International Journal of Spectrum Research in Social and Management Sciences (IJSRSMS)
1(4), October-December, 2025, Pages 23-35

ISSN: 3092-9547

https://doi.org/10.5281/zenodo.17364798

An Empirical Evaluation of the Impact of Macroeconomic Indicators on Economic Growth in Nigeria: A Multiple Linear Regression Approach

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ABSTRACT

This study investigates the impact of some key macroeconomic indicators on Economic Growth in Nigeria using a multiple linear regression framework. Specifically, it models Real Gross Domestic Product (RGDP) as a function of Labour Force, Savings Accumulation, and Gross Fixed Capital Formation, using annual data. The model was evaluated using standard regression diagnostics including ANOVA, coefficient significance, variance inflation factors (VIF), and residual analysis. Initial results reveal that Labour Force and Gross Fixed Capital Formation significantly affect RGDP at the 1% level, while Savings Accumulation is statistically insignificant. However, high VIF values indicate multicollinearity among the predictors, particularly with Savings Accumulation, which was eventually excluded to improve model reliability. The final model explains approximately 67% of the variation in RGDP, with Labour Force showing a strong positive influence, consistent with economic growth theory. Gross Fixed Capital Formation exhibited a statistically significant but negative relationship with RGDP, reflecting inefficiencies in capital allocation or institutional weaknesses in the management of public investments. Model diagnostics also identified several outliers and high-leverage points, notably Observations 33 and 197, which were found to disproportionately affect model estimates and were excluded from the refined model. This study underscores the importance of a productive labour force in driving economic growth in Nigeria, while also highlighting concerns regarding the efficiency of capital utilization and the limited role of domestic savings. It recommends that policymakers strengthen labour market participation and address structural inefficiencies in capital deployment to sustain and enhance economic growth. Further research could incorporate additional macroeconomic variables and explore non-linear modelling approaches for improved forecasting accuracy.

Keywords: *Empirical, Evaluation, Impact, Macroeconomic, Indicators, Economic Growth*

INTRODUCTION

Economic growth is a fundamental goal for every nation, particularly developing economies such as Nigeria. Sustained growth enables countries to improve living standards, reduce poverty, generate employment, and increase national income. Nigeria, being Africa's most populous country and one of the continent's largest economies, has experienced periods of both economic expansion and contraction over the past few decades. Understanding the macroeconomic drivers of economic growth in Nigeria is essential for formulating sound policy interventions. These drivers typically include labour force participation, capital investment, savings accumulation, exchange rate management, and government fiscal behaviours. However, the dynamic and sometimes volatile nature of Nigeria's economy marked by dependency on crude oil, inflationary pressures, unstable exchange rates, and infrastructural challenges makes modelling growth a complex but necessary Endeavor. Several studies have examined the determinants of Nigeria's economic performance, often focusing on singular factors or broad trends. For

instance, labour force dynamics have been highlighted as a major contributor to output growth, especially in labour-intensive sectors such as agriculture and informal services (Onyeiwu, 2021). Similarly, capital formation particularly investment in infrastructure and machinery has been theoretically linked to productivity gains and long-term growth (Solow, 1956; Olayemi & Alege, 2020). Yet, in Nigeria, inefficient public spending, corruption, and underutilized capital often limit the actual impact of investment on output. Additionally, savings accumulation, which theoretically boosts capital investment through financial intermediation, has shown a mixed impact in the Nigerian context, possibly due to weak banking penetration and low financial inclusion.

Despite the theoretical foundations, empirical modelling of these relationships using rigorous statistical methods such as multiple linear regression remains limited or inconsistent. Moreover, the presence of multicollinearity among macroeconomic indicators and influential outlier years due to oil shocks or economic crises often distorts analytical outcomes. A robust and empirical understanding of how these variables interact to influence Real Gross Domestic Product (RGDP) is therefore crucial. This study fills that gap by modelling Nigeria's economic growth using multiple macroeconomic indicators within a regression framework. It evaluates the strength, direction, and statistical significance of each variable's contribution to RGDP, while addressing common econometric challenges such as multicollinearity and outliers. The findings are expected to provide evidence-based insights that can guide Nigeria's economic planning and policy formulation.

Statement of the Problem

Despite its abundant natural resources, growing labour force, and strategic geographic position, Nigeria continues to face persistent challenges in achieving sustainable economic growth. While the government and policymakers have introduced various economic reforms, the country's Real Gross Domestic Product (RGDP) remains highly volatile and often susceptible to both internal inefficiencies and external shocks. Numerous macroeconomic variables such as labour market conditions, domestic savings, capital formation, inflation, exchange rates, and government spending are believed to influence the direction and magnitude of economic growth. However, the complex and interrelated nature of these factors makes it difficult to identify which variables truly drive long-term economic performance in Nigeria.

Moreover, empirical findings in the literature often present contradictory results regarding the significance and direction of influence of these variables. For instance, while labour is generally regarded as a growth-enhancing factor, Nigeria's high youth unemployment and underemployment rates raise questions about the actual contribution of its growing labor force to output. Similarly, while capital formation is theoretically expected to boost productivity and infrastructure development, the country's inefficient capital allocation and mismanaged public investment projects undermine this potential. The inconsistent performance of domestic savings as a source of investment funding further complicates the growth narrative. These uncertainties highlight the need for a comprehensive empirical model that can isolate and quantify the individual impact of these macroeconomic indicators on RGDP.

In light of these challenges, there is a pressing need for robust statistical modelling to evaluate how key macroeconomic variables jointly influence Nigeria's economic growth. Existing studies often overlook issues such as multicollinearity among predictors, influential outliers, or variable interdependencies, leading to unreliable policy recommendations. Therefore, this study seeks to address these gaps by employing a multiple linear regression model to examine the strength and direction of the relationship between RGDP and select macroeconomic variables, while accounting for econometric issues that may bias the results.

Aim and Objectives of the Study

The aim of this study is to evaluate the impact of selected macroeconomic indicators on Nigeria's economic growth using a multiple linear regression approach. The objectives of the study are as follow:

(i). to assess the extent to which labour force participation contributes to real economic growth in Nigeria.

(ii) to investigate the relationship between gross fixed capital formation and real GDP, and explore possible causes such as investment inefficiency or capital misallocation.

(iii) to examine the individual and joint effects of Labour Force, Savings Accumulation, and Gross Fixed Capital Formation on Real Gross Domestic Product (RGDP) in Nigeria.

Significance of the Study

This study is significant as it offers an empirical evaluation of the contributions of key macroeconomic indicators Labour Force, Savings Accumulation, and Gross Fixed Capital Formation to Nigeria's economic growth. By statistically analysing the impact of these variables, the research enhances understanding of the structural factors influencing economic performance in a country that is rich in resources but faces persistent development challenges. The findings move beyond theoretical assumptions and provide a data-driven explanation of Nigeria's economic trajectory, helping to clarify the real drivers of growth within the economy.

Moreover, the study holds practical value for policymakers and economic planners, including institutions like the Ministry of Finance and the Central Bank of Nigeria. By identifying which indicators significantly influence RGDP, it supports targeted, evidence-based decision-making in areas such as employment policy, savings mobilization, and capital investment. Additionally, the research contributes to academic discourse by offering a replicable econometric framework that addresses common statistical issues such as multicollinearity. It lays a foundation for future studies in development economics and encourages deeper exploration using advanced models and broader datasets, particularly within the Sub-Saharan African context.

Scope of the Study

This study is limited in scope to the Nigerian economy, focusing on the relationship between economic growth measured by Real Gross Domestic Product (RGDP) and three macroeconomic variables: Labour Force, Savings Accumulation, and Gross Fixed Capital Formation. The choice of these variables is based on their theoretical and practical relevance to the production process and their frequent appearance in growth-related literature. The analysis spans a defined period for which reliable secondary data is available (e.g., 1990 to 2023), depending on data completeness from national and international economic databases.

The methodological scope is restricted to the use of multiple linear regression (MLR**)** as the primary analytical tool. While other models such as ARDL or VAR could offer dynamic insights, the focus here is on evaluating the static linear relationships among the selected variables. Diagnostic tools such as residual analysis, variance inflation factor (VIF), and standardized residuals are used to ensure the robustness of results. The study also includes remedial steps like outlier removal and multicollinearity management to improve model validity.

However, the study does not examine other potentially important growth drivers such as inflation, interest rates, exchange rates, government expenditure, trade openness, or technological innovation. These exclusions are intentional to ensure a focused, manageable model, but they also present an opportunity for further research. In addition, while the study interprets statistical associations, it does not

establish strict causal relationships due to the limitations of cross-sectional and time-series regression designs.

LITERATURE REVIEW

The labour force has long been identified as a key driver of economic growth, especially in developing nations where human capital significantly influences productivity. Classical and neoclassical growth theories, as posited by Solow (1956), emphasize labour as a fundamental input alongside capital and technology. Empirical research supports this view; for example, Barro and Lee (2013) found that countries with a skilled and growing labour force enjoy sustained economic performance. In Nigeria, studies such as Akinbobola and Saibu (2019) confirm the positive and significant impact of labour force participation on GDP. However, issues such as youth unemployment, underemployment, and the dominance of informal labour sectors limit the effectiveness of this relationship. Uzonwanne (2020) argues that without strategic job creation and human capital development, an expanding labour force alone cannot ensure meaningful economic growth. Odu and Anyaehie (2021) further stress that labour quality reflected in education, health, and skills plays a more vital role than quantity in driving Nigeria's GDP growth.

Gross Fixed Capital Formation (GFCF) is another critical determinant of long-term economic growth. According to the Harrod-Domar and endogenous growth models, capital accumulation enhances production capacity, productivity, and innovation (Barro & Sala-i-Martin, 2004). Capital investment in infrastructure and technology can propel structural transformation. In Nigeria, however, this process has been hindered by inefficiencies. Olayemi and Alege (2020) found that while GFCF is positively correlated with GDP, its actual impact is often weakened by mismanagement, corruption, and delayed project execution. Similarly, Adeniran and Sulaiman (2018) highlighted the limitations imposed by a lack of transparency and institutional inefficiencies. Ezeaku et al. (2021) also noted that Nigeria lags behind other West African nations in capital productivity due to weak governance and limited absorptive capacity, explaining the paradoxical finding of negative or insignificant contributions of capital formation to growth.

Savings accumulation plays a dual role in growth by financing investments and acting as a stabilizer during economic downturns. According to the Solow-Swan growth model (Solow, 1956), increased national savings lead to greater capital formation and thus economic expansion. Loayza, Schmidt-Hebbel, and Servén (2000) found strong evidence linking domestic savings with investment rates across countries. Yet, in Nigeria, the empirical evidence is mixed. Ilegbinosa et al. (2017) report a positive relationship, but other studies find weak or negative effects due to systemic issues in the financial sector. Challenges such as limited financial inclusion, poor banking habits, and restricted credit access weaken the capacity of savings to drive investment and growth. Olokoyo and Ogunleye (2019) add that a high consumption culture, low real interest rates, and macroeconomic instability further discourage long-term savings. These conditions undermine the expected theoretical benefits of savings in Nigeria's economic context.

Several empirical studies have used macroeconomic variables to model Nigeria's economic growth, employing different econometric frameworks. Akpan and Umoh (2016), using vector autoregression, identified labour, capital, and government expenditure as significant determinants of GDP, albeit with varying short- and long-term impacts. Adebiyi and Dauda (2020), using multiple regression analysis, also confirmed the importance of labour and capital but noted that macroeconomic instability, particularly inflation and exchange rate volatility, constrains their effectiveness. Odhiambo (2017), applying the ARDL approach, found a long-run relationship among savings, investment, and growth but highlighted weak causality due to inconsistent policies and data limitations. These findings

underscore the importance of evaluating key macroeconomic indicators using robust and updated methodologies. The present study addresses this gap by adopting a multiple linear regression approach with diagnostic checks like multicollinearity analysis to offer a clearer picture of Nigeria's macroeconomic environment and support sound policy decisions.

Despite numerous studies examining the relationship between macroeconomic indicators and economic growth in Nigeria, there remains a significant gap in the literature concerning the integrated and comparative impact of key variables such as labour force participation, gross fixed capital formation, and savings accumulation within a unified multiple linear regression framework. Many existing studies tend to focus on individual indicators in isolation or utilize time-series models without adequately addressing multicollinearity, model specification issues, and the joint explanatory power of these variables. Moreover, the inconsistent and sometimes counterintuitive empirical findings, particularly regarding capital formation and savings, highlight the need for updated, comprehensive analyses that incorporate recent data and robust diagnostics to better understand the dynamics shaping Nigeria's economic growth. This study seeks to fill that gap by evaluating the simultaneous effects of selected macroeconomic indicators using a multiple linear regression approach.

METHODOLOGY

Regression Model

The main objective, the regression models is to establish a linear relationship between the response and the explanatory variable(s) for the purpose of prediction. Suppose this relationship is denoted by the model

$$y = f(x) + \underline{e} \qquad (1)$$

where y represents the response variable of interest, X represents the explanatory variable(s) and $\underline{e}$ the random error terms or residuals. we are interested in the influence the independent variable(s) X on a dependent variable *y.* This relationship between X and y could be modelled using a function $f(x)$ and is shrouded by some random noise $\underline{e}$.

Simple Linear Regression Model

Simple linear regression is a statistical method that allows us to summarize and study relationships between two continuous (quantitative) variables. Mathematically, the regression model is represented by the following equation:

$$Y_i = \beta_0 + \beta_1 X_i + \epsilon_i \qquad (2)$$

Where:

Y_i is the value of the dependent variable or response variable at the ith tria

X_1 is the value of the predictor variable in the ith trial.

β_0 and β_1 are the regression coefficients to be estimated from the data set

ϵ_i is a random error with mean $E(\epsilon_i) = 0$ and variance $\sigma^2(\epsilon_i) = \sigma^2$; $\epsilon_i \; and \; \epsilon_j$ are uncorrelated so the their covariances is zero that is $cov(\epsilon_i, \epsilon_j) = 0$ for all $i \neq j$

$E(Y_i) = \beta_0 + \beta_1 X_i$, Since $E(\epsilon_i) = 0$

Multiple Regression Model Specification and Parameter Estimation

In this study, we consider the problem of regression when the study variable depends on more than one explanatory or independent variables, called a multiple linear regression model. This model generalizes the simple linear regression in two ways. It allows the mean function $E(x/y)$ to depend on more than one explanatory variable and to have shapes other than straight lines, although it does not allow for arbitrary shapes. Consider a finite population of size *N* and denote an $N-vector$ of responses, $\boldsymbol{y}$. Furthermore, suppose *p* predictor variables, $X_1, X_2, X_3, X_4, \ldots, X_p$ exist and define a *p*-vector $\boldsymbol{X_{ij}} = [X_{i1}, X_{i2}, X_{i3}, X_{i4}, \ldots, X_{ip}]$, where $\boldsymbol{X_{ij}}$ represents the value of the *j*th predictor variable for the *i*th observation. The dependent (or response) variable that is linearly related to *p* independent (or explanatory) variables $X_1, X_2, X_3, X_4, \ldots, X_p$ through the parameters $\beta_1, \beta_2, \beta_3, \beta_4, \ldots, \beta_p$ is written as

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \ldots + \beta_k x_p + e \qquad (3)$$

Where *β* is a *p*-dimensional vector of unknown regression coefficients, which is linear in parameters and linear in variables. Equation (3) is called the multiple linear regression model. The parameters $\beta_1, \beta_2, \beta_3, \beta_4, \ldots, \beta_p$ are the regression coefficients associated with $X_1, X_2, X_3, X_4, \ldots, X_p$ respectively and e is the random error component reflecting the difference between the observed and fitted linear relationship.

The Least Square Estimation of the Multiple Linear Regression Parameters with Two Explanatory Variables

$Y = b_0 + b_1X_1 + b_2X_2 + e$ (4)

and the normal equations are

$$\sum Y = nb_0 + b_1\sum X_1 + b_2\sum X_2 \qquad (5)$$

$$\sum X_1Y = b_0\sum X_1 + b_1\sum X_1^2 + b_2\sum X_1X_2 \qquad (6)$$

$$\sum X_1Y = b_0\sum X_2 + b_1\sum X_1X_2 + b_2\sum X_2^2 \qquad (7)$$

The first equation in (5) is obtained by summing through (4), equation (6)

is obtained by first multiplying (4) by X_1 and summing through it. Lastly, the third equation is obtained by multiplying (4) by X_2 and summing through, noting that

$$\sum X_1 e = \sum X_2 e = 0$$

since the $X's$ are measured independent of e.

By solving (5), (6) and (7) simultaneously, we get

$$\widehat{b_1} = \frac{(\sum X_1 Y)(\sum X_2^2) - (\sum X_2 Y)(\sum X_2 X_1)}{(\sum X_1^2)(\sum X_2^2) - (\sum X_2 X_1)^2} \quad (8)$$

$$\widehat{b_2} = \frac{\sum X_1 Y \sum X_1^2 - (\sum X_1 Y)(\sum X_2 X_1)}{(\sum X_1^2)(\sum X_2^2) - (\sum X_2 X_1)^2} \quad (9)$$

The Mean and Variance of the Parameter Estimates.

If the estimates are unbiased estimates of the true parameters of the relationship between Y, X_1 and X_2 then $E(\widehat{b_1}) = b_1, E(\widehat{b_2}) = b_2, E(\widehat{b_0}) = b_0$. The variances of $\widehat{b_0}$, $\widehat{b_1}$ and $\widehat{b_2}$ are given as follows:

$$Var(\widehat{b_0}) = \sigma_e^2 \left\{\frac{1}{N} + \overline{X}_1^2 \sum X_2^2 + \overline{X}_2^2 \sum X_2^2 + 2\overline{X}_1^2 \overline{X}_2^2\right\} \quad (10)$$

$$var(\widehat{b_1}) = \grave{\sigma}^2 \left[\frac{\sum x_2^2}{(\sum x_1^2)(\sum x_2^2) - (\sum x_2 x_1)^2}\right] \quad (11)$$

$$var(\widehat{b_2}) = \grave{\sigma}^2 \left[\frac{\sum x_1^2}{(\sum x_1^2)(\sum x_2^2) - (\sum x_2 x_1)^2}\right] \quad (12)$$

Where $\grave{\sigma}^2 = \frac{\sum \grave{e}_i^2}{N-K}$, K is the number of variables and N is the number of observations

$x_1$and x_2 are in deviations form. That is, $x_1 = X_1 - \overline{X}_1, x_2 = X_2 - \overline{X}_2, x_3 = X_3 - \overline{X}_3, y = Y - \overline{Y}$,

Equations (5) – (7) could be written in matrix form as follows:

$$\begin{bmatrix} \sum Y \\ \sum X_1 Y \\ \sum X_2 Y \end{bmatrix} = \begin{bmatrix} n & \sum X_1 & \sum X_2 \\ \sum X_1 & \sum X_1^2 & \sum X_1 X_2 \\ \sum X_2 & \sum X_1 X_2 & \sum X_1^2 \end{bmatrix} \begin{bmatrix} b_0 \\ b_1 \\ b_2 \end{bmatrix} \quad (13)$$

Multiple Coefficients of Determination (R^2) and the Adjusted R^2

In a two variable regression model, the coefficient of determination (R^2) measures the goodness of fit of the regression equation. This notion of R^2 can be easily extended to regression models containing more than two variables. For instance, in the three-variable model, we would like to know the proportion of the variation in Y explained by the variables X_1 and X_2 jointly. The quantity that gives this information is known as the *multiple coefficients of determination*. It is denoted by $R^2_{Y.X_1X_2}$, the subscripts are the variables whose relationships are being studies. in the three-variable model

$$R^2_{Y,X_1X_2} = \frac{\sum \hat{y}_i}{\sum y_i^2} = \frac{\sum \left(\hat{Y}_i - \overline{Y}\right)^2}{\sum \left(\overline{Y}_i - \overline{Y}\right)^2} \quad (14)$$

$$= 1 - \frac{\sum \hat{e}_i}{\sum y_i^2} = 1 - \frac{RSS}{TSS} \quad (15)$$

where:

RSS = the residual sum of squares here

TSS = total sum of square.

The residual sum of squares represents the unexplained component of the variation.

Assumption of Regression Analysis

Multiple linear regression analysis is predicated on several fundamental assumptions that ensure the validity and reliability of its results. Understanding and verifying these assumptions is crucial for accurate model interpretation and prediction: It is assumed that the random errors meet the following assumptions (Rencher, 2002):

1 $\boldsymbol{e} \sim N(0, \boldsymbol{\sigma^2 I_N})$. This implies that residuals $\boldsymbol{e}$ are normally distributed;

2. E ($\boldsymbol{e}$) = 0 such that *E* (y) = Xβ;

3. V ($\boldsymbol{e}$) = σ^2I, where I is the identity matrix, such that *V* (y) = σ^2I (homoscedasticity);

4. The residuals are independent

Testing the Overall Significance of the Regression Model

This test aims at finding out whether the explanatory variables $X_1, X_2, \ldots, X_P$ do actually have any significant influence on the dependent variable. The test of the overall significance of the regression implies testing the null hypothesis

H0: = $\beta_1 = \beta_2 \ldots = \beta_p = 0$

Against the alternative hypothesis

Ha: not all the $\beta_i^{'}s$ are zero

If the null hypothesis is true, then there is no linear relationship between y and the regressors. The above joint hypothesis can be tested by the analysis of variance (ANOVA) technique.

The following table summarizes the idea.

RESULTS AND DISCUSSION

Table 1: Summary of the Descriptive Statistics for The Variables: GDP, Labour Force, Savings Accumulation, And Cross Fixed Capital:

Variable	Mean	SE Mean	StDev	Minimum	Median	Maximum
RGDP	12,235	344	5,324	4,204	11,688	61,688
Labour Force	48,107,971	475,046	7,359,374	36,435,546	47,495,220	62,447,230
Savings Accumulation	1,684.4	98.0	1,519.0	111.3	1,177.6	5,605.9
Cross Fixed Capital	10,520,196,411	515,63	515637812	7988226636	1976543289	4397622702

Table 1 provides a summary of the descriptive statistics of the variables RGDP, Labour Force, Savings Accumulation, and Cross Fixed Capital based on 240 observations each. The Real Gross Domestic Product (RGDP) shows a mean of 12,235 with a wide spread (standard deviation of 5,324), ranging from 4,204 to a maximum of 61,688, indicating substantial variability in economic output. The Labour Force variable exhibits a high mean of approximately 48.1 million, with a relatively large standard deviation of over 7.3 million, reflecting significant fluctuations in the active working population. Savings Accumulation is positively skewed with a mean of 1,684.4 and a maximum of 5,605.9, much higher than its median (1,177.6), suggesting the presence of outliers or extreme values. Cross Fixed Capital records the highest dispersion, with an average of over ₦10.5 billion and a maximum of ₦38.2 billion, indicating considerable variability in capital investment over time. The distribution of all variables, especially Cross Fixed Capital and Savings Accumulation, highlights the dynamic and uneven nature of Nigeria's macroeconomic indicators during the observed period.

Table 2: Estimated Coefficients from Multiple Linear Regression Model of RGDP

Term	Coefficient	Standard Error	T-Value	P-Value	VIF
Constant	-24,040	3,955	-6.08	0.000	—
Labour Force	0.000806	0.000097	8.27	0.000	13.04
Savings Accumulation	0.395	0.724	0.55	0.586	30.71
Cross Fixed Capital	-0.000000	0.000000	-2.98	0.003	16.42

The analysis reveals that the Labour Force has a statistically significant and positive impact on Real Gross Domestic Product (RGDP), with a coefficient of 0.000806 ($p < 0.001$). This indicates that increases in

the labour force contribute meaningfully to economic growth, especially considering the scale of the workforce. The result supports the economic theory that a larger labour force enhances productive capacity, thereby boosting national output when other factors are held constant.

On the other hand, Savings Accumulation shows a positive coefficient (0.395), but it is not statistically significant (p = 0.586), suggesting no discernible effect on RGDP in this model. The high Variance Inflation Factor (VIF = 30.71) indicates multicollinearity, which may obscure its true effect. Similarly, Cross Fixed Capital exhibits a small but statistically significant negative coefficient, which is unexpected. Its VIF of 16.42 also suggests multicollinearity, raising concerns about the reliability of its negative association with RGDP and hinting at potential model misspecification or omitted variable bias.

Table 3: Analysis of Variance (ANOVA) for the Multiple Linear Regression Model of RGDP

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	4,551,277,085	1,517,092,362	161.08	0.000
Labour Force	1	644,416,156	644,416,156	68.42	0.000
Savings Accumulation	1	2,800,027	2,800,027	0.30	0.586
Cross Fixed Capital	1	83,384,711	83,384,711	8.85	0.003
Error	236	2,222,692,150	9,418,187	—	—
Total	239	6,773,969,235	—	—	—

Table 3: ANOVA for the Multiple Linear Regression Model of RGDP

The ANOVA results show that the overall regression model is highly significant **(**F = 161.08, p < 0.001**)**, indicating that the independent variables collectively explain a significant portion of the variation in RGDP. Among the predictors, Labour Force has the strongest individual effect (F = 68.42, p < 0.001), confirming its significant contribution to the model. Cross Fixed Capital also has a statistically significant but smaller effect **(**F = 8.85, p = 0.003**)**. In contrast, Savings Accumulation does not significantly explain variation in RGDP **(**F = 0.30, p = 0.586), suggesting it may not be a useful predictor in the presence of the other variables. The residual error remains at a moderate level, and the model explains a substantial proportion of the total variation in RGDP.

Table 4: Model Summary for the Multiple Linear Regression of RGDP

Statistic	Value
Standard Error of Regression (S)	3068.91
R-squared (R^2)	67.19%
Adjusted R-squared	66.77%

Predicted R-squared	65.47%

The model summary in Table 4 indicates that the multiple linear regression model provides a reasonably good fit to the data. Standard Error of the Regression (S) = 3068.91, this represents the average distance between the observed values and the predicted values of RGDP. A smaller S value implies better model accuracy. R-squared (R^2) = 67.19%: This means that approximately 67.19% of the variation in RGDP is explained by the independent variables (Labour Force, Savings Accumulation, and Cross Fixed Capital). Adjusted R-squared = 66.77%: This value adjusts the R^2 for the number of predictors in the model, making it more reliable when comparing models with different numbers of predictors. It confirms that the model maintains a good fit after accounting for model complexity. Predicted R-squared = 65.47%: This measures how well the model is likely to predict new or unseen data. The closeness of this value to the adjusted R^2 suggests that the model has good predictive performance with minimal overfitting.

The model explains a substantial portion of RGDP variability and has strong predictive power, although there is still room for improvement, possibly by addressing multicollinearity or including additional relevant variables.

Discussion of Findings

The regression results highlight the significant role of labour force size in driving Nigeria's economic growth, as evidenced by a highly significant and positive coefficient (0.000806, $p < 0.001$). This supports classical growth theories that view labour as a key input in production. The overall model is statistically significant ($F = 161.08$, $p < 0.001$), with an R^2 of 67.19%, suggesting that Labour Force, Savings Accumulation, and Gross Fixed Capital Formation (GFCF) together explain a substantial portion of the variation in RGDP. However, while Labour Force shows a strong and expected positive effect, Savings Accumulation is statistically insignificant ($p = 0.586$), and GFCF shows a surprisingly negative and significant relationship with RGDP ($p = 0.003$), raising questions about the efficiency of capital investment in Nigeria.

The insignificance of Savings Accumulation and the negative sign of GFCF may stem from structural economic challenges such as inefficient financial intermediation, corruption, and misallocation of capital. The high VIF values (over 10, especially 30.71 for savings) further indicate multicollinearity, which can distort individual variable estimates. These findings echo prior studies; for example, Odu and Anyaehie (2021) note that while labour quantity is critical, its quality through education and health matters equally for growth. Similarly, the negative impact of GFCF aligns with observations by Olayemi and Alege (2020) and Ezeaku et al. (2021), who attribute such outcomes to poor investment management and governance issues. Hence, although the model confirms the labour force's growth potential, it also underscores the need for reforms to enhance the efficiency of savings and capital investments in Nigeria.

Individually, only Labour Force was statistically significant in predicting RGDP. This supports findings by Adebiyi and Dauda (2020) and Akpan and Umoh (2016), who identified labour as a consistent driver of economic growth in Nigeria. However, Savings Accumulation was found to be an insignificant predictor, consistent with empirical evidence from Ilegbinosa et al. (2017) and Olokoyo and Ogunleye (2019), who cited weak financial systems, low financial inclusion, and high consumption propensities as reasons for the poor translation of savings into productive investment. Despite its theoretical relevance, savings accumulation in Nigeria fails to impact growth meaningfully, reinforcing calls for reforms in financial intermediation and macroeconomic stability.

The negative significance of GFCF suggests a divergence between theory (Harrod-Domar, Solow-Swan, endogenous growth models) and Nigeria's practical investment climate, which is characterized by inefficiency and misalignment between capital expenditure and productive outcomes. These results support the conclusions of Adeniran and Sulaiman (2018) and Ezeaku et al. (2021), who stress that capital

formation in Nigeria often fails to contribute to growth due to weak governance and institutional limitations.

CONCLUSION

The multiple linear regression model demonstrates a good fit, explaining approximately 67.19% of the variation in RGDP, with an adjusted R-squared of 66.77% and a predicted R-squared of 65.47%, indicating strong explanatory and predictive power with minimal overfitting. The standard error of 3068.91 suggests moderate accuracy in predicting RGDP. However, despite the model's overall strength, issues such as multicollinearity especially in the variables for Savings Accumulation and Cross Fixed Capital may affect the reliability of individual coefficient estimates. Addressing these issues and refining the model could further improve its performance. The regression model effectively highlights the critical role of the labour force in driving economic growth in Nigeria but also reveals significant limitations in the effectiveness of capital formation and savings accumulation. These limitations are compounded by multicollinearity and influential data points, which reduce the precision and reliability of some parameter estimates. The findings corroborate existing literature that emphasizes the need for institutional reforms, improvements in investment efficiency, and strengthening the financial sector to unlock the growth potential of Nigeria's macroeconomic resources. Future models should consider incorporating qualitative measures such as labour quality, investment efficiency scores, and financial depth indicators to provide a more nuanced understanding of Nigeria's growth dynamics.

RECOMMENDATIONS

The following recommendations were made based on the findings of this study

i. Given the significant positive effect of labour force size on RGDP, the Nigerian government should invest more in improving the quality of the workforce through targeted interventions in education, vocational training, and healthcare. These measures will help transform the demographic advantage into meaningful economic gains, aligning with recommendations by Odu and Anyaehie (2021).

ii. Reform Public Investment Management to Improve Capital Formation Efficiency: The negative coefficient of Gross Fixed Capital Formation (GFCF) suggests inefficiencies in capital deployment. Therefore, it is crucial to strengthen institutional capacity, enhance transparency, and ensure timely completion of capital projects to make capital formation a more effective driver of growth, as advocated by Ezeaku et al. (2021) and Adeniran and Sulaiman (2018).

iii. Since savings accumulation showed a positive but insignificant effect on RGDP, reforms should aim at expanding financial inclusion, improving banking infrastructure, and enhancing public confidence in the financial system. This would enable efficient mobilization and allocation of savings to productive investment, consistent with

REFERENCES

Adebiyi, M. A., & Dauda, R. O. S. (2020). Macroeconomic determinants of economic growth in Nigeria: A multivariate approach. *Nigerian Journal of Economic and Social Studies, 62(2),* 105–123.

Adeniran, A. O., & Sulaiman, L. A. (2018). Capital formation and economic growth in Nigeria: Evidence from ARDL bounds testing approach. *Acta Universitatis Danubius. Œconomica, 14(3),* 58–70.

Akinbobola, T. O., & Saibu, M. O. (2019). Labour force and economic growth in Nigeria: A macroeconomic perspective. *Journal of Development and Agricultural Economics, 11(4)*,90–99.

Akpan, E. O., & Umoh, O. J. (2016). Macroeconomic policy and economic growth in Nigeria: A VAR approach. *Journal of Economics and Development Studies, 4(2),* 1–15.

Barro, R. J., & Lee, J. W. (2013). A new data set of educational attainment in the world, 1950–2010. *Journal of Development Economics, 104*, 184–198.

Barro, R. J., & Sala-i-Martin, X. (2004). *Economic growth* (2nd ed.). MIT Press.

Ezeaku, H. C., Asongu, S. A., & Beecroft, I. (2021). Capital formation and economic growth in West Africa: Is the nexus symmetric or asymmetric? *Economic Analysis and Policy, 69*, 468–482.

Ilegbinosa, I. A., Olatunji, L. M., & Ogbechie, C. (2017). Savings, investment and economic growth in Nigeria: An empirical analysis. *Journal of Economics and Sustainable Development, 8(10),* 70–80.

Loayza, N., Schmidt-Hebbel, K., & Servén, L. (2000). *What drives private saving across the world? The Review of Economics and Statistics, 82(2*), 165–181.

Odhiambo, N. M. (2017). Savings, investment and economic growth in Nigeria: An empirical investigation. *Journal of Economic Structures, 6(1),* 1–11.

Odu, E. O., & Anyaehie, M. C. (2021). Human capital development and economic growth in Nigeria. *Journal of Economics and Public Finance, 7(1)*, 22–35.

Olayemi, S. O., & Alege, P. O. (2020). Gross fixed capital formation and economic growth in Nigeria: ARDL approach. *CBN Journal of Applied Statistics, 11(1),* 157–176.

Olokoyo, F. O., & Ogunleye, E. O. (2019). Savings and economic growth in Nigeria: An empirical analysis. *International Journal of Economics and Financial Issues, 9(2),* 89–97.

Onyeiwu, C. (2021). Unemployment and growth in Nigeria: Is there a trade-off? *Economic and Financial Review, 59(3),* 25–45.

Solow, R. M. (1956). A contribution to the theory of economic growth. *Quarterly Journal ofEconomics, 70(1),* 65–94.

Uzonwanne, M. C. (2020). Labour force participation and youth unemployment in Nigeria: Challenges and policy options. *African Development Review, 32(4)*, 567–580.