Relative Effectiveness of Monetary and Fiscal Policy Measures and The Performance of The Industrial Sector in Nigeria

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Abstract
This study examined the relative effectiveness of monetary and fiscal policy measures and the performance of the industrial sector in Nigeria. Industrial Output were regressed on monetary and fiscal policies measures. Following the stationarity and bounds cointegration tests results, the Autoregressive Distributed Lag method of analysis was applied. the results revealed that in the long and short runs, all the employed policies' instruments positively and insignificantly impacted on Industrial Output except recurrent spending which was negative but significant only in the short-run, capital spending had only short-run significance while banks' loans and advances impacted negatively in the short-run. Therefore, the researcher recommended among others that government should increase expenditures on productive Industrial activities, ensure increase in deposit money banks' credits for Industrial investment and enforce special low interest rate to stimulate investments in the sector.

Introduction

Monetary and fiscal policy measures that can be directly controlled by economic policy makers. The former refers to the use of interest rates / money supply in order to influence the level of economic activities in a country. The later refers to the use of government expenditure and taxation in order to influence the level of economic activities in a country. Industrial Output is the production of Industrial products for commercial purposes. In Nigeria, Industrial Output is highly significant for merchants in terms of raising their income and improving their economic status. Lack of funding has made significant improvement in production of Industrial Outputs difficult. Though efforts have been made by the government and monetary authorities to encourage production of Industrial Outputs, much is still desired. Hence this study examines the effect monetary and fiscal policy measures and the performance of the industrial sector in Nigeria. In the light of the foregoing, this paper is aimed at investigating the impact of fiscal and monetary policy measures on Industrial Output in Nigeria. Specifically, the paper investigates the effect of: fiscal measures (government capital expenditure and government recurrent expenditure on Industrial Output; and Monetary measures (deposit money banks' loans and advances and interest rate) on Industrial Output; and

2. Review of Relevant Literature

Review of Theoretical Literature

2.1 Fiscal Policy Theory

The earliest theory advanced on public expenditure is that of Adolph Wagner in 1876 which came to be known as "Wagner's law". He propounded the "law of increasing expansion of public and particularly states activities' which is referred to as the "law of increasing expansion of fiscal requirements". The law suggests that the share of the public sector in the economy will rise as economic growth proceeds, owing to the intensification of existing activities and extension of new activities. According to Wagner, social progress has led to increasing state activity with resultant increase in public expenditure. He predicted an increase in the ratio of government expenditure to national income as per capita income rises. It is the result of growing administrative and protective actions of government in response to more complex legal and economic relations, increased urbanization, and rising cultural and welfare expenditures (Okoh, 2015). According to Musgrave & Musgrave (1988), however, it is not fruitful to seek an explanation for the total expenditure. Tests carried out by various researchers have shown that the increase in expenditure is far more complex than is evident from the tests carried out on empirical data. Therefore, according to them, it may be far more rewarding to adopt a disaggregated approach (an approach which divides the study of expenditures of government) through a study of expenditures of government on capital formation, consumption and transfer payments. Irving (1968) used the law and came up with a different view (Akogwu, 2007). He opined that public expenditure (E) is an increasing function of per capita gross domestic product (GDP). Similarly, Essien (2005) carried out studies and employed modern econometric techniques, He posited that even though the variables public expenditure and economic growth were found to be stationary, that is, integrated of order (1), and they were not co integrated. Thus the long run tendency for public sector spending whether as a proportion of total output, its per capita value or as its singular definition, to grow with income could not be established. He therefore concluded that he found no evidence to support Wagner's law using Nigeria data.

2.2 Monetary Policy Theory

There are the monetarist viewpoints represented by Friedman (1969), the Keynesian school and lastly the one represented by Raddiffe (1963) (Robbins, 1963). Friedman (1969) is of the view that changes in the stock of money are closely related to changes in the price level and through it, on other general economic aggregates. But, precision and rigidity in this relationship is distorted because of changes in output and the amount of money that the public desires to hold relative to its income. The effects of these changes are not to be seen as instantaneous as there is sometimes lag between the application of the monetary policy and its effectiveness. Keynesian viewpoint is that money plays a role in the determination of real output, general price level and other Macro-economic variables. According to this school of thought, national income depends on the interplay between such variables as expected rate of profit and interest. The rate of interest is a function of the supply of and the demand for money. Equilibrium income depends on two conditions in this model, that is: planned savings must be equal to planned investment, and at any point in time, supply of money must equal demand for money. But both savings, investment, demand for and supply of money is influenced by changes in the rate of interest. Within this context, monetary policy will consist of altering the rate of interest to achieve the desired trend in the economy. The effectiveness of monetary policy will then depend on the interest elasticity of demand for money. This also dictate the effectiveness or otherwise, in combating depression as

well as inflation. The third viewpoint represented by Raddiffe (1963) is a variant of the Keynesian school of thought. A distinction is made between the demand for money and the demand for liquidity. These two types of demand are not the same thing because there exist interest yielding money substitutes, which people can easily turn to cash whenever they want. As a result of this, whatever is done to change the demand for money may be less effective than expected. because it is the demand that will respond to interest rate changes. The amount of money desired may not increase, if the interest rate falls even though the amount of liquidity increases. Part of the accumulation of liquidity is likely to take the form of interest bearing near-money instead of non-interest yielding cash. The results obtained from changing the money supply depend on shifts in the demand for money and not on short- run interest elasticity of demand for money. Therefore, for monetary policy to be effective it has to address itself to the control of the volume, cost and direction of liquidity, rather than money supply in the economy. Traditionally, there are other three tools of control; they are (i) open market operations, (ii) the legal reserves ratio and (iii) the bank rate. The recent additions are special deposit and stabilisation security. They are called quantitative controls because their main aim is to regulate the quantity of money in circulation and the volume of credit that could be created by the commercial banking system, since these credits constitute part of the money supply.

2.3 Exchange Rate Policy Theory

In today's world with a rapidly increasing global economy and constantly changing international trade laws and technology, the exchange rate plays a role in valuing industrial production and equipment. The seminal work on the role of exchange rates was that of Edward Schuh. In 1974, he argued that the overvalued dollar caused the decline in Industrial exports due to their relative expense in other countries. The overvalued dollar led to depressed prices and lower industrial profits, causing an undervaluation of industrial resources and oversupply of output. Schuh called attention to the relationship between the exchange rate and industrial product and factor markets. Schuh's view was that while many variables affect industrial, the exchange rate plays a role in all aspects of industrial (Kristinek, & Anderson, 2002). Paarlberg, Webb, Morey and Sharples (1994) detail the economic theory behind the impact of exchange rates on prices, production, and consumption. The authors report the research of other studies that have measured the effects of exchange rate movements on industrial activities. The theoretical constructs and research results confirm that exchange rates are an important factor in determining prices, supplies, and demands. Tweeten (1992) also reviews the economic theory behind the impacts of exchange rate changes and various studies on exchange rates. He explains the impact of an appreciation of an exporter's currency is to raise the price of the good in the importing country. This, in his graphical analysis, is illustrated by the rotation of the excess supply curve, which decreases export quantities supplied at any given price. However, some disagreement persists on the magnitude of different effects between different commodities.

2.3 Review of Empirical Literature

Bamba and Reed (2004) posit that international market for the tropical Industrial Outputs are marked by high price instability. The authors' investigated whether monetary policy disturbances contribute to price instability. The econometric evidences point toward high flexibility of the prices. Money supply shock has persistent impact on the tropical industrial prices and explains an economically significant proportion of their price's variability.

Akanni, Akinleye, and Oyebanjo (2009) investigated the free trade policy of the Federal

Government, particularly as it affects the average market prices of the three traditional Industrial Output. Sectional data were obtained on the average producer prices of the industrialists, the production and export level of these industrials before and during free trade policy era. Trend and regression analytical tools were employed to handle the collected data. Result showed that time variation, was a significant determinant of the aggregate level of export (tonnes) before and during the implementation of the free trade policy. Value of exports was a significant determinant of the total value of exported Industrial Outputs before and during the implementation of the trade policy. With reduced and stable exchange rate and duties or tariffs on exported Industrial Outputs the Nigerian Industrial sector will improve. High level of consistency in export trade policy will help ensure a sustainable economy in Nigeria.

Ibekwe (2020) has examining the effects of exchange rate on Industrial sector output in Nigeria as the main objective of a study. To analyze the data, econometric techniques involving Augmented Dickey Fuller tests for Unit Roots and the Ordinary Least Square (OLS) were used. The result of regression indicate that nominal exchange rate and money supply has positive and significant effect on Industrial sector output while interest rate and inflation rate has negative and insignificant effect on Industrial sector output. The study therefore concludes that exchange rate has adverse effect on the performance of Industrial sector output and have not helped to improve the rate of investment in industrial in Nigeria. Omojimite and Akpokodje (2010) found a negligible positive impact of exchange rate depreciation on non-oil exports and concluded that exchange rate reforms are not sufficient to diversify the economy. Yaqub (2013), found output of different sub-sectors responded to the exchange rate changes differently. While the exchange rate changes had negative effects on industrial and fishery output, they had positive effects on livestock and forestry. Abiola (2017), showed that real exchange rate, average price of the Industrial commodity and degree of commercial openness were found to be positively related to Industrial supply. Also, nominal exchange rate was negatively related to Industrial supply. Wasiu and Ndukwe, (2018) investigated the possible asymmetric effect of real exchange rate dynamics on Industrial output performance in Nigeria over the period of 1981 to 2016. The study employed a combination of stationary and nonstationary variables as was found out through the ADF unit root test. Based on the Bounds test for cointegration, a long-run relationship was absent between real exchange rate and Industrial output, irrespective of specifications. The result of model estimation showed that the significant drivers of Industrial output are real exchange rate (log-levels), real appreciation and depreciation (after some lags), industrial capacity utilization rate, and government expenditure on industrial (after some lags). ACGSF loan exerted positive and influence on Industrial output. Gatawa and Mahmud (2019) analyzed short and long-run impacts of exchange rate fluctuations on Industrial exports volume in Nigeria. ARDL was used as the method of analysis; the independent variables include official exchange rate, Industrial loans and relative prices of Industrial exports while the dependent variable is Industrial export volume. GARCH was used to estimate the volatility of exchange rates, and other diagnostic tests. The short-run results revealed that official exchange rate and Industrial loans have significant positive impact on Industrial export volumes which has the effect of expanding the dependent variable while, relative prices of Industrial exports have significant negative impact on Industrial exports volume which also has the effect of contracting the dependent variable. The long-run results revealed similar findings with the exception of official exchange rate which has statistically significant negative impact on Industrial exports volume. i.e. contrary to normal expectations. Charles and Fortune (2019) examined the effect of exchange rate variation on Nigeria economy. The objective was to investigate how Naira exchange rate variations against

key currencies affect the country's real gross domestic product. The ordinary least square method was used as data analysis techniques. The study used cointegration, unit root, and granger causality test and error correction estimate to study the dynamic effects of commodity currencies on financial market. The study found that naira exchange rate variation with the currencies can explain 65 percent variation on Nigerian real gross domestic products while the remaining 35 percent estimation can be traced to external variables not included in the model.

3. Methodology

3.1 Research Design

This investigation adopted a quasi-experimental research design, which is often applied as a substitute for true experimental research to test hypotheses about cause-and-effect relationships. Time series data were utilized in this study. The data were collected from various issues of Central Bank of Nigeria Statistical Bulletin and annual reports (CBN, 2008; 2011) and National Bureau of statistics (NBS, 2010).

3.1 Model Specification

ISO = f (GCE, GRE, DCI, EXR, INR) 3.1

Where;

ISO = Growth Rate of Industrial Output (Contribution of Industrial Output to Gross Domestic Product at 1990 Constant Basic Prices)

GCE = Growth Rate of Government capital expenditure

GRE = Growth Rate of Government recurrent expenditure

DCI = Growth Rate of Deposit Money Banks' Loans and Advances to Industrial Sector

INR = Interest Rate (i.e., monetary policy rate)

EXR= Exchange Rate,

u_t = Error Term

α_0 = The constant parameter

$\beta_1, \beta_2, \beta_3, \beta_4,$ and β_5 = The slope parameters

Apriori expectation: On the apriori $\beta_1 - \beta_4 > 0$, and $\beta_5 < 0$

3.2 Analytical Framework

Pre-estimation (unit root and cointegration) tests, model estimation (Autoregressive Distributive Lag), and post-estimation tests were all included in the analytical framework of this paper. Both the Augmented Dickey Fuller (ADF) and Phillip Perron (PP) unit root test were conducted on each of the time series variables included in the specified model. The model of the Augmented Dickey Fuller (ADF) with the constant term and trend is as follows:

$$\Delta Y_t = a_1 + a_2 t + \beta Y_{t-1} + \sum_{i=1}^{n} \gamma_i \Delta Y_{t-1} + \varepsilon_t$$

3.3

Where;

ΔY_t = first difference of Y_t

Y_{t-1} = lagged values of Y_t

ΔY_{t-1} = first difference of Y_t

β = test coefficient

ε_t = white noise

a_1 = constant

a_2 = coefficient of time variable

The null hypothesis $(H_0 : \beta = 0)$ of the ADF test indicates that the series is not stationary and the alternative hypothesis $(H_1 : \beta = 0)$ indicates that the series is stationary. If the absolute value of calculated ADF statistic (τ) is higher than the absolute value of the critical values, we reject the hypothesis which shows that the series is stationary. However, if this value is lower than the critical values, the time series is not stationary (Gujarati, 2003). The Phillip-Perron test was also conducted to support the findings of the ADF test. The ARDL Bounds test is the adopted cointegration test for this paper. To satisfy the bounds test assumption of the ARDL models, each variable must be I(0) or I(1).

Both the Error Correction Model (ECM) and Autoregressive Distributive Lag (ARDL) econometric technique were adopted for this study. While the ECM is estimated when all the time series in the model are non-stationary, the ARDL is estimated when a mixed order of integration is evident among the time series in the model. If Y_t and X_t are cointegrated, we can express the relationship between Y_t and X_t with an ECM specification as:

$$\Delta Y_t = a_0 + b_1 \Delta X_t - \pi u_{t-1} + e_t$$

3.4

which will now have the advantage of including both long-run and short-run information. In this model, b_1 is the impact multiplier (the short-run effect) that measures the immediate impact a change in X_t will have on a change in Y_t. On the other hand, π is the feedback effect, or the adjustment effect, and shows how much of the disequilibrium is being corrected – that is the extent to which any disequilibrium in the previous period affects any adjustment in Y_t (Neusser, 2016).

The ARDL model is an ordinary least square (OLS) based model, which is applicable for both non-stationary time series as well as for times series with mixed order of integration. The selected ARDL(k) model long run equation is stated thus:

$$Y_t = \delta_0 + \sum_{i=1}^{k} \alpha_1 X_{1t} + \sum_{i=1}^{k} \alpha_2 X_{2t} + ... + \sum_{i=1}^{k} \alpha_n X_{nt} + \nu_{1t} \qquad 3.5$$

Where

$Xs(X_{1t}, X_{2t}, ..., X_{nt})$ = explanatory or the long run forcing variables

k = number of optimum lag order.

The best performed model provides the estimates of the associated Error Correction Model (ECM) (Nkoro & Uko, 2016).

Two key post-estimation residual diagnostic test were conducted on each of the estimated model. They are the serial autocorrelation test and heteroscedasticity. While the serial autocorrelation for the residual's tests for the presence of serial autocorrelation among the independent variables, the heteroscedasticity test will be conducted to determine whether the variance of the regression is constant or not over time. If the variance is not constant, there will be high standard error resulting to poor analytical use of the result.

4. Results and Discussion

Table 1: Descriptive Statistics Result

	ISO	GCE	GRE	DCI	INR	EXR
Mean	3.141026	51.67308	52.65436	22.46333	12.85615	85.03421
Median	3.000000	3.550000	0.470000	8.000000	12.25000	112.9400
Maximum	23.98000	904.5500	957.6700	336.0400	26.00000	161.5000
Minimum	-6.820000	-81.01000	-84.58000	-16.01000	6.130000	0.670000
Std. Dev.	5.161879	170.6582	176.1310	54.76304	3.787390	67.83822
Skewness	1.549858	3.707071	4.110796	4.982711	1.087273	-0.147456
Kurtosis	8.228308	17.92573	20.29442	29.07236	5.167843	1.195831
Jarque-Bera	60.03310	451.3387	595.8735	1266.001	15.32081	5.430749
Probability	0.000000	0.000000	0.000000	0.000000	0.000471	0.066180
Observations	39	39	39	39	39	39

Source: Computed by the researcher using E-Views 10 (2023)**.**

The descriptive statistics reported in Table 1 indicates that Industrial Output (ISO), government capital expenditure (GCE), government recurrent expenditure (GRE), deposit money banks' loans and advances to industrial sector (DCI), interest rate (INR) and exchange rate (EXR) averaged 3.141026, 51.67308, 52.65436, 22.46333, 12.85615 and 85.03421 respectively. The standard deviation showed that interest rate and exchange rate converged around their mean. Meanwhile, Industrial Output, government capital expenditure, government recurrent expenditure, and deposit money banks' loans and advances to industrial sector did not converge around their respective mean. The Skewness test result showed positive values for Industrial Output, government capital expenditure, government recurrent expenditure, and deposit banks' loans and advances to industrial sector, meaning that they have high tails. However, the Skewness test result showed negative value for exchange rate. This means that it (exchange rate) does not have a high tail. Furthermore, exchange rate is platykurtic relative to normal, since its value for kurtosis 1.195831 is less than 3. This suggests that the variable has short and thin tails, and it central peak is lower and broader. Moreover, Industrial Output, government capital expenditure, government recurrent expenditure, deposit money banks' loans and advances to industrial and interest rate have leptokurtic distributions relative to normal, since their values for kurtosis 8.228308, 17.92573, 20.29442, 29.07236 and 5.167843 respectively are more than 3. This indicates a flatter than normal distribution and the variables have large tails. That is, they have longer and fatter tails, and their central peaks higher and sharper.

The probability of Jarque-Bera statistics suggests that the alternative hypotheses of normal distribution for Industrial Output, government capital expenditure, government recurrent expenditure, deposit money banks' loans and advances to industrial and interest rate were accepted at 5% level while the alternative hypothesis of exchange rate was rejected at 5% level.

Arising from the above results of descriptive statistics, the statistical properties of the time series of all the variables were not normally distributed, which may have resulted from the problem of unit root.

4.2 Pre-estimation Test

4.2.1 Unit Root Test Results

Table 2 Augmented Dickey Fuller (ADF) Unit Root Test at Level and First Difference

Variables	ADF Test@ Level	Critical Value			ADF Test@ 1ST Diff	Critical Value			Order of Integration
		1%	5%	10%		1%	5%	10%	
ISO	-5.394897	-3.615588	-2.941145	-2.609066					1(0)
GCE	-7.071396	-3.615588	-2.941145	-2.609066					1(0)
GRE	-6.624953	-3.615588	-2.941145	-2.609066					1(0)
DCI	-5.761352	-3.615588	-2.941145	-2.609066					1(0)
INR	-3.091594	-3.615588	-2.941145	-2.609066					1(0)
EXR	-0.744841	-3.615588	-2.941145	-2.609066	-6.193544	-3.621023	-2.943427	-2.610263	1(1)

Source: Computed by the researcher using E-Views 10 (2023).

The above results reveal that in Tables 2, all the variables were not stationary at level, considering the 1 per cent, 5 per cent and 10 per cent critical values. Therefore, the null hypothesis of the presence of unit root was accepted. In line with Granger and Newbold (1974), the variables were differenced. Thus, they became stationary at first difference (i.e., integrated of order one). Hence, the entire variables in this study are stationary. The results of the variables being stationary at various levels makes it inappropriate for the application of the Ordinary Least Square (OLS) method, therefore the tests to determine the long run relationship for model one to four can be achieved with the aid of ARDL bounds testing approach as popularized by Pesaran and Shin (1999). Specifically, given that the variables were integrated of order 1(0) and 1(1). The requirement to fit in an ARDL model to test for long run relationship is satisfied.

4.2.2 Bounds Co-integration Tests

Table 3: ARDL Bounds Co-integration Test Result for Model IV

Model		**F-Statistic =** 5.890384
ISO = F(GCE, GRE, DCI, INR, EXR)		K = 5
Critical Values	Lower Bound	Upper Bound
10%	2.26	3.35
5%	2.62	3.79

Source: Computed by the researcher using E-Views 10 (2023).

From the ARDL bounds test result presented in Table 4.3, it is clear that there is a long run relationship amongst the variables (ISO, GCE, GRE, DCI, INR and EXR). This is because the computed F-statistic of about 5.890384 is higher than the upper critical bounds at 5% critical value. This provided evidence to reject the null hypothesis of no co-integration at 5% significance level for the Industrial Output Output (ISO) model (i.e., model three). It can therefore be concluded from the ARDL bounds test that there is a long-run relationship among the variables. Therefore, this study illustrates that government capital expenditure (GCE), government recurrent expenditure (GRE), deposit money banks' loans and advances to industrial sector, interest rate and exchange rate have long run relationship with Industrial Output in Nigeria. Following the establishment of long-run co-integration relationship among the variables, the long-run and short-run dynamic parameters for the variables were obtained.

Table 4 Estimated ARDL Long Run Coefficients. Dependent Variable: ISO ARDL (4, 3, 3, 3, 3, 3)

Regressors	Coefficient	t-Statistic	P-Value
GCE	0.005906	0.308578	0.7640
GRE	-0.028658	-1.405485	0.1902
DCI	0.136539	1.820344	0.0987
INR	0.534281	1.361829	0.2031
EXR	0.009424	0.583954	0.5722

Source: Computed by the researcher using E-Views 10 (2023)

The estimated ARDL long run coefficients reveals that government capital expenditure, deposit money banks' loans and advances to industrial, interest rate and exchange rate have positive relationship with Industrial Output in Nigeria. However, government recurrent expenditure has a negative relationship with Industrial Output. Importantly, government recurrent expenditure and interest rate do not conform to the apriori expectations. Meanwhile, government capital expenditure, deposit money banks' loans and advances, as well as exchange rate conform to the apriori expectations. In addition, none of the variables is statistically significant.

Table 5: Error Correction Representation for the Selected ARDL Model

Regressors	Coefficients	t-Statistic	P-Value
GCE	0.044575	5.361801	0.0003
GRE	-0.033101	-3.186563	0.0097
DCI	-0.040506	-1.686335	0.1226
INR	0.158016	0.701584	0.4989
EXR	0.203192	1.740152	0.1125
ECM (-1)			
R-squared = 0.926484		Durbin-Watson stat = 2.589808	
Adjusted R-squared = 0.750046		Akaike info criterion = 4.277226	
Schwarz criterion = 5.388188		F-statistic = 5.251041	Prob(F-statistic = 0.004712

Source: Computed by the researcher using E-Views 10 (2023).

The error correction representation for the selected ARDL Model as shown in Table 5 suggests evidence of error correction. The coefficient of the ECM has the hypothesized negative sign (-1.176912) and is statistically significant. This implies that deviations from the short-term in Industrial Output adjust quickly to long run equilibrium. That is, the long run equilibrium

Industrial Output can almost immediately be restored should there be short run distortion in the Industrial Output. Moreover, the result revealed that disequilibria in the Industrial Output in the previous year were corrected for in the current year. It therefore, follows that the ECM could rightly correct any deviations from short run to long-run equilibrium relationship between Industrial Output and the explanatory variables (government capital expenditure, government recurrent expenditure, deposit money banks' loans and advances to industrial sector, interest rate and exchange rate). Furthermore, the R^2 value of 0.926484 % shows that the model is a good fit. Thus, about 93 percent variation in Industrial Output is explained by the systematic changes in the independent variables (government capital expenditure, government recurrent expenditure, deposit money banks' loans and advances to industrial sector, interest rate and exchange rate). Meanwhile, the remaining 7 percent is captured by the error term. In addition, the reason why the R^2 is 93% and the error term captures 7% is because there are other explanatory variables that determine Industrial Output which were omitted in the model. This happened because the number of variables that determine Industrial Output is too long to be placed in a single model. In this study, variables were selected in line with the topic, conceptual, empirical and theoretical literatures reviewed. However, according to Chris (2008), R^2 never fall if more regressors are added to the regression. Therefore, the overall fit is satisfactory given the R^2 of 93%.
Moreover, the f-statistic value of 5.251041 with probability value of 0.004712 which is less than 0.05 critical value shows that all the explanatory variables (government capital expenditure, government recurrent expenditure, deposit money banks' loans and advances to industrial sector, interest rate and exchange rate) are significant in explaining increase in the level of Industrial Output in Nigeria during the period of study. At the same time, the Durbin Watson statistic value of 2.589808 suggests that the model has no autocorrelation problem. Hence, the explanatory variables in the model are not serially correlated. The result also showed that the Alkaike and Schwarz criterion for the model are 4.277226 and 5.388188 respectively.

4.3 Post-Estimation Diagnostic Test

4.3.1 Wald Test

Table 6: Wald Test for Coefficient of Restrictions

Test Statistic	Value	Df	Probability
F-statistic	247043.1	(6, 10)	0.0000
Chi-square	1482259.	6	0.0000

Source: Computed by the researcher using E-Views 10 (2023).

The result in Table 6 shows that the F-statistic is approximately 247043 and the probability value of 0.0000 is less than 0.05 at the conventional 5 per cent level. Therefore, all the explanatory variables (government capital expenditure, government recurrent expenditure, deposit money banks' loans and advances, interest rate and exchange rate) included in the estimated model (i.e., model four) are jointly significant in explaining the performance of Industrial Output in Nigeria over the data period

4.3.2 Test for Serial Correlation

The Breusch-Godfrey Serial Correlation LM test is used as a higher order test statistic for testing the null hypothesis of no serial correlation against the inferred alternative hypothesis of serial correlation in the parsimonious ECM result at 5 per cent level of significance.

Table 7: Breusch-Godfrey Test for Serial Correlation

F-statistic	0.149941	Prob. F(2,18)	0.8623
Obs*R-squared	0.853333	Prob. Chi-Square (2)	0.6527

Source: Computed by the researcher using E-Views 9 (2023).

The result as displayed in Table 7 reveals that the parsimonious error correction model is not suffering from serial autocorrelation problem. This is because the chi-square value of about 0.853333 and the corresponding probability value of 0.6527 of the chi-square statistics surpass the 0.05.

4.3.3 Heteroscedasticity Test

Table 7: Autoregressive Conditional Heteroscedasticity Test Result

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.538685	Prob. F (24, 10)	0.2426
Obs*R-squared	27.54184	Prob. Chi-Square (24)	0.2798
Scaled explained SS	6.031312	Prob. Chi-Square (24)	0.9999

Source: Computed by the researcher using E-Views 9 (2023).

The Breusch-Pagan-Godfrey test result in Table 7 confirms that the parsimonious error correction model (i.e. for model four) is free from heteroskedasticity, which suggests that the variance of the residual in the parsimonious ECM model is homoscedastic over the period covered in this study.

4.3.4 Normality Test

The Jarque-Bera statistic is applied to examine whether the error term in the ECM model is normally distributed at 5 per cent significance level.

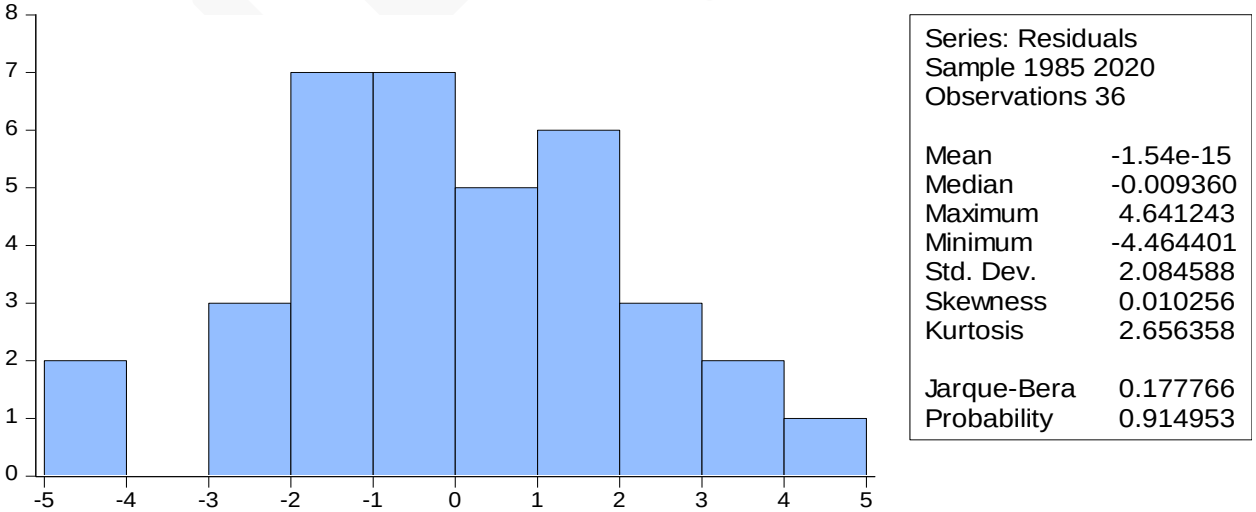


Figure 6: Normality Test Result for

Source: Computed by the researcher using E-Views 10.

The result shown in Figure 6 depicts that the error term is normally distributed at the conventional level (i.e., 5%). This is because the probability value of the Jarque-Bera statistic of approximately 0.915 is greater than the 0.05% conventional level. This implies that the Jarque-

Bera statistic hypothesis of normally distributed residuals in the parsimonious ECM model is accepted.

5. Conclusion and Recommendation

The ARDL result revealed that in the long run, government capital expenditure, deposit money banks' loans and advances to industrial sector, interest rate and exchange rate have positive and insignificant impact on Industrial Output in Nigeria. Government recurrent expenditure has negative and insignificant impact on Industrial Output in Nigeria. In the short run, government capital expenditure and government recurrent expenditure have positive and negative impact on Industrial Output respectively. Their impact on Industrial Output is also significant. Deposit money banks' loans and advances to industrial has negative and insignificant impact on Industrial Output in Nigeria. Interest rate and exchange rate have positive and insignificant impact on Industrial Output in Nigeria. From the findings of the study, some recommendations have been made by this study. First, it is recommended that government should generally cut down on her recurrent expenditure on governance and particularly in the Industrial sector to free up scarce investible resources for improving the hard and soft enabling environments which will stimulate private sector investments in the economy, especially in the industrial sector. To achieve this, government should provide conducive infrastructure, build human capital (education, health care and technological know-how); govern effectively in the public interest; and orient the economy towards diversified, export-oriented development based on national comparative advantage. This study also recommends that the apex monetary authority should especially direct the deposit money banks to see the Industrial sector as the buffer sector of the economy and that their loans and advances to the sector should be increased to stimulate investment in the sector.

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