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A Statistical Analysis on the Growth Rate of Selected Sectors of Nigerian Economy

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ABSTRACT

In this paper, multiple regression analysis was used to measure the impact of the growth rate of some selected sectors of the Nigerian economy on the real Gross Domestic Product (GDP). For cases where linear relationship between the explanatory and response variables does not exist, non-linear regression model was applied. Dataset used was obtained from the National Bureau of Statistics database which contains the real gross domestic product growth rate of each sector from 2018 to 2022. The results obtained from the study revealed that a significant linear relationship exists between the manufacturing, transportation with storage sectors and the real GDP. However, a non-linear relationship exists between the real GDP growth rate and Information Communication Technology (ICT) sector. Suggestions were made on how to improve the various sectors of the economy.

KEYWORDS: *gross domestic product; Nigerian economy; multiple regression analysis, general linear model; model forecast.*

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I. INTRODUCTION

The Gross Domestic Product (GDP) is a key economic indicator that estimates the total value of all products and services generated within a nation's boarders during a given time period. It functions as a significant indicator of a nation's economic health and size [1].

GDP is one of the primary indicators used to measure the healthiness of a country's economy [2]. It is also used to determine the standard of living of individuals in an economy.

When the overall GDP declines for two consecutive quarters or more, the economy is in recession [3]. More so, it is considered to be the world's most powerful statistical indicator of national development and progress [4].

In recent years, the Nigerian government has made efforts to diversify the economy away from oil, which has been the mainstay of the economy for decades. One of the key strategies for economic diversification is the development of the non-oil sectors, including the agriculture sector, mining and quarrying sector, manufacturing sector, transport and storage sector, and ICT sector [5].

The role which non-oil sector plays in economic growth of Nigeria was examined by [6]. They proposed an economic growth model using vector auto-regression (VAR) technique and suggested that more attention should be paid to the service sectors, agriculture and solid minerals aside the oil sector as revenues from them will greatly increase the real GDP on the long run.

[7] applied the Autoregressive Distributed Lag (ARDL) model to estimate the long-run relationship between economic growth and the various sectors of the economy. They concluded that the agricultural sector, the industrial sector, and the services sector all made significant contributions to economic growth in Nigeria. However, the industrial sector was found to be the most significant contributor to economic growth in the long run.

The role of manufacturing sector in economic development using the manufacturing sectors of India and China as case study was studied by [8]. They found that both countries had experienced significant growth in manufacturing however, China surpassed India in terms of output and productivity. This was attributed to China's more favorable policies towards manufacturing, better infrastructure, and higher levels of investment in research and development.

The significant contribution of the agricultural sector to Nigeria's economic growth was explored by [9] while [10] explored the positive role of Information Communication Technology (ICT) on Africa's developing economy.

STATEMENT OF THE PROBLEM

As a developing country, Nigeria's economy (being measured by the real GDP) has experienced considerable changes over the years. Although the economy as a whole has grown, it is important to look at the growth rates of individual sectors to understand how they contribute to the overall growth and sustainability of the Nigerian economy. By concentrating on these sectors, all stakeholders may identify opportunities, eliminate bottlenecks and create tailored plans to promote a sustainable economy.

Objectives

The objectives of this study are to

- Examine the impact of selected sectors of the economy on GDP.
- To forecast the GDP of these sectors for two consecutive years.

Research Questions

- Is there any significant impact of selected sectors of the economy on GDP?
- What is the GDP of selected sectors in two years' time?

Hypotheses

H_{01}: There is no significant impact of selected sectors of the economy on GDP

H_{02}: There is a significant impact of selected sectors of the economy on GDP $\alpha = 0.05$

Decision rule: Reject H_{01} if p–value < 0.05, otherwise accept H_0

Methodology

Multiple linear regression analysis was used to examine whether a linear relationship exists between the real Gross Domestic Product (GDP) and agriculture, mining and quarrying, manufacturing, transport and storage and ICT sectors respectively.

The multiple linear regression model is given by

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_k X_k + \varepsilon, \quad (1)$$

where

Y = dependent variable (real GDP),

β_0 = intercept or constant,

$\beta_1, \beta_2, \beta_3, \ldots, \beta_k$ = Beta coefficients

X_1, X_2, X_3, X_k = the independent variables (representing agriculture, mining and quarrying, manufacturing, transport and storage and ICT sectors respectively.

ε = error term assumed NID $(0, \sigma^2)$

The assumptions of the model include the normality (the model's residual should be normally distributed), homoscedasticity (error variance should be equal for all observations), no multicollinearity (the independent variable should not be highly correlated) and independence of observation.

The quadratic model is given by

$$Y=\beta_0+\beta_1X_1+\beta_2X^2+\varepsilon, \quad (2)$$

DATA ANALYSIS AND DISCUSSION OF FINDINGS

Table 1 shows the growth rate percentage of five sectors of the economy from year 2018 to 2022. Shapiro-Wilk normality test was carried out to check if the model's residual was normally distributed. The result did not show evidence of non-normality (W=0.95, p=0.3932). Breusch-Pagan test was used to test for homoscedasticity. We infer that the error variance is constant (Chisquare = 0.06154, Df = 1, p = 0.8041). Table 2 shows the correlation coefficients of variable used to ascertain if the variables were highly correlated or not so as to rule out multicollinearity. The variables were not highly correlated. Table 3 shows the result of the multiple regression analysis. The fitted regression model was GDP= 1.117 + 0.423AGRIC + 0.014MINING_QUARRY + 0.486MANUFACT + 0.055TRANSP_STOR + 0.097 ICT.

The overall regression was statistically significant (R^2 = 0.91, F (5, 14) = 27.88, p <0.05). R^2 = 0.91 indicates that 91% of the total variation in GDP was explained by the predictors. It was further observed that only the Manufacturing sector (β=0.486, p<0.05) and the Transportation and Storage sector (β=0.055, p<0.05) significantly predicted GDP. The Agric sector, mining and quarrying, ICT sectors respectively did not significantly predict GDP. A significant non-linear relationship exists between the real GDP growth rate and ICT sector (R^2 = 0.58, F (2, 117) = 11.81, p <0.05). R^2 = 0.58 indicates that 58% of the total variation in real GDP growth rate was explained by the ICT sector. The fitted quadratic model was GDP= -0.3026 + 1.1611ICT – 0.0865ICT^2.

Table I: Dataset on real growth rate % of selected sector on GDP

GDP Growth Rate							
Year	Quarter	GDP Growth Rate (%)	Agric Sector GDP (%)	Mining And Quarrying Sector GDP (%)	Manufacturing Sector GDP (%)	Transport And Storage Sector GDP (%)	ICT Sector GDP (%)
2018	Q1	1.89	3	14.1	3.39	14.45	1.58
2018	Q2	1.5	1.19	-3.84	0.68	21.76	11.81
2018	Q3	1.81	1.91	-2.81	1.92	11.95	12.09
2018	Q4	2.38	2.46	-1.23	2.35	9.48	13.2
2019	Q1	2.1	3.17	-1.37	0.81	19.5	9.48
2019	Q2	2.12	1.79	7	-0.13	8.02	9.01
2019	Q2	2.28	2.28	6.19	1.1	18.24	9.88
2019	Q4	2.55	2.31	6.07	1.24	-0.8	10.16
2020	Q1	1.87	2.2	4.58	0.43	2.82	7.65
2020	Q2	-6.1	1.58	-6.6	-8.78	-49.23	15.09
2020	Q3	-3.62	1.39	-13.22	-1.51	-42.98	14.56
2020	Q4	0.11	3.42	-18.44	-1.51	-5.95	14.95
2021	Q1	0.51	2.28	-2.19	3.4	-21.89	6.47
2021	Q2	5.01	1.3	-12.29	3.49	76.81	5.55
2021	Q3	4.03	1.22	-10.56	4.29	20.61	9.66
2021	Q4	3.98	3.58	-6.16	2.28	29.72	5.03
2022	Q1	3.11	3.16	-25.89	5.89	-17.41	12.07
2022	Q2	3.54	1.2	-11.09	3	51.66	6.55
2022	Q3	2.25	1.34	-21.31	-1.91	41.59	10.53
2022	Q4	3.52	2.05	-11.39	2.83	0.78	10.35

Table 2 Correlation Coefficients of Variables

	AGRIC	MINING_QUARRY	MANUFACT	TRANSP_STOR	ICT
AGRIC	1				
MINING_QUARRY	0.11	1			
MANUFACT	0.20	0.00	1		
TRANSP_STOR	-0.18	-0.01	0.43	1	
ICT	-0.14	-0.43	-0.52	-0.55	1

Table 3 Result of regression analysis

Coefficient	Estimate	Standard error	t-value	p-value
Intercept	-1.117	1.209	-0.924	0.371
AGRIC	0.423	0.288	1.469	0.164
MINING_QUARRY	0.014	0.024	0.578	0.572
MANUFACT	0.486	0.085	5.695	5.53e-05
TRANSP_STOR	0.055	0.010	5.741	5.10e-05
ICT	0.097	0.092	1.050	0.311

CONCLUSION

The results obtained from the study revealed that a significant linear relationship exists between the manufacturing, transportation with storage sectors and the real GDP growth rate. However, a non-linear relationship exists between the real GDP growth rate and Information Communication Technology (ICT) sector. Therefore, all stakeholders (the government as well as individual investors) should make more investments in these sectors so as to ensure its growth and continuous boost on the nation's GDP.

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