MACROECONOMIC SUSTAINABILITY AND ECONOMIC GROWTH IN NIGERIA: AN EMPIRICAL ANALYSIS

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INTRODUCTION

Macroeconomic sustainability is a fundamental requirement for the economic growth of a country. The effective coordination of macroeconomic variables (MEV) and how they perform in evaluating the sustainability will determine economic growth because it helps provide social welfare. Some of the macroeconomic variables that may affect the economies of countries around the world including Nigeria are inflation rates, interest rates, employment and unemployment rate, foreign direct investment (FDI), exchange rate, etc.

Inflation is politically expensive to government in any country. Inflation adversely affects economic growth. Inflation has a negative impact on GDP growth. Pakistan's monetary authorities used broad money as a tool to control inflation. To control inflation it is important to understand the factors that cause inflation like: population growth, increase in public spending, hoarding, exports, trade unions etc. (Kamran, Arshad, Kibra, Mehmood, Sajid & Imadad 2014)

Economic growth of a country is desirable whether underdeveloped or developed as it is a desirable outcome of a people and a global measure of standard of living. (Ogbebor, Awonuga, Ezenwa & Oamen 2021).

Interest rate is the amount of interest paid per unit of time expressed as a percentage of loans, (Aluko et al.,2019). Interest rate is an important economic price, because no matter from the perspective of the cost of capital or the perspective of the opportunity cost of capital, interest rates have a fundamental impact on the economy. (Acha & Acha 2011)

Exchange rate can be defined as the price at which a country's currency can be bought or exchange for another country's currency (Ca Li et al., 2021). Mcdonald in Ezenwa, (2017) opine that exchange rate simply means the price of foreign currency which clears the foreign exchange market. Exchange rate of currency is therefore the link between domestic and foreign prices of goods and services also exchange rate can either appreciate or depreciate.

Inflation rate is measured as the percentage change in the price index 'consumer price index, wholesale price index, and producer price index' (Wollie, 2018). Inflation is measured by the persistent increase in the general prices of goods and services within an economy. Inflation which has both direct and indirect impact on the activities and various sectors within an economy is also reported to have a ripple effect on other economic variables such as exchange rates, unemployment, interest rate, investment and other variables (CaLi et al.,2021).

Research Questions

1. What is the effect of inflation on Gross Domestic Product?
2. What is the effect of interest rate on Gross Domestic Product?
3. What is the effect of exchange rate on Gross Domestic Product?

Research Hypotheses

The hypotheses stated below are quoted in the null form.

Hypothesis One H_1: There is no significant effect between inflation and Gross national product.

Hypothesis Two H_2:There is no significant effect between interest rate and Gross national product.

Hypothesis Three H_3: There is no significant effect between exchange rate and Gross national product.

LITERATURE REVIEW

Abina and Ogunbiyi (2019) investigated relationship between macroeconomic variable and Nigeria economic growth (1984 – 2015). Seven variables made use of are inflation pressure, exchange rate depreciation, money supply, credit to private sector, total debt, total revenue and credit to public sector also the dependent variable was gross domestic product. Data used in the study was drawn out from central bank bulletin covering a period of 31 years. The findings of the study stated that inflation affects virtually all the macroeconomic variables used in the study and it recommends that there is need to moderate price level in the country as well as corruption.

Ogu M.A, Adagiri I.H and Abdulsalam A.U (2020) examined the impact of inflation on economic growth in Nigeria, utilizing time series data sourced from CBN for the period spanning from 1999 to 2017. The study had two objectives (i) To determine the impact of inflation on economic growth in Nigeria and (ii) To determine the impact of interest rate on economic growth in Nigeria. The study adopted the Ordinary Least Square (OLS) regression technique and established that inflation has positive but not significant impact on economic growth in Nigeria. The result also revealed that interest rate has negative and significant effect on economic growth in Nigeria. It was recommended amongst others that efficient tax policy be implemented and policy to invisible hands on the side of consumers and one-digit interest rate should be achieved

Godwin A.A and Sergius N.U (2021) studied the effect of exchange rate on the economic growth of Nigeria. It specifically looked at effect of exchange rate on gross domestic product (GDP), gross national product (GNP) and unemployment. Secondary data from the Central Bank of Nigeria Statistical Bulletin were collected for a period of ten years, 2009 to 2018. Ex-post facto research design was utilized. While some diagnostic tests were carried out to confirm the integrity of the data and their relatedness in both short and long term basis, Ordinary Least Square technique was employed in the analysis of hypotheses. It was found that while exchange rate had significant effect on GDP and GNP, it was non-significant on unemployment. This implies that micro economic indices of GDP and GNP could be used to consciously adjust standard of living of the citizens. The study concluded that exchange rate should be handled with utmost concern by experts in the field to avoid unnecessary fluctuations that may inflict unbearable economic consequences on the Nigerian people. The study recommended, among others, the adoption of policies that will affect GDP in such a way that the welfare of the people can be upgraded.

Austin and Ogbole (2014) examined public sector spending and macroeconomic variables in Nigeria using Augmented Dicky Fuller (ADF) stationarity test, Johanson's co-integration test, OLS, multiple regression analysis and Granger causality test. From the results of the regression estimates, the level of effectiveness of fiscal measure (GE) in stimulating growth (GDP) is only marginally higher in the period of deregulation that regulation though the difference is not statistically significant. In the area of inflation control, (IFR) the period of deregulation was more effective than regulation and the difference is statistically significant. The paper recommended appropriate policy mix improvement in quality of government expenditure, infrastructural development value – added export, regulated flow of FDI to retail sector, emphasis on import of capital good, and focus on the agricultural sector among others.

Onuorah and Osuji (2014) studied the impact of exchange rate on economic growth in Nigeria. The study used secondary data and adopted Ordinary Least Square (OLS).Based on the findings, from the granger causality investigation procedure at 5% critical value are EXR, INTR, INFR, IMPT and EXPT among other variables affects economic growth. The study recommends the need to be technological incline in all sectors of Nigerian's economy, excess and over budgetary inflation and implementation should be cut to barest minimal level to avert the ideal of external borrowing which most consequently result in external debt and services. The Nigerian government should tow to the path of redirecting its investment profile by channeling it towards capital projects of the government.

Aigbovo and Izeko, (2015) studied the impact of macroeconomic variables on stock market index in Nigeria making use of exchange rates, inflation rates, interest rates, money supply, industrial production index and international oil price. The study covered the period of 11 years (2000 – 2010) using Augmented Dickey-Fuller unit root test, Johansen cointegration test, multivariate Ordinary Least Square (OLS), Error Correction Model (ECM) and Granger causality test. The findings are that inflation rate, interest rate, money supply, industrial production index and oil price significantly influence stock market index either in the short-run or the long run while there are discrepancies between short-run result and long-run results, there are also areas where they confirm each other. The study recommends the adoption of appropriate macroeconomic policies that are favorable to stock market index (proxy for stock prices) and this in turn will stimulate the growth of the stock market in Nigeria.

Jabaru and Jimoh, (2021) evaluated the effect of selected macroeconomic variables on the Nigeria economy. This study made use of secondary data, At 5% significance level, only exchange rate and population growth rate significantly affects the Nigeria economy within the study periods. Unemployment rate (X1) and crude oil exports (X7) were found to be collinear, likewise exchange rate (X3) and foreign direct investment in Nigeria (X4). The error terms of the fitted model are positively auto correlated while the error term of crude oil exports (X7) is not normally distributed. This paper recommended to future researchers, transformation or increase in sample sizes of those variables that did not conform to multiple regression assumptions.

CalLi et al., (2021) carried out a research on the impact of macroeconomic variables on mutual funds' performance in Ghana over the period of2008 – 2016. The study performed correlation analysis to examine the co-movement of the returns from the selected funds with the key macroeconomic variables. The findings of the study established that macroeconomic variables such as inflation rate, exchange rate, interest rate and GDP which were considered in the study affects the confidence of consumers who purchase shares in the mutual funds and also affects the return of funds. The study also came into conclusion that exchange rate is the strongest macroeconomic variable that affects the performance of mutual funds in Ghana.

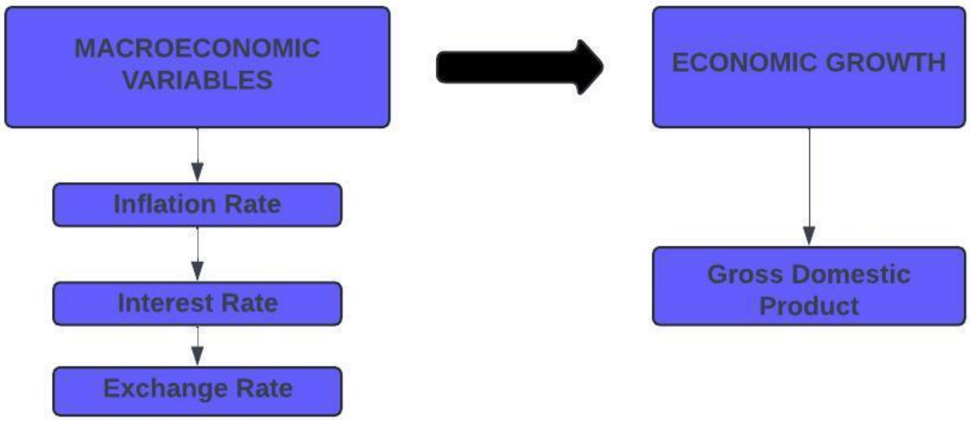
Gylych Jelilov (2016) studied the impact of interest rate on economic growth example of Nigeria. Ordinary least square regression method was used in the study. The result found that the interest rate has a slight impact on growth; however the growth can be improved by lower the interest rate which will increase the investment. As a result of study was found out that Nigerian authorities should set interest rate policies that will boost the economic growth. It recommended that proper measure should be taken in order to have a more rapid economic growth.

Saira and Imran (2016) studied the impact of macroeconomic variables on the economic growth of Pakistan. The study made use of secondary data and also employed quantitative research design. The study ascertained the effect on GDP performance in short or long run of inflation, unemployment, foreign direct investment and import prices of goods and services. It recommended that government needs to pay more attention to the control of inflation through effective and efficient monetary policies.

Lyndon and Imbazi (2020) studied the influence of selected macroeconomic variables on Economic growth in Nigeria (1999 – 2018), it made use of gross domestic product to measure economic growth and the macroeconomic variables used were interest rate, Exchange rate, inflation, and broad money supply. The multiple regression technique based on the ordinary least square method with the help of several inferential statistical tools were used for data analysis. The result showed that macroeconomic decision is not enough to bring about economic growth. The study recommended that the government should improve the regulations and supervisory role in the financial sector for sustainable growth to be achieved in Nigeria and Government should muzzle enough political will and good governance to back the interplay of both fiscal and monetary policies to achieve growth in the economy as macroeconomic decisions alone would not bring about economic growth.

Conceptual framework

The conceptual framework of which is used for this empirical is shown in figure below and it shows the relationship between the dependent and independent variables with their proxies.



METHODOLOGY

Data Collection and Source

This study uses secondary data pooled from World Bank database. It covered a period of twenty years (2003 – 2022). The data contained the GDP growth rate (annual %), Interest Rate (IR) in (%), Inflation Rate (IR) in (%) and Exchange Rate (ER) LCU per US$.

Data presentation

Year	GDP	INF	INT	EXR
2003	7.3471950	14.031784	9.9357134	129.2224
2004	9.2505582	14.998034	-2.6048471	132.8880
2005	6.4385165	17.863493	-1.5936805	131.2743
2006	6.0594280	8.225221	-5.6279680	128.6517
2007	6.5911304	5.388008	9.1871712	125.8081
2008	6.7644728	11.581075	6.6849086	118.5667
2009	8.0369251	12.537828	18.1800017	148.8800
2010	8.0056559	13.740052	1.0677361	150.2975
2011	5.3079242	10.826137	5.6855799	153.8625
2012	4.2300612	12.224241	6.2248086	157.5000
2013	6.6713354	8.495518	11.2016222	157.3117
2014	6.3097187	8.047411	11.3562130	158.5526
2015	2.6526933	9.009435	13.5961532	192.4403
2016	-1.6168689	15.696813	6.6862336	253.4920
2017	0.8058866	16.502266	5.7905669	305.7901
2018	1.9227573	12.095106	6.0559772	306.0837
2019	2.2084293	11.396422	4.5221885	306.9210
2020	-1.7942531	13.246023	5.3712802	358.8108
2021	3.6471865	16.952846	1.2277185	401.1520
2022	3.2516814	18.847188	0.9192319	425.9792

Method of Data Analysis

Data was analyzed using descriptive statistics for quantitative data and content analysis for the qualitative data. Descriptive data was presented in tables while explanations to the same were presented in detail. The following model was used to evaluate the study:

GDP = F (ER, IR, IF) ………………… (1)

Model Specification

To analyze the relationship between macroeconomic variables and economic growth in Nigeria, a multiple linear regression model was employed. The model is specified as follows:

$$GDP \equiv \beta_0 + \beta_1 INF + \beta_2 INT + \beta_3 EXR + \varepsilon$$

where:

GDP represents the growth rate (dependent variable).

INF, INT and EXR denote the inflation rate, interest rate and exchange rate respectively (independent variables).

β_0 - is the intercept, representing the expected value of GDP when all independent variables are zero.

$\beta_1, \beta_2, \beta_3$ - Coefficients associated with each independent variable, representing their respective marginal effects on GDP Growth.

ε - is the error term

Operationalization of Variables

Dependent Variable

GDP Growth Rate (GDP): GDP growth rate represents the annual percentage change in real GDP, which serves as a proxy for economic growth in Nigeria. It is calculated as the percentage change in GDP from the previous period.

Independent Variables

Exchange Rate (EXR): The exchange rate refers to the rate at which the Nigerian Naira (NGN) exchanges for foreign currencies, such as the US Dollar (USD). A higher exchange rate indicates a weaker domestic currency relative to foreign currencies.

Inflation Rate (INF): The inflation rate measures the annual percentage change in the general price level of goods and services in Nigeria. It reflects the rate of increase in the cost of living over time.

Interest Rate (INT): The interest rate represents the cost of borrowing or the return on investment in Nigeria. It is typically influenced by monetary policy decisions and affects consumption, investment, and savings behavior.

RESULTS AND DISCUSSION

Descriptive Statistics

The table presents the descriptive statistics of the data on the effect of macroeconomic sustainability on economic growth in Nigeria. These data were Gross Domestic Product (GDP), Interest rate (INT), Exchange rate (EXC), Inflation (INF) from 2003 to 2022. The table include the mean, median, maximum, minimum, and standard deviation of each of the dependent and independent variables.

Descriptive Statistics

	GDP	INF	INT	EXR
vars	1.0000	2.0000	3.0000	4.0000
n	20.0000	20.0000	20.0000	20.0000
mean	4.6045	12.5852	5.6933	212.1742
sd	3.1450	3.6104	5.7542	101.2041
median	5.6837	12.3810	5.9233	157.4058
trimmed	4.8884	12.5974	5.6452	198.2487
mad	3.2309	4.3980	6.4552	44.7389
min	-1.7943	5.3880	-5.6280	118.5667
max	9.2506	18.8472	18.1800	425.9792
range	11.0448	13.4592	23.8080	307.4125
skew	-0.5778	-0.0919	0.0531	0.8403
kurtosis	-0.7711	-0.9484	-0.4461	-0.8814
se	0.7032	0.8073	1.2867	22.6299

Multicollinearity Test

Correlation Matrix

	GDP	INF	INT	EXR
GDP	1.0000000	-0.2385143	-0.0205070	-0.7199775
INF	-0.2385143	1.0000000	-0.3968621	0.5086614
INT	-0.0205070	-0.3968621	1.0000000	-0.1614690
EXR	-0.7199775	0.5086614	-0.1614690	1.0000000

The correlation coefficients of Gross Domestic Product (GDP), Interest rate (INT), Exchange rate (EXR), Inflation (INF). While there is a positive correlation between INF and EXR with the correlation coefficient of 0.5086, a negative correlation between GDP & EXR, GDP & INT, GDP & INF and INF & INT and INT & EXR with the coefficient of -0.7199, -0.0205, -0.2385 and -0.3968 and -0.1614 respectively. Since the correlation coefficients between the independent variables are less than 0.85, the study concluded that the occurrence of multicollinearity problem in the analysis is minimal.

Estimated result of Macroeconomic Sustainability and Economic Growth in Nigeria

The result on the effect of the macroeconomic sustainability on economic growth in Nigeria was presented in the table 4&5. While the independent variables were Interest rate (INT), Exchange rate (EXC), Inflation (INF), the dependent variable was Gross Domestic Product. The estimation result was presented below using Ordinary Least Square as the method:

Estimated result of Macroeconomic Sustainability and economic growth

	Variables	Coefficient	Stand..Error	T_Statistics	P_Value
(Intercept)	Intercept	8.7683048	2.3534941	3.7256540	0.0018399
INF	Inflation	0.1137525	0.1829840	0.6216528	0.5429271
INT	Interest_Rate	-0.0536849	0.1001610	-0.5359859	0.5993412
EXR	Exchange_Rate	-0.0249311	0.0060714	-4.1063294	0.0008255

Additional Regression Statistics

Statistic	Value
R-squared	0.5484777
F-statistic	6.4785599
Adjusted R-squared	0.4638173
Probability (F-statistic)	0.0044594

The value of the R-squared of 0.54847 is an indication that about 54.847% variation in GDP is explained by Interest rate (INT), Exchange rate (EXC) and Inflation (INF). The F-Test which test the overall significance of the model indicates that by its value of 6.4785 and the corresponding probability value of 0.0044 which is less than the significance level (0.05), which means that we reject the null hypothesis. Therefore, we can conclude that the regression model is statistically significant at the 5% level, indicating that at least one of the independent variables has a significant effect on the dependent variable.

Research Objectives One: To examine the effect of inflation on Gross Domestic Product
Research Questions One: What is the effect of inflation on Gross Domestic Product?

H_1: There is no significant relationship between inflation and Gross national product. Base on the first hypothesis, on the effect of inflation on gross domestic product, the study shows that Inflation has a positive effect on GDP with a coefficient of 0.1137. This shows that a unit increase in inflation brings about a increase of 0.1137% in gross domestic product in Nigeria. However, the T-statistics of 0.6216 and a corresponding probability value of 0.5429 shows that the inflation is statistically significant to Gross Domestic

Product. Hence, the null hypothesis of no significant effect of inflation rate on Gross Domestic Product cannot be rejected, therefore, the study concluded that inflation rate has no significant effect on Gross Domestic Product in Nigeria.

Research Objectives two: To examine the effect of interest rate on Gross Domestic Product in Nigeria.

Research Questions two: What is the effect of interest rate on Gross Domestic Product in Nigeria?

H_2: There is no significant relationship between interest rate and Gross domestic product in Nigeria.

Base on the second hypothesis, on the effect of inflation on gross domestic product, the study shows that Interest rate has a negative effect on GDP with a coefficient of -0.0536. This shows that a unit increase in inflation brings about a decrease of 0.0536% in gross domestic product in Nigeria. However, the T-statistics of -0.5359 and a corresponding probability value of 0.5993 shows that the interest rate is not statistically significant to influence the Gross Domestic Product. Hence, the null hypothesis of no significant effect of exchange rate on Gross Domestic Product cannot be rejected, therefore, the study concluded that interest rate has no significant effect on Gross Domestic Product in Nige ria.

Research Objectives three: To examine the effect of exchange rate on Gross Domestic Product.

Research Questions three: What is the effect of exchange rate on Gross Domestic Product?

H_3: There is no significant relationship between exchange rate and Gross domestic product.

Base on the second hypothesis, on the effect of exchange rate on gross domestic product, the study shows that exchange rate has a negative effect on GDP with a co efficient of -0.0249. This shows that a unit increase in inflation brings about a decrease of 0.0249% in gross domestic product in Nigeria. However, the T-statistics of -4.1063 and a corresponding probability value of 0.0008 shows that exchange rate is sta tistically significant to Gross Domestic Product. Hence, the null hypothesis of no significant effect of exchange rate on Gross Domestic Product was rejected; therefore, the study concluded that there is significant effect of exchange rate on Gross Domestic Product in Nigeria.

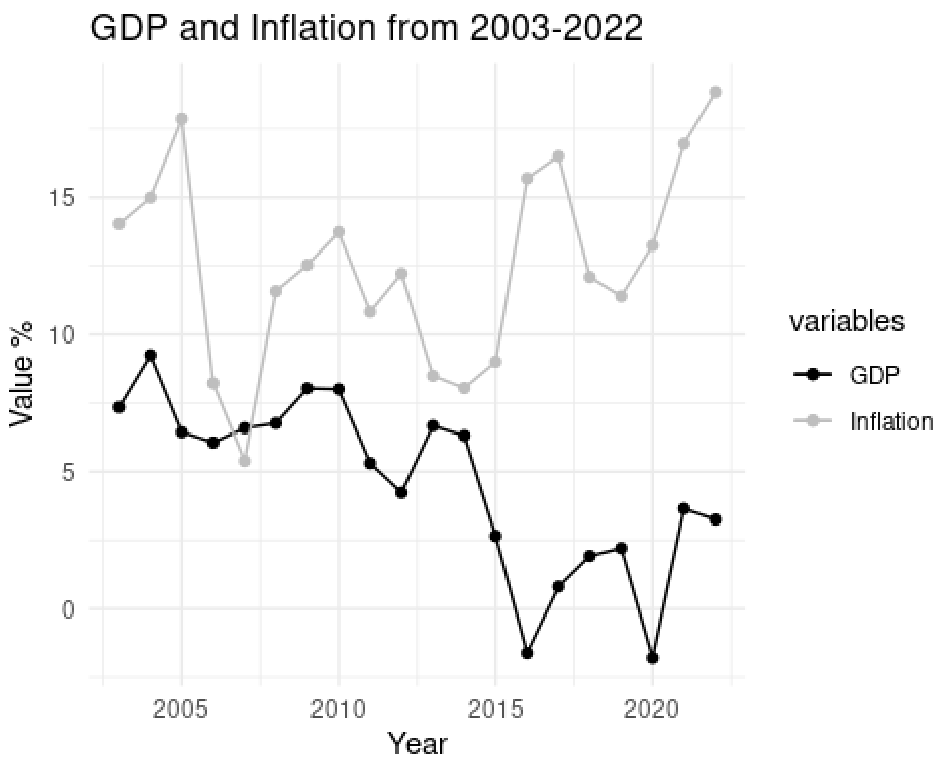
Ordinary Least Square Model Diagnostic Tests

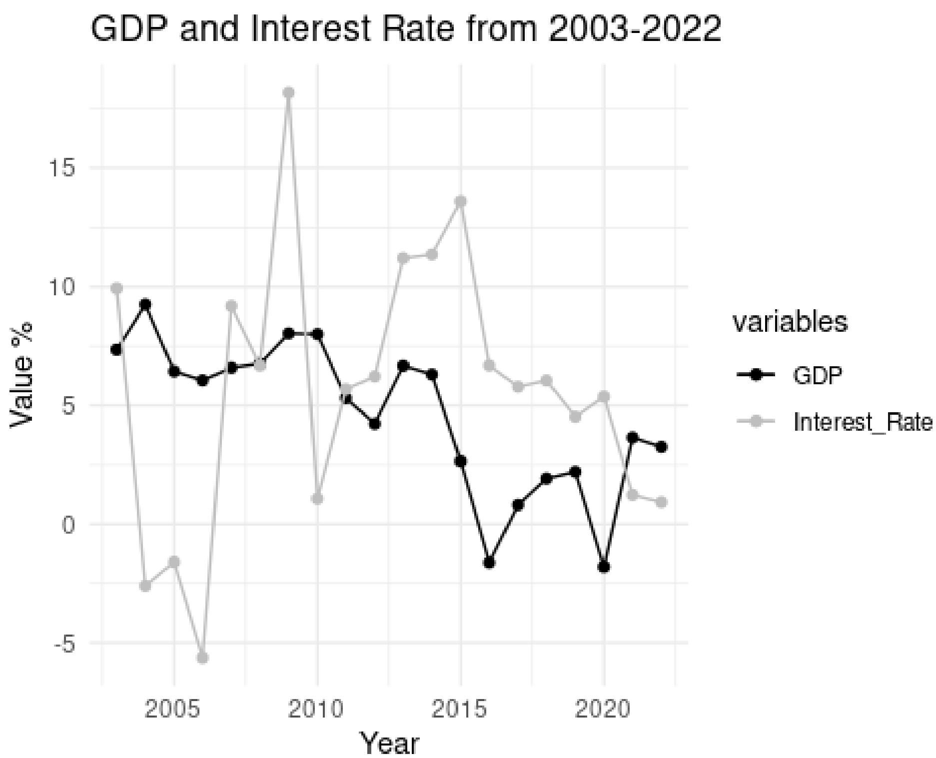
OLS Model Diagnostic Test Results

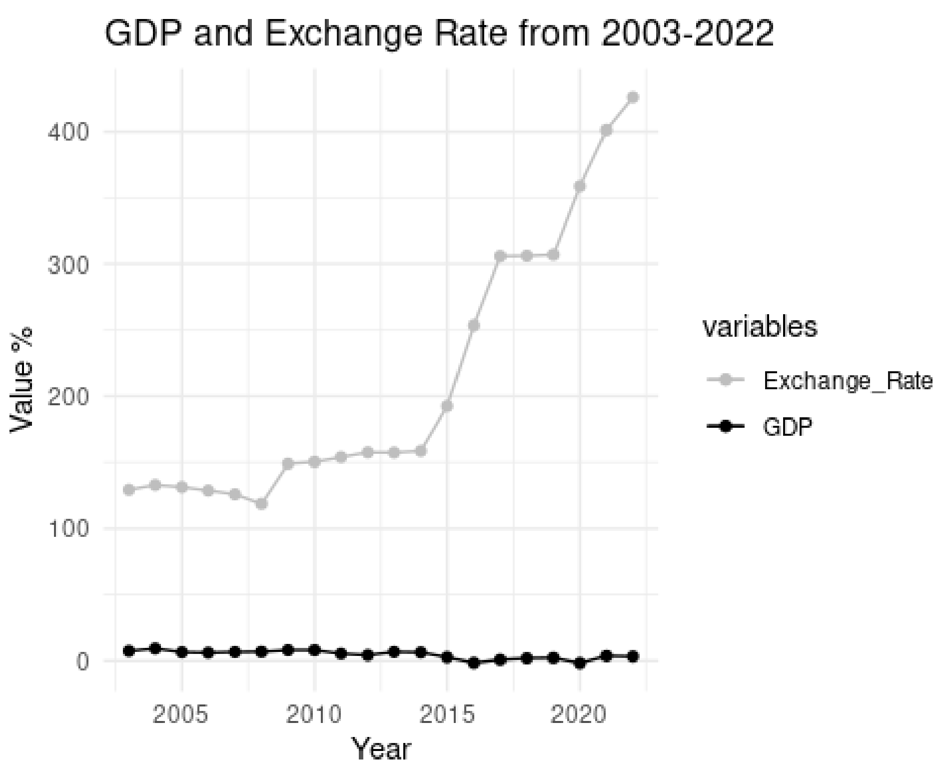
	Test	Statistic	P_Value
DW	Serial Correlation	1.395860	0.0325784
BP	Heteroscedasticity	4.967968	0.1741578
X-squared	Normality Test	1.704369	0.4264823

The serial correlation result shows that the statistic value of 1.3958 and the probability value of 0.0325 implying that we accept H_0 and reject H_1 and conclude that there is no serial correlation in the model. The heteroscedasticity test was also satisfied using the Breusch-Pagan-Godfrey's heteroscedasticity test. The presences of heteroscedasticity in a least square estimator render the model inefficient and that the estimators are no longer best linear unbiased estimators. The result shows that there exist no heteroscedasticity in the model. This implies that there is constant variance of the error term with the chi square value of 4.9679 and probability value of 0.1741. Hence, it is safe to conclude that the model possess homoscedasticity. The Jarque-bera statistics result of the normality test shows the t statistics of 1.704 and the probability value 0.4264 which is greater than 0.05. Based on this, we concluded that the residual is normally distributed and this result from this model is desirable.

Data visualization of relationship between variables




GDP and Interest Rate from 2003-2022
Value %
Year
variables
GDP
Interest_Rate
15
10
5
0
-5
2005
2010
2015
2020


GDP and Exchange Rate from 2003-2022
Value %
Year
variables
Exchange_Rate
GDP
400
300
200
100
0
2005
2010
2015
2020

CONCLUSION

The purpose of the study is to determine the effect of macroeconomics sustainability and economic growth in Nigeria. Secondary data is used for the analysis. From the descriptive regression analysis, the following are the findings:

The results on the effect of inflation on gross domestic product, the study shows that Inflation has a negative effect on GDP with a coefficient of 0.1137. This shows that a unit increase in inflation brings about a increase of 0.1137% in gross domestic product in Nigeria. On the level of significance test the result shows that inflation is not statistically significant on gross domestic product at 0.5429 at 5% level of significance, the state null hypotheses cannot be rejected. The findings of the study are in line with Ogu M.A, Adagiri I.H and Abdulsalam A.U (2020) studied the impact of inflation on economic growth in Nigeria. Ordinary Least Square (OLS) regression technique was used in the study. The results of the estimated model show that there is positive and not significant relationship between inflation and gross domestic product in Nigeria within the period of the study (1999-2017). It recommended amongst others that efficient tax policy be implemented and policy to invisible hands on the side of consumers and one-digit interest rate should be achieved.

The results on the effect of interest rate on gross domestic product, the study shows that interest rate has a negative effect on GDP with a coefficient of -0.0536. This shows that a unit increase in inflation brings about a decrease of 0.0536% in gross domestic product in Nigeria. On the level of significance test the result shows that interest rate is not statistically significant on gross domestic product at 0.5993 at 5% level of significance, the state null hypotheses cannot be rejected. The findings of the study are in line with Jelilov Gylych (2016) studied the impact of interest rate on economic growth example of Nigeria. Ordinary least square regression method was used in the study. The result found that the interest rate has a slight impact on growth; however, the growth can be improved by lower the interest rate which will increase the investment. As a result of study was found out that Nigerian authorities should set interest rate policies that will boost the economic growth. It recommended that proper measure should be taken in order to have a more rapid economic growth.

The results on the effect of exchange rate on Gross Domestic Product in Nigeria, the study shows that exchange rate has a negative effect on GDP with a coefficient of -0.0249. This shows that a unit increase in exchange rate brings about a decrease of 0.0249% in gross domestic product in Nigeria. On the level of significance test the result shows that exchange rate is statistically significant on gross domestic product at 0.0008 at 5% level of significance, the state null hypotheses was rejected. The findings of the study are in line with Godwin A.A and Sergius N.U (2021) studied the effect of exchange rate on the economic growth of Nigeria.The result found that exchange rate has a significant impact on the GDP hence the null hypothesis was rejected.

In conclusion, this study examined the relationship between macroeconomic sustainability and economic growth in Nigeria using secondary data analysis. The findings provide insights into how key macroeconomic variables—namely, inflation, interest rate, exchange rate, and gross domestic product (GDP)—interact in the Nigerian context.

The analysis revealed that while inflation and interest rates exhibited negative coefficients in relation to GDP, they were not statistically significant determinants of economic growth at the significance 5% level. This suggests that variations in inflation and interest rates may not have a significant impact on GDP in Nigeria within the studied period.

In contrast, the exchange rate demonstrated a statistically significant negative effect on GDP, indicating that fluctuations in the exchange rate may significantly influence economic growth in the country. This underscores the importance of exchange rate stability and effective management policies in fostering sustainable economic growth.

Overall, the study highlights the complexities of macroeconomic dynamics in Nigeria and underscores the need for policymakers to prioritize measures aimed at stabilizing the exchange rate to support sustainable economic development. Future research could delve deeper into the underlying mechanisms driving the observed relationships and explore additional macroeconomic factors that may impact economic growth in Nigeria.

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