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# Impact of Manufacturing Sector Development on Economic Growth: Evidence from Nigeria Economy

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ABSTRACT

*This work examined the impact of manufacturing sector development on economic growth in Nigeria for the period 1981 to 2017 using ordinary least square (OLS) technique. The major objective of the study is to determine the impact of manufacturing sector development on economic growth in Nigeria. Another objective of the study isto ascertain the direction of causality relationship between manufacturing sector and economic growth in Nigeria. The error correction model (ECM) result showed that manufacturing sector output has no significant impact on economic growth in Nigeria as revealed by its t-statistic and probability values of 1.19 and 0.24 respectively. The result further revealed that interest rate and gross fixed capital formation have statistically insignificant impact on economic growth in Nigeria over the period. Government expenditure and agricultural sector outputwere found to have statistically significant impact on economic growth in Nigeria as indicated by their t-statistic and probability values of -3.62(0.0011) and 14.14(0.0000) respectively. The result also indicated that the coefficient of the error correction term is negative and statistically significant and shows speed of adjustment of 33.24% of the dependent variable to equilibrium in the short run. The study therefore recommended that the government should implement appropriate reform policies that will ensure efficiency in the workings of manufacturing sector in Nigeria.*

*Keywords: Manufacturing sector development, economic growth, Nigeria.*

## INTRODUCTION

The relevance of manufacturing sector in world economies cannot be overemphasized; it makes for sustainable growth and development of an economy. As noted by [1], 'manufacturing sub-sector is the heart of the economy'. [2] also observed that manufacturing and agricultural sectors matter for Africa in various ways and stressed that long-term development prospects of Africa might be at risk if more robust growth of these sectors were not be achieved. The manufacturing sector which forms part of the industrial sector functions to turn raw materials into finished consumer goods; intermediate goods or producer goods. It provides employment opportunities, boosts agriculture, diversifies the economy and increases foreign exchange in an economy. In modern economy, it does not only act as a catalyst but also serves many dynamic benefits required for economic transformation. It also reduces the risk of over dependence on foreign trade and aids full utilization of available resources.

Manufacturing sector development implies the application of modern technology, machinery and equipment for production of goods and services, alleviation of human suffering as well as continuous improvement in welfare of the people. Modern manufacturing processes are therefore associated with features like high technological innovations, development of managerial and entrepreneurial talents, and improvement in technical skills for the promotion of productivity and better conditions of living. Manufacturing sector forms the basis for determining a nation's economic efficiency and serves as vehicle for the production of goods and services, creation of employment opportunities and enhancement of income. [3] saw the manufacturing sector as one of the Nigeria's most important sectors with potentials for the

future economic growth and development of the country. In view of the potentials of this sub-sector to grow an economy, especially the developing economies, Nigeria has, over the years, designed various policies and programmes, such as import substitution industrialization strategy during the First National Development Plan (1962-1968), to reduce the volume of imports of finished goods and encourage foreign exchange savings through local production of some of the imported consumer goods [4]. Inspite of these efforts to industrialize, the share of manufacturing sector in the total output has remained unimpressive [5]. The performance of the manufacturing sector, irrespective of some observed growth trends in the sector as the fastest growing sector in the country's GDP, has remained poor in terms of enhancing economic growth and development of the country. [6] revealed that the pattern of growth in the Nigerian economy had not gained significant input from the manufacturing sector. This raises some questions: What is the impact of manufacturing sector on economic growth in Nigeria? What is the direction of causality relationship between manufacturing sector and economic growth in Nigeria? The major objective of the study is therefore to examine the impact of manufacturing sector development on economic growth in Nigeria. The study specifically wants to determine the impact of manufacturing sector on economic growth in Nigeria and to ascertain the direction of causality relationship existing between manufacturing sector output and economic growth in Nigeria. This work therefore investigates the impact of manufacturing sector development on economic growth in Nigeria from 1981 to 2017. The investigation is guided by the following hypotheses: Manufacturing sector output has no significant impact on economic growth in Nigeria. There is no directional causality relationship between manufacturing sector and economic growth in Nigeria.

## CONCEPTUAL FRAMEWORK

### Concept of Manufacturing Sector

The manufacturing sector is a subset of the industrial sector which includes processing, quarrying, craft and mining. Manufacturing sector has to do with the conversion of raw materials into finished consumer goods or intermediate or producer goods. It creates avenue for employment, helps to boost agriculture, and helps to diversify the economy and to increase a nation's foreign exchange. Manufacturing sector development implies the application of modern technology, machinery and equipment for the production of goods and services, alleviating human suffering and ensuring continuous improvement in welfare of citizens. Modern manufacturing processes are characterized by high technological innovations, the development of managerial and entrepreneurial talents and improvement in technical skills which normally promote productivity and better living conditions. In modern world, manufacturing sector is regarded as a basis for determining a nation's economic efficiency and as vehicle for the production of goods and services, and a means of creating employment opportunities and enhancing income. As [7] noted, manufacturing sub-sector is the heart of the economy.

### Economic Growth

According to [8], Economic growth is the steady process through which the productive capacity of the economy is increased over time, to bring about rising level of national income. From the definition, growth leads in turn to increase in National income. Growth is thus meaningful if there is an improvement in the well-being of the populace overtime which can only be possible if the rate of population growth lags behind rate of economic growth.

## THEORETICAL LITERATURE

### Lewis Production Model

The Lewis model is known for the two sector economy concept (a rural, agricultural and traditional sector and an urban, industrial and capitalist sector). In the agricultural and traditional sector the population is very high in relation to production output and the natural resources available and the (MPL) marginal productivity of labour in the traditional sector is very low or zero. This means that there is

unemployment or under-employment. This is seen as a reservoir of labour supply to the industrial sector [9]. This labour be reduced without reducing output. Moreover there are factors that support an adequate supply of labour; high population growth as a result of low mortality and high birth rate, the daughters and wives released from domestic work, and workers from different types of casual jobs and the unemployment created by increasing efficiency. Hence, labour supply will exceed demand. At that juncture, the labour market will be in favour of capitalists, and capitalists can maintain a constant wage. [10] believes that the supply of labour is effectively unlimited on the basis that the capitalist can have a reliable supply of labour at the same wage. The level of wages in the industrial sector is determined by that in the rural sector. Because if the wage in the industrial sector is less than that in the rural sector, no peasant will leave the rural sector to find a job in the industrial or urban sector. According to Lewis, the urban wage is about 30% more than rural wage. This gap is seen necessary to prompt the change from the rural sector to compensate for the higher cost of living in an urban area or the mental cost of transfer. As the marginal product of labour is insignificant or zero, the wages in the rural sector remain unchanged at a subsistence level. Thus, the wages in the urban sector also remains unchanged. Even if it is greater than the earnings in the rural sector because of a little encouragement, it is no more than rural level in urban life. In the industrial sector, labour is engaged to the point where the marginal product is equal to the earnings in order not to decrease the industrial surplus. Since labour supply is greater than demand and the wage remains unchanged at rural level, the level of profits is fully maximized. Profit oriented capitalists are presumed to invest all profits to generate new capital at a maximum level. Then an industrial expansion creates new employment. The capital accumulation becomes greater but the earnings or wage still remain unchanged so that the excess becomes greater. Full investment level and an unlimited supply of labour guarantee that both capital accumulation and employment improve at the maximum level. As it engages more labour, the industrial sector keeps improving and expanding. This continues until surplus labour reduces. Henceforth, the migration of surplus labour from the rural sector creates an increase of the marginal productivity of labour in the sector. However, before all surplus labour is exhausted, an increment in profit in the rural sector may occur and influence the growth of the industrial sector. Lewis clarifies this in terms of an exchange between the two sectors on the assumption that they are producing and trading different things. Firstly, the change of total population by transfer of labour will prompt the two circumstances stated below: One is a decrease of without a doubt in the amount of individuals in the rural sector, regardless of the fact that there is surplus labour and aggregate productivity does not increase, the normal creation per head might perhaps increase. This increase in profit in this part pushes up the earnings in the industrial sector [11] [12]. The other circumstance is that as the industrial sector expands in respect to the supply of rural sector, it has to pay the higher cost of the rural or agricultural products. Accordingly, the terms of exchange move against the industrial sector and industrial its benefits are reduced. Furthermore, if an increase in productivity of the agricultural sector occurs, due to innovation or more efficient cultivating methods, it will directly increase the spending per head in this sector, and indirectly, the industrial workers' earnings will rise. The outcome is the diminishment of the industrial surplus and a reduction in the rate of capital aggregation. Lewis, then, expands his model beyond just one country. Utilizing the established structure which accepts that all countries must have surplus labour, he recommends that the industrialist could minimize the brake on capital accumulation by importing labour from, or sending funding to, countries where surplus work is still accessible at a rural wage.

**Harrod-Domar Growth Model**

The Harrod-Domar is a modern theory of growth which is propounded by Roy Harrod with an article “an Essay in

Dynamic Theory (1939)". This model was meant to tickle the problem of underdevelopment in the developing countries the necessary criterion for development is the ability of a nation to save a proportionate part of it national income, if only to change worn-out or impaired capital goods (buildings, equipment, and materials). However, in order to grow, new investments representing net additions to the capital stock are necessary.

Harrod-Domar theory of economic growth, states simply that the rate of growth of GDP ($\Delta Y/Y$) is determined jointly by the net national savings ratio, *s,* and the national capital-output ratio, More specifically, it stated that in the absence of government intervention, the growth rate of national income will be directly or positively related to the savings ratio (that is, the more an economy is able to save and invest out of a given GDP, the greater the growth of that GDP will be) and inversely or negatively related to the economy's capital-output ratio (that is, the higher *c* is, the lower the rate of GDP growth will be).

The equation of the Harrod-Domar theory of growth is given thus:

$$\Delta Y/Y = S/C \quad (1)$$

Where Y= GDP of the economy,
$\Delta Y/Y$= rate of GDP growth,
S = net savings ratio,
C =capital-output ratio.

On a general note, the famous Harrod-Domar equation of economic growth can be stated as:

$$\Delta Y/Y = S^g/c - \delta \quad (2)$$

where $\delta$ is the rate of capital depreciation.

Unfortunately, the mechanisms of development stated in the Harrod-Domar model failed. The basic reason of it failure was not because more saving and investment isn't a necessary condition for accelerated rates of economic growth but rather because it is not a sufficient condition. The Harrod-Domar model based its analysis implicitly on the existence of already made institutional, structural and attitudinal conditions because it explained vividly the development situation of Europe via the Marshall Plan.

**Economic Growth and Industrialization**

Industrialization refers to an increase in the share of manufacturing in the gross domestic product (GDP) and in the occupations of the economically active population. It could also be used to describe the development of economic activity in relatively large units of production, making much use of machinery and other capital assets, with the tasks of labour finely divided and the relationships of employment formalized [13]. In either case, industrialization is concerned with the expansion of a country's manufacturing activities, including the generation of electricity and the growth of its communications network. It is also a process of reducing the relative importance of extractive industries and of increasing that of secondary and the tertiary sectors [14]. There is evidence to suggest that industrialization and in particular manufacturing is the prime mover of economic growth. This is given that it creates employment, enables wealth creation and facilitates poverty alleviation. Former United Nations Secretary General, Kofi Anan in his message to Africa's Industrialization Day (2003), highlighted the relevance of industrialization, especially its varied and valuable contribution to the alleviation of poverty. Industrialization, he argued, raises productivity, creates employment, reduces exposure to risk, enhances income-generating assets of the poor and helps to diversify exports. It is in fact argued, that the transformation of Southeast Asia within a few years and the unprecedented pace of development of China and India. (Which has lifted millions from poverty), are examples of what sustained industrialization could do to any economy. There is an intrinsic relationship between industrialization and economic growth. This is given that there is hardly any country that has developed without industrializing even as rapidly growing economies tend to have rapidly growing manufacturing sectors (UNIDO 2009). Similarly, virtually every country that experienced rapid growth of productivity and living standards over the last two hundred years has done so by industrializing [15]. England, which is widely acclaimed

as the first developed country, achieved this status using the Industrial Revolution, which enabled it, thanks to series of cost-reducing innovations, to increase its industrial output fourfold beginning from the first half of the eighteenth century. Since then, the main criterion for growth has been an increase in per capita income resulting mainly from industrialization. The example of Southeast Asia, which we earlier alluded to, is self-evident. In these economies industrialization has proved to be the natural route to growth in an economy. Their spectacular rise, contrasts sharply with the continued industrial marginalization of sub-Saharan Africa as well as other least developed economies [16].

**Government Policy/Incentives to Boost the Nigeria Manufacturing Sector**

Government has since independence in 1968 made conscious effort to reduce dependence on foreign manufacturers through supportive program aimed at making the local manufacturers meet local demand along the line of import substitution. In order to achieve the above objective, the Nigerian government has drafted for the country an industrial policy document to guide its achievement. According to the Bureau of Public Enterprise (2005), Industrial policy can be defined as a systematic government involvement through specifically designed policies in industrial affairs, arising from the adequacy of macroeconomic policies in regulating the growth of the industry. It went further to say that the instrument of industrial policy includes; subsidies, tax incentives, export promotion, government procurement and import restrictions. Others include direct investment which formed the pivot of industrial policy from 1970s to 1980s. Foreign exchange rate policy, monetary policy and trade policy also help to shape investment decision. The industrial policies of Nigeria intend to achieve the following objectives -to generate and raise the production, increase export of locally manufactured goods, create a wider geographical dispersal of industries, improve the technological skill and capabilities available in the country, increase local contest of industrial output by looking inwards for the basic and intermediate input, and affect foreign direct investment. To achieve the above, the Nigerian government has put in place some policy measures or policies such as funding industrial development, incentives to industry and institutional frame work. Funding Industrial Development and improving industrial production in Nigeria require high financial resources.

EMPIRICAL REVIEW

[17], appraised the impact of the manufacturing sector on economic growth of Nigeria using time series data from 1981 to 2014. They found that the manufacturing sector in Nigeria has the potential of growth inducing but it has not contributed meaningfully to the economic growth of Nigeria because of low market capitalization, epileptic power supply, misappropriation of funds among others.

[18] examined the impacts of Agricultural sector credit on economic growth in Nigeria for the period 2000:Q1 to 2014:Q4 using the [19] cointegration test to account for structural breaks and endogeneity problems. They found a cointegrating relationship between output and its selected determinants, though with a structural break in 2012Q1. Furthermore, the error correction model confirmed a positive and statistically significant effect of agricultural sector credit on output, while increased prime lending rate was inhibiting growth.

[20] examined the roles of the manufacturing sector on Nigeria's economic growth using Granger-causality test and regression analysis. They discovered a one-way causality between GDP growth and manufacturing output and advised that government should encourage the development of manufacturing sector since it has a positive effect on economic growth. [21] used the ordinary least square technique to analyze the contribution of the manufacturing sector to the growth of the Nigeria economy from 1980 to 2007, the result showed that the Nigeria manufacturing sector has positively influenced economic growth in Nigeria.

[22] carried out a study on manufacturing sector and economic growth and Development in Nigeria

from 1980 to 2012 and employed the Error correction Mechanism in the estimation of the relevant equations, and found out that manufacturing sector has positive and significant impact on economic growth in Nigeria.
[23] examined the relationship between manufacturing sector and economic growth in Nigeria for the period 1980 to 2000 using ordinary least squares regression (OLS). The result showed that there is a positive relationship between the manufacturing sector development and economic growth and suggested the pursuit of policies geared towards rapid development of the manufacturing sector.
[24] examined the impact of Agricultural sector on economic growth in Nigeria, from the period of 1970-2012. The study employed the classical linear regression model. The regression result showed that agricultural sector had a positive and significant relationship with economic growth in Nigeria the period under review.
[25] analysed the role of manufacturing sector as a vehicle for economic diversification and growth in Nigeria from 1986 to 2011. The linear regression model was used for the analysis of data. The findings revealed a significant relationship between manufacturing sector activities and economic growth in Nigeria.
[26] examined the impact of Agricultural sector on Economic growth in Nigeria. The study employed the ARDL methodology from the period of 1970 to 2011. The result revealed that Agricultural Credit Guarantee Scheme Fund and Government fund allocation to agriculture produced a significant positive effect on economic growth in Nigeria while the other variables produced significant negative effect. He thus concluded that agricultural sector drives growth.
[27] investigated the efficiency of the Nigerian manufacturing sector from 1986 to 2009 through the Random Walk Theory. The study made use of ADF unit root test, the ARMA Test, the VAR-based granger causality test, the Cointegration analysis and the Vector Error Correction Test. The results revealed that there is still room for improvement in the efficiency level of the Nigerian manufacturing sector. The result further indicated a significant relationship between manufacturing sector performance and economic development. The study recommended that there should be an increase in the level of government budgetary allocation to the manufacturing sector.
[28] examined agricultural financing in Nigeria and its implication on the growth of Nigeria economy using ordinary least square method and quantitative research design from 1972 to 2013. The study revealed that there is significant relationship between agricultural financing and the growth of Nigerian economy and that the level of loan repayment rate over the years negatively impacted significantly on the growth of Nigerian economy.
[29] examined the impact of manufacturing sector on economic growth in Nigeria using time series data from 1990 to 2013. They employed OLS methodology for the analysis. The results showed that manufacturing sector has a positive significant impact on gross domestic product of the country.
[30] studied the impact of manufacturing sector on Economic Growth: The Nigerian Experience from 1980 to 2012 using co-integration and ordinary least square regression. The study revealed that manufacturing sector reform positively impact on the growth of Nigeria economy on the long run.
[31] investigated the impact of manufacturing sector on economic growth in Nigeria using Johansen Co-integration, Granger Causality test and VAR model. Their result showed that the Nigerian manufacturing sector and economic growth are co-integrated, meaning that there is relative positive impact of the Nigeria manufacturing sector on economic growth of the country.
[32] analyzed manufacturing sector performance and the growth of the Nigerian, economy. A co-integration approach was used for the analysis of data. He used the real gross domestic product (as a proxy for development indicator). The result showed a long run relationship between the growth of GDP and the manufacturing sector Output in Nigeria.

[33] investigated manufacturing sector development and economic growth in Nigeria from the period 1980 to 2010 using OLS methodology. They found out that manufacturing sector and economic growth have a positive relationship in Nigeria. [34], empirically examined the causal linkage between manufacturing sector and economic growth in Nigeria between 1970 and 2004 using the ordinary least square estimation method. The result showed that manufacturing sector drives economic growth in Nigeria.

## METHODOLOGY

Research design adopted for this study is the ex post facto research design. This work is anchored on production theory. Cobb–Douglas production function is a functional form of the production function generally used to represent technological relationship between the amounts of two or more inputs (physical capital and labor) and the amount of output that can be produced by those inputs. The Cobb–Douglas form was developed and tested against statistical evidence by Charles Cobb and Paul Douglas during 1927–1947.

### Model Specification.

The functional form of the model is specified

RGDP= f(MUQ, GEXP, GCF, INTR, AGQ) (1)

The mathematical form of the model is specified as:

$RGDP_t = b_0 + b_1MUQ_t + b_2GEXP_t + b_3GCF_t + b_4 INTR_t + b_5AGQ_t$ (2)

The econometric form of the model is specified as:

$RGDP_t = b_0 + b_1MUQ_t + b_2GEXP_t + b_3GCF_t + b_4 INTR_t + b_5AGQ_t + \mu t$ (3)

where;RGDP = Real gross domestic product, MUQ= Manufacturing sector output (measured by its contribution to GDP), GCF = Gross fixed capital formation, GEXP= Government expenditure, INTR= interest rate and AGQ= Agricultural sector output(measured by its contribution to GDP), f = functional relationship, t = time from 1981-2017; $b_0$= constant, $b_1$, $b_2$, $b_3$, $b_4$, $b_5$ are the relative slope coefficient and partial elasticity of the parameters and µt = stochastic error term.

### Apriori Expectation

The economic a priori expectation test evaluates the parameters whether they meet standard economic theory which includes the sign and sizes. The economic a priori expectation are $b_0$, $b_1$, $b_2$, $b_3$, $b_5 > 0$, and b4< 0.

### Justification of Variables

**Real Gross Domestic Product (RGDP)**:

Real gross domestic product (RGDP) is used to proxy economic growth. It is the increase in the total value of goods and services (adjusted for price changes) produced in a year and the closest measure of economic growth as it encompasses all forms of production that was carried out in the economy [35]. It is expected that real economic growth rate should have a positive relationship with manufacturing sector output.

**Manufacturing Sector output (MUQ)**

This is the estimate of the total value of goods and services produced by the manufacturing sector. They include oil refining, cement production, food, beverage and tobacco, textile, apparel and footwear, chemical and pharmaceutical products etc. The manufacturing sector accounts for almost 80% of total industrial production and tends to have a huge impact on market behaviour [36]. This variable is used because it has a positive and significant contribution to the performance of macroeconomic variables like general price level, employment and economic growth.

**Interest Rate (INTR**).

This is the proportion of an amount loaned which a lender charges as interest to the borrower, normally expressed as an annual percentage. It is the rate a bank or other lender charges to borrow its money, or the rate a bank pays its savers for keeping money in an account. INTR is the rate at which the commercial banks lend money to its customers. INTR is one of the most effective monetary policy instruments that are used by the CBN. This variable is used because it is a very important monetary policy instrument that determines the performance of macroeconomic variables like general price level, employment and economic growth [37]. Since interest rate is the cost of borrowing to finance investment,

an increase in the rate of interest leads to a reduction in investment which reduces economic growth.

**Government expenditure (GEXP)**

Government expenditure (like expenditure by private sector firms) can be categorized into recurrent expenditure or capital expenditure. Government expenditure includes all government consumption, investment, and transfer payments [38]. In national income accounting the acquisition by governments of goods and services for current use, to directly satisfy the individual or collective needs of the community, is classed as Government final consumption expenditure Government acquisition of goods and services intended to create future such as infrastructure investment or research spending, is classed as government investment (government gross capital formation).

**Agricultural sector output (AGQ)**

This is the overall quantity of agricultural output produced in a nation. It is measured as the ratio of agricultural contribution to GDP. Therefore, output is usually measured as the market value of final output, which excludes intermediate products such as corn feed used in the meat industry. This output value may be compared to many different types of outputs such as labour and land (yield). These are called partial measures of productivity. Agricultural output may also be measured by what is termed total factor productivity (TFP) or by its contribution to GDP. This method of calculating agricultural output compares an index of outputs in a year. This, measure of agricultural productivity was established to remedy the shortcomings of the partial measures of output; notably that it is often hard to identify the factor that causes them to change. Changes in AGQ are usually attributed to technological improvements.

**Gross fixed capital formation (GCF)**

Gross fixed capital formation (formally gross domestic fixed investment) is a macroeconomic concept used in official national accounts. Statistically, it measures the value of acquisitions of new or existing fixed assets by the business sector, government and "pure" households. GCF is a component of the expenditure on gross domestic product (GDP), and thus shows something about how much of the new value added in the economy is invested rather than consumed [39]. This includes land improvements (fences, ditches, drains, and so on); plant machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, commercial and industrial buildings etc.

## DATA ANALYSIS TECHNIQUES

This study will employ the Ordinary least squares (OLS) technique to estimate the multiple regression models. This is because the model is linear in parameters as demanded by the OLS approach. According to [40], the Ordinary least square (OLS) is extensively used in regression analysis primarily because it is intuitively appealing and mathematically much simpler than other econometric techniques. Also, this method credited to Carl Gauss is preferred because of its attractive statistical properties of linearity, unbiasness and efficiency in the class of unbiased estimator which made it one of the most powerful and popular method of estimation.

### Pre - Estimation tests

**Unit Root Test:** The test is conducted to ascertain the level of stationarity of the variables under consideration; since the time series variables are generated through a stochastic process. Augmented Dickey-Fuller test is applied following the decision rule: if the absolute value of the Augmented Dickey-Fuller (ADF) test is greater than the critical value at 5% level of significance at level, 1st difference and 2nd difference, conclude that the variables under consideration are stationary; if otherwise, they are not.

$$\Delta Y_t = \beta_1 + \beta_2 + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t$$

where: Y is a time series, t is a linear time trend, Δ is the first difference operator, $\beta_s$ are parameters, n is the optimum number of lags in the dependent variable and εt is a pure white noise error term. If ADF statistic > ADF critical, reject the null hypothesis that the variable is non-stationary at the chosen level of significance, if

otherwise, do not reject the null; conclude that the variable is stationary.

**Cointegration Test**: The co-integration test is conducted to establish a long run relationship between the variables under consideration. ADF test on the regression residuals is used to test for co-integration among the variables [41]. The ADF unit root test on the residuals work with the same decision rule as unit root test that is if the absolute value of the Augmented Dickey-Fuller (ADF) test is greater than the critical value at 5% level of significance at level [I(0)], we conclude that the variables under consideration are co-integrated; if otherwise, they are not. the co-integration Test equation is expressed as follows:

$$\Delta\mu_t = \delta\mu_{t-1} + \alpha_i \sum_{i=1}^{n} \Delta\mu_{t-i} + \varepsilon_t$$

Where $\mu_t$ = the generated residual series and $\varepsilon_t$ = pure white noise error.

**Error Correction Mechanism (ECM):** An error correction mechanism is a dynamical system with the characteristics that the deviation of the current state from its long-run relationship will be fed into its short-run dynamics. An error correction model is not a model that corrects the error in another model. Error Correction Models (ECMs) are a category of multiple time series models that directly estimate the speed at which a dependent variable Y returns to equilibrium after a change in an independent variable X. ECMs are a theoretically-driven approach useful for estimating both short-term and long-term effects of one time series on another [42]. Thus, they often mesh well with our theories of political and social processes. ECMs are useful models when dealing with co-integrated data, but can also be used with stationary data.

**Granger Causality Test:** Granger Causality test is conducted to establish the direction of causality among the variables of interest [43]. This test is undertaken to investigate whether there is a degree of causation of one variable on the other. The essence of causality analysis, using the granger causality test, is to actually ascertain whether a causal relationship exists between two variables of interest. Below is the Granger Causality model specification:

$$MUQ = b_0 + \sum_{i-1}^{n} b_1 RGDP_{t-i} + \sum_{i-1}^{n} b_2 AGQ_{t-i} + \sum_{i-1}^{n} b_3 MUQ_{t-i} + \sum_{i-1}^{n} b_4 GCF_{t-i} + \sum_{i-1}^{n} b_5 GEXP_{t-i} + \sum_{i-1}^{n} b_6 INTR + \mu$$

$H_0$: $MUQ^{1t}$ does not Granger cause RGDP

**Decision Rule:**
The rule of thumb states that the probability of F-statistic must be less than 0.5 to show causal relationship. Or if the computed F-value exceeds the critical F value at the chosen level of significance, reject the null hypothesis; otherwise do not reject it.

**Post - Estimation test**

**Multicollinearity Test:** In this study, the test for linear relationship among the variables used in the model would be performed to see if there is high collinearity among variables or not [44]. This is in line with Assumption of the Classical Linear Regression Model (CLRM) of "no high or perfect multi-collinearity". The correlation matrix is used for this test. If the correlation coefficient between two variables exceeds 0.8, then such variables has high multi-collinearity test.

**Normality Test** This is carried out to test if the error term follows the normal distribution. Under the null hypothesis that the residuals are normally distributed, if the computed value of the JB-statistics is greater than the tabulated value (chi-square distribution with 2df at 5% level of significance), we reject $H_0$, and we do not reject $H_0$ if otherwise [45]. Alternatively, we reject the null hypothesis if the probability value is < 0.05, we do not reject if otherwise. Hypothesis: Ho: error terms are normally distributed. H1: error terms are not normally distributed.

**Heteroscedasticity Test:** The aim of this test is to see whether the error variance of each observation is constant or not. Non-constant variance can cause estimated model to yield a biased result. White's general heteroscedasticity test would be adopted for this purpose at 5% level of significance [46]. $H_{0:}$ presence of homoscedasticity. $H_{1:}$ presence of heteroscedasticity

Decision rule: Reject $H_0$ if the probability value of Chi-Square is less than 0.05, do

not reject if otherwise OR reject $H_0$ if $n.R^2 > \chi^2$ tab, do not reject if otherwise.

**Autocorrelation Test:** This is to test whether errors corresponding to different observations are uncorrelated. It checks the randomness of the residuals. The Durbin–Watson test is adopted for this test. Hence, we compare the established lower bound dL and the upper bound dU of Durbin Watson based on 5% level of significance and k-degrees of freedom. Where: k = number of explanatory variables excluding the constant.

SOURCES OF DATA

The data used for this study were obtained from Central bank of Nigeria statistical bulletin 2017. The data are secondary time series data on real gross domestic product (RGDP), Manufacturing sector output (MUQ), Gross fixed capital formation(GCF), Government expenditure (GEXP), interest rate (INTR) and Agricultural output(AGQ).

DATA PRESENTATION AND ANALYSIS

The results of the research carried out are presented and analyzed in this section.

**Unit Root Test Result**

The result of unit root test is presented in table 1. below.

**Table 1. Unit Root Test Result**

| Variables | ADF Statistic | 5% Critical Value | Order of Integration | Remarks |
|---|---|---|---|---|
| **RGDP** | -5.298095 | -2.948404 | I(1) | Stationary |
| **LOG(MUQ)** | -4.870698 | -2.948404 | I(1) | Stationary |
| **GEXP** | -4.537588 | -2.948404 | I(1) | Stationary |
| **LOG(GCF)** | -5.881253 | -2.948404 | I(1) | Stationary |
| **INTR** | -5.869384 | -2.948404 | I(1) | Stationary |
| **AGQ** | -6.310680 | -2.948404 | I(1) | Stationary |

Source: Researcher's computation

The result shows that all the variables in the model: RGDP, MUQ, GEXP, GCF, INTR and AGQ are stationary at first difference. To ascertain whether the variables have a sustainable long run relationship or are stable over time, cointegration test was conducted.

**Co-integration Test Result**

The Engle Granger co-integration test result in table 4.2 below shows that the residual is integrated at level as indicated by the probability value, 0.0001 and the ADF test statistic -5.588441 which is greater than the critical value -2.967767 at 5% level of significance in absolute terms.

**Table 2 Co-integration test result**

Null Hypothesis: RESIDUAL01 has a unit root

Exogenous: Constant

Lag Length: 7 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.588441 | 0.0001 |
| Test critical values: | 1% level | -3.679322 | |
| | 5% level | -2.967767 | |
| | 10% level | -2.622989 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESIDUAL01)

Method: Least Squares

Date: 07/14/19 Time: 13:37

Sample (adjusted): 1989 2017

Included observations: 29 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| RESIDUAL01(-1) | -4.221591 | 0.755415 | -5.588441 | 0.0000 |
| D(RESIDUAL01(-1)) | 2.837787 | 0.643675 | 4.408725 | 0.0003 |
| D(RESIDUAL01(-2)) | 2.376492 | 0.567088 | 4.190695 | 0.0005 |
| D(RESIDUAL01(-3)) | 2.341896 | 0.485829 | 4.820415 | 0.0001 |
| D(RESIDUAL01(-4)) | 1.717937 | 0.469010 | 3.662903 | 0.0015 |
| D(RESIDUAL01(-5)) | 0.945261 | 0.342189 | 2.762393 | 0.0120 |
| D(RESIDUAL01(-6)) | 1.275637 | 0.301023 | 4.237666 | 0.0004 |
| D(RESIDUAL01(-7)) | 0.874121 | 0.303490 | 2.880228 | 0.0093 |
| C | -173.8951 | 170.0670 | -1.022509 | 0.3187 |

| | | | |
|---|---|---|---|
| R-squared | 0.777912 | Mean dependent var | 91.03287 |
| Adjusted R-squared | 0.689077 | S.D. dependent var | 1535.474 |
| S.E. of regression | 856.1869 | Akaike info criterion | 16.59198 |
| Sum squared resid | 14661121 | Schwarz criterion | 17.01631 |
| Log likelihood | -231.5837 | Hannan-Quinn criter. | 16.72488 |
| F-statistic | 8.756818 | Durbin-Watson stat | 2.074467 |
| Prob(F-statistic) | 0.000043 | | |

There is therefore co-integration among the variables; a long-run equilibrium relationship exists between the independent and dependent variables in the model.

**Error Correction Model (ECM) Result**

The result of Error Correction Mechanism (ECM) is presented in table 4.3 below.

**Table 3. Error Correction Model (ECM) Result**

Dependent Variable: D(RGDP)
Method: Least Squares
Date: 07/14/19 Time: 13:42
Sample (adjusted): 1982 2017
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 392.0774 | 171.6801 | 2.283768 | 0.0299 |
| D(LOG(MUQ)) | 5120.422 | 4298.254 | 1.191279 | 0.2432 |
| D(INTR) | 4.072108 | 3.666488 | 1.110629 | 0.2759 |
| D(GEXP) | -2.007391 | 0.554855 | -3.617867 | 0.0011 |
| D(LOG(GCF)) | -1906.998 | 1488.995 | -1.280728 | 0.2104 |
| D(AGQ) | 1.831254 | 0.129483 | 14.14281 | 0.0000 |
| ECM(-1) | -0.332414 | 0.152064 | -2.186022 | 0.0370 |

| | | | |
|---|---|---|---|
| R-squared | 0.951595 | Mean dependent var | 1173.696 |
| Adjusted R-squared | 0.941580 | S.D. dependent var | 3048.918 |
| S.E. of regression | 736.9306 | Akaike info criterion | 16.21553 |
| Sum squared resid | 15748933 | Schwarz criterion | 16.52344 |
| Log likelihood | -284.8795 | Hannan-Quinn criter. | 16.32300 |
| F-statistic | 95.01829 | Durbin-Watson stat | 1.517457 |
| Prob(F-statistic) | 0.000000 | | |

The result indicated that manufacturing sector output (MUQ) has no significant impact on economic growth in Nigeria over the period studied as revealed by its t-statistic and probability values of 1.191279 and 0.2432 respectively [47]. The result also showed that interest rate (INTR) and gross fixed capital formation (GCF) have statistically insignificant impact on economic growth in Nigeria over the period. However, government expenditure (GEXP) has statistically significant impact on economic growth in Nigeria as indicated by its t-statistic and probability values of -3.617867and 0.0011 respectively. It also revealed that agricultural sector output (AGQ) has statistically significant impact on Economic growth in Nigeria within the period studied as revealed by its t-statistic and probability values of 14.14281and 0.0000 respectively. Furthermore, the result showed that the coefficient of the error correction term, ECM(-1), is -0.332414. This means that 33.24% of the disequilibrium in the model is corrected in the short run. In other words, the speed of adjustment of the dependent variable to equilibrium in the short run is 33.24%. The result also showed that the coefficient of the error correction term, ECM (-1), is negative and statistically significant as expected. The ECM result equally indicated that the constant term (C) is positive and this conforms to a priori expectation [48].

The value of the constant is 392.0774 and implies that holding all the other variables in the model constant, RGDP will be equal to 392.0774. From the model, the coefficient of multiple determinations, $R^2$is 0.951595. This means that the variability in the independent variables account for 95.16% of the variability in the dependent variable, RGDP and indicates very high explanatory power of variables in the model [49]. The probability of the (F-statistic) from the regression result indicates 0.000000 which is less than 0.05. Reject the null hypothesis and conclude that the model is statistically significant.

**Causality Analysis (Granger Causality Test)**

The result ofGranger Causality test is presented in table .4 below

**Table 4: Pairwise Granger Causality Tests Result**

Pairwise Granger Causality Tests
Date: 07/14/19 Time: 13:55
Sample: 1981 2017
Lags: 2

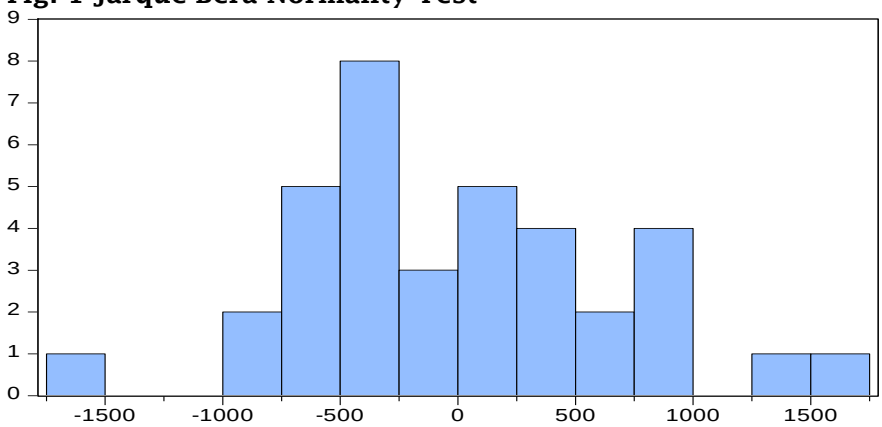
| Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|
| MUQ does not Granger Cause RGDP | 35 | 1.54680 | 0.2294 |
| RGDP does not Granger Cause MUQ | | 1.22757 | 0.3073 |
| INTR does not Granger Cause RGDP | 35 | 24.9732 | 4.E-07 |
| RGDP does not Granger Cause INTR | | 0.36497 | 0.6973 |
| GEXP does not Granger Cause RGDP | 35 | 0.37431 | 0.6909 |
| RGDP does not Granger Cause GEXP | | 0.54836 | 0.5836 |
| GCF does not Granger Cause RGDP | 35 | 2.67726 | 0.0851 |
| RGDP does not Granger Cause GCF | | 0.40046 | 0.6735 |
| AGQ does not Granger Cause RGDP | 35 | 4.59982 | 0.0181 |
| RGDP does not Granger Cause AGQ | | 4.99419 | 0.0134 |
| INTR does not Granger Cause MUQ | 35 | 15.4337 | 2.E-05 |
| MUQ does not Granger Cause INTR | | 0.39550 | 0.6768 |
| GEXP does not Granger Cause MUQ | 35 | 0.18794 | 0.8296 |
| MUQ does not Granger Cause GEXP | | 0.04209 | 0.9588 |
| GCF does not Granger Cause MUQ | 35 | 1.17605 | 0.3223 |
| MUQ does not Granger Cause GCF | | 0.84900 | 0.4379 |
| AGQ does not Granger Cause MUQ | 35 | 2.70378 | 0.0832 |
| MUQ does not Granger Cause AGQ | | 1.62465 | 0.2138 |
| GEXP does not Granger Cause INTR | 35 | 6.64099 | 0.0041 |
| INTR does not Granger Cause GEXP | | 0.23313 | 0.7935 |
| GCF does not Granger Cause INTR | 35 | 2.51889 | 0.0974 |
| INTR does not Granger Cause GCF | | 7.73516 | 0.0020 |

| | | | |
|---|---|---|---|
| AGQ does not Granger Cause INTR | 35 | 0.10885 | 0.8972 |
| INTR does not Granger Cause AGQ | | 42.3040 | 2.E-09 |
| GCF does not Granger Cause GEXP | 35 | 0.00031 | 0.9997 |
| GEXP does not Granger Cause GCF | | 0.86176 | 0.4326 |
| AGQ does not Granger Cause GEXP | 35 | 0.64772 | 0.5304 |
| GEXP does not Granger Cause AGQ | | 0.24455 | 0.7846 |
| AGQ does not Granger Cause GCF | 35 | 0.30105 | 0.7422 |
| GCF does not Granger Cause AGQ | | 2.01279 | 0.1513 |

The result of the Granger Causality test indicated that there is no significant causality relationship between manufacturing sector output and economic growth.

**Normality Test**

**Fig. 1 Jarque-Bera Normality Test**




Series: Residuals
Sample 1982 2017
Observations 36

| | |
|---|---|
| Mean | -3.16e-14 |
| Median | -19.89055 |
| Maximum | 1511.880 |
| Minimum | -1638.944 |
| Std. Dev. | 670.7977 |
| Skewness | 0.162616 |
| Kurtosis | 2.988816 |
| Jarque-Bera | 0.158851 |
| Probability | 0.923647 |

The result of Jarque-Bera Normality Test in fig. 1 above shows that the error terms of the variables in the model are normally distributed at 5% level of significance, as revealed by the probability value of JB of 0.923647 which is above 0.05. Thus, the null hypothesis was not rejected.

**Heteroscedasticity Test**

This test is to find out whether the error variance of each observation is constant or not. Non-constant variance can cause estimated model to yield a biased result. Breusch-Pagan-Godfrey heteroscedasticity test was adopted for this purpose at 5% level of significance. $H_{0:}$ presence of homoscedasticity, $H_{1:}$ presence of heteroscedasticity

**Decision rule:** reject $H_0$ if the probability value of Chi-Square is less than 0.05, we do not reject if otherwise OR reject $H_0$ if $n.R^2 > \chi^2$ tab, do not reject if otherwise.

**Table 5: Breusch-Pagan-Godfrey Heteroskedasticity Test**

Heteroskedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 0.160772 | Prob. F(6,29) | 0.9851 |
| Obs*R-squared | 1.158922 | Prob. Chi-Square(6) | 0.9789 |
| Scaled explained SS | 0.747842 | Prob. Chi-Square(6) | 0.9934 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Date: 07/14/19 Time: 13:44
Sample: 1982 2017
Included observations: 36

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 501852.6 | 157538.3 | 3.185592 | 0.0034 |
| D(LOG(MUQ)) | -2183449. | 3944194. | -0.553585 | 0.5841 |
| D(INTR) | 1255.848 | 3364.468 | 0.373268 | 0.7117 |
| D(GEXP) | 94.15291 | 509.1496 | 0.184922 | 0.8546 |
| D(LOG(GCF)) | -322657.4 | 1366342. | -0.236147 | 0.8150 |
| D(AGQ) | 4.763262 | 118.8171 | 0.040089 | 0.9683 |
| ECM(-1) | 106.7603 | 139.5377 | 0.765100 | 0.4504 |

| | | | |
|---|---|---|---|
| R-squared | 0.032192 | Mean dependent var | 437470.4 |
| Adjusted R-squared | -0.168044 | S.D. dependent var | 625695.7 |
| S.E. of regression | 676227.4 | Akaike info criterion | 29.85911 |
| Sum squared resid | 1.33E+13 | Schwarz criterion | 30.16702 |
| Log likelihood | -530.4640 | Hannan-Quinn criter. | 29.96658 |
| F-statistic | 0.160772 | Durbin-Watson stat | 2.151431 |
| Prob(F-statistic) | 0.985123 | | |

Conclusion: Prob. Chi-Square 0.9789 is greater than 0.05 (0.9789 > 0.05) we do not reject $H_0$ and conclude that there is homoscedasticity.

**Autocorrelation Test**

**TABLE 6 Breusch-Godfrey Serial Correlation LM Test**

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.433563 | Prob. F(2,27) | 0.2560 |
| Obs*R-squared | 3.455857 | Prob. Chi-Square(2) | 0.1777 |

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/14/19 Time: 13:43
Sample: 1982 2017
Included observations: 36
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -16.29617 | 172.1170 | -0.094681 | 0.9253 |
| D(LOG(MUQ)) | 267.4801 | 4372.842 | 0.061168 | 0.9517 |
| D(INTR) | 1.865679 | 3.780907 | 0.493447 | 0.6257 |
| D(GEXP) | 0.210953 | 0.560896 | 0.376100 | 0.7098 |
| D(LOG(GCF)) | 226.2194 | 1485.652 | 0.152269 | 0.8801 |
| D(AGQ) | 0.004554 | 0.128701 | 0.035388 | 0.9720 |
| ECM(-1) | -0.139934 | 0.189795 | -0.737290 | 0.4673 |
| RESID(-1) | 0.414972 | 0.253366 | 1.637833 | 0.1131 |
| RESID(-2) | -0.128570 | 0.214079 | -0.600573 | 0.5531 |

| | | | |
|---|---|---|---|
| R-squared | 0.095996 | Mean dependent var | -3.16E-14 |
| Adjusted R-squared | -0.171857 | S.D. dependent var | 670.7977 |
| S.E. of regression | 726.1542 | Akaike info criterion | 16.22572 |
| Sum squared resid | 14237098 | Schwarz criterion | 16.62160 |
| Log likelihood | -283.0630 | Hannan-Quinn criter. | 16.36389 |
| F-statistic | 0.358391 | Durbin-Watson stat | 1.932586 |
| Prob(F-statistic) | 0.933307 | | |

The result of Breusch-Godfrey Serial Correlation LM Test in table 4.7 above shows that there is no autocorrelation; the prob. Chi-Square is 0.1777 which is greater than 0.05.

**Stability Diagnostic Test**

**Figure 2 CUSUM test**

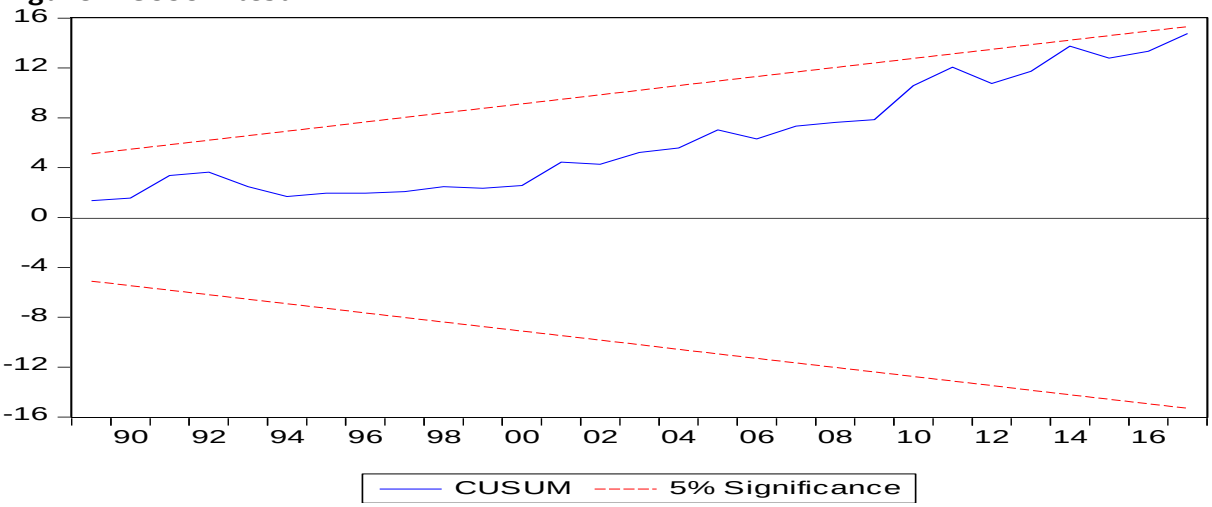
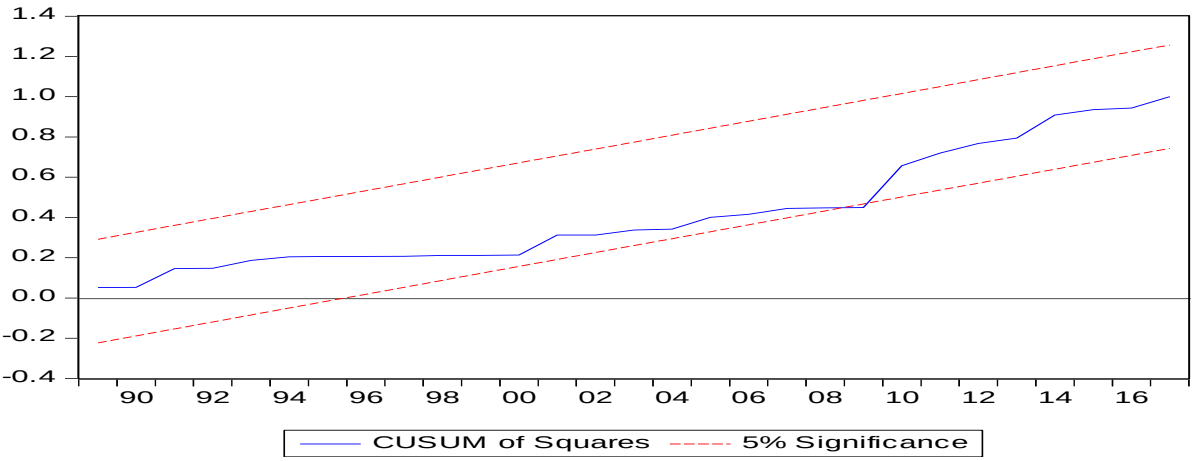



**Figure 3 CUSUM square tests**




Figures 2 and 3 above show the results of CUSUM and CUSUM squarestability diagnostic tests. They indicate that the model is stable. The blue lines lie within the two red dotted lines.

SUMMARY

This work examined the impact of manufacturing sector development on economic growth in Nigeria for the period 1981 to 2017 using the ordinary least square (OLS) technique for the econometric analysis [50]. The objectives of the study are to determine the impact of manufacturing sector on economic growth in Nigeria and ascertain the direction of causality relationship between manufacturing sector and economic growth in Nigeria [51].

The result of the error correction model (ECM) indicated that manufacturing sector development (MUQ) has no significant impact on economic growth in Nigeria as revealed by its t-statistic and probability values of 1.191279 and 0.2432 respectively. The result also showed that interest rate (INTR) and gross fixed capital formation (GCF) have statistically insignificant impact on economic growth in Nigeria over the period. Government expenditure (GEXP) and agricultural sector output (AGQ) have statistically significant impact on

economic growth in Nigeria as indicated by their t-statistic and probability values of -3.617867(0.0011) and 14.14281(0.0000) respectively. Furthermore, the result showed that the coefficient of the error correction term, ECM(-1), is -0.332414. This means that 33.24% of the disequilibrium in the model is corrected in the short run. In other words, the speed of adjustment of the dependent variable to equilibrium in the short run is 33.24%. The result also showed that the coefficient of the error correction term, ECM (-1), is negative and statistically significant as expected.

## CONCLUSION

The study concluded that manufacturing sector does not impact significantly on economic growth in Nigeria and that significant causality relationship does not exist between manufacturing sector output and economic growth in Nigeria.

## RECOMMENDATIONS

Based on the findings of this work, the study recommends that the government should implement appropriate reform policies that will ensure efficiency in the workings of manufacturing sector in Nigeria. The study also recommends that the government should, through the Nigerian stock exchange, lower the cost of raising capital by firms since high cost and other bureaucratic delays could limit the use of capital market as veritable source of raising funds for investment by the manufacturers.

Government should also ensure that the environment is investment friendly by putting in place the required infrastructures such as adequate power supply, good road networks, construction of markets etc. This would reduce shortage of food stuffs, industrial raw materials, and bring down the high level of importation of these commodities in Nigeria. Proper management of existing industries is required to ensure positive effects of industrial productivity in the country. Foreign investors should be encouraged to participate in the manufacturing sector to improve market capitalization.

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