INTERNATIONAL JOURNAL OF RESEARCH AND SCIENTIFIC INNOVATION (IJRSI)
ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue X October 2024

The Long-Run Bound Cointegration Influence of Unemployment Rate on the Nigerian Economic Growth

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DOI: https://doi.org/10.51244/IJRSI.2024.1110024

Received: 22 September 2024; Accepted: 05 October 2024; Published: 07 November 2024

ABSTRACT

The aim of this paper is to investigate the relative influence of the macroeconomic variables on the Nigerian economic growth for the purpose of sustaining the country's economic development. The paper focuses on the unemployment rate, inflation rate and exchange rate as independent variables. Gross Domestic Products (GDP) is considered as dependent variable. The study uses the aforementioned dependent and independents macroeconomic variables from the year 2001 to 2022 annual Nigerian data. The study adopts Autoregressive Distributed Lags (ARDL) model to analyze the cointegration and long-run impact of inflation rate, exchange rate and unemployment rate on the GDP for the Nigerian economic growth. The result of the bound cointegration test indicates the palpable cointegration in the model. The study further found that inflation rate has insignificant effect on the economic growth. The unemployment rate has negative impact on the economic growth in the long run. Although the result found that the exchange rate positively influences the economic growth, only the exchange rate lag one that affects the dependent variable in the long run. The implication of the study findings indicate that the acceleration of economic growth could be achieved through measures for solving issues of unemployment rate in the country. Hence, the practical implication of the study is the creation of job opportunity for the sustainability of economic development.

Keywords: Sustainably, Economic Growth. ARDL

INTRODUCTION

One of the main aim of any economic policy of a country is to accelerate its economic growth for the economic development and sustainability. In order to achieve this aim, any identified impediment must be addressed and be solved. One of the major obstacle of economic growth in both developed and developing countries is unemployment. Unemployment is a proportion of people who are not actively engaged in income generated jobs to those who are actively engaged in income-generated jobs. Simply, Unemployment is the state of having no work. Akeju and Olanipekun (2014), categorized unemployment into four; classical, cyclical, frictional and structural unemployment. Under the classical unemployment high payment resulted for high demand for job that creates room for high unemployment where government could not provide job for everyone. The cyclical unemployment occur as a result surplus which discourage the reproduction. The fractional unemployment is as a result of mismatching the skills of workers. The structural unemployment is a result of technological structural replacement of workers with machineries.

According to Okun's theory, unemployment is a serious obstacles to economic growth. The theory stated that there is a negative relationship between cyclical unemployment and cyclical economic growth. The theory was first documented in 1962 by an economist author named Arthur Okun (Okun, 1962 & Knotek, 2007). The aim of the present study is to test the validity of Okun's theory on the Nigerian economy. The study employs Autoregressive Distribution Lag (ARDL) to empirically prove the theory covering the annual data for twenty two observations from 2001 to 2022.

The remaining sections of the paper include literature review, research methodology, data analysis and conclusion.

LITERATURE REVIEW

Literature review as the second section of the paper, consists of both theoretical and empirical review of the relationship between unemployment and economic growth.

Theoretical Literature

The concept of unemployment and how it affect the economic growth has it economic history of how the classical economists headed by Adam Smith (1776) observed at the concept. According to the view of classical economist with their liberal approach of allowing the market forces of demand and supply to determine the optimum level of economic activities. Therefore, based on this view the macroeconomics determinants like unemployment rate to free determine the economy such as economic growth with government laws and regulation intervention. According to Neva, Julie, Frank and Thomas (2006) the classical viewed on unemployment as of the market economy that is characterized by competition, transaction of the spot and institutional bidding. Hence, in line of this hypothesis of the classical economics, the demand and supply market forces automatically changes to form the economic equilibrium amend; and thus, create full employment at any given point. Simultaneously, solve the issue of unemployment. Therefore, based on the classical economic perception, the price and wages changes ensure market equilibrium; and thus, maintained full employment (Kalu, 2001).

However, from the other side of the economist view, A British economist known as John Maynard Keynes (1883 – 1946) founder of Keynesian economist school, advocated that the government intervention stabilized the prices and wages; and thus maintained full employment. The economist further argue that once there is increase in prices, it is going to be very difficult for the demand and supply to force the prices to come down Meltze, 1981). Therefore, the Keynesians propose the adoption of an interventionist approach that needs government intervention in the economy to solve the issue of unemployment and provide full employment through government laws and regulation such as taxation, public investment and expenditure. According to their view increase in consumption and investment contributes towards a decrease in unemployment.

Based on the review of the approaches of the two classes of the economist view, in order to come with empirical evidence of influence of unemployment on the economic growth, the present study considers the Okun's theory of unemployment that stated that unemployment is indirectly related to the economic growth.

Empirical Review

The study consider, the previous study to empirically review of the relationship between the independent variables (exchange rate, inflation rate and unemployment rate) and the dependent variable (economic growth).

The study of Akeju and Olanipekun (2014) employed error correction model and Johasen cointegration test to determine the relationship between unemployment and the output growth in Nigerian economy. The result empirically proved both short run and long run a positive relationship between the two variables. The result is in contradiction with the Kun's law. According to the findings of Akeju and Olanipekun (2014), the positive relationship between unemployment and the output growth in the country is as a result of over dependency of crude oil as the major source of revenue. The study recommended the attraction of foreign direct investment in different sectors as fiscal measures for the reduction of unemployment in the country. Suleiman, Kassim and Hemed (2017) employed cointegration and Dynamic least square model to test the causal relationship for unemployment on economic growth in Tanzania. The study found positive impact of unemployment on the economic growth. In addition the result of granger causality shows unidirectional causal relationship of economic growth on unemployment.

The study of Arewa and Nwakanna (2012) indicated zero evidence to support the validity of Okun's law in Nigerian economic growth. Similarly, Shahid (2014) found the effect of inflation and unemployment on economic growth in Pakistan covering the time period from 1980 to 2010. The result indicated insignificant effect of both inflation and unemployment on the economic growth. Correspondingly, the study of Yelwa, David and Omoniyi (2015) also found insignificant impact of inflation and unemployment on the economic growth in Nigeria. The study covered the period from 1987 to 2012 in Nigeria using ordinary least square. But the result of the study found that interest rate and total public expenditure have significant impact on economic growth in the long run.

The study of Mohseni and Jouzaryan (2016) considered Iranian data from 1996 to 2012 to examine the role of unemployment on economic growth using Autoregressive Distributed Lag (ARDL) Model. The result indicates negative influence of inflation and unemployment on the economic growth in the long run. Likewise the study of Makaringe, Sibusiso Clement and Khobai, Hlalefang (2018) investigate the impact of unemployment on South African economic growth using the quarterly data from first quarter 1994 to the last quarter 2016. The study applied Autoregressive Distribution Lag (ARDL) bound cointegration test to find the long run relationship between unemployment and economic growth in the South African economy. The outcome of the result, empirically confirmed negative relationship between the two variables in both long run and short run.

Correspondingly, to the above two studies, Sekwati and Dagume (2023) analyzed the effect of inflation and unemployment on economic growth in South Africa considering quarterly data from first quarter 1994 to last quarter 2018, using quarterly data. The result of The Johansen co-integration test showed the existence of long-run relationship among variables. Whereas result of the Vector error correlation model confirmed negative impact of inflation and unemployment on economic growth. In the same way Uddin and Rahman (2023) considered seventy nine developing countries to empirically examine the impact of corruption, inflation, political stability and unemployment on economic growth for seventy nine (79) developing countries. The data used for the study covered the period from 2002 to 2018. The result shows negative effect of corruption, unemployment and political stability on the GDP, but at the same time indicates positive influence of unemployment of the GDP.

Therefore, based on different outcome of the reviewed studies, that came up with three different result between unemployment and economic results. Some results indicate insignificant others indicate positive significant relationship. These two different result contradict with Okun's law. Whereas other results show negative significant relationship which confirmed the law. Therefore based on the different results of the reviewed studies, the present study develop this hypothesis.

H_0: there is no long run cointegration between the selected macroeconomic variables and economic growth ($H_0 = \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$).

H_1: there is no long run cointegration between the selected macroeconomic variables and economic growth ($H_1 = \neq \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 = 0$).

METHODOLOGY

The study employs Autoregressive Distributed Lags (ARDL) model to examine the long run and short run cointegration the macroeconomic variables that consist of economic growth, exchange rate, inflation rate and unemployment rate with the focus of the economic growth as the dependent variable. Whereas the remaining three macroeconomic variables serve as independent variables. The study employs Nigerian annual time series data from 2001 to 2022. The ARDL model was introduce by Pesaran, Shin and Smith (Pesaran, Shin & Smith, 1996). The model has the advantage of using limited time series data. Secondly, it also has the advantage of running the analysis with the variables that are integrated at level or first difference or mixing of both two integrations at level and first difference (Bahmani-Oskooee & Ng, 2002). Thirdly, ARDL model uses a sufficient number of lags to reduce the strength of the serial correlation of residuals (Laurenceson & Chai, 2003). The advantages mentioned above justified the use of ARDL model to run the analysis of the study.

The model of ARDL of the present study can be presented as:

$$GDPt={}_{\alpha}0+{}_{\alpha 1}GDP_t+{}_{\alpha 2}EXCR_t+\alpha_3 INFR_t+\alpha_4 UNER_t+\mathcal{E}_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(3.1)$$

where α_0 is the constant and $\alpha_1 \ldots\ \alpha_n$ represent the coefficient of specific macroeconomic variables. The term $\mathcal{E}$ is referred to as the error term as the residual error of the regression and t = 1…n which represent the time series. GDP represent the economic growth as the dependent variable. The macroeconomic determinants used as the

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue X October 2024

independent variables in the equation are EXCR = exchange rate Naira per US Dollar, INFR = inflation rate and *UNER* = unemployment rate.

The analysis started with the unit root test because most of the macroeconomic variables series have unit root. Before running the ARDL cointegration test the unit test is conducted to ensure none of the variable is integration at second difference. The presented study uses Augmented Dickey-Fuller Stationary Test Result because it is most commonly used for the test according to Karim and Gee (2006). The study further finds the optimum lag criteria because the ARDL is sensitive to lag order. After generating the optimum lag, the analysis run the ARDL bound cointegration test to determine the cointegration and long run relationship among the variables. Subsequently, after long run cointegration relationship, the study undertakes the stability test to robust the result. The stability test consist of the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) to discover the goodness of fit of the ARDL model used in the study.

Research Framework Model

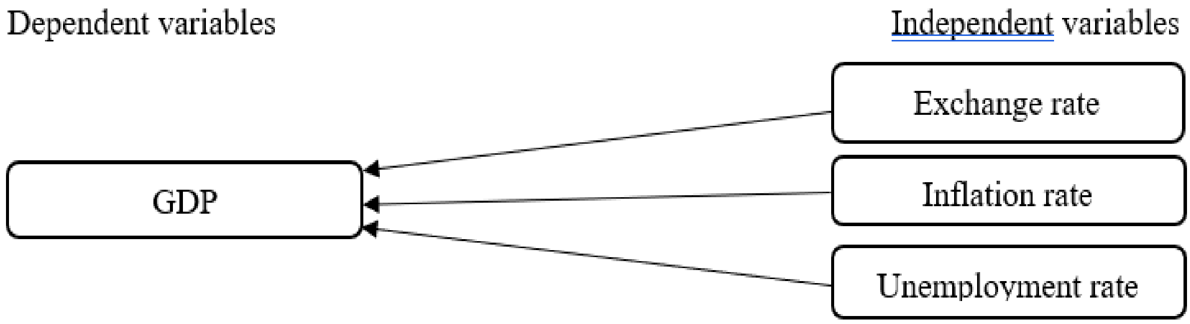

Figure 1:

Figure 1 above shows the research framework of the study. GDP as the dependent variable, and exchange rate, inflation rate and unemployment rate serve as independent variables.

The study justified to use GDP as the determinant to measure the economic growth because it is regarded as the dominant economic indicator that determines income and economic growth (D'Arcy, McGough, & Tsolacos, 1997). The concept of GDP as a major macroeconomic indicator was initially developed in the 1934 by American economist called Simon Kuznets after it was first initiated toward the end of 18th Century (Abramovitz, 1986).

After developing the model equation and the research framework. The study proceed to data analysis in order to provide the empirical result of the study.

Data analysis

The data analysis section is divided into three section. The first section of the analysis presents the correlation analysis to ensure that the variables are not highly correlated. The second section focus on the unit root test to ensure that all the variables are stationary at level or first difference and none of the variable is stationary at second difference. Thirdly, the analysis find the lag criteria then followed by the ARDL bound cointegration and long run analysis using the maximum lag criteria. Finally stability test to ensure that the model is stable.

The table below shows the variables, the measurements, the annual period of the time series from 2001 to 2022 and their sources.

Table 4.1 Measurement of Variables

Variables	Measurement	period	Sources
Economic growth	GDP	2001 – 2022	http://imf.org

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Unemployment	Unemployment rates	2001 – 2022	http://imf.org
Inflation	Inflation rate	2001 – 2022	http://imf.org
Exchange rate	Naira/US dollar	2001 – 2022	http://imf.org

Source: IMF Data base

Correlation Analysis

The data analysis started with correlation analysis in order to avoid overestimation of the standard errors that is to show whether there is existence of multicollinearity between the regressors and regressand (Evans, 1996). Table 4.2 below shows the correlation coefficients of the variables and their probability values. The result of the correlation analysis shows that only GDP and Exchange rate is highly correlated. According to Tabachnik and Fidell (2007) any correlation that is below 0.9 is not crucial for the analysis or model. Therefore, the corretion of 0.876973 of the GDP and Exchange rate could not iliminate the two variables in running the analysis. The remaining variables have weak correlations and thus, they are recommended for the model analysis.

Table 4.2 Correlation analysis

Variables	GDP	CPI	REER	UEMPR
GDP	1			
INFR	0.194935	1		
EXCR	0.876973***	0.134846	1	
UNER	0.017844	0.298969	0.290558	1

Note: *** indicates rejection of the null hypothesis of no correlation among the variables at 1% significant level.

Unit Root Test

The study further conducted unit root test to find out whether the variables are integrated at level I(0) or first difference I(1) in order to run the ARDL cointegration test. The cointegration test of the variables that are stationary at level, or at first difference or even mixed of I(0) and I(1) stationary levels. However, the ARDL model do not consider any variable that is only stationary at second difference because it could lead to a spurious result (Enders, 2004; Narayan, 2004; Pesaran et al., 2001). The result shows that inflation rate (IMPR) is integrated at level, whereas the all the variables are integrated at first difference, as shown on Table 4.3 below. Hence, stationary result justified the use of ARDL cointegration bound test.

Table 4.3 The Augmented Dickey-Fuller Stationary Test Result

	Constants without trend		**Constant trend**	
Variables	**Level**	**1st Difference**	**Level**	**1st Difference**
GDP	-0.940932	-3.386157**	-2,307831	-3.283023*
INPR	-5.464927***	-5.907528***	-3.309916*	-5.614700***
EXCHR	1.790068	-3.162621**	-2.911741	-3.747116**
UEMPR	2.287005	-1.790915	1.193897	-19.29824***

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Notes: Figures are the t-statistics for testing the null hypothesis that the series are non-stationary. * denotes significance at 10%, ** denote significance at 5% and *** denote significance at 1%.

Optimum ARDL Model Selection Criteria

Before running the ARDL model, there need to determine optimum lag selection criteria because the ARDL is sensitive to lag selection order for F-statistic (Bahmani-Oskooee & Ng, 2002)**.** The study considered the three popular information criteria that include Akaike information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQIC) as shown on Table 4.4 below.

Table 4.4 Lag length Selection Criteria

Lags	**AIK**	**SCH**	**HQ**
0	27.64573	27.84456	27.67938
1	22.88503	23.87917	23.05327
2	21.22891	23.01838	21.53176
3	18.59306*	21.17784*	19.03051*

Note: * indicates the lowest value under each criterion that represents the optimum lag

The optimum lag from the result of the three information criteria is set to be three (3) as shown in the above table. Therefore, the study select 3 as the maximum order of lags for the regression. Using 3 as the maximum lag order, the result of ARDL come up with model (3, 1, 3, 3) for GDP, INFR, EXCR and UNER as shown on the Table below.

Table 4.5 Optimal ARDL Model Section:

Model ARDL (3, 1, 3, 3)				
Variable	Coefficient	Std. Error	t-Statistic	Prob. *
GDP(-1)	0.046190	0.172239	0.268176	0.7993
GDP(-2)	0.044095	0.275538	0.160032	0.8791
GDP(-3)	0.377317	0.174551	2.161644	0.0830*
INFR	-1.053280	2.749533	-0.383076	0.7174
INFR(-1)	1.864573	2.258770	0.825482	0.4467
EXCR	1.841965	4.195434	0.439040	0.6790
EXCR(-1)	-0.645296	6.418595	-0.100535	0.9238
EXCR(-2)	11.63563	4.988296	2.332586	0.0670*
EXCR(-3)	-7.475613	5.118319	-1.460560	0.2040
UNER	-29.56891	21.45220	-1.378362	0.2266
UNER(-1)	76.70567	24.28384	3.158712	0.0251**
UNER(-2)	-49.29975	90.70904	-0.543493	0.6101

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UNER(-3)	367.7951	122.2821	3.007759	0.0298**
C	-3732.035	842.0924	-4.431859	0.0068***

F-statistic is 104.9125, and it is significant at 1% probability level

After determining the maximum lag length, the study proceeds to the cointegration test. As the models is unrestricted, the linear trend term is omitted in the equation. This is because the constant coefficient values of the model is significant one percent significant level as indicated in the Table 4.5. In this case, there is no need to include the linear trend in the model provided that the coefficient of constant value is significant as stated earlier on. The ARDL bound test is aimed to establish the existence of cointegration among the independent variables and the dependent variable. The study performed the ARDL bound cointegration test using GDP as the dependent variable.

The *F*-statistics the ARDL bound test is compared to Narayan (2004) upper and the lower critical values. If the result of the F-statistics is greater than the upper critical value, the null hypothesis is rejected. This indicates the existence of cointegration. Whereas if the result is less than the lower critical value, it shows the nonexistence of cointegration. Nevertheless, if it is between the upper and the lower critical values, hence, the result is inconclusive result.

Table 4.6 ARDL Bound Test Results: Model

Variables	**F Statistic**	**Co integration**	**CV**	**I (0)**	**I (1)**
GDP (INF, EXC, IMF, UEM)	7.847537***	Cointegration.	1%	4.29	5.61
			5%	3.23	4.35
			10%	2.72	3.77

The above bound cointegration test is conducted for the purpose of testing the existence of cointegration relationship against the null hypothesis of the non-existence of cointegration relationship between the dependent variable (GDP) and independent variables (INFR, EXCR and UNER). The results are reported based on Narayan's (2004) critical values. The bound test results of *F*-statistic is 7.847537 which is above the upper bounds of the critical value that is an indication of the presence of cointegration on the model. The *F*-statistic value is significant at one percent significance level as indicated in Table 4.6. This indicates the strong evidence of the existence of long run cointegration relationship over the period of analysis that covers 22 observations annually. Hence, the findings suggest that the economic growth (GDP) is significantly linked to the selected macroeconomic variables (INFR, EXCR and UNER). The bound test cointegration result is consistent with the study of Salihu (2018), and Salihu and Yusof (2017).

Long Run Effect

As the study determined the optimum ARDL specification for the model and bound cointegration relationship, the paper proceeds to the estimation of long run parameters based on the results of the bound cointegration of the model as indicated in Table 4.6. The result of unemployment rates both lag one and lag two after first difference show negatively significant relationships with the economic growth. Table 4.7 indicates that one unit increase in unemployment rate lag one after first difference decreases the GDP by 4.73 units. The result of unemployment rate lag two after the first difference indicates that one unit increase in the unemployment rate causes a decrease by 3.01 units the GDP.

Table 4.7 Long-Run Elasticity Estimate for the Model

Variables	Coefficient	Std. Error	t-Statistic	Prob.
D (GDP (-1))	-0.421412	0.218471	-1.928912	0.1116

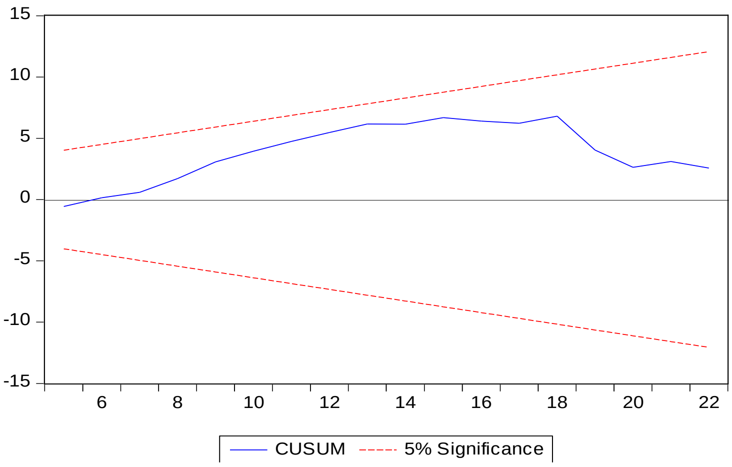
D (GDP (-2))	-0.377317	0.174551	-2.161644	0.0830*
D (INFR)	-1.053280	2.749533	-0.383076	0.7174
D (EXCR)	1.841965	4.195434	0.439040	0.6790
D (EXCR (-1))	-4.160016	6.479917	-0.641986	0.5492
D (EXCR (-2))	7.475613	5.118319	1.460560	0.2040
D(UNER)	-29.56891	21.45220	-1.378362	0.2266
D (UNER (-1))	-318.4954	67.39819	-4.725577	0.0052***
D (UNER (-2))	-367.7951	122.2821	-3.007759	0.0298**
C	-3732.035	842.0924	-4.431859	0.0068***
INFR (-1)	0.811293	3.889937	0.208562	0.8430
EXCR (-1)	5.356685	1.827390	2.931332	0.0326**
UNER (-1)	365.6321	85.85641	4.258647	0.0080***
GDP (-1)	-0.532397	0.246297	-2.161604	0.0830*

Note: ***,** and * represent 1%, 5% and 10% significance levels respectively

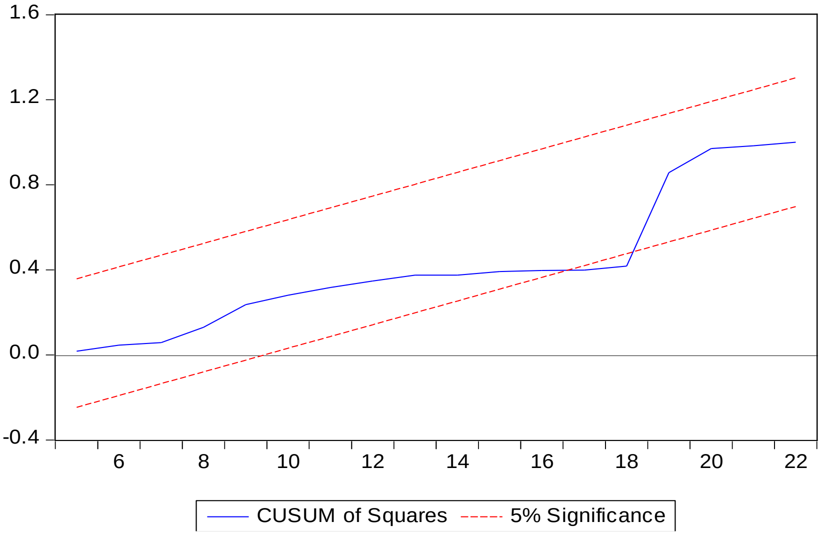
Stability Test

The last stage of the ARDL model is the stability test. The model stability test consist of CUSUM and CUSUMQ tests. The two stability tests were proposed by Brown, Durbin and Evans (1975). The tests are usually applied on the residuals of the estimated model. The CUSUM test shows systematically changes of the coefficient of regression, whereas CUSUMQ shows suddenly changes of the coefficient of regression. If the blue plot of CUSUM falls inside the upper and lower critical limit of five percent significance level (Brown *et al*., 1975) which are portrayed by two straight red lines, it shows that the coefficients of the dependent variable in the ECM of the ARDL model are stable. The same procedure is applied to CUSUMSQ that is based on square recursive residuals. The test was conducted for the model of the study.

The blue plotted CUSUM of the model is within the upper and lower critical bound at five percent significance level. This confirmed the stability of the model as depicted in Figure 4.1. The blue plot of CUSUMQ test of the model crosses the critical lower bound in 2017 and comes back to the critical value after 2018. But the issue is mild since the blue plot goes bellow the critical lower bound only within two observations out of twenty observations. According to Yin and Hamori (2011), the mild instability is not crucial for analysis.



ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue X October 2024



Diagnostic Checks

Diagnostic checks were conducted to test normality, serial correlation, heteroskedasticity and model specification tests. The diagnostic tests are performed for the model of the present study. The normality test on error terms confirmed that the model is normally distributed. The normality indicates that the results failed to reject the null hypothesis which states that error terms are normally distributed. Secondly, the serial correlation as per Lagrange Multiplier results pointed out that the residuals are not serially correlated. The result shows that the test failed to reject the null hypotheses of the model. The existence of serial correlation could lead to the wrong specification of the model (Mackinnon, 1992). The third diagnostic test of heteroskedasticity test of errors failed to reject the null hypothesis. The result confirmed the presence of homoskedasticity which is an indication of the absence of heteroskedasticity (Breusch & Pagan, 1979). Hence, this indicates the model is free from the problem of underestimating the variables and standard errors.

The fourth test that comprises of Ramsey's Regression Equation Specification Error Test (RESET) confirmed the goodness specification and functionality of the model (Ramsey, 1969). Therefore, as illustrated in Table 4.8 below, the ARDL error correction term confirmed that all the models is normally distributed, serially uncorrelated, and the existence of homoskedasticity are well specified and formulated. Hence, this creates room for BLUE estimates.

Table 4.8 Diagnostic Tests

Bound test (F-Statistics)	7.847537***
Serial Correlation test (F-Statistics)	0.068396 (0.9342)
Hetroskedasticity test (F-Statistics)	2.690094 (0.0771)
Normality (Jarque Berra)	2.241138 (0.326094)
Ramsey RESET test	0.006605 (0.9362)
CUSUM	Stable
CUSUMQ	Stable

Summary of the results

Table 4.8 above, present the summary result of the ARDL bound cointegration test, normality and stability tests.

CONCLUSION

The implication of the study from the analysis shows negative relationship between unemployment rate as an independent variable and the economic growth as dependent variable in the long run relationship. The result of the study empirically proved the Okun's law theory. Hence, it concludes that unemployment is inversely proportion to the economic growth in Nigeria based on the result of the analysis using the data annual data from 2001 to 2022. Simply means increase in the unemployment rate resulted the decrease in the economic growth. Therefore, in order to achieve the economic growth, the issue of unemployment need to be tackle. Hence, there need for the creation of more job opportunity from both private and public sector. For the achievement of economic development and its sustainability as the recommendation of the study. Academically, the present study recommends future to research to include more macroeconomic variables and longitudinal data for further outcome of the result.

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