchange rate stability on growth. For large country samples in the words of Ghosh, Gulde and Wolf (2013), there is weak evidence that exchange rate stability affects growth in a positive or negative way.

The appreciation of currency happens by an upward movement while a downward movement indicates a loss in value (depreciation) against exchange rate (Anyanwu, Ananwude, & Okoye, 2017). The issue of exchange rate volatility and management in both developing and developed economies has attracted the attention of researchers and policymakers especially due to its impact on macroeconomic indicators: on investment. The centrality of exchange rate as one of the major macroeconomic policies derives from the fact that for most countries, the prevailing objective of monetary policy is price stability. Consequently, volatility in the exchange rate is generally counter-productive to the goals of price stability. This explains the political sensitivity of exchange rate regimes in both developing and developed economies. There is a widespread presumption that volatility of the exchange rates of developing countries is one of the main sources of economic instability in the world. The impact of the global economy on emerging countries like Nigeria is driven significantly by swings among the currencies of the major economic powers like United State. In recent years, these swings have been enormous, volatile and frequently unrelated to underlying economic fundamentals (Adeoye & Saibu, 2023). The swings and instability in exchange rates have prompted monetary authorities in developing countries to intervene on ad hoc and episodic basis, without any clear sense of a sustainable equilibrium. Such exchange rate stability intervention typically comes too late to prevent severe currency misalignment and volatility. These imbalances, in turn, trigger major economic distortions, protectionist trade pressures, and inevitably sharp currency reversals (Adeoye & Saibu, 2022).

An efficient and effective economic management is the ability to design and implement appropriate policies that enhance and facilitate high performance in an economy’s gross domestic product (GDP) vis-à-vis the balance of payment. In other words, a policy

that drives the economy in a positive direction towards the attainment of the ultimate goals of increased prosperity, sustainability, and general improvement on the standard of living. The instrument of macroeconomic management is either macroeconomic (fiscal, monetary, exchange rate, and external debt policy instrument) or microeconomic (sectoral policy instruments) comprising agricultural, industrial, and social sector development policies (Ojo, 2021). There is ample evidence, however, that the government did not use exchange rate policy effectively and actively to adjust and correct balance-of-payments disequilibrium. This confirms the statement of (Oshikoya, 2014) that “the limited adjustments in the official nominal exchange rate coupled with Nigeria's high inflation rate led to real exchange rates that appreciated by more than 64 percent between 1973 and 1984. The high real appreciation of the Nigerian currency caused imports to be 44 percent cheaper than nontraded goods in 1981 relative to 1972 and also intensified the Dutch disease phenomenon”. For the purposes of adjusting the balance of payments, one of the most significant macroeconomic policy instruments is the foreign exchange rate. It is therefore necessary to investigate the implications and nature of the foreign currency policies formulated, adopted and implemented by the government of Nigeria over the time period under discussion (1981 - 2020), as well as the impact of the fluctuations on the Nigerian economy, in order to better understand the situation combustion engine valve actuator. Furthermore, in conjunction with variable timing, the piezoelectric control-based pilot allows for direct regulation of other engine valve parameters including variable lift and seating velocity (Dornbusch 2020).

2.4 Consequences of foreign exchange volatility on economic growth in Nigeria

The Nigerian economy has been visibly distressed in the different phases of exchange rate management (ERM); each coming with its own, possible problem. According to Idika (2018), frequent changes in foreign exchange policies caused by unstable political environment have prevented these policies from coming full circle. Exchange rate stability, which is essential for growth is influenced greatly by the appropriate policy mix by government in their quest to attain macroeconomic targets. Fluctuations in exchange rate have powerful consequence on imports and exports of the countries in question through relative prices of goods. Mordi (2016) posited that the Nigerian economy is highly dependent on imports for both consumption and production. According to World Bank (2015), many oil producing nations are exposed to variations in exchange rate due their large

oil wealth. This variation which acts as tax on investment in trade goods production has adverse impact on growth especially on agricultural and manufacturing sectors. Ewa (2011) agreed that the exchange rate of the naira was relatively stable between 1970 and 1979 during the oil boom era and when agricultural produce accounted for more than 70% of the nation's Gross Domestic Products (GDP). In 1986 when Federal government adopted Structural Adjustment Programme (SAP), the country moved from a pegged to a flexible regime where foreign exchange rate was left completely to be determined by market forces but with monetary authorities intervening periodically in the foreign exchange market in order to attain some strategic objectives (Mordi, 2016). This inconsistency and lack of continuity in exchange rate policies aggravated the unstable nature of the naira rate which reduce the level of economic growth in Nigeria (Gbosi, 2023). Benson and Victor (2020) and Aliyu (2021) noted that despite various efforts by the government to maintain a stable exchange rate, the naira has depreciated throughout the 80's to date. Gross National Product (GNP) was similarly affected. The combined effects of exchange rate variability on GDP and GNP, among others, resulted in the abysmal low level of per capita income of Nigerians.

The economic implication of this may not be clear to the ordinary citizens. What they invariably understand is that the Naira has lost reasonable proportion of its purchasing power. This is often reflected in the quantity of goods and services purchased by Naira. Another area where deplorable state of the GDP and GNP in Nigeria usually become evident is in unemployment rate. Consequent upon the intrinsic relationship between these variables, unemployment rate in the country has continued to rise unabated with decline in the GDP and GNP. There is no gainsaying that the economic, psychological and physical consequences of unemployment in a country like Nigeria where provision of social welfare for the unemployed is seen as hallucination, can better be imagined than described. Following the seminal work of Mundell (1961) and McKinnon (1963) on optimum currency area (OCA) theory, examining foreign exchange rates volatility and its consequence to economic growth and overall performance in the short, medium and long-term has been a topical subject of debate in the international trade and finance literature. However, there is an absence of consensus among scholars in this research space. Even though some studies (Greenaway-McGrevy, 2018; Ismailov & Rossi, 2018) find evidence that exchange rates comove with macroeconomic foundation over long horizons, contemporary literature in international

finance is: exchange rates are unpredictable, especially at short horizons (Della et al., 2019).

The consequence of excess exchange rate volatility has been identified to reduce economic growth by creating business uncertainty, deteriorating competitiveness, lowering productivity and profits, and increasing domestic prices. Ahiabor and Amoah (2019) examined the link between exchange rate volatility and long-run productivity growth. It revealed a non-linearity between real exchange rate volatility and output volatility among emerging market economies. Their finding suggests that real exchange rate volatility aids in absorbing shock and limiting output volatility, but too much volatility in the exchange rate increases output volatility.

2.5 Theoretical Framework

The exogenous theory was adopted for this study. The exogenous growth model, also known as Solow's Theory, is used in this study. To characterise economic growth, one of the most popular models in economics is Solow's theory. In the model, total factor productivity results can lead to a country's standard of living increasing at an infinite rate. Solow's economic growth model introduced labour as a factor of production and capital output ratios that were not set as in Harrodmodel. Domar's According to the Economic Growth Model, the total amount of GDP is determined by factors such as population growth, technological advancement, and consumer spending. It is possible to achieve full employment in this model, with an overall output that shows consistent returns to scale. Solow (2002) combined the supply and demand sides of the economy when analysing the Balami (2006) economic growth cycle. He maintained that the supply side of neoclassical economics, which asserts $Q = f(K, L)$, is the best way to look at economic growth. This has led to it being referred to as the "neoclassical" growth model. Exogenous growth or a technological standard would be applied exogenously to the labour force, according to his theory. When it comes to long-term economic stability, Solow's model states that technological advancement is the only means for sustained growth in the economy. Changes in saving and population increase, according to his theories, have only long-term level effects. Notably, Solow's model implies that developing countries should grow quicker and eventually overtake more developed ones. According to Robert M. Solow's article published in 1957, the United States' economic growth is primarily driven by technological advancement, not land, capital, or labour (Solow 1957). The exogenous growth model was used to explain the interaction foreign exchange volatility and

its consequences on economic growth in Nigeria using the model explanation

Solow's growth model is based on three equations. He first assumes that output is a function of both capital and labour (Solow 1956, p. 66).

$$Y = F(K, L) \text{ for } K, L > 0 \tag{6a}$$

In intensive form per effective labour, equation (6a) is represented as:

$$Y = Lf(k) \text{ for } k = K/L \tag{6b}$$

To solve two unknowns, Solow assumes the rates of change for K and L overtime to be the following. For capital

$$\frac{dK}{dt} = k = Sy \tag{7a}$$

Alternatively from equation (6b) using the product rule, $K = Kl + kL$ (7b)

The labour force grows exponentially given by the following labour function

$$\frac{dL}{dt} = L = \lambda L \text{ for } \lambda > 0 \tag{7c}$$

The Solow growth model is therefore solved as follows, substituting equation (6b), (7b), and (7c) into (7a)

$$kL + k\lambda L = sLf(k) \tag{8a}$$

Dividing equation (8a) throughout by L and solving for k, we get the fundamental equation of the Solow growth model

$$k = sf(k) - (\lambda + \delta)k \tag{8b}$$

In the Solow growth model, the optimal growth path, where output, consumption and capital are maximized, will be at the intersection where $sf(k) = (\lambda + \delta)k$. The long-run growth rates are determined by exogenous elements in a closed economy. The transitional dynamics of the Solow growth model allows the growth path to converge to some optimum level even when exogenous shocks (s, λ) are experienced within the economy (Barro and Sala-i-Martin 2005, pp. 37–40). The strength of the Solow growth model, unlike the Domar model, depends on its convergence whenever there is an external shock. Solow argues that shifts in the production function caused by increases (or decreases) in the rates of savings, population growth and technological progress have temporal level effects. Once the shifts to the balanced growth path are made, the economy returns to its steady state growth path. For savings in a closed economic setting, there is a limit to which households can save their income for future consumption. Similarly, there is a limit to how much a population can grow or decrease. Solow's model proposition argues that it is only technological progress that would continue to generate level-effect economic growth in the long-run per capita income and consumption. As such, technological progress in the Solow neoclassical growth model is the only source of sustained long-run growth of per capita income (Solow 1956), and a source of international productivity differences. Because Solow's growth model is designed in a closed economic setting, this implies that the rate of growth driven by technology is

determined outside his model and is independent of any government policy intervention that may be instituted.

3. Research Methodology

Expos factor research design was adopted for this study. The model to capture the foreign exchange rate volatility on economic growth in Nigeria are stated below with the independent variables as Exchange Rate Volatility, Foreign Direct Investment, Foreign Trade Balance, International Oil Price in Naira, External Reserve, Inflation, Money supply, Interest Rate, while the dependent Variable is Gross Domestic product growth rate.

This is expressed functionally as GDP

The operational and log form of the model is stated thus:

$$GDP = \beta_0 + \beta_1 \log FDI + \beta_2 \log FTB + \beta_3 \log IOP + \beta_4 \log EXR + \beta_5 \log INF + \beta_6 \log MS + \beta_7 \log ITR + \mu_t \quad (3.1)$$

Where:

GDP= Gross Domestic Product Growth Rate.

ERV= Exchange Rate Volatility.

FDI= Foreign Direct Investment.

FTB= Foreign Trade Balance.

IOP = International Oil Price.

EXR = External Reserve.

INF = Inflation Rate

MS= money supply (captured by M₂)

ITR= Interest Rate

μ_t = stochastic error term.

The model is represented mathematically to define the dependent and independent variable as indicated in the equation

$$GDP = \beta_0 + \beta_1 \log FDI + \beta_2 \log FTB + \beta_3 \log IOP + \beta_4 \log EXR + \beta_5 \log INF + \beta_6 \log MS + \beta_7 \log ITR + \mu_t \quad (3.2)$$

Where β_0 = the intercept or the constant.

β_1, β_2 = the co-efficient of the explanatory variable.

μ_t = stochastic error term.

4. Results and Discussion

Descriptive Statistics

Table 4.1: Descriptive Statistics of Variables

	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min.</i>	<i>Max.</i>
Gross Domestic Product Growth Rate (GDP)	34	21.21	15.07	5.59	75.27
Exchange Rate Volatility (EVAT)	34	22.78	21.11	0.04	66.55
Foreign Direct Investment (FDI)	34	1.25	0.90	-0.83	2.90
Foreign Trade Balance (FTB)	34	28.86	9.74	8.72	42.93
International Oil Price (OPN)	34	12.50	5.85	2.68	28.70
External Reserve (RES)	34	23.36	1.21	20.90	24.70
Money Supply (MS)	34	7.88	2.18	3.82	10.78
Inflation Rate (INF)	34	18.51	16.60	0.22	76.75
Interest Rate (INT)	34	18.06	3.74	11.48	29.8

Source: Author's Computation using Stata 16

Gujarati (2003) defines μ_t as a random variable that has well defined probabilistic properties. The μ_t stochastic error term represent other determinants of economic growth not explicitly taken into account by the above model.

The apriori expectation:

$$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8 > 0; \beta_4 < 0$$

Estimation Procedure

Unit root

It is used to test for the stationarity of the time series data. Augmented Dickey fuller will be used in the process. In considering the levels the data could be said to be integrated of order 1 which is often denoted as I(1) or 2 represented by I(2).

The null hypothesis is that $\alpha_I = 0$. If the null hypothesis $\alpha_I = 1$, then we conclude that the series under consideration $\Delta(y_t)$ has a unit root and is therefore non-stationary. If the ADF test fails to reject the test in levels but rejects the test in first differences, then the series contains one unit root and is of integrated order one I (1). If the test fails to reject the test in levels and first differences but rejects the test in second differences, then the series contains two-unit roots and is of integrated order two I(2).

The Philip-Perron (PP) Unit Root Test is implemented to justify the results of ADF test. The equation is thus:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \varepsilon_t \quad 3.4$$

The result emanating from the model is evaluated based on the following criteria: Economic, Statistical and Econometric Criteria.

Sources of Data The dataset for this study is from secondary source and obtained from the Central Bank of Nigeria's Statistical Bulletin and the National Bureau of statistics. The period of the study is from 1990- 2021 inclusive, an annual data of 33 years.

The table presented provides descriptive statistics for various macroeconomic variables over a sample of 34 observations. The variables include the Gross Domestic Product Growth Rate (GDP), Exchange Rate Volatility (EVAT), Foreign Direct Investment (FDI), Foreign Trade Balance (FTB), International Oil Price (IOP), External Reserve (RES), Money Supply (MS), Inflation Rate (INF), and Interest Rate (INT). The table reports the mean, standard deviation, minimum, and maximum values for each variable, offering insight into the central tendency, dispersion, and range of these economic indicators.

The average GDP growth rate is 21.21%, indicating a relatively high growth period in the sample. This suggests robust economic activity, although the standard deviation of 15.07% highlights significant fluctuations in growth rates across different periods. High GDP growth is typically associated with increased production, employment, and income levels, contributing positively to economic development. However, the high standard deviation may indicate periods of volatility and economic uncertainty, which can affect investor confidence and long-term economic planning.

The average exchange rate volatility is 22.78, with a standard deviation of 21.11, reflecting considerable fluctuations in the exchange rate over time. High exchange rate volatility can create uncertainty in international trade and investment decisions. It may lead to increased costs for businesses involved in international transactions, potentially reducing foreign investment and trade volumes. Additionally, it could affect inflationary pressures if the exchange rate fluctuations lead to higher import costs.

The mean FDI is 1.25%, with a standard deviation of 0.90%, indicating a relatively stable inflow of foreign investment during the period studied. Steady FDI inflows suggest investor confidence in the economy's stability and growth prospects. However, the relatively low mean FDI may indicate that there are structural challenges or barriers that need to be addressed to attract higher levels of foreign investment, which is crucial for technology transfer, job creation, and economic growth.

The mean of FTB is 28.86, with a standard deviation of 9.74, indicating a consistent surplus in the trade balance. A positive trade balance suggests that the country is exporting more than it is importing, contributing positively to GDP. However, reliance on trade surpluses might expose the economy to external shocks, such as changes in global demand or

commodity prices, particularly if the exports are not diversified.

The average international oil price is 12.50, with a standard deviation of 5.55, reflecting the volatility in global oil markets. As an oil-exporting country, fluctuations in international oil prices can significantly impact the economy. Higher oil prices may boost export revenues and improve the trade balance, while lower prices could lead to budget deficits and reduced foreign exchange reserves. The economy's dependency on oil underscores the need for diversification to mitigate the risks associated with oil price volatility.

The mean external reserve is 23.36, with a standard deviation of 1.21, indicating relatively stable reserves during the period. Sufficient external reserves provide a buffer against external shocks, support currency stability, and enhance the country's ability to meet its international obligations. The stability in reserves suggests prudent fiscal and monetary policies, although continuous monitoring is essential to maintain this stability, especially in volatile global economic conditions.

The average money supply is 7.88, with a standard deviation of 2.18, indicating moderate growth in the money supply. Growth in money supply can stimulate economic activity by making more funds available for investment and consumption. However, excessive growth in money supply without corresponding growth in output can lead to inflationary pressures, reducing the purchasing power of consumers and potentially destabilizing the economy.

The average inflation rate is 18.51%, with a standard deviation of 16.60%, indicating periods of high inflation. High and volatile inflation can erode purchasing power, distort investment decisions, and lead to uncertainty in the economy. Persistent inflation can also lead to higher interest rates, which may stifle economic growth. Managing inflation effectively is crucial for maintaining economic stability and fostering sustainable growth.

The mean interest rate is 18.06%, with a standard deviation of 3.74%, indicating relatively high borrowing costs. High interest rates can deter investment and consumer spending, potentially slowing economic growth. However, they may also be necessary to control inflation and maintain price stability. The balance between maintaining affordable credit and controlling inflation is a critical challenge for policymakers.

Unit Root Test

This study conducted a test of order of integration for each variable using Augmented Dickey-Fuller (ADF). This is to ensure that the variables are stationary as coefficients of regression derived from such non-stationary variables will be spurious and deceptive. The results of the unit root test are presented below.

Result of the Unit Root Test

Table 4.2: Unit Root Test

Variable	Augmented Dickey Fuller test		Summary
	Level	1 st Difference	
Gross Domestic Product Growth Rate (GDP)	-1.78	-4.57**	I(1)
Exchange Rate Volatility (EVAT)	-0.52	-3.66**	I(1)
Foreign Direct Investment (FDI)	-1.32	-1.71**	I(1)
Foreign Trade Balance (FTB)	-0.85	-2.80**	I(1)
International Oil Price (IOP)	-1.46	-2.35**	I(1)
External Reserve (RES)	1.10	-2.42**	I(1)
Money Supply (MS)	6.66**	-	I(0)
Inflation Rate (INF)	-1.14	-3.98**	I(1)
Interest Rate (INT)	-1.18	-5.53**	I(1)

Source: Author's Computation, using Stata 16

The ADF test statistic at the level is -1.78, which is higher than the critical values at conventional significance levels, indicating that GDP is non-stationary at its level. The ADF test statistic at the first difference is -4.57**, which is lower than the critical values, indicating stationarity at the first difference. GDP is integrated of order 1, denoted as I(1), meaning it becomes stationary after differencing once.

The ADF test statistic at the level is -0.52, indicating non-stationarity at the level. The ADF statistic at the first difference is -3.66**, showing that EVAT becomes stationary after the first difference. EVAT is also I(1), requiring first differencing to achieve stationarity.

The ADF test statistic at the level is -1.32, suggesting that FDI is non-stationary. At the first difference, the ADF statistic is -1.71**, which still might not reach stationarity depending on the critical value used. FDI is I(1), indicating it is stationary after first differencing. The ADF statistic at the level is -0.85, indicating non-stationarity. The statistic at the first difference is -2.80**, confirming stationarity after differencing. FTB is I(1), becoming stationary after the first difference.

The level ADF statistic is -1.46, indicating non-stationarity. The first difference statistic is -2.35**, showing stationarity at the first difference. The level statistic is 1.10, suggesting non-stationarity. The ADF statistic at the first difference is -2.42**, indicating stationarity. The ADF statistic at the level is 6.66**, which is significant, indicating stationarity. The ADF statistic at the level is -1.14, indicating non-stationarity. The ADF statistic at the first difference is -3.98**, confirming stationarity. The ADF statistic at the level is -1.18, indicating non-stationarity. The ADF statistic at the first difference is -5.53**, confirming stationarity.

Most of the variables in the analysis are non-stationary at their levels, as indicated by their ADF test statistics, but become stationary after first differencing. This means they follow a random walk and only become stable after removing trends. Economically, this suggests that these variables are influenced by external shocks that have lasting effects over time. For accurate modeling and forecasting, these variables need to be differenced to avoid misleading conclusions in regression analysis. The fact that variables like GDP, FDI, EVAT, and others are I(1) implies that policies targeting these areas should consider the persistence of shocks over time. For instance, a temporary shock to GDP growth or FDI might have prolonged effects, necessitating long-term policy interventions rather than short-term measures.

The stationarity of the Money Supply (MS) at level implies that its effects are immediate and do not exhibit prolonged persistence. This characteristic suggests that monetary policy changes could have more immediate effects on economic conditions, as adjustments in money supply do not lead to long-term trends but rather immediate shifts. Both inflation (INF) and interest rates (INT) being I(1) suggest that these variables are prone to persistent shocks, which can complicate monetary policy efforts aimed at stabilizing the economy. Persistent inflation might require sustained

intervention, while interest rates being I(1) indicates that changes in policy rates might have long-term impacts on the economy. Variables such as international oil prices (IOP) and exchange rate volatility (EVAT) being I(1) highlight the vulnerability of the economy to external shocks. Policies aimed at economic stabilization must take into account the potential for prolonged effects of external shocks on these variables.

Long run estimation of the model.

The long run analysis is carried out on the model and the result is presented in Table 4.6.

Table 4.3 LONG RUN Estimation of the model

Long Run Estimation Results				
Dependent Variable: GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EVAT	-0.12	0.07	-1.54	0.14
FDI	3.01	2.09	1.44	0.17
FTB	0.99	0.32	3.03**	0.00
OPN	-2.90	1.07	-2.71**	0.01
RES	1.02	3.84	0.27	0.79
MS	-8.60	3.15	-2.73**	0.01
INF	0.85	0.16	5.22**	0.00
INT	-1.22	0.90	-1.36	0.19
Short Tun Estimation Results				
D(EVAT)	-0.25	0.13	-1.91**	0.07
D(FDI)	-6.30	2.04	-3.08**	0.00
FTB	-101	0.24	-4.17**	0.00
OPN	2.94	0.54	5.36**	0.00
RES	6.46	4.08	1.58	0.13
MS	-22.66	12.35	-1.83***	0.08
INF	-0.84	0.16	-4.96**	0.00
INT	-1.38	0.56	2.47**	0.02
C	88.52	88.73	1.00	0.33
R-squared = 0.95				
Adj-R-squared = 0.90				

Source: Authors Computation using Stata 16

In the long run, exchange rate volatility has a negative but statistically insignificant impact on GDP growth. The coefficient of -0.12 indicates that a 1% increase in exchange rate volatility would reduce GDP by 0.12%. However, the impact is not statistically significant, implying that exchange rate volatility might not have a strong direct effect on long-term GDP growth in the economy under study. Foreign Direct Investment (FDI) has a positive relationship with GDP growth in the long run. A 1% increase in FDI could lead to a 3.01% increase in GDP. However, this relationship is not statistically significant, suggesting that while FDI is expected to boost economic growth, other factors may be influencing its impact, and its effect may not be consistent over time. The foreign trade balance has a significant positive impact on GDP growth in the long run. A 1% improvement in the trade balance is associated with a 0.99% increase in GDP. This result indicates that a strong trade balance, possibly through export growth or reduced imports, is crucial for sustaining long-term economic growth. International oil prices negatively affect GDP growth in the long run, with a statistically significant coefficient of -2.90. A 1% increase in oil prices could

reduce GDP by 2.9%, reflecting the potential economic challenges faced by oil-importing countries when oil prices rise, leading to higher production costs and reduced consumer spending. External reserves have a positive but statistically insignificant impact on GDP growth. A 1% increase in reserves is associated with a 1.02% increase in GDP, but the lack of statistical significance suggests that while reserves are important for economic stability, they may not directly drive long-term growth in this context. The money supply has a significant negative impact on GDP growth in the long run. A 1% increase in the money supply is associated with an 8.60% reduction in GDP. This suggests that excessive money supply growth, possibly leading to inflation or currency devaluation, could be detrimental to long-term economic growth.

Inflation has a significant positive impact on GDP growth in the long run. A 1% increase in inflation could increase GDP by 0.85%. This counterintuitive result might suggest that mild inflation can stimulate economic activity, possibly by encouraging spending rather than saving. However, this relationship must be managed carefully to avoid hyperinflation. Interest

rates have a negative but statistically insignificant impact on GDP growth. A 1% increase in interest rates could reduce GDP by 1.22%. While the result suggests that higher borrowing costs might dampen economic activity, the lack of statistical significance means this relationship is not strongly supported in the long-term analysis.

The long-run results show that factors like the trade balance, international oil prices, money supply, and inflation have statistically significant impacts on GDP growth, with varying signs. However, not all factors, like FDI and interest rates, show significant long-term effects, indicating the complexity of these relationships over time.

Short run estimation of the model.

In the short run, exchange rate volatility has a negative impact on GDP growth, but the relationship is only marginally significant ($p = 0.07$). This suggests that sudden changes in exchange rates can disrupt economic growth in the short term, potentially due to uncertainty and its effects on trade and investment. Surprisingly, in the short run, FDI has a significant negative impact on GDP growth. A 1% increase in FDI could lead to a 6.30% decrease in GDP. This could be due to the initial adjustment costs or the crowding out of domestic investment in the short term.

The trade balance has a significant negative impact on GDP growth in the short run. A 1% improvement in the trade balance could reduce GDP by 1.01%, which might indicate that trade balance improvements could be associated with reduced domestic consumption or investment in the short term. In the short run, international oil prices have a positive and significant impact on GDP growth. A 1% increase in oil prices could increase GDP by 2.94%. This could be due to the immediate benefits for oil-exporting countries or sectors dependent on oil prices.

External reserves have a positive but statistically insignificant impact on GDP growth in the short run. The coefficient suggests that an increase in reserves might boost economic growth, possibly by stabilizing the economy, but the result is not strong enough to be conclusive. The money supply has a significant and large negative impact on GDP growth in the short run. A 1% increase in money supply could decrease GDP by 22.66%, which might reflect short-term inflationary pressures or instability caused by rapid changes in the money supply. Inflation has a significant negative impact on GDP growth in the short run. A 1% increase in inflation could reduce GDP by 0.84%. This result is consistent with the adverse effects of inflation on purchasing power and

economic stability in the short term. Interest rates have a significant negative impact on GDP growth in the short run. A 1% increase in interest rates could decrease GDP by 1.38%, reflecting the typical short-term effects of higher borrowing costs on economic activity.

The short-run results highlight the immediate impacts of economic variables on GDP growth, with most factors having significant effects. Notably, the negative impacts of FDI and money supply in the short run suggest possible adjustment challenges or inflationary pressures. Overall, these results provide valuable insights into the dynamics of GDP growth, emphasizing the importance of considering both short-term and long-term perspectives in economic policy and decision-making.

Test of Hypothesis One

H_0 : There is no significant impact of foreign exchange volatility on economic growth of Nigeria.

To test the hypothesis that:

$H_0: \beta_1 = \beta_2 = 0$ i.e. all slope coefficients are simultaneously zero.

$H_1: \beta_1 \neq \beta_2 \neq 0$ i.e., not all slope coefficients are simultaneously zero.

The study used probability of the T-stat regression estimate to ascertain the significance effect of foreign exchange volatility and economic growth of Nigeria.

Decision Rule: If the probability of the foreign exchange volatility obtained from the T-stat result is less than 5% level of significance, the study would reject the null hypothesis, H_0 and accept the alternate hypothesis H_1 .

Foreign exchange volatility with T-statistics of -1.54 and a p-value of 0.14 is statistically not significant in the long run, while it is statistically significant in the short run. The study accepted the null hypothesis and therefore concludes that foreign exchange volatility has no significant effect on economic growth in Nigeria.

5. Policy Implication of Result

Given the findings related to the foreign exchange volatility on economic growth in Nigeria, several policy implications can be drawn to guide economic strategy and planning:

- The lack of heteroscedasticity implies that the volatility of key economic variables, such as GDP, is stable over time. Policymakers

can be confident that large economic shocks will not lead to periods of heightened uncertainty. This stability is critical for designing long-term economic policies, as it suggests that the economy is less vulnerable to volatile swings in risk or uncertainty.

- Given this stability, policymakers can focus on growth-oriented policies without the immediate need to create buffers for unpredictable spikes in volatility. For instance, investments in infrastructure, education, or healthcare can be pursued with reduced concern for unexpected economic instability that might arise from shocks.

6. Policy Recommendations

Based on the findings regarding the impact of foreign exchange volatility on economic growth in Nigeria, the following recommendations were proposed:

- Policymakers should prioritize addressing systemic issues contributing to the volatility of exchange.
- Government should make policy that will reduce the effect of Inflation was on economic growth of Nigeria.

In light of these findings, it is imperative for policymakers in Nigeria to prioritize measures aimed at addressing the foreign exchange volatility to ensuring the stability of inflation and ensuring the existence of balanced trade if not a surplus balance.

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