Uses of Heteroskedasticity Analysis in Some Selected Factors on Gross Domestic Product in Nigeria

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Abstract

This research paper analyzed the aids of each sector (Agriculture, Industry, Trade, Construction and services) to Nigeria's Gross Domestic Product growth. Secondary data was used for the study. The data was sourced from the statistical bulletin of Central bank of Nigeria (CBN) within the year *1981-2018* – a thirty- eight year period. Ordinary Least Square (OLS) method was used in this research paper. This paper revealed that all the sectors provide significant contribution to the gross domestic product (GDP) in Nigeria. From the heteroskedasticity analysis, the agriculture and construction sectors contribution have significant influence on Gross Domestic Product (GDP) growth in Nigeria.

KEYWORDS: Econometrics, GDP growth, Agriculture Sector, Industry Sector, Service Sector, , OLS, Heteroskedasticity

Introduction

In the search to improve the well-being, standard of living and the welfare of the citizens, various governments have over time embarked upon numerous development policies, plans, programs and projects. Important among the plans and policies which were designed to improve the well-being and welfare of the citizens is to put the economy on the path of accelerated growth by prioritizing agricultural, trade, service, construction and industrial development. This reiterate the fact that agricultural and industrial development were to guarantee Nigeria's economic development by altering the model of economic structure of production and consumption pattern, reduce dependence on oil, diversify the economic base, generate employment, create a globally competitive and stable economy.

The national economy development goal in Nigeria has remained that of altering the structure of production and consumption activities, so as to diversify the economic base, reduce dependence on oil and imports, all in the attempt to put the economy back on a path of self-sustainability, thereby reducing poverty and increasing the standard of living of the citizens. In considering the Nigeria economic development experience, it resolve worthwhile to examine the growth and structural changes in certain major aspects of the economy, the agriculture and industry sector.

The study of economic development theories has shown signs that the agricultural revolution is strong and major pre-required condition for sustainable economic development. Development economists are in support of the position that agricultural sector has a vital role in the economic development process of a nation, emphasizing that agricultural productivity is major for a sustainable development strategy.

Thus, this research paper is piloted to examine the relationship of economic variables (Agriculture Sector, Industry Sector, Service Sector, Trade Sector and Construction Sector) toward the economic growth of GDP in Nigeria. The independent variables are used to test whether these variables are able to clarify the economic growth in Nigeria. The time series data from 1981 until 2018 were employed and explained using deterministic approach in statistical and econometric analyses.

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LITERATURE REVIEW

The few of economic sector has impact to the development of any economy. It adds up to the aggregate income of the economy and thus contributing directly or indirectly to the gross domestic incomes of such economy. Gross Domestic Product (GDP) is referred to as the value of final goods and services produced in the economy during a given period of year.

The agriculture is actually referred to as the production of goods through farming, cultivation, animal husbandry and forestry. Agriculture has significant development to the rise of civilization when planting and breeding lead to goods surpluses that enabled the development of a society gradually teeming and refined. The agricultural sector is one of the economic activities that are classified as primary sectors (primary) other than mining and quarrying (Da Silva & Rankin, 2013). Agricultural sources cover all of agriculture, livestock, fisheries and forestry.

Ahungwa, Haruna. and Rakiya, (2013). examined Trend Analysis of the contribution of Agriculture to the GDP of Nigeria between the periods (1960-2012). The study utilized multiple regression analysis specified as Double- Log model to examine the contribution of Agriculture to Gross Domestic Product (GDP). The study showed a statistical significant relationship between GDP and both agriculture and industrial sector; with R^2 value of 99%.

Hashim, Norimah, Mohd and Haslindai,(2016) worked on the application of heteroskedasticity on contributions of economic sectors of Gross Domestic product (GDP) by testing the economic growth model time series data, ranging from 1983 to 2014, and ordinary least square (OLS) method are used in this study. This study reveals that agricultural sector provides an important contribution to the gross domestic product (GDP) and exports, at a declining rate. In fact, this sector also contributes to the industrial chain in manufacturing and services sectors. In addition, the analysis of the t test shows that the variables of agricultural growth and the contribution of agriculture are positively related, while the workforce in agriculture is negatively related to economic growth. From heteroskedasticity analysis, the growth of agriculture and agriculture's contribution are not important in influencing Malaysian economic growth, in line with the declining growth and contribution of agricultural sector toward GDP.

Oziengbe (2012) studied the relative impacts of Federal Capital and recurrent expenditures on Nigeria's Economy (1980-2011) using multiple regression, co-integration and Error Correction Model (ECM). The OLS results show that only the signs on the coefficients of government expenditure (GOVEXP) and remittance (REMIT) conform to a priori expectations. The signs on the other variables, including foreign direct investment (FDI), and official development assistance and foreign aid (ODAAID) do not conform to a priori expectations. The study concluded that within the period under review, government expenditure and personal remittances from Nigerians abroad contributed significantly to the size of the nation's economy, while the effects of FDI and ODAAID on the nation's economy, showed negative signs and were not significant. The study also drew attention to the fact that "we must be cautious not to insinuate that foreign aid, ODA and foreign direct investment pose dangers to the economy as they could be vital ingredients for economic growth and development if properly harnessed".

Methodology

This research paper used the method of ordinary least squares (OLS) regression estimate for the purposes in determining the variables that has effect on the gross domestic product in Nigerian economy. Moreover, the results of this research paper are analyzed in two groups such as Statistical and econometrics analysis. In the statistical analysis, we can see that the relationship of variables have unperfected similarity due to the random element of variables that have certain probability distribution. The statistical principles commonly used are the coefficient of determination (R^2) as well as the standard deviation. In this research paper, F-test is used to test its significance in order to determine the validity of the estimated parameters in a model.

Econometric analysis is proposed to determine whether the assumptions used in the estimation of an econometric theory meet the desires or otherwise. Here, we only test for the heteroskedasticity problem.

With previous research work that have been studied on the problem of heteroskedasticity, therefore, the dependent variable data is converted by taking the logarithm form (log) for estimation purposes so as to avoid problems in the model specification. The equation below is log linear regression model of economic growth.

$$GDP^* = \beta_0 + \beta_1 AGRSC + \beta_2 INDSC + \beta_3 SRVC + \beta_4 TRADE + \beta_5 CONST + \varepsilon_i$$

Where, GDP^* = Converted GDP (LOG GDP)

$AGRSC$ = Agriculture Sector

$INDSC$ = Industry Sector

$SRVC$ = Service Sector

$TRADE$ = Trade Sector

$CONST$ = Construction Sector

Result Findings

This study shows the factors namely, Agriculture Sector, Industry Sector, Service Sector, Trade Sector and Construction Sector contribution to GDP in influencing economic growth in Nigeria.

Table1: The estimation of regression model

Variables	Coefficient	Std. Error	t-ratio	p-value
Constant	-60.6225	40.2639	-1.5056	0.14197

Variables	Coefficient	Std. Error	t-ratio	p-value
Agricultural	0.960616	0.0376994	25.4809	<0.00001***
Industry	1.03097	0.0239521	43.0431	<0.00001***
Services	0.799494	0.0505754	15.8080	<0.00001***
Trade	1.41389	0.102709	13.7660	<0.00001***
Construction	1.11705	0.108628	10.2832	<0.00001***

Mean dependent variable	27569.56	S.D dependent variable	37735.35
Sum square residual	987850.5	S.E of regression	175.6995
R-squared	0.999981	Adjusted R-squared	0.999978
F(5, 32)	341333.7	p-value (F)	1.26e-74
Log-likelihood	-247.0680	Akaike Criterion	506.1359
Schwarz criterion	515.9615	Hannan-Quinn	509.6318

White's test for heteroskedasticity (squares only) -

Null hypothesis: heteroskedasticity not present

Alternative hypothesis: heteroskedasticity is present

Test statistic: LM=20.2008 with p-value= P(chi-square (10) > 20.2008) = 0.0274099

Based on the obtained result from table 1 with p-value of 0.0274099 being less than significance level of 0.05, it implies that the null hypothesis cannot be accepted and therefore concluded that there is problem of heteroskedasticity in the data.

To remove the problem of heteroskedasticity in the data, the log of the dependent variable is taken and the following result is obtained in table 2

Table 2: The estimation of regression model for log of dependent variable

Variables	Coefficient	Std. Error	t-ratio	p-value
Constant	2.80892	0.0954004	29.4435	<0.00001***
Agricultural	0.000336983	8.93242e-05	3.7726	0.00066***

Industry	1.41482e-05	5.67516e-05	0.2493	0.80472
Services	-8.9695e-05	0.000119832	-0.7485	0.45962
Trade	5.26494e-05	0.000243357	0.2163	0.83009
Construction	-0.000729002	0.000257381	-2.8324	0.00793***

Mean dependent variable	3.706445	S.D dependent variable	1.014676
Sum square residual	5.545742	S.E of regression	0.416298
R-squared	0.854420	Adjusted R-squared	0.831673
F(5, 32)	37.56194	p-value (F)	1.76e-12
Log-likelihood	-17.35310	Akaike Criterion	46.70621
Schwarz criterion	56.53172	Hannan-Quinn	50.20205

White's test for heteroskedasticity (squares only) -

Null hypothesis: heteroskedasticity not present

Alternative hypothesis: heteroskedasticity is present

Test statistic: LM=15.2274 with p-value= P(chi-square (10) > 15.2274) = 0.123988

From the result of p-value = 0.123988 being greater than significance level of 0.05, it implies that the null hypothesis cannot be rejected and therefore concluded that there is no problem of heteroskedasticity in the data.

Table 2 reveals that the value of R-Squared = 0.85442 implies that the explanatory variable has explained 85.44% of the dependent variable(GDP) and the value being close to one also implies that the model is adequate for use.

The value of F-Test (1.76e-12) which is less than significance level of 0.05 also implies that the model is significant for use. **Table 3: Results of Heteroskedasticity Analysis for the Estimated Model**

Model	Variable	Hypothesis	Result	
			Accept/reject	Significant/Not-Significant
Original Model	Agriculture Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Reject H_0	Significant
	Industry Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Reject H_0	Significant
	Service Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Reject H_0	Significant
	Trade Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Reject H_0	Significant
	Construction Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Reject H_0	Significant
White Model	Test Agriculture Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Reject H_0	Significant
	Industry Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Accept H_0	Not Significant
	Service Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Accept H_0	Not Significant
	Trade Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Accept H_0	Not Significant
	Construction Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Reject H_0	Significant

Breusch-Pagan Test Model	Agriculture Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Reject H_0	Significant
	Industry Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Accept H_0	Not Significant
	Service Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Accept H_0	Not Significant
	Trade Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Accept H_0	Not Significant
	Construction Sector	$H_0 : \beta = 0$ $H_1 : \beta \neq 0$	Reject H_0	Significant

From table 3, heteroskedasticity is tested by using two tests that are, White test and Breusch-Pagan test. Both tests indicate that all independent variables, Industry Sector, Service Sector and Trade Sector variables are not important to explain the growth of GDP in Nigeria. It is seen that only Agriculture and Construction Sectors have impact on the growth of GDP in Nigeria.

Conclusion

Based on the objectives of the study, each sector of an economy is believed to contribute to GDP from which the growth rate is estimated. Studies have been conducted to examine the contribution of each sector within the Nigerian economy and the relevance of each sector to the nation's economy. It was established that both Agriculture and Construction sectors contributed significantly to the economic growth of GDP after heteroskedasticity problem have been removed from the data set.

Recommendation

Other sectors of the economy such as Trade, Industry and Services should be given more attention. This will be a form of diversification of the economy of the country and Government should pursue a favorable policy framework and provide necessary infrastructures and create an enabling environment which will raise huge investment in research and development.

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