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AN ANALYSIS ON THE IMPACT OF MACROECONOMIC PERFORMANCE ON INDUSTRIAL DEVELOPMENT IN NIGERIA: MEDIATING THE ROLE OF INFLATION

***Sani Muhammad and Salawu, Aminu Mohammed**
Department of Economics, Department of Business Administration, Usmanu Danfodiyo University, Sokoto
*Correspondence: sani.muhammad1@udusok.edu.ng

ABSTRACT
This paper is set out to examine the impact of macroeconomic performance on industrial development in Nigeria over the period of 1981 to 2020. The paper employed Autoregressive Distributive Lag (ARDL) Model to examine the impact of macroeconomic performance, inflation rate and real interest rate on industrial development over the aforesaid period. The results of bound test approach revealed that macroeconomic performance has significant positive impact on industrial development. However, inflation rate has significant negative impact on industrial development over the study period. On the other hand, real interest rate is statistically insignificant in the period. It is concluded that macroeconomic performance promotes industrial development in Nigeria. The study recommended that the government should intensify efforts and provide appropriate rewards for private individuals in order to promote macroeconomic performance and thus industrial development in Nigeria. Secondly, it is also recommended that government should implement Export Import Strategies to encourage and incentivize the domestic companies to compete with the foreign companies in both the domestic and foreign markets so that Nigerians might no longer depend on imports but rather export industrial goods to the rest of the world.
Keywords: macroeconomic performance, industrial development, *inflation, ARDL, bound test*
JEL Classification: *E6, E31, L6*.

1. INTRODUCTION

Over the years, Sub-Saharan African countries have accomplished impressive macroeconomic performance, yet for most of them, industrial development remains dismal. According to the report of Organization for Economic Co-operation and Development (OECD, 2013), the economies of developing countries (Sub-Saharan countries inclusive) had been growing at the rates that supersede that of the OECD countries since the mid-1990s. ‘‘since 2003 more than half of the world’s economic growth has derived from non-OECD countries; by 2011, non-OECD economies accounted for more than 45 percent of world Gross Domestic Product, in purchasing power parity (PPP)’’. Nigeria in particular has almost been experiencing good macroeconomic performance over the years. For example, the rate of macroeconomic performance on the economy in 2005is0.805 percent, rose to 5.42 percent in 2006 but fell to 4.50 in 2007 due to global economic meltdown that started in United States of America. However, the average rate of macroeconomic performance rose to 5.0 percent in 2010, and was at 3.52 percent in 2014. However, despite this impressive macroeconomic performance in Nigeria, the economy is generally characterized with high rate of poverty, galloping inflation rate as well as high rate of unemployment due to poor industrial sector development, thus, considering the fact that the contribution of industrial sector to real Gross Domestic Product and employment generation is dismal and insignificant. This is despite policy efforts, over the last 50 years, and, in particular, more recently, that have attempted to facilitate the industrialization process in Nigeria.

The major gap as established in previous studies is the scanty and inadequate research, not only on Nigeria but also across the globe, on the relationship as well as causality between macroeconomic performance and industrial development. As only very few studies have either studied macroeconomic performance or industrial development in relation to any other macroeconomic variables of interest. For example, Loto and Musa (2018) studied macroeconomic policy in relation to industrial sector performance from 1981 to 2016; (2003) discovered that macroeconomic performance and policies reduce poverty rate; Using Ordinary Least Square (OLS) technique, Aiyedogbon and Anyanwu (2016) examined the Epaulard macroeconomic determinants of industrial development from 1981 to 2013 and found that real GDP has positive impact on industrial development in Nigeria; however, Iyoboyi, Jalingo and Tsauni (2016) examined the impact of

institutional indicators on macroeconomic performance from 1981 to 2013 and found that there is evidence of bidirectional causality between institutional indicators and macroeconomic performance in Nigeria. A major gap identified in the previous relevant studies, on Nigeria as well as across the globe, is the lack empirical research on the relationship and causality flows between macroeconomic performance and industrial development. It is against this background that this research work intends to examine the short-term and long-term impact of macroeconomic performance on industrial development in Nigeria. To the best of my knowledge there is no empirical research on the impact of macroeconomic performance on industrial development. This lacuna identified in the previous relevant studies is the contribution to knowledge as well as part of the motivation for the present study.

2. LITERATURE REVIEW

This section extensively reviewed related empirical literature on macroeconomic performance and industrial development: In Nigerian studies; Loto M.A. and S.O. Musa (2018) investigated the effect of macroeconomic policy on industrial sector performance from 1981 to 2016. The authors revealed that the results of nonlinear ARDL model indicated that a long-run bound relationship exists between selected policy variables and each industrial sub-sector. They also revealed that error correction terms show that short run disequilibrium can be corrected in the long-run without extending the lag period. Financial deepening, exchange rate depreciation and economic openness are significant in the long run while monetary policy rate is effective in the short run. Deepening of financial system and prudential management of macroeconomic framework are recommended essential for industrial growth in Nigeria.

Using Ordinary Least Square (OLS) technique, Aiyedogbon and Anyanwu (2016) examined the macroeconomic determinants of industrial development from 1981 to 2013 in Nigeria. The authors used industrial production index, interest rate, broad money supply, exchange rate, foreign direct investment (FDI), credit to manufacturing sector, consumer price index, and real GDP as macroeconomic variables in the model. Thus, the results revealed that FDI, interest rate, real GDP exchange rate have significant positive impact on industrial productivity. On the other hand, credit to manufacturing sector, broad money supply, and consumer price index have significant negative impact on industrial development.

Using Vector Error Correction Model (VECM), Iyoboyi, Jalingo and Tsauni (2016) examined the impact of institutions on macroeconomic performance from 1981 to 2013 in Nigeria. The authors used contract intensive money, quality of service delivery and revenue source volatility as institutional measures. The result reveled that there is a long-run equilibrium relationship between macroeconomic performance and institutions; there is bidirectional causality between institutional measures and macroeconomic performance in the short-run; there is unidirectional causality from revenue source volatility to macroeconomic performance in the long-run; and finally there is evidence of bidirectional causality between macroeconomic performance and the quality of service delivery and between macroeconomic performance and contract intensive money. Using GMM, Samouel and Aram (2016) examined the factors that determine industrialization in 35 African countries from 1970 to 2012. The study found that labor market conditions, human capital, GDP per capita and real effective exchange rate determine industrialization in Africa.

In Asian studies, Ejaz, Ullah, and Khan (n.a) examined the determinants of industrial growth in Bangladesh, India, Pakistan, and Sri Lanka using panel data analysis from 1990 to 2015. The authors found that GDP per capita, public expenditure, governance, foreign direct investment (FDI), and trade openness have a significant and positive effect on industrial growth. Wang and Luyen Le (2018) used real GDP growth, government debt, inflation rate, and unemployment rate as macroeconomic indicators to measure and forecast the macroeconomic performance in Asian developing countries as well as developed countries from 2013 to 2020. The results revealed that the aforesaid macroeconomic indicators promote macroeconomic performance in Switzerland, Singapore, and the United States. Using panel ARDL, Maroof, Hussain, Jawad and Naz (2018) examined the determinants of industrial development in South Asian economies; Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, over the period of 1996 to 2015. The paper found that inflation, foreign direct investment (FDI), governance, and equity openness as important determinants of industrial development.

Ito and Kawai (2018) studied the impact of quantity and quality measures of financial development on macroeconomic performance in advanced economies, emerging economies, emerging Asian economies and other economies. The authors demonstrated that quality measurement of financial development discharges positive impact on output growth as well as negative impact on output volatility and inflation in both developing and emerging economies. They also showed that a higher level of financial development is associated with greater financial openness, and greater financial openness is associated with lower output growth, higher output growth volatility and higher inflation for both the developing and emerging economies. Onyeiwu (2010) found that good policies

played a vital role in the imposition of industrial performance of these countries. Also, Epaulard (2003) discovered that macroeconomic performance and policies indirectly reduce poverty rate pending on growth intensity.

From the foregoing empirical literature review, it is established that there is scanty and inadequate empirical literature on macroeconomic performance and industrial development. It is against this background that this study intends to examine the short-term and long-term impact of macroeconomic performance on industrial development in Nigeria. In fact, the lacuna that this study identified in the related empirical literature, which it is intended to fill, is that there is no empirical research specifically conducted on the short-term and long-term impact of macroeconomic performance on industrial development.

3. METHODOLOGY

The study proposes to examine the impact of macroeconomic performance on industrial development in Nigeria, from 1981 to 2020 using annual data. Hence, the study used purposive sampling technique to select the period under study which is justifiable on the basis of availability of data on Nigeria. Therefore, the choice of control variables is theoretically guided by the fact that inflation rate and real interest rate are the most essential macroeconomic variables that might affect our analysis if not captured in the model.

The study intends to use secondary data in the form of time series; the time series macroeconomic data are notably not stationary due to change in their time trend. As such, this study tends to apply Augmented Dickey Fuller (ADF) and Phillips Peron (PP) tests for stationarity so as to investigate the unit root properties of the variables under investigation. This is to find out whether the series used are stationary or otherwise. In order to estimate the coefficients of the variables, this study employs Autoregressive Distributed Lag (ARDL) model as developed by Pesaran*et al.* (2001). The model is a more robust econometric technique for estimating level of relationship between a dependent variable and a set of independent variables that may not necessarily be integrated of the same order. Autoregressive distributed lag (ARDL) model provides consistent estimation in the presence of a mixture of stationary series at level value as well as at first difference (Pesaran*et al*. 2001). This model is superior to other approaches such as VAR and Johansen co-integration models because it allows mixture of I(0) and I(1) variables as regressors thereby making pretest for unit root become unnecessary. Furthermore, the model can differentiate dependent and independent variables and allow testing for the relationship between them and also allows different variables with different number of lags. Finally, ARDL model is not only suitable for estimating small or finite sample size but also capable of estimating both short-run and long-run parameters of the model simultaneously (Pesaran*et al.*, 2001).

The ARDL model for this study is specified in equations (i), following the work of Pesaran et al, (2001) as follows:

$$\Delta INDEV_t = \beta_0 + \sum_{i-1}^{m} \beta_1 INDEV_{t-1} + \sum_{i-1}^{m} \beta_2 GDPK_{t-1} + \sum_{i-1}^{m} \beta_3 CPIN_{t-1} + \sum_{i-1}^{m} \beta_4 IRINTR_{t-1} + \alpha_1 INDEV_{t-1} + \alpha_2 GDPK_{t-1} + \alpha_3 CPIN_{t-1} + \alpha_4 IRINTR_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:
β_0 = Constant parameter
$\beta_1 - \beta_5$ = Coefficient of independent variables
GDPK = Macroeconomic Performance
INDVA = Industrial Development
RINTR = Interest Rate
CPIN = Inflation
$_{t-1}$ = Lag Value

Thus, ARDL model is usually begun by conducting cointegration test in order to determine the co-movements among the variables under investigation. To achieve that, the calculated F-statistics is compared with the Critical Value as tabulated by Pesaran*et al.* (2001). If F-statistics exceeds or supersedes the upper bounds (critical values), then the decision rule is to reject the null hypothesis of existence of no cointegration (no long-run relationship) among the variables under study irrespective of whether the variables are stationary at level or first differenced (underlying order of integration of the variables is zero or one) i.e. I (0) or I (1), whereas if F-statistics falls below lower bounds (critical values), then the null hypothesis cannot be rejected and if F-statistics falls within these two critical bounds, hence the result is bound to be inconclusive (Pesaran et al, 2001). Consequently, the Error Correction Model (ECM) of the ARDL approach is specified as follows:

$$\Delta INDEV_t = \beta_0 + \sum_{i-1}^{m} \beta_1 INDEV_{t-1} + \sum_{i-1}^{m} \beta_2 GDPK_{t-1} + \sum_{i-1}^{m} \beta_3 CPIN_{t-1} + \sum_{i-1}^{m} \beta_4 IRINTR_{t-1} + \alpha_1 INDEV_{t-1} + \alpha_2 GDPK_{t-1} + \alpha_3 CPIN_{t-1} + \alpha_4 IRINTR_{t-1} + \beta_5 ECM_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where ECM is the Error Correction Model representation of equation (i) is to capture the short-run relationship among the variables under investigation. However, before estimating equation (i), there is need to conduct unit root tests using popular stationarity tests; Augmented Dickey-Fuller (ADF) and Phillips-Perron tests.

4. DATA PRESENTATION AND ANALYSIS

This section presents the results of inferential analyses of the study. It is categorically divided into three subsections; the pre-estimation tests and interpretation of the results, the estimation tests of the model, and the post-estimation tests and interpretation of the results.

4.1 Unit Root Result

This subsection presents the results of Augumented Dickey Fuller (ADF) unit root test as follows;

Table 4.1: Unit Root Results

Variables	ADF		Phillips-Perron Test	
	Level	First Diff.	Level	First Diff.
Industrial Development		-6.1182***		-6.174019***
Macroeconomic Performance		-3.4958***		-4.683804***
Consumer Price Index		-4.149189***		-4.899143***
Real Interest Rate	-6.056659***		-6.056981***	

Note: ***, **, and * indicating significant at 1%, 5% and 10%, respectively.
Source: *Authors computation using Eviews Version 9.*

The study applied ADF test to determine order of integration and unit root properties of the variables under investigation. This is because time series analysis requires unit root test in order to avoid spurious result that may lead to wrong policy recommendations. Thus, Table 1, indicates the results of the Augumented Dickey Fuller (ADF) and Phillips-Perronunit root tests, and only real interest rate is stationary at level value {I(0)} and none of the variables goes beyond integration of order one I(1) i.e. first differenced. However, the result of ADFand Phillips-Perron unit root tests show that industrial development, macroeconomic performance and consumer price index are stationary at first differenced going by their respective probability values. Using the four variables that passed the unit root tests, the model has Industrial Development (INDEV), and Macroeconomic Performance (log_GDPPK) as the main variables, while consumer price index and real interest rate as the control variables of the model.

However, after the unit root test, there is a need to know the value of F-statistics in order to determine the presence or existence of cointegration or otherwise among the variables under estimation. This has been carried out using Autoregressive Distributed Lag (ARDL) bounds testing approach and the result reveals the evidence of co-integration among the variables under study. From Table 2, the result indicates that F-statistics is 4.925154. This shows that the null hypothesis of no cointegration among the variables can be rejected at five percent level of significance as depicted in the table. This is because the value of F-statistics is greater than the both values in upper bound critical value as well as the lower bound critical value, 3.23 and 4.35, respectively. Since there is co-integration among the variables, we should go further to estimate the long-run relationship among the variables under investigation using Autoregressive Distributed Lag (ARDL) model.

Table 2: ARDL Bounds Test for Cointegration

F-statistics value = 4.925154		
Critical Value of Bounds		
Significance	I(0) Bound	I(1) Bound
1%	4.29	5.61
2.5%	3.69	4.89
5%	3.23	4.35
10%	2.72	3.77

Source: *Authors Computation Using Eviews Version 9.*

However, the ARDL long-run coefficients are presented in Table 3. The results indicate that macroeconomic performance has positive as well as significant impact on industrial development over the period of the study at 10 percent level of significance going by its p-value of 0.092. Furthermore, the extent of the impact is explained by its coefficients, 28.52050. That is, a 1 unit increase in macroeconomic performance will lead to about 28.52050 increases in industrial development over the period of the study. This means that macroeconomic performance promotes industrial development in Nigeria over the period of the study. Though, there is need to estimate the magnitude of the impact of Macroeconomic Performance, consumer price index and real interest rate (i.e. independent variables) on the industrial development (dependent variable).

Also, the results revealed that Consumer Price Index has negative impact on industrial development over the period of the study at 1 percent level of significance going by its respective p-value of 0.005. Moreover, the magnitude of the impact is explained by its coefficients, which is -0.143868. That is, a 1 unit increase in Consumer Price Index will lead to -0.143868decreases in industrial development over the period of the study. This means that Consumer Price Index dampens industrial development in Nigeria over the period of the study. Nevertheless, the coefficient of real interest rate is insignificance going by its probability value. Having estimated the long-run relationship among the variables, then there is need to estimate the short-run relationship using Error Correction Model (ECM) of the ARDL model that determine the speed of adjustment form short-run disequilibrium to long-run.

Table 3: Result of the Estimated Long-Run Coefficients of the ARDL Model

Dependent Variable: **Industrial Development**

Independent Variables	Coefficients	Std. Error	t-Statistics	Prob.
Macroeconomic Performance	28.52050	14.93124	1.910123	0.0925
Consumer Price Index	-0.143868	0.025252	-5.697378	0.0005
Real Interest Rate	-0.105470	0.088121	-1.196883	0.2656

Source: *Authors' Computation Using Eviews Version 9.0*

Furthermore, the moment variables under investigation are co-integrated. Then we should go further to conduct an error correction model (ECM) analysis to express the short-run relationship among the variables and the speed of adjustment from the short-run disequilibrium to the long-run. Thus, this is because ECM expresses the speed of adjustment from the short-run to the long-run equilibrium in case of any distortion in Nigerian economy as the case may be. The results as presented in Table 4, show that the ECM coefficient is -0.80724 and statistically significant at 1% level going by its probability value of 0.0043. This shows a very high speed of adjustment to equilibrium level after a shock or distortion in the economy. For the other explanatory variables, the short-run analysis reveals the existence of a statistically significant relationship between Inflation

rate and industrial development at 1 percent level of significance.

Table 4: Error Correction Estimate of the ARDL Model (Short-Dynamics)				
Dependent Variable: Financial Development				
Variables	Coefficients	t-Statistics		
Industrial Development (-1)	-0.137774	0.195397	-0.705096	0.5008
Macroeconomic Performance	27.96036	24.39392	1.146202	0.2848
Consumer Price Index	-0.116136	0.032112	-3.616569	0.0068
Real Interest Rate	-0.004671	0.033798	-0.138214	0.8935
ECM(-1)	-0.807240	0.204928	-3.939144	0.0043

Source: *Authors computation using Eviews Version 9.0*

4.3 Diagnostic Tests

This subsection presents the results of diagnostic tests of the heteroskedasticity test, serial correlation test as well as normality test. Moreover, the result of diagnostic test was depicted in Table 5, Table 6 and Table 7 in order to perform robust check of the estimated results. Thus, this study applied Breusch-Pagan-Godfrey Test of Heteroskedasticity, Breusch-Godfrey Serial Correlation LM Test and Normality Test.

4.3.1 Heteroskedasticity Test and Interpretation of Results

This subsection presents the results of Heteroskedasticity Test using Breusch-Pagan-Godfrey Test of 1979. The results in Table 5 revealed that the Breusch-Pagan-Godfrey Test displayed that the corresponding probability values of 0.5327 and 0.4896 for the F-statistics as well as the observed R-Squared, respectively are not significant. Therefore, the null hypothesis that says there is no heteroskedasticity in the residuals generated from the OLS model, thus it is not rejected going by the probability values that are insignificant at all levels. This implies that the estimated results are valid because it is not victimized by heteroskedasticity problem throughout the series. We therefore concluded that the residuals are homoskedastic and have a constant variance, Classical Linear Regression Model.

Table 5: Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.653681	Prob. F(2,17)	0.5327
Obs*R-squared	1.428237	Prob. Chi-Square(2)	0.4896
Scaled explained SS	2.548499	Prob. Chi-Square(2)	0.2796

Source: *Authors' Computation Using Eviews Version 9.0*

4.3.2 Serial Correlation Test and Interpretation of Results

The results of the serial correlation test using Breusch-Godfrey Serial Correlation Lagrange Multiplier Test was applied and presented in Table 6 to ascertain the presence of autocorrelation or otherwise. The results in Table 4.8 revealed that there is no serial correlation in the residuals of the parameters going by the fact that all the probability values are statistically insignificant because they are above 10 percent level of significance. Moreover, the value of F-Statistic is 0.586893 and Observed R^2 is 1.366802 with corresponding probability values of 0.5676 and 0.5049, respectively. Thus, we reject alternative hypothesis in favour of null hypothesis that says there is no autocorrelation between the residuals of the parameters. Therefore, the residuals of the parameters are free from autocorrelation quagmire.

Table 7: Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.586893	Prob. F(2,16)	0.5676
Obs*R-squared	1.366802	Prob. Chi-Square(2)	0.5049

Source: *Authors' Computation Using Eviews Version 9.0*

4.3.3 Stability Test

To ensure the stability of the equation and parameters under estimation, stability test was conducted using Recursive Residuals and Residual Actual Fitted graphs and the result is presented in Figure 1 and 2. The equation is said to be stable if the entire sum of the recursive error lies between two critical lines. From the test conducted, the result indicated that the Recursive Residuals and Residual Actual Fitted line have crossed the critical bounds showing instability of the parameters under investigation.

4.3.4 Normality Test

To ensure the residuals of the variables under study are normally distributed, the Histogram and Normality test has been conducted and presented in figure 3. The result shows that the Jarque Bera coefficient is 0.42 with 0.81 probability value which is insignificant. Therefore, we reject null hypothesis that says that the residuals are not normally distributed. However, it implies that the residuals of the variables under study are normally distributed and hence, the estimated result of the ARDL model is adequate for policy recommendations.

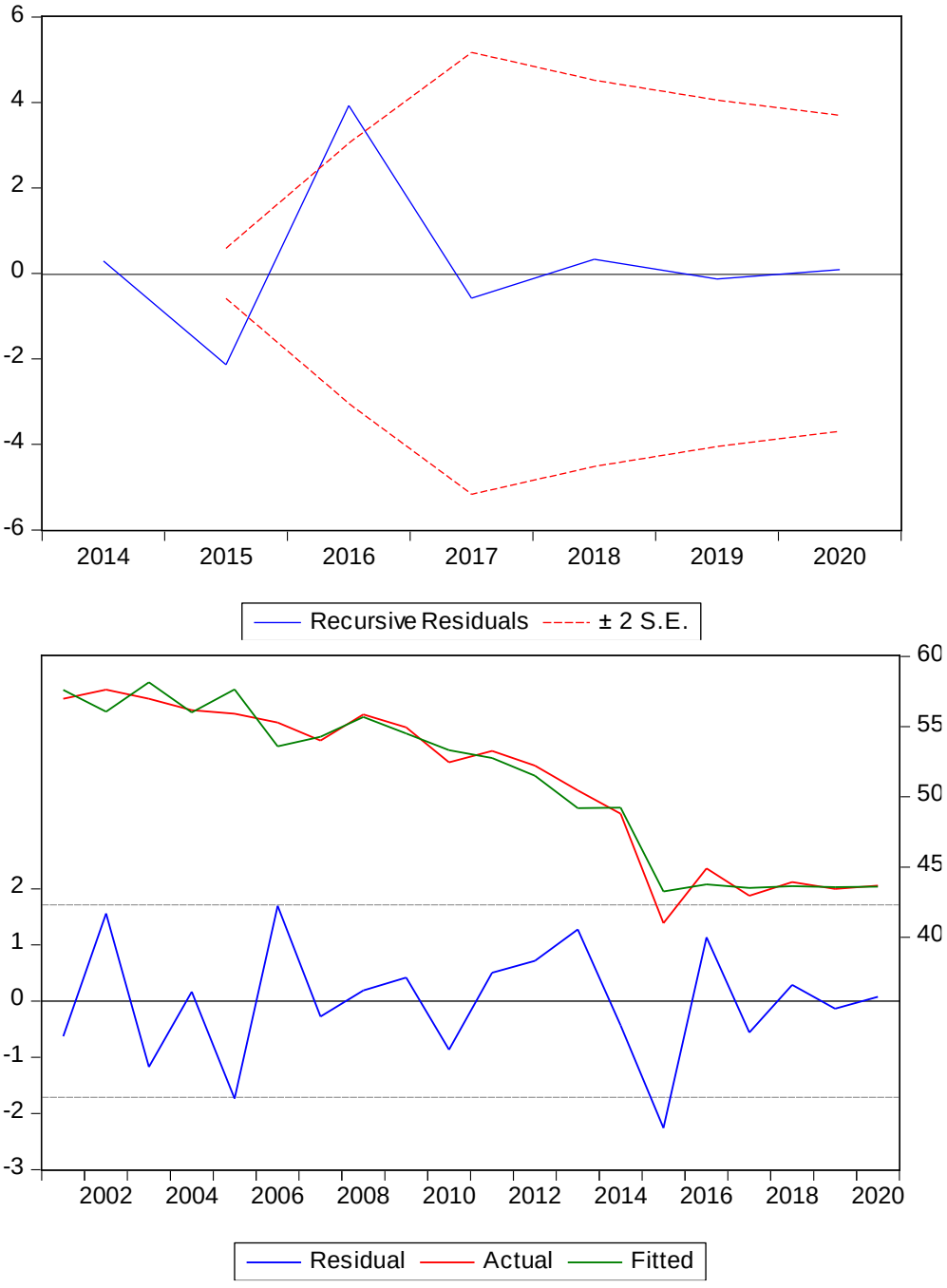

Figure: 1 and 2 on Stability Test

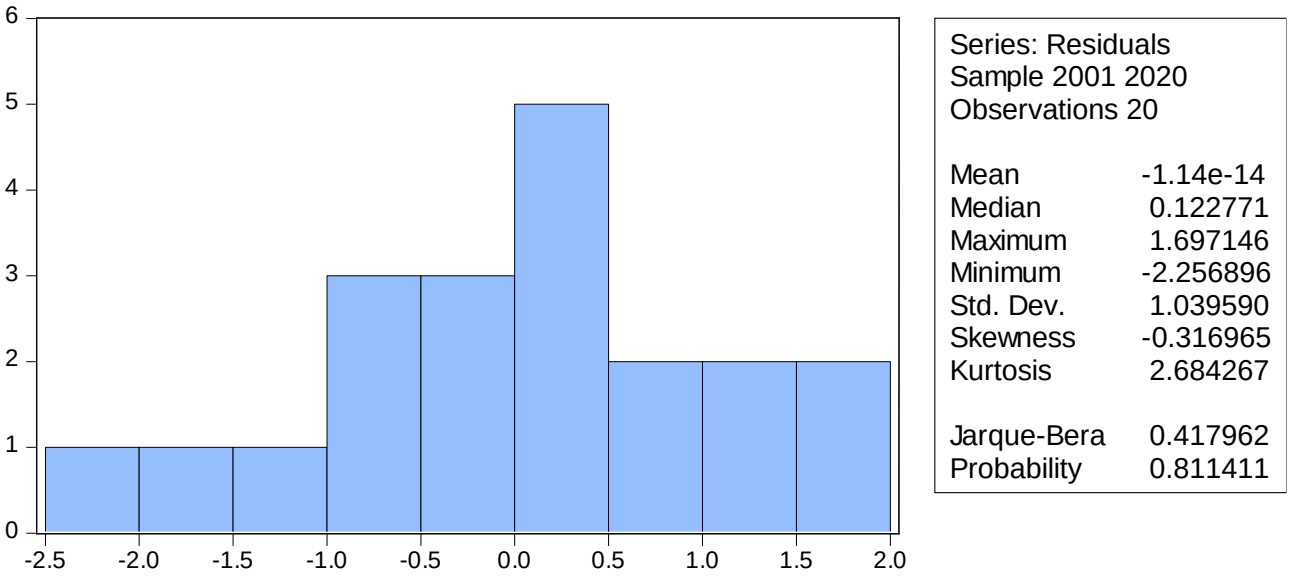

Figure 3: Normality Test

5. CONCLUSIONS AND RECOMMENDATION

On the basis of the findings of this study, the following conclusion are drawn: the study found that macroeconomic performance has significant positive impact on industrial development over the period of the study. On the other hand, inflation rate (measured with consumer price index) has significant negative impact on industrial development over the period of the study. The study concludes that macroeconomic performance promotes industrial development in Nigeria.

Given the conclusion drawn from the findings of this study, some recommendations are presented below to help improve the level of industrial development of Nigerian economy. From the conclusion of the study that macroeconomic performance has significant positive impact on industrial development, it is therefore, recommended that the government should intensify efforts and provide appropriate rewards for private individuals in order to promote industrial development in Nigeria. Secondly, we therefore recommend that government should implement Export Import Strategies to encourage the domestic companies in competing with the foreign companies so that the shareholders' confidence on the capital market would be revived. This will raise the level of production of goods and services to the next level and hence industrial development. This should be achieved if government reduce or remove export duty and company income tax to encourage the domestic companies to produce more goods and services and export same to the rest of the world. Thirdly, government should diversify other sectors of the economy such as agricultural, mining (most especially gold, silver and iron-ore mining) and industrial sectors to balance the trade with the rest of the world.

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