Climate Change-Economic Growth Nexus in Nigeria

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DOI: 10.56201/ijssmr.v10.no4.2024.pg52.63

Abstract

The study examined the climate change-economic growth nexus in Nigeria for the period 1981-2021using time series data obtained from the Central Bank of Nigeria Statistical Bulletin. Economic growth was specified as a function of capital stock, variables precipitation, temperature, carbon dioxide emission, and inflation. Preliminary test on the time series data was done using pairwise correlation, Augmented Dickey-Fuller unit root test for stationarity and Bound test cointegration analysis for long run relationship. The technique of Autoregressive Distributed Lagged Model (ARDL) was employed to estimate the parameters of the model since the time series were stationary at levels I(0) and at first difference Result indicates that that precipitation, mean temperature and carbon dioxide emissions have insignificant impact on economic growth over the period under study. The study recommends the necessity for economic managers in Nigeria to embrace effective management of water resources through purposeful construction of irrigation projects in order to avoid drought and ensure availability of arable land for agriculture, and consequently economic growth. Economic managers should lay emphasizes on those goods and services, especially staple foods like cereals, tubers, spices, etc. that require hot climate for production.

***Keywords**: Climate Change, Economic Growth, Nigeria*

1. INTRODUCTION

Climate change is a threat not only to the affected nation but also to the whole world. Over the last few decades, incidents of climatic change have increased drastically, and these incidents have both direct and indirect impacts on the economy. Examining the impacts of climate change goes with a lot of complexities (Hsiang, Kopp, Jina, Rising, Delgado, Mohan, and Oppenheimer 2017). The transmission mechanisms through which climate may positively or negatively influence economic outcomes is a challenging task to investigate comprehensively.

Going by facts and figures, data from Climate Change knowledge Portal of the World Bank database (2020) shows an erratic trend of carbon dioxide emission for the period under study with respect to Nigeria. Between the period 1980 and 1985 CO_2 emission per metric ton declined to 4.3 per cent. The trend remained on negative decline to 14.8 per cent by 1990. Between 1990 and 1995, CO_2 emission per ton increase by 6 per cent. The trend declined by 17.6 per cent by the year 2000. Between 2000 and 2005, CO_2 emission increased to 14 per cent. Another decline in the trend by 19.25 per cent was recorded between 2005 and 2010. CO_2 emission between 4.8 per cent and 3.8 per cent growth rates was recorded for 2015 and 2020 respectively (Climate Change knowledge Portal, 2022).

Information from the same source Climate Change knowledge Portal, (2022) shows that annual mean temperature between the period 1980 and 1985 increased to 0.81 per cent in Nigeria. The trend remained on negative decline to 3.01 per cent by 1990. Between 1990 and 1995, declined further to1.12 per cent. The trend reversed positively to 0.74 per cent by the year 2000. Between 2000 and 2005, annual mean temperature declined to 0.43 per cent. Another decline in the trend by 0.40 per cent was recorded between 2005 and 2010. The value of annual mean temperature of 0.83 per cent and -0.51 per cent growth rates was recorded for 2015 and 2020 respectively. The growth rate of annual mean temperature by year 2021 was put at -0.87 per cent. Similarly, time series data for precipitation for the period 1980 to 2021 shows increasing and downward trend. Between 1980 and 1985 there was 5.26 per cent decline. By 1990, there is an upward trend of 3.87 per cent and a slight decline to 3.10 per cent by 1995. The trend increased to 9.26 per cent by the year 2000. There was a drastic decline to 3.46 per cent by year 2005. There was a further decline of the rate of precipitation to 6.02 per cent by 2010. An upward increase of the rate of precipitation in Nigeria increased to 7.17 per cent by year 2015 and a decline to 3.22 per cent by year 2020. The growth rate of precipitation by year 2021 in Nigeria was put at 11.5 per cent (Climate Change knowledge Portal, 2022).

In literature, results of empirical studies have not been in unifying with regards to the impact of climate change on economic growth in Nigeria. This is because most studies on this issue were mainly cross-country or panel studies (Abidoye, & Odusola, 2015; Akram 2012; Alagidede, Adu, & Frimpong 2014; Belford, Delin, Ceesay, Ahmed & Jonga (2020; Dell, Jones & Olsken 2008; Ngepah, Djemo, & Saba, 2022). These studies did not consider the peculiarities of Nigeria as a country. Country-specific studies on the impact of climate change on economic growth in Nigeria are few. To the best of the researcher's knowledge, only the study by (Ogbuabor & Egwuchukwu 2017) examined climate change impact on economic growth in Nigeria using Ordinary Least Squares (OLS) technique. The use of OLS has some inherent defects that makes its estimates unreliable and not for robust enough for long run inference and decision making. Climate change is a long run phenomenon, thus, it requires robust examination of time series data that would provide information for long run planning, modeling and decision making. The present study intends to use a dynamic model that incorporates data for precipitation, mean temperature, and carbon dioxide emission) to empirically determine the short run and long run impact of climate change variables on economic growth in Nigeria, hence, the need for this study.

The work is organized in five sections. The introduction serves as the first part of the study, while the literature review served as the second part. Methodology forms the third section of the study. Results and discussions formed the fourth part of the study. The final part of the is the conclusion and recommendations.

2. LITERATURE REVIEW

Theoretical Literature

Endogenous Growth Theory

This theory was pioneered by Romer (1986); Lucas (1988); and Barro & Sala-i-Martin (1995). The endogenous growth theory posits that economic growth is primarily driven by internal factors such as continuous improvements and technological advancements generated within the economy, education and skill development that enhance productivity, and positive externalities from research and development (R&D).

Endogenous growth theory highlights the importance of innovation and technology in driving economic growth, which can be harnessed to combat climate change. By fostering a green economy through investments in sustainable technologies and policies that support environmental goals, economic growth can be achieved while mitigating the impacts of climate change.

Empirical Literature

Dell, Jones and Olsken (2008) examined the impact of temperature and precipitation on national economies. Using panel data regression analysis, the study finds that higher temperatures substantially reduce economic growth in poor countries. Second, higher temperatures appear to reduce growth rates, not just the level of output. Third, higher temperatures have wide-ranging effects, reducing agricultural and industrial output, investment, innovation, and political stability. Decade or longer increases in temperature also show substantial negative effects on poor countries' growth.

Akram (2012) examined the impacts of climate change on economic growth for selected Asian countries during the period 1972-2009. A growth model has been developed by incorporating temperature and precipitation as proxies for climate change in the production function and a fixed effect model (FEM) and seemingly unrelated regression (SUR) have been used to estimate the model. Results show that changes in temperature, precipitation and population growth negatively affects economic growth, while, urbanization and human development stimulates economic growth. Result indicates that agriculture sector is the most vulnerable sector to climate change and manufacturing sector is the least affected.

Alagidede, Adu, and Frimpong (2014) examined the empirics of climate change and its effect on sustainable economic growth in Sub-Saharan Africa. Using data on two climate variables, temperature and precipitation, and employing panel cointegration techniques, the study estimates the short- and long-run effects of climate change on growth. Findings reveal that an increase in temperature significantly reduces economic performance in Sub-Saharan Africa. Furthermore, the study shows that the relationship between real gross domestic product per capita on one hand, and the climate factors on the other, is intrinsically non-linear.

Abidoye, and Odusola, (2015) examined the empirical linkage between economic growth and climate change in 34 African countries for the period 1961 to 2009. The study finds a negative impact of climate change on economic growth. Results show that a 1°C increase in temperature reduces gross domestic product (GDP) growth by 0.67 percentage point. Result indicates that mean long-run temperature changes affect long-run economic growth as measured by five-year averages.

Ogbuabor and Egwuchukwu (2017) examined the impact of climate change on the overall growth of the Nigerian economy for the period 1981-2014 using the technique of Ordinary Least Squares (OLS). estimation technique and data for the period 1981-2014 were used. Findings reveal that in the long-run and short-run, carbon emissions impacts growth adversely. Moreover, forest depletion impacts negatively on growth in the short-run.

Sandhani, Pattanayak, and Kumar, (2020) examined climate change impact on economic growth in the India for the period 1980-2019. The results based on state-level analysis are suggestive of negative effects of rising temperature on growth.

Belford, Delin, Ceesay, Ahmed and Jonga (2020) analyzed the impacts of climate change on economic growth in Anglophone West Africa with similar background, during the periods 1969-2016. Techniques of fixed effect model, random effect model and Hausman test were employed for data analysis. The results conclude that the consequences of climate change in the region are sluggish economic performance and growth, underdevelopment, poverty and human misery.

Kadanali, and Yalcinkaya (2020) examined the effects of climate change (temperature and precipitation) variables and six other indicators on economic growth in the top 20 economies in the world over the period 1990 to 2016. Evidence indicates that climate change has negative and statistically significant effects on economic growth.

Ngepah, Djemo, and Saba (2022) estimated the effects of climate change by means of the systems generalized method of moments (System GMM) using panel data across South African municipalities from 1993 to 2016. The results indicate that natural resources and primary sectors are the most impacted, while the economic losses are more than the gains in almost all municipalities in South Africa.

Shabir, Dar, and Uddin, (2022) used the technique of Panel ARDL to investigate the short-run and long-run impacts of climate change on economic growth across low-income countries for the period 2005 to 2018. Results show that climatic change, especially weather-related events, negatively impacts the economic growth of low-income countries. However, in the short run, climatic change does not significantly affect the economic growth of countries.

From the foregoing, it is deductible that country-specific studies as it regards to the impact of climate change on economic growth in Nigeria are relatively scarce. Apart from the dearth of such study, none of the reviewed studies considered the three notable variables (precipitation, mean temperature and carbon dioxide emission) used in measuring climate change in one study. This is one novel thing about the present study.

3. METHODOLOGY

The present study adopts the *Ex Post Facto* research design. The time series data for real gross domestic product was obtained from the Central Bank of Nigeria Statistical Bulletin for the period

1981-2021. Data for temperature, precipitation and carbon dioxide emission were obtained from the Climate Change knowledge Portal of the World Bank database.

The preliminary test for stationarity is done using the Augmented Dickey fuller Unit root test. The study adopted the Pairwise correlation analysis using Eviews 9 software. The ADF equation is stated below:

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^{P} \alpha i \Delta y_{t-i} + \mu_t \quad (2)$$

The testing procedure follows an examination of the student-t ratio for δ. The critical values of the test are all negative and larger in absolute terms than standard critical t-values, so they are called ADF statistics. If the null hypothesis cannot be rejected then the series Y_t cannot be stationary. The decision rule is to reject Ho, if the absolute ADF t-statistic > 5% critical values. If otherwise, accept Ho.

The researcher utilized the autoregressive distributed lag (ARDL) Bound testing method to investigate the long-term association between economic growth and climate change variables, along with short-term dynamics. This approach was preferred over Engle-Granger and Johansen techniques for cointegration analysis (Pesaran, Shin & Smith, 2001). In bound test cointegration, an F-test examines the joint significance of lagged levels of variables to discern whether a long-term relationship exists. Pesaran et al. (2001) proposed adjusted critical values for this test, considering variables as either stationary (1(0)) or integrated of order one (1(1)). If the computed F-statistic surpasses the upper bound critical value, the null hypothesis of no cointegration is rejected. Conversely, if it falls below the lower bound, rejection is not warranted. Results between the bounds are inconclusive. This procedure continues as long as variables exhibit different orders of integration (Ilyas, Hafiz, Afzal & Tahir, 2010).

Model Specification

While adopting the Cobb–Douglas production function, Alagidede, Adu and Frimpong (2015) modeled their panel study of the impact of climate change on economic growth as thus:

$$y_{it} = A_{it} K_{it}^{\alpha} T_{it}^{\tau} P_{it}^{\gamma}\ e^{\varepsilon it} \quad (1)$$

where y_{it} is real per capita income for a given country; k_{it} is capital per worker in country; T_{it} is the mean annual temperature; P_{it} is the annual rate of precipitation; e_{it} is a random error factor and *i* and *t* represent country and time.

Both temperature and precipitation enter production function in aggregate terms having been deemed as global public goods. A_{it} indicates the state of technology in country *i* at date *t*. Carbon dioxide emission is an effect of the use of technology in production by firms. In order to reflect the three climate change variables in the production function for a country-specific study, we modify and logged the model used by Alagidede, et al. (2015) as thus:

$$lnY_t = \beta_0 + \beta_1 T_t + \beta_2 lnK + \beta_3 lnP_t + \beta_4 INF_t + \beta_5 lnCO2_t + \varepsilon_t \quad (2)$$

where:

Y = Real GDP (proxy for economic growth); K = capital stock (proxied by gross fixed capital formation); CO2 = Carbon emission per metric ton (proxy for climate change, biophysical effects, Parry 2004); *T* = Annual average temperature; *P* = Annual rate Precipitation; INF = inflation rate (economy-wide macroeconomic variables); t = time series (annual); β = parameter estimates

ε = error term

A priori expectations

$f(\beta_1) > 0$, $f(\beta_2) < 0$, or $f(\beta_2) > 0$, $f(\beta_3) < 0$, $f(\beta_4) < 0$, $f(\beta_5) < 0$.

However, with the assumption of cointegration of the variables in Eqn. 2, the short run dynamics of the autoregressive distributed lag model is therefore specified in equation 3.

$$\Delta Y_t = \propto_0 + \propto_{1i} \sum_{i=1}^{q} \Delta Y_{t-i} + \propto_{2i} \sum_{i=0}^{q} \Delta K_{t-i} + \propto_{3i} \sum_{i=0}^{q} \Delta P_{t-i} + \propto_{4i} \sum_{i=0}^{q} \Delta T_{t-i} + \propto_{5i} \sum_{i=0}^{q} \Delta CO2_{t-i} + \propto_{6i} \sum_{i=0}^{q} \Delta INF_{t-i} + \varphi ECM_{t-1} + \mu_t \quad (3)$$

φ = error correction coefficient (speed of adjustment from the short run to the long run equilibrium after a shock).

4. RESULTS AND DISCUSSIONS

Table 1: Result of Descriptive Statistics

	Y	K	P	T	CO2	INF
Mean	37710.48	8657.709	1158.564	27.24024	0.689024	19.44268
Median	26658.62	8246.210	1158.260	27.28000	0.670000	12.20000
Maximum	72393.67	15789.67	1296.430	27.86000	0.870000	76.80000
Minimum	16048.31	5668.870	887.7500	26.39000	0.460000	0.200000
Std. Dev.	20309.83	1994.857	84.10160	0.317470	0.101558	17.65582
Skewness	0.575311	1.225619	-0.740679	-0.347603	0.108821	1.759647
Kurtosis	1.704524	5.395442	3.855982	3.068665	2.553349	5.215808
Jarque-Bera	5.128737	20.06730	5.000511	0.833709	0.421729	29.54603
Probability	0.076968	0.000044	0.082064	0.659117	0.809884	0.000000
Sum	1546130.	354966.1	47501.11	1116.850	28.25000	797.1500
Sum Sq. Dev.	1.65E+10	1.59E+08	282923.1	4.031498	0.412561	12469.12
Observations	41	41	41	41	41	41

Source: Author's output of descriptive statistics

The descriptive statistics provide insights into the characteristics of six key variables: national output (K), capital stock (L), precipitation (P), average temperature (T), carbon emissions (CO2), and inflation rate (INF). Among these variables, national output (K) and capital stock (L) exhibit high positive skewness and kurtosis, suggesting heavy-tailed distributions with significant deviations from normality. Precipitation (P) and inflation rate (INF) also deviate from normality, albeit to a lesser extent, indicating potential challenges with assumptions in statistical analyses. However, average temperature (T) and carbon emissions (CO2) appear to have distributions closer to normal, with lower skewness and kurtosis values. Notably, variables like capital stock (L) and inflation rate (INF) show considerable variability, as indicated by their relatively high standard

deviations, signifying greater dispersion of data points around their means. Overall, these descriptive statistics offer valuable insights into the characteristics and distributions of the variables, highlighting potential considerations for further analysis and modeling.
The next step is the correlation analysis. This is done using the pairwise correlation analysis. Below is the result of the correlation analysis of the time series variables in Table 1.

Table 2: Result of the Correlation Matrix

	Y	T	K	P	INF	CO2
Y	1.00	0.68	0.43	0.26	-0.34	-0.59
T	0.68	1.00	0.25	0.11	-0.56	-0.47
K	0.43	0.25	1.00	0.02	-0.24	-0.04
P	0.26	0.11	0.02	1.00	-0.02	-0.26
INF	-0.34	-0.56	-0.24	-0.02	1.00	0.28
CO2	-0.59	-0.47	-0.04	-0.26	0.28	1.00

Source: Author's output of correlation matrix

Ordinary Least Squares (OLS) technique assumes that the independent variables do not exhibit high correlation among themselves. The highest correlation value (0.68) observed between two explanatory variables in the matrix is between Real GDP (Y) and mean temperature (T). This outcome is not considered too high, since the threshold given is 0.8 (Gujarati & Porter, 2009). Therefore, OLS assumption of multicollinearity may not arise in the modelling, even if it does, transforming the variable will reduce the effect of multicollinearity problems in a model.
The time series data are tested for stationarity. The result is shown in Table 2 below

Table 2: Result of ADF Unit Root Test of the Variables

Variable	Level Form		First Difference		Order of integration
	ADF test statistic	5% critical value	ADF test statistic	5% critical value	
LY	-0.950480	-2.941145	-3.979343	-2.938987	I(1)
T	-3.232520	-2.936942	-	-`	I(0)
LK	-2.226185	-2.941145	-5.157162	-2.941145	I(1)
L(P)	-4.763517	-2.936942	-	-`	I(0)-
INF	-3.288903	-2.936942	-	-`	I(0)
CO2	-3.396651	-2.936942	-	-`	I(0)

Source: Author's output of ADF unit root test

The result of the Augmented Dickey Fuller Unit root test shows the variables are stationary at levels I(0) and at first differences I(1), hence, there is need to check if the variables co-move in the long run. The result of the bound test cointegration is shown on Table 3 below.

Table 3: Result of Bound Test cointegration

Test Statistic	Value	K	Bound Test	
			Lower bound	upper bound
F-statistic	4.518606	*7*	2.62	3.79

Source: Author's output of Bound test cointegration

From Table 3 above, it is seen that the value of the F-statistic (4.52) is above the value of the 5 per cent lower bound (IO =2.62) and 5 per cent upper bound (I1=3.79), we, therefore, conclude that cointegration exists. Simply put, there is a long run relationship among the variables in the model. With this result in mind, we go ahead to estimate the short and long run estimates of the ARDL in Table 4 as shown below.

Table 4: Result of Short Run and Long Run ARDL Estimates

Dependent Variable: LY				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(T)	0.038191	0.026361	1.448761	0.1622
D(LK)	-0.060764	0.056730	-1.071114	0.2963
D(LP)	0.024852	0.097057	0.256055	0.8004
D(LP(-1))	0.041128	0.070587	0.582653	0.5663
D(LP(-2))	-0.156335	0.077407	-2.019640	0.0564
D(INF)	-0.000691	0.000452	-1.528749	0.1413
D(INF)	-0.000265	0.000553	-0.478134	0.6375
D(INF)	0.000791	0.000389	2.033660	0.0548
D(CO2)	0.022400	0.097179	0.230503	0.8199
D(CO2(-1))	0.022626	0.073456	0.308021	0.7611
D(CO2(-2))	0.150620	0.077599	1.941016	0.0658
CointEq(-1)	-0.028545	0.031020	-0.920207	0.3679
Cointeq = LY - (+ 1.3379*T -5.6780*LK + 7.9270*LP --0.0386 *INF --9.3951*CO2 - 22.2039				

Source: Author's computation of short run ARDL Model

Precipitation (P) had a positive and insignificant impact on economic growth (LY). The higher the increase in rainfall (P), the higher the national output (LY). A one per cent increase in rainfall (P) activities led to a 0.02 per cent and 7.9 per cent expansion in economic growth (LY) in the short run and long run respectively. This finding agrees with the revelations made in the study by Shabir, Dar, and Uddin (2022), which showed that climatic change, especially weather-related events, negatively impacted the economic growth of low-income countries during the studied period in the long run. But in the short run, climatic change did not significantly affect the economic growth of countries.

Average temperature (T) had a positive relationship with national output (LY) over the period under study. The result showed that an increase in average mean temperature led to a 0.04 per cent and 1.33 per cent increase in economic growth (LY) in the short run and in the long run respectively. This outcome was not statistically significant at 5 per cent in the short run (P = 0.1622) and long run (P = 0.3113) respectively. This finding did not agree with the findings by Abidoye and Odusola (2015), Akram (2012), and Kadanali and Yalcinkaya (2020), whose evidence showed that average long-run temperature changes affected long-run economic growth.

Likewise, another climate change variable, carbon emission per tonne (CO2), had a positive relationship with economic growth, but it was not statistically significant at 5 per cent, with the p-value at 0.8199 and 0.2614 in the short run and in the long run. A one per cent increase in carbon emission (CO2) led to a 0.02 per cent increase in economic growth (LY) in Nigeria in the short run. However, in the long run, a unit change increase in carbon emission led to a 9.40 per cent decrease in economic growth in Nigeria. The implication was that an increase in carbon emission would hurt the economy in the long run. This finding varied with the evidence yielded in the study by Ogbuabor and Egwuchukwu (2017), which indicated that both in the long run and short run, carbon emissions affected growth adversely.

The relationship between the inflation rate and economic growth met economic expectations by being negative in the short run and in the long run. The higher the inflation, the lower the increase in output over the period under study. A one per cent increase in the inflation rate led to a 0.0001 per cent and 0.04 per cent decrease in national output in the short run and in the long run respectively. This outcome was not statistically significant at 5 per cent in the short run (P = 0.1413) and long run (P = 0.4487) respectively.

The error correction term of the model was computed at 0.028545. This meant that the speed by which real GDP was restored back to its original equilibrium after a shock to the economy was 28.55 per cent. Though this outcome was not statistically significant at 5 per cent, it still met economic expectations by being negative.

Post-Estimation Results

Table 5: Summary of the Post estimation tests.

Test for Normal Distribution		**Breusch-Godfrey Serial Correlation LM Test:**		**Heteroskedasticity Test: Breusch-Pagan-Godfrey**	
Jarque-Bera	0.304349	Obs*R-squared	3.960881	Obs*R-squared	7.761810
Probability	0.858838	Prob. Chi-Square(2)	0.1380	Prob. Chi-Square(16)	0.9556

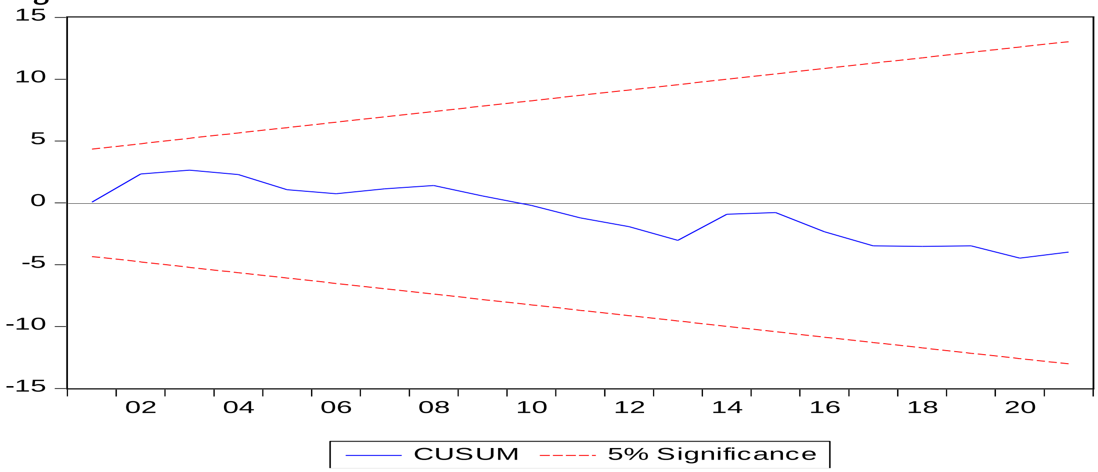
Source: Author's computation of post-estimation tests for the ARDL Model

From Table 5 above, the value of the probability of the JB statistic (0.839686) exceeds 0.05. Therefore, it is concluded that the residual follows normal distribution. The result of serial correlation test indicates that the probability Observed *R-squared -statistic (0.1380) is greater than 0.05. This implies that the null hypothesis that there is no serial correlation in the residual of the estimated cannot be rejected. Therefore, there is no serial correlation in the residual of the model. Chi-square probability value of the observed*R-squared test for constant variance (Homoscedasticity) (0.9556) is greater than 0.05. This implies that the null hypothesis is not to be rejected at the chosen level of significance. Therefore, it means that residual of the estimated ARDL model has constant variance.

Test for Model Stability

Stability of the ARDL model was tested using CUSUM test. The idea behind this test is to reject the hypothesis of model stability if the blue line lies outside the dotted red lines otherwise, the model is said to be stable. The result of this test is presented in figure 1.

Figure: 1: Result of CUSUM test of the ARDL model



Source: Eviews 9 Output for Stability test of Estimated Model

The result of the CUSUM test shows that the blue lines lie inside the dotted red line which indicates that the model is dynamically stable at 5 per cent significance level.

Conclusion and Recommendations

Greenhouse gas emissions result from human activity, necessitating action to prevent impending catastrophe. Economic analysis of climate change impacts is intricate due to numerous uncertainties. This study investigates climate change effects on Nigeria's economic growth using precipitation, mean temperature, and carbon emissions. After a thorough literature review, a linear model linking economic growth to capital stock, precipitation, temperature, carbon emissions, and inflation guides data analysis. Autoregressive Distributed Lagged Model (ARDL) techniques reveal that these climate variables have no significant impact on economic growth. Recommendations include efficient water resource management through irrigation projects to mitigate drought and ensure agricultural land availability. As Nigeria's economic growth correlates positively with mean temperature, policymakers should prioritize goods like cereals and tubers suited to warmer climates. Given carbon dioxide's detrimental long-term effect on growth, transitioning to clean, renewable energy sources is essential for production.

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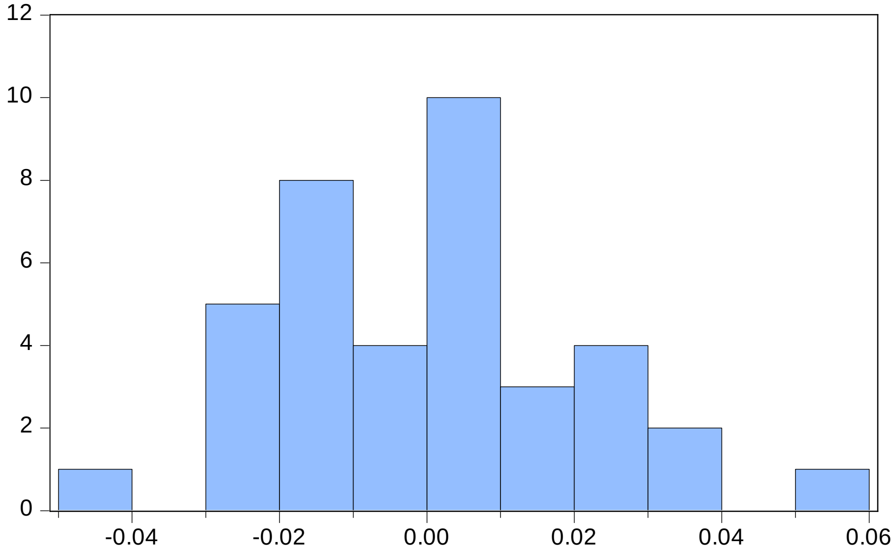
Figure: 4.2: Result of Histogram analysis for normal distribution



Series: Residuals	
Sample 1984 2021	
Observations 38	
Mean	2.27e-15
Median	0.000803
Maximum	0.051583
Minimum	-0.048686
Std. Dev.	0.019747
Skewness	0.175342
Kurtosis	3.263138
Jarque-Bera	0.304349
Probability	0.858838