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FINANCIAL INSTABILITY AND THE STATE OF ENVIRONMENTAL QUALITY IN NIGERIA

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ABSTRACT

The study aims to look at the relationship between environmental quality and financial instability in Nigerian over the period of 1970 to 2019 respectively. The Autoregressive Distributed Lag (ARDL) model is used in estimating the short-run as well as the long-run relationship between financial instability and the quality of the environment. The results of the study reveal that financial instability has a significant and positive impact on CO2 emissions, implying that financial instability is lowering the quality of environment in Nigeria. In addition, consistency and strength are verified by the application of numerous tests of diagnostic. The research introduces new insights that would not only be of benefit in advancing prevailing research but may also be of specific concern to policymakers in the financial sector of the country and its starring role in enhancing the quality of the environment. The results recommend that to prevent financial instability and its effect on environmental degradation in the light of policy consequences, financial sector reforms should be implemented with great caution.

Contribution/Originality: This study contributes to the existing literature as the first research considering Nigeria that establishes the Aggregate Financial Stability Index (AFSI) to investigate the relationship between financial stability and environmental quality. The AFSI is made up of sub-indices that measure the development, vulnerability, and soundness of the financial sector.

1. INTRODUCTION

Development initiatives in the modern age are targeted at achieving environmentally sustainable economic growth rather than accruing and concentrating solely on growth. A clear correlation between economic activities and their adverse effects on environmental standards prevails in the current literature, and there is agreement among scholars that economic activities promote environmental degradation (Ahmad, Khan, Ur Rahman, & Khan, 2018). Many advanced and developing economies are making comprehensive efforts to resolve the issue of high CO2 emissions.

In the past few years, the topic of increasing global warming has emerged as an important aspect of international and domestic strategy debates. Environmental issues are important topics of public interest, as well as economic and political decisions (Ayeche, Barhoumi, & Hammas, 2016). The primary strategic target of the world is to minimize the negative effects of global environmental change through the reduction of global CO_2 emissions (Tamazian & Rao, 2010).

Henceforth, regardless of the fact that global atmospheric warming is dependent on overall global Greenhouse Gas (GHG) emissions, the results differ by country, depending on their natural and social characteristics (Danlami, Applanaidu, & Islam, 2018). Nigeria is one of Africa's most populous countries and has seen rapid economic growth. Despite government efforts to boost the nation's quality of life, the country still suffers from high levels of income inequality, corruption, and environmental degradation. Nigeria also faces depletion of natural resources such as land and water, as well as soil erosion and deforestation among others. More issues have arisen as a result of the continuous flooding, including cyclic as well as dynamic droughts, intensified starvation, scarce resources, and high economic costs (Jakada, Mahmood, Ahmad, & Bambale, 2020).

As a result of the above concerns, climate change is no longer just an environmental problem; it has evolved into an environmental issues while considering its potential impact on economic activities. It is a major threat to the long-term growth of many developing countries, including Nigeria. In Nigeria, for example, climate change is predicted to result in a reduction of 6% to 30% of GDP by 2050, equating to US$ 100 billion to US$ 460 billion if no mitigation and adaptation measures are taken (Cosmas, Chitedze, & Mourad, 2019). As a result, international organizations such as the United Nations Development Program (UNDP) and the Global Environment Facility (GEF) are actively working in Nigeria to promote carbon pollution reduction strategies through their programmes. In Nigeria, for example, UNDP is funding a solar energy master plan, and the World Bank is currently working on a project through its sustainable project fund (Eleri, Onuvae, & Ugwu, 2013). Despite its attempts to reduce carbon emissions, the country was ranked 44th out of 200 countries on a list of the most polluting countries (Sulaiman & Abdul-Rahim, 2018). Similarly, carbon emissions increased from 68.04 million tonnes in 1980 to 107.30 million tonnes in 2017 (Jakada & Mahmood, 2020). Nigeria is likely to formulate a long-term carbon pollution reduction strategy in the future.

Almost all sectors are clearly important for economic growth and environmental quality. Similarly, the financial market contributes greatly to global economic growth and environmental issues. The country's economic growth is aided by a stable and developed financial market. It stimulates the capital market, strengthens risk control, mobilizes capital, supervises company activities, and emphasizes the use of environmentally friendly technologies for companies by offering lower-interest loans (Morris, 2010). The financial-growth nexus was discussed for the first time by Schumpeter (1911). The role of the financial sector in a country's economic growth has received a lot of attention since the endogenous growth hypothesis was introduced. However, King and Levine (1993) have observed a significant development following the seminal work in empirical literature. A well-functioning financial market is critical to a country's economic growth. It improves financial services by making trades easier and lowering the cost of monitoring (Shahbaz, 2013). Furthermore, financial development raises energy consumption and, as a result, CO2 emissions.

Countries with a well-established and sound financial system are more likely to have a clean environment than countries with a less defined financial system. A healthy financial market stimulates economic growth by fascinating foreign investors. In comparison to local plants, foreign plants use renewable energy and are more environment friendly. Similarly, financial stability stimulates investment by making money more affordable, but it also penalizes companies who harm the environment by enforcing fines and restricting their access to cheap credit (Nasreen, Anwar, & Ozturk, 2017). Furthermore, the established financial sector serves as a portal to innovative environmentally sustainable technologies that reduce energy demand and, as a result, CO2 emissions (Dabachi et al., 2020). As such, the financial sector has a critical role to play in cutting carbon emissions by encouraging emerging energy technology (Shahbaz, 2013).

Another school of thought, on the other hand, believes that financial stability is the source of Carbon dioxide emissions. A strong financial sector reduces credit limits and boosts economic activity, resulting in increased energy consumption and, as a result, CO2 emissions. Furthermore, financial development makes it possible for consumers to obtain low-interest loans and buy expensive goods such as air conditioners, automobiles, and home appliances, both of which increase CO2 emissions (Sadorsky, 2010). Furthermore, the expansion of the financial markets allows companies to receive low-cost capital and expand their production, resulting in increased energy use and carbon dioxide emissions (Dasgupta, Laplante, & Mamingi, 2001).

As a consequence of the preceding debate, it is difficult to determine if the financial sector's instability causes environmental destruction. The effect of financial instability on CO2 emissions has been ambiguous. With symmetrical information, the financial sector will be able to fund loans and incentives for environmentally friendly projects. Due to a lack of symmetrical knowledge, the nexus of financial development and the environment during times of financial crisis is weakened. The lack of symmetrical information impedes the company's growth and can put it in jeopardy. Companies would not only find it impossible to repay their bank loans on time, but their benefits would be cut off as well due to low environmental efficiency. Furthermore, when it comes to deciding whether or not to follow environmental laws, corporate executives face moral hazard problems (Richard, 2010). It is fair to assume that since accurate information is difficult to access and the repercussions for fraud are higher, companies do not care about the environment. Companies raise their efficiency and income at the detriment of the environment's long-term sustainability.

Since Nigeria relies heavily on oil revenue, its economy is vulnerable to changes in crude oil prices. The IMF forecast shows that the amount received from natural gas and oil exports in 2015 amounted to $35 billion, less than $52 billion earned in 2014, as a result of a decline in the price of oil on the world market. Nigeria's fiscal buffers are the Sovereign Wealth Fund and the Excess Crude Account, which take savings into account in a time where oil revenues exceed budget revenues. Those coffers, however, declined from $11 billion to $2 billion between 2011 and 2014 (Hassan, Babafemi, & Jakada, 2016). As a result, there is a massive reduction in federal spending and payments to suppliers have also been deferred. In addition, government domestic borrowing has significantly increased, shaking the financial market of Nigeria.

As a result, Nigeria's financial sector instability is impacting not only economic growth, but also energy use and CO2 emissions. In addition, as firms lack the financial capital to maintain their profit margins due to financial uncertainty, they increase production without considering the environmental effects (Ahmad, Abdullah, Abdullahi, & Muhammad, 2015). The scarcity of empirical studies in Nigeria motivates this study. In particular, the effect of financial instability on the quality of environment has not to the best of our knowledge, been empirically investigated in any study so far within the context of Nigeria, as similar works are limited in the prevailing literature. The relationship between CO_2 emissions and financial instability is a contentious issue among Nigerian policymakers. As such this research is relevant because identifying the trend and degree to which the above factor impact environmental quality will offer information regarding the recent as well as forthcoming challenges and knowledge into how these variables can be successfully manipulated to create a healthier environment.

Due to the above mentioned issues, the research was undertaken with the significant role of examining the effect of financial insatiability on the quality of environment in Nigeria over the period of 1970 to 2019. To investigate empirically how to limit CO2 emissions caused primarily by the factor mentioned above. The following sections make up the majority of the paper. The literature review is in section two, and the methodology is in section three. The results and observations are presented in section four. The fifth section discusses the implications of the results. Finally, section six contains a conclusion based on the study's results. It also includes the study's limitations.

2. LITERATURE REVIEW

In recent years, plenty of research have been conducted to look at the relationship between environmental sustainability and a variety of other factors. Long, Oh, and Cheng (2013) for example, discuss the impact of environmental policies as a result of China's deal with the World Trade Organization (WTO) on environmental sustainability. The findings suggest that China's WTO agreement may have understated its effect on improved environmental sustainability. Long, Wu, Zhang, and Zhang (2018) found that innovation has a negative effect on CO_2 emissions rate, while FDI has a positive impact on innovation.

Henceforth, just a few research have empirically investigated the impact of financial instability on CO_2 emissions. Richard (2010) for example, examines the impact of financial instability on national-level CO_2 emissions using panel evidence from 36 countries. The findings suggest that financial instability is associated with CO_2 emissions in a positive way. Be pitted against to this, according to Brussels (2010) financial instability is not detrimental to the environment. According to the report, CO_2 emissions in Estonia, Romania, Italy, Spain, and the United Kingdom decreased by 24 percent, 22 percent, 16 percent, and 13 percent, respectively, following the financial crisis. Furthermore, according to Enkvist, Dinkel, and Lin (2010) the financial crisis has had only a minor impact on CO_2 emissions worldwide. Shahbaz (2013) investigates the connection between financial instability and CO_2 emissions in Pakistan. The results indicate that financial instability degrades the environment by releasing significant quantities of CO_2 emissions. The results of Nasreen et al. (2017) suggest that financial stability reduces CO_2 emissions. Baloch, Meng, Zhang, and Xu (2018) recently discovered that financial market instability raises energy demand and, as a result, CO_2 emissions. Baloch et al. (2018) use a multivariate approach to look at the relationship between financial instability and CO_2 emissions in Saudi Arabia's economy between 1971 and 2016. The findings of the analysis show that financial instability has an insignificant effect on carbon dioxide emissions.

3. METHODS AND DATA

3.1. Construction of Financial Development Index

The findings of the PCA that were used to simplify the five indices of financial development into a single dataset are discussed and analyzed in this section. The study employs PCA to find the factor that provides the most detail on the variables, following Jolliffe (1986) protocol for preserving the sum of components based on their eigenvalues as shown in Table 1 respectively. Certain components with an eigenvalue less than 0.70 are discarded, while those with a value greater than 0.70 are retained (Islam, Khan, Popp, Sroka, & Oláh, 2020).

Table-1. Results of Principal Component Analysis (PCA) Results.

Component	Eigenvalue	Difference	Proportion	Cumulative	
Comp 1	3.19493	2.23602	0.6390	0.6390	
Comp 2	0.958907	0.380905	0.1918	0.8308	
Comp 3	0.578002	0.311104	0.1156	0.9464	
Comp 4	0.266898	0.265635	0.0534	0.9997	
Comp 5	0.00126293	----------	0.0003	1.0000	
Eigenvectors or Factor Loading					
Variable	Comp1	Comp2	Comp3	Comp4	Unexplained
Mc	0.4843	-0.0321	0.3828	-0.7860	0
Db	0.5219	-0.0848	-0.4537	0.1087	0.0006349
Dp	0.5195	-0.1168	-0.4588	0.0968	0.0006273
Bm	0.4516	-0.0368	0.6588	0.6006	0
Lr	0.1387	0.9883	-0.0562	0.0176	0

Notes: Lr = lending rate, Dcb = direct credit to private, Dcb = direct credit by the bank, Bmg = broad money growth, Mc = market capitalization.

Components 1, 2, 3 and 4 both have eigenvalues greater than 0.7, as seen in Table 1, and these four components are held based on their eigenvalues.

3.2. Construction of Financial Instability Index

The author creates a financial instability index based on Loayza and Ranciere (2006). These two methods to calculating financial instability have two advantages: the first is the standard deviation growth rate of the concerned measure. The absolute value of residuals obtained by regressing financial development on its lagged value with time pattern is the second and final strength. To put it another way, let I_{FD} be a measure of financial instability, and let gr^{FD} be the rate of financial development growth (FD).

The standard deviation of financial development is: $I_1^{FD} = \sqrt{\sum_{t=1}^{n} \frac{1}{n-1} (gr^{FD} - fd^{FD})^2}$

The average of absolute value of residuals is: $I_2^{FD} = \frac{1}{n} \sum_{t=1}^{n} |\mu_t|$

μ_t is gain through the following equation estimation:

$$X_t = \sigma + \rho_1 X_{t-1} + \rho_2 t + \varepsilon_t$$

It can be altered in line with the interest of the research as ensuing: $FD_t = \rho_1 + \rho_2 FD_{t-1} + \rho_3 t + \varepsilon_t$. The second method of determining financial instability is preferable to the first. The first approach makes no assumptions about a stochastic or deterministic time pattern, while the second does. As a result, we use the second approach to establish the financial instability index.

3.3. Data and their Measurement

In the case of Nigeria, the analysis uses the annual form of time series data covering the period from 1980 to 2018. The data for carbon dioxide emissions (CO_2 emissions, in metric tons per capita), financial instability (FI, five indicators of financial development that include domestic credit to private sector by banks as a share of GDP, domestic credit to private sector by financial sector as a share of GDP, broad money as a share of GDP, market capitalization percentage of GDP and lending were used as a single index for financial development using principal component analysis (PCA) for policy implications and better understanding of financial development, as well index for financial instability is generated following Loayza and Ranciere (2006). price of oil (OP, the West Texas Intermediate (WTI) price of crude oil), economic growth (GDP, GDP in constant 2005 US$), foreign direct investment (FDI, the total inflow of FDI percentage of gdp), renewable energy output (RE, % of total electricity output) are sourced from the data base of World Development Indicator (WDI) with the exception of crude oil price that were sourced from the OPEC data base.

3.4. Model Specification

The focus of this research is to examine the relationship between financial instability and the Nigeria's state of environmental quality. For estimation of the model, we relied on Jakada, Mahmood, Ahmad, Faruq, and Mustapha (2020) and Baloch et al. (2018). The model specification is as follow:

$$CO_{2t} = f(FI_t, , FDI_t, GDP_t, RE_t) \quad (1)$$

Where CO_2 is representing the quality of environment variable, FI stands as financial instability, FDI signifies the inflow of foreign direct investment, GDP as economic growth and RE as renewable energy. After the transformation of the variables, then Equation 1 is expanded to express the quality of environment as a function of financial instability well as other control variables and the model is specify as Equation 2 below:

$$lnCO_{2t} = \delta_0 + \delta_1 lnFI_t + \delta_2 lnFDI_t + \delta_3 lnGDP_t + \delta_4 lnRE_t + \varepsilon_t \quad (2)$$

Where t symbolizes the time, α_0 is the parameter of drift, μ_t is the residual error term, δ_1 to δ_4 represents the elasticities of financial instability, foreign direct investment, economic growth and renewable energy respectively. It is projected that $\delta_1 > 0$ meaning that financial instability is expected to be positively related with the amount of CO_2 emissions and then $\delta_2 < 0 < \delta_2$ meaning that FDI could be expected to either be positively or negatively related with carbon emissions. The coefficient $\delta_3 > 0$ this indicates that increase in GDP is expected to deteriorate the quality of environment and $\delta_4 < 0$ meaning that RE is expected to be negatively related with carbon emissions.

3.5. Econometrical Methodology

3.5.1. Unit Root Tests

The goal of this study is to examine the relationship between financial instability and Nigeria's state of environmental quality. We use Augmented Dickey-Fuller (ADF), and Phillips Perron (PP) unit root tests simultaneously to determine the order of integration of the variables and assess whether the possibility of using ARDL is viable or not. Furthermore, the unit root test is an important prerequisite for testing the order of integration since it confirms that regression analysis findings are not spurious.

3.5.2. ARDL Cointegration Analysis

Ever since their works were developed by Pesaran, Shin, and Smith (1999) as well as Pesaran, Shin, and Smith (2001), the ARDL bound test approach to cointegration has become one of the most widely used methods of analysis. This is because, compared to other similar co-integration approaches such as Johansen and Juselius (1990) as well as Engle and Granger (1987) the methods have a range of advantages. Under this approach, there is no need to have a number of variables with the same integration order or to have the variables with similar optimal system lags, no need to have a large or non-existence sample of endogeneity among the regressors to obtain an efficient estimator. Similarly, since a reduction-form of an equation that is single will give the same results, the techniques do not require an equation that is multiple (Farouq, Sulong, Ahmad, Jakada, & Sambo, 2020). Essentially, the Bound Test ARDL approach to cointegration involves two long-term relationship estimation steps. The first step is to explore the existence of a long-term relation between variables in the Equation 2. The model of ARDL will, therefore, be given as Equation 3:

$$\Delta lnCO_{2t} = \emptyset_0 + \sum_{i=1}^{n-1} \emptyset_{1i}\, \Delta lnCO_{2t-i} + \sum_{i=1}^{n-1} \emptyset_{2i}\, \Delta lnFI_{t-i} + \sum_{i=1}^{n-1} \emptyset_{3i}\, \Delta lnFDI_{t-i} + \sum_{i=1}^{n-1} \emptyset_{4i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{n-1} \emptyset_{5i}\, \Delta lnRE_{t-i} + \beta_1 lnCO_{2t-1} + \beta_2 lnFI_{t-1} + \beta_3 lnFDI_{t-1} + \beta_4 lnGDP_{t-1} + \beta_5 RE_{t-1} + \mu_t \qquad (3)$$

Where Δ signifies the term regarding the first difference as well μ_t stands as the error term that recognized to have a mean value that is zero as well as variance that stands to be constant. In relation to the test of joint significant that take into account the null hypothesis of the absence of cointegration $H_0: \beta_1 = \beta_2 = \beta_4 = \beta_5 = 0$ contrary to alternative hypothesis $H_1: \beta_1 \neq \beta_2 \neq \beta_4 \neq \beta_5 \neq 0$, it would be perform for Equation 3. Pesaran et al. (2001) provided two sets of important values for the F-statistics: the lower bound corresponds to the case where I(0) is all variables, and the upper bound corresponds to the case where all the variables are I(1). If the F-statistic resides below the lower bound, there can be no co-integration. If the F-statistic is above the upper limit, then a co-integration can take place. Therefore, the test is inconclusive if the F-statistics are between the upper and lower limits. The second stage consists of performing the general error correction representation of the selected ARDL model of Equation 4 Listed below:

$$\Delta lnCO_{2t} = \emptyset_0 + \sum_{i=1}^{n-1} \emptyset_{1i}\, \Delta lnCO_{2t-i} + \sum_{i=1}^{n-1} \emptyset_{2i}\, \Delta lnFI_{t-i} + \sum_{i=1}^{n-1} \emptyset_{3i}\, \Delta lnFDI_{t-i} + \sum_{i=1}^{n-1} \emptyset_{4i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{n-1} \emptyset_{5i}\, \Delta lnRE_{t-i} + \varphi ECT_{t-1} + \mu_t \qquad (4)$$

Where φ is the error correction parameter and ECT_{t-1} stands as the lagged residuals obtained from the estimation of the long-term cointegrating equation, which is Equation 4. There will be isolation of the lagged residual from Equation 4 at that stage and shall be defined in Equation 5 below:

$$ECT_{t-1} = lnCO_{2t-1} + \hat{\alpha}_1 lnFI_{t-1} + \hat{\alpha}_2 lnFDI_{t-1} + \hat{\alpha}_3 lnGDP_{t-1} + \hat{\alpha}_4 RE_{t-1} \quad (5)$$

4. EMPIRICAL RESULTS

The study's empirical findings are summarised and discussed in this section. In Table 2 below, the analysis first presents the descriptive statistics of the variables described. The outcomes of the probability values and the Jarque-Bera demonstrate that the variables are normally distributed. Kurtosis and Skewness do not contain extreme values in the distribution. Similarly, in Table 2, the correlation matrix results reveal the degree of interaction between the variables.

Table-2. Descriptive Statistics.

	$lnCO_2$	$lnFI$	$lnFDI$	$lnGDP$	$lnRE$
Mean	-0.462557	0.251645	20.77150	1.473042	4.457415
Median	-0.363036	0.236829	20.49914	1.677129	4.459868
Maximum	0.009908	1.780287	22.90268	3.219165	4.486745
Minimum	-1.164707	-2.507066	19.05813	-2.797779	4.418311
Std. Dev.	0.320999	1.025923	1.203992	0.989443	0.014141
Skewness	-0.874344	-0.368699	0.337815	-2.043465	-0.492019
Kurtosis	2.616579	2.707667	1.757286	9.042360	3.094019
Jarque-Bera	6.676918	1.310862	4.168366	80.8606	2.035770
Probability	0.035492	0.519218	0.124409	0.170000	0.361358

Table-2. Correlation Matrix (Continue).

	$lnCO_2$	$lnFI$	$lnFDI$	$lnGDP$	$lnRE$
$lnCO_2$	1.000000				

$lnFI$	0.188021	1.000000			
	0.1910	-----			
$lnFDI$	0.020138	0.735762	1.000000		
	0.8896	0.0000	-----		
$lnGDP$	0.138097	-0.130318	0.027403	1.000000	
	0.3389	0.3670	0.8502	-----	
$lnRE$	-0.313427	0.185708	0.144843	-0.332621	1.000000
	0.0267	0.1966	0.3156	0.0183	-----

It is important to remember that the lag-order is reasonably sensitive to the statistical output of the time-series data statistical analysis, and hence it is important to classify the lag-length according to the relevant criteria. According to Farouq, Sulong, Ahmad, Jakada, and Sambo (2020) and Malam, Abba, and Hassan (2018) any other criteria used in limited sample sizes below 60 observations, the "Schwarz Information Criterion" (SIC) is superior to any other criterion used. The outcome of the study's lag selection criterion is shown in Table 3, and it is one if we obey LR, SBC, AIC, FPE and HQ.

Table-3. Lag selection criterion.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	31.88004	NA	2.14e-07	-1.168697	-0.969932	-1.094239
1	97.97073	114.9403*	3.61e-08*	-2.955249*	-1.762657*	-2.508497*
2	105.2986	11.15115	8.10e-08	-2.186897	-0.000478	-1.367851
3	123.3584	23.55625	1.22e-07	-1.885148	1.295097	-0.693809
4	150.0064	28.96519	1.40e-07	-1.956799	2.217273	-0.393167

Note: LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan–Quinn information criterion. * denotes Lag order selected by the criterion.

Furthermore, in order to ensure that the variables are stationary, discussions of the results will begin with the test of the order of integration of the series. To achieve this, the research first applied the unit root test methods of Dickey and Fuller (1981) and Phillips and Perron (1988). The results from these two techniques are consistent as shown in Table 4. With $lnCO_2$,$lnFI$, $lnFDI$ and $lnRE$ being stationary at first difference meaning that integrated of order one while $lnGDP$ is stationary at level meaning integrated of order zero. The result from

Table 4 reveals that none of the above mentioned variables reach the second difference, meaning that none of them that is integrated of order two I(2), in this condition therefore an ARDL Bound testing approach is considered the most suitable and correct model to estimate these variables.

Table-4. Unit Root Test.

Variables	ADF Test		PP Test		Decision
	Level	Δ	Level	Δ	
	P.value	P.value	P .Value	P.Value	
$lnCO_2$	0.1360	0.0000*	0.2391	0.0□00*	I(1)
$lnFI$	0.0000*	------	0.0000	-------	I(1)
$lnFDI$	0.0080*	------	0.0105**	-------	I(1)
$lnGDP$	0.0001	------	0.0002	-------	I(0)
$lnRE$	0.1062	0.0000*	0.1202	0.0000*	I(1)

Note: *, **, *** indicate Significance levels at 1, 5, and 10%, respectively.

The outcomes of the ARDL bounds F-test co-integration method are presented in Table 5. The result shows that the F-statistics are greater than the upper and lower bound critical value relevant at 1 percent, 5 percent, and 10 percent significance level. The null hypothesis of no co-integration among the variables of concern is therefore rejected. Specifically, from these outcomes, it is evidently shown that long run relationship among the $lnCO_2$, $lnFI$, $lnFDI$, $lnGDP$, and $lnRE$ exists in Nigeria.

Table-5. The Results of ARDL Cointegration Test.

Level of Sig.	1% sig. level		5% sig. level		10% sig. level	
Critical Bound	Lower (0)	Upper (1)	Lower (0)	Upper (1)	Lower (0)	Upper (1)
Critical Value	3.41	4.68	2.62	3.79	2.26	3.35
F-Statistics = 6.495452	K= 5					

Note: K is a number of variables.

Turning to the long-term relationships, as shown in Table 6 respectively. Some interesting details concerning the nexus of financial instability and CO2 emissions in Nigeria are provided in the empirical findings. The long run relationship between financial instability and CO2 emissions is positive and significant and the coefficient of financial instability is 0.740, meaning that a 1% increase in the financial instability will leads to a 0.74% increase in the amount of CO2 emissions respectively. This means that financial instability is a major contributor to CO2 emissions, thus worsening the quality of Nigeria's environment.

The result is justifiable because the financial institutions and government are more worried with steps during the time of the crisis that will place the financial sector in a stable state as a proper credit evaluation by the financial institution to ensure that companies comply with mitigation policies will be ignored because financial institutions are not in a stable state. Similarly, government would ignore clean energy programmes and initiatives because their goal would be to save financial institutions from failing rather than making a green environment, as such emissions would continue to increase and environmental quality would deteriorate. The study's findings are in line with Shahbaz (2013) who states that the environment in Pakistan is degraded by financial instability.

With regard to the nexus of FDI inflow and CO2 emissions, the result provides clear evidence that, in the long run, FDI has substantial negative relations with CO2 emissions. The coefficient of the FDI inflow in the long run is -0.154 respectively. This finding indicates that a 1% increase in $lnFDI$ in Nigeria will lead to a 0.15% decrease in

CO_2 emissions. This result confirm with a priori expectation and support the pollution halo hypothesis and confirm with the findings of Jakada, Mahmood, Ahmad, Farouq, and Mustapha (2020).

Similarly, the long-term relationship between economic growth and CO_2 emissions is insignificant. This ensures that economic growth does not lead to the emission of CO_2 and is not detrimental to Nigeria's environment and the result outcome contradicts with the findings of Jakada et al. (2020) for 10 leading African economies that reveals that economic growth deteriorate the quality of environment.

In addition, $lnRE$ is having a negative coefficient and is statistically significant even at 1% level of significant, this indicates that a 1% increase in renewable energy would result into a 5.65% decrease in the amount of carbon emissions in Nigeria, this result is in line with the finding of Jakada et al. (2020) who state that increases in renewable energy reduces the amount of CO_2 emissions and enhances the quality of the environment.

Table-6. Estimated Long run Coefficients for ARDL Model.

Regressors	Coefficient	Std. Error	t-Statistics	Prob.
$lnFI$	0.740879	0.079067	9.370296	0.0000
$lnFDI$	-0.154839	0.071526	-2.164784	0.0360
$lnGDP$	0.056358	0.044834	1.257057	0.2155
$lnRE$	-5.654565	1.725199	-3.277632	0.0021
C	25.14799	7.710003	3.261736	0.0022

Note: *, **, *** indicate Significance levels at 1, 5, and 10%, respectively.

Table 7 shows the outcome of the short-run form of the dynamic model in a similar vein. The F-statistic value specifies that the variables are jointly and highly significance. The R^2 value of 0.76 indicates that the independent variables account for an average 76 per cent shift in the dependent variable, which further demonstrates the existence of a close association between the dependent variable that is environmental quality (CO_2 emissions) and the various explanatory variables.

Further, $lnCO_2$ is negatively and insignificantly related $lnFI$, this justifies the fact that in the short run increase in financial instability has no effect on the quality of the environment. This justifies the fact that the rise in financial instability in the short term does not have any effect on the quality of the environment. Contrarily, $lnFDI$ is having negative association with $lnCO_2$ in the short run and the relationship is statistically significant, this entails that in the short run increase in the inflow of FDI would improve the quality of environment in Nigeria. On the other hand, $lnGDP$ is having a positive coefficient and is insignificant relationship with the amount of CO_2 emissions, meaning that increase in economic growth has no effect on the quality of the environment even in the short run in Nigeria. Likewise the coefficient of $lnRE$ is having negative sign and is statistically significant, meaning that increase in the amount of renewable energy enhance the quality of environment even in the short run.

In addition, both the sign and the ECT(-1) coefficient value as shown in Table 7 are negative and statistically significant at the level of 1 percent. This means that because of the inclusion of self-adjustment devices in the model, the model will respond to the dynamics of the short-run variables with their long-run values. In addition, this shows the existence of a long-term relationship between the explanatory variables and environmental quality (CO_2 emissions). The ECT(-1) coefficient value of -0.68 indicates the speed of transition to the state of equilibrium. The relatively high pace indicates that next year the variance in the growth of CO_2 emissions from the state of equilibrium will be changed by around 68%.

However, the study conducted various diagnostic tests, including the autocorrelation Lagrange multiplier, the heteroscedasticity ARCH (Auto Regressive Conditional Heteroskedasticity) test as well as the residual normality test following the work of Ahmad, Loganathan, Streimikiene, and Hassan (2018) which are presented in Table 7, indicating that all these diagnostic tests are passed by the ARDL mode. This is because we find no proof of serial correlation and heteroscedasticity. The residual terms are distributed normally and the functional term of the model tends to be well defined.

Table-7. Error Correction Representation for ARDL model.

Regressors	Coefficient	Std. Error	t-Statistics	Prob.
LFI	-0.013134	0.040387	-0.325213	0.7466
LFDI	-0.154839	0.071526	-2.164784	0.0360
LGDP	0.056358	0.044834	1.257057	0.2155
LRE	-5.654565	1.725199	-3.277632	0.0021
ECT(-1)	-0.259121	0.079067	-3.277251	0.0021
Statistical Tests		Diagnostic Test		Prob.
R^2	0.766720	Autocorrelation Test	F-statistic	0.3100
Adj R^2	0.739595	Hetroskedasticity Test	1.246374	0.5095
AIC	-0.695654	Normality Test	0.972287	0.366401
SC	-0.464002			
F-Statistic	28.26562			

Note: *, **, *** indicate Significance levels at 1, 5, and 10%, respectively.

However, CUSUM (Cumulative Sum of Recursive Residuals) and CUSUMQ (Cumulative Sum of Square of Recursive Residuals) (Cumulative Sum of Square of Recursive Residuals) have been used for stability testing in order to ensure the robustness and stability of the model parameters. In the two test graphs shown in Figures 1a and 1b below, with regard to the stability of the parameters, the decision rule was based on the position of the CUSUM and CUSUMQ graphs. As provided, the stability tests of both CUSUM and CUSUMQ are considered stable and consistent since the models fall within the critical limits at the significance level of 5 percent.

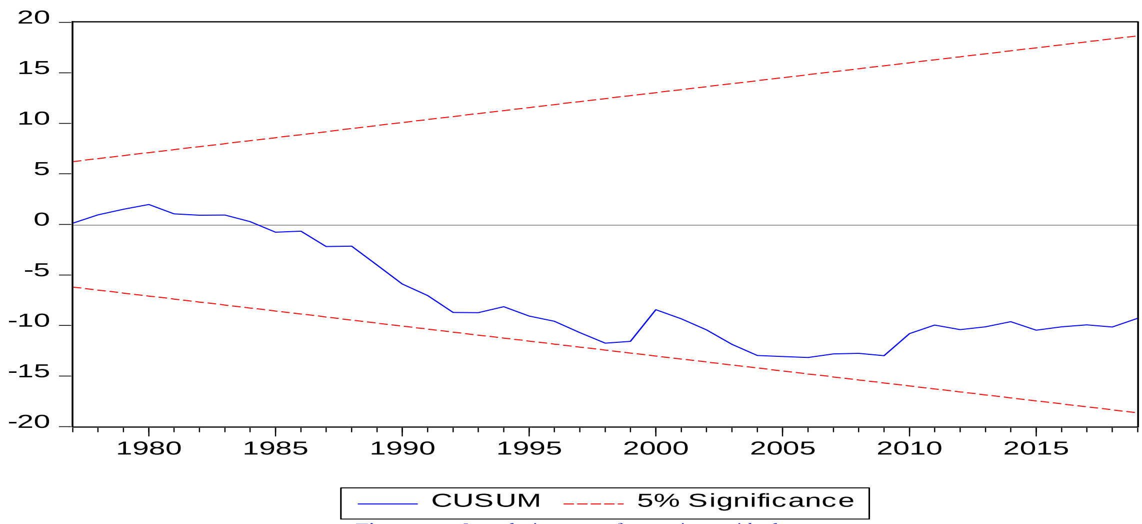

Figure-1a. Cumulative sum of recursive residuals.

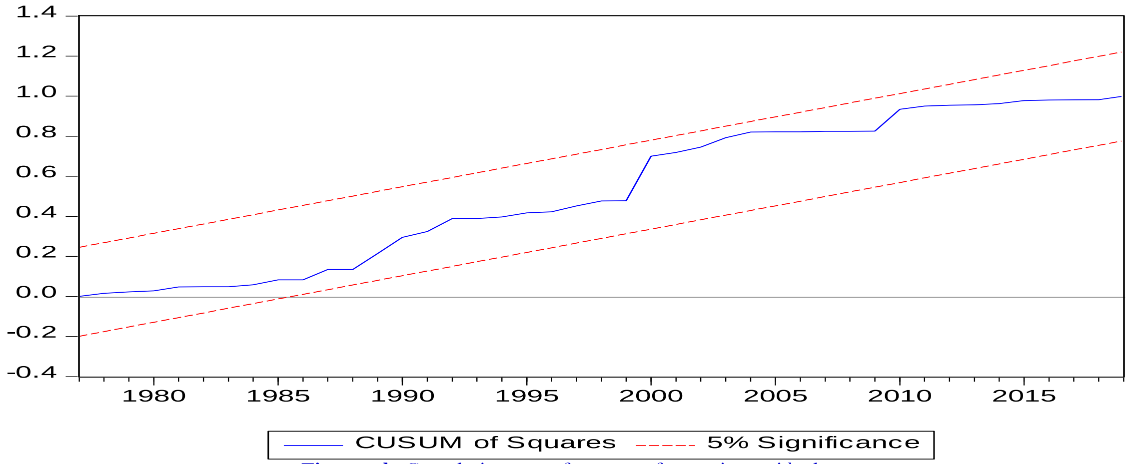

Figure-1b. Cumulative sum of squares of recursive residuals.

5. CONCLUSION AND POLICY RECOMMENDATION

This study examines the nexus between Nigeria's financial instability and CO2 emissions by integrating economic growth, FDI inflows and renewable energy for the period from 1970 to 2019. Nevertheless, only a few studies to examine the relationship between financial instability and CO2 emissions have been performed. We have used the ARDL cointegration technique to estimate the long-run relationships for empirical study. By applying the unit root test, the stationary nature of the series is evaluated. Finally, (CUSUM) and (CUSUMQ) checks are used in order to assess the model's stability. Among the variables of interest, the results of the analysis indicate some interesting facts. The findings of the empirical study indicate that, by increasing CO2 emissions, financial uncertainty deteriorates the efficiency of the environment.

The findings obtained from empirical research put fascinating facts to the fore. Firstly, in order to prevent financial instability and its effect on environmental degradation in the light of policy consequences, financial sector reforms should be implemented with great caution. Without any political interference, financial institutions should be allowed to operate. It is important to avoid waiving and issuing loans on political grounds. This is not only a waste of national resources, but because of the negative externality of financial instability in the environment, more resources are needed to save the environment. If any firm is financially defaulting, then for the sake of the environment, the financial sector should take care of that firm by giving it relief in paying back the loan. Second, policymakers should upgrade or implement financial sector reforms, particularly in the area of releasing funds for productive purposes, to reinforce the connection between financial stability and environmental quality. It would encourage the finance sector to penalize companies that produce more pollution into the air and water by reducing their access to capital. Finally, a variety of legislative proposals that will boost support for improved environmental protection and its long-term viability should be explored.

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