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FISCAL AND MONETARY MEASURES IN ACHIEVING GREEN ECOLOGY: EVIDENCE FROM NIGERIA

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Abstract

Research background: In light of the apparent density of the carbon output in the ecosystems of emerging regions, the United Nations has established a manual that puts an emphasis on carbon taxes as one of the quick fixes to environmental uncleanness in evolving states.
Purpose: The purpose of this research is to look into the impact of monetary and fiscal policy measures on reducing carbon emissions in the ecosystems of Nigeria.
Research methodology: The study employs the Autoregressive Distributed Lag (ARDL) co-integration technique or the bound co-integration technique to confirm the existence of long and short term nexus and the influence of selected financial instruments on pollutant reduction. The study spans 1991 to 2021 and relies on World Bank Development Indicators data on inflation and CO_2 discharges in millions of metric tons. The statistics on tax earnings is derived from the Central Tax Authority in billions of national currency, but the figures on the state's outlay and broad money supply are generated from the database of the Apex Bank in the country.
Result: According to the analysis, financial instruments are not yet being directed toward reducing air pollution and environmental devastation in the country. Further investigation reveals that tax revenue gathering is positively irrelevant, but CO_2 has a strong positive effect on its reduction at lag 1, implying that a more eco-friendly financial strategy is required to combat environmental hazards in Nigeria.
Novelty: A Green financial system is a big issue of contention in the global public discussion about rising temperatures. Presently, there are few studies on the management of pollution using financial instruments in emerging regions. This study will serve as one of the leading investigations to align with the United Nations goal to restore our biodiversity through green fiscal and monetary policies. The study strongly suggests that the Nigerian government should pursue green fiscal and monetary mechanisms that include: issuance of green bonds; potential and cost-effective green payment plans, carbon taxation, and ecologically responsible national budgets and investment opportunities.

Keywords: Green-financing, eco-friendly budget, CO_2; carbon taxation, inflation

JEL classification: O23, Q55, Q57

Introduction

The monetary arrangement and anthropogenic inclusive climate change connect to influence output growth, with policies and outcomes in one sphere influencing the symbolic importance in the other (McKibbin *et al*., 2020). Despite this, researchers and lawmakers are striving to come up with a long-term remedy. One strategic approach for addressing the present predicament is to examine the effectiveness of financial and budgetary strategy tools in lowering emissions of greenhouse gases at the present time. A financial programme, through public disbursements, taxation, and income, is a critical component of the global utilization aspect of the economy (Halkos, Paizanos, 2013). Environmental integrity, collaborative energy requirements, industrial production, food production, configurability levels, and social economic resilience are all directly and indirectly associated with fiscal policy instruments such as taxation and public spending (Mughal *et al*., 2020). As a result, the fiscal policy tool of taxation can increase dynamism productivity, and tax credits have a constructive and significant impact on ecological protection (Dongyan, 2009).

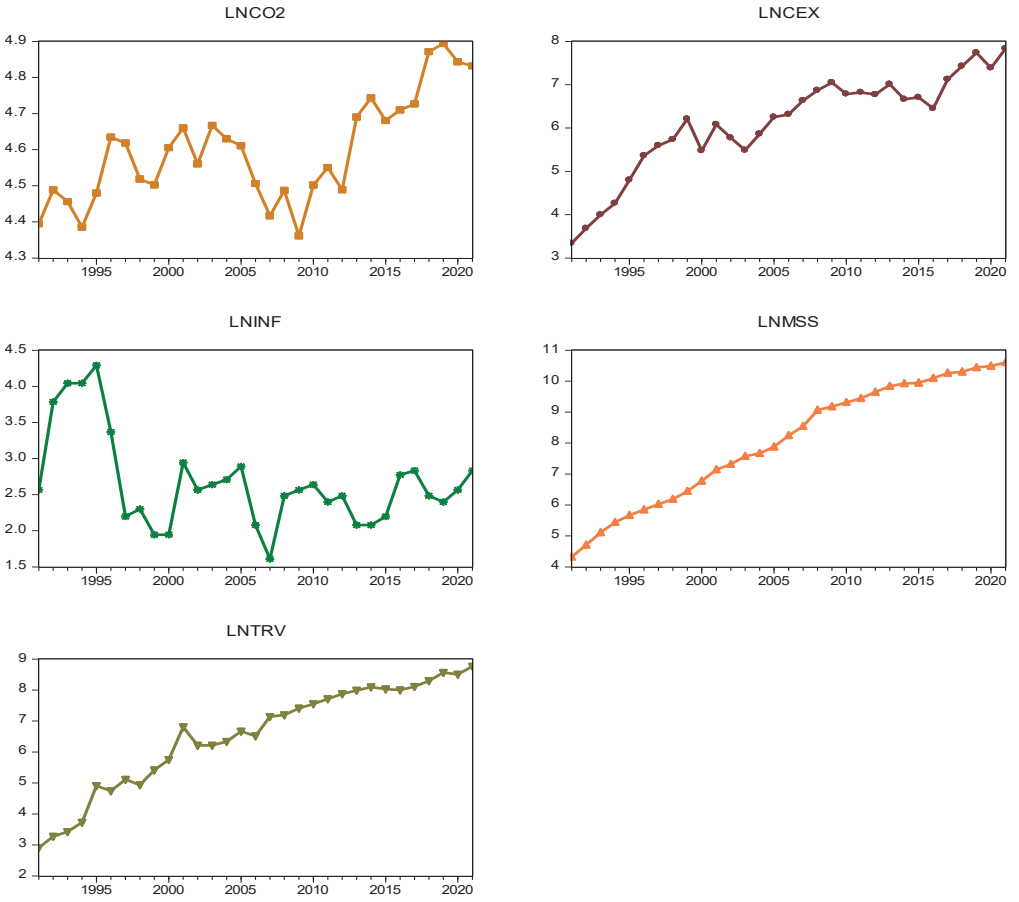
On the other hand, green monetary measures have been advocated for by central banks around the world, as well as international green associates, to significantly strengthen weather patterns and speed up nations' capital formation (Battiston *et al*., 2017; Campiglio *et al*., 2018; Lui *et al*., 2017; Reinders *et al*., 2020; TCFD, 2017; Wiethe, 2022). Given the shortage of financial resources, the efficient allocation of subsidized financing is advised to achieve maximum Atmospheric carbon reductions per unit of currency expended (Wiethe, 2022). The Network for Greening the Financial System (NGFS, 2019) emphasizes the importance of assessing the monetary and economic dimensions that are going to be utilized to give an explanation for shifts in the environment on economic factors such as production, increased costs, and underemployment. Besides that, NGS (2019) advises interested parties to examine the level of both direct and indirect perceived weakness of budgetary gadgets to atmospheric dangers. As the component of a financial plan, fiscal distribution to all control divisions must be aimed to give support to air quality refinement (Li *et al*., 2021; Omodero, 2021). In line with NGS (2019), the budgetary framework increases government income by instituting ecological taxation on electricity, transportation, and industrial sectors. The current financial regulation is an essential law-making tool for governing and guiding business growth, as well as instituting the finest and yet most imaginative moving low-carbon upfront investment (Kamal *et al*., 2021). According to Ajanovic and Haas (2014), the Greenhouse gas hazard can also be addressed monetarily by enforcing a tax on fuel in relation to a vehicle identification

service charge and a VAT. This fiscal strategy will notify motorists about the kind of car or truck to buy as well as how regularly a vehicle should be replaced.

Financial plans include state spending, taxation, broad money supply, price level volatility and external and domestic borrowing. Adequate money supply is key to ensure the viability of economic activities but must be controlled to prevent inflation. Taxation is a crucial revenue source for broader economic managing; even budgetary strategies are built on anticipated tax receipts, and tax plans are an essential component of every state's investment plan (Maneerat, Fazal, 2020). To maintain its international competitiveness in the global market, every country must generate tax revenue to fund major government investments (Maneerat, Fazal, 2020). In a nutshell, tax policy is critical in the context of structural reforms because it provides economic support (Jahanger *et al*., 2021). Fiscal and monetary policy is crucial in lowering carbon output, as most major air pollution carcinogens are caused by budget constraints and industrial growth (Abbass *et al*., 2021). Furthermore, financial techniques play a critical role in the worldwide effort to protect the atmosphere.

Money or capital is critical for enabling the transition to a low-carbon and endurable climate variability societal structure (Bhandary *et al*., 2021). Severe weather can also have an influence on the passive diffusion of the financial process to the wider economy, according to (Breitnenfellner, Pointner, 2021), because when central bankers change their purely monetary programme frame of reference, they rely on the banking system to convey their instinctive strategic plan to industry players. Monetary policy has traditionally been regarded as insignificant in long-term climate action plans and the monetary authorities' money supply obligation has recently been thrown into the mix.

Nigeria has put in place a number of schemes, frameworks, and innovative activities aimed at addressing the national adaptation threat posed by climate change, as well as embracing climate mitigation control into sound financial capacity building (Lopez *et al*., 2011). Levels of carbon dioxide in Nigeria accelerated from 111.07 mt to 133.46 mt in metric tons between 2016 and 2019 (see Figure 1). Because of increased global sensitivity and public outrage from many environmental safety agencies, such as the United Nations Environmental Programme, more precautions and notifications were noticed in 2020, and as a result the pollution rate dropped to 126.92. Figure 1 depicts a pictorial depiction of Nigeria's CO_2 levels from 1991 to 2021 and the financial tools employed for this research.



$LNCO_2$ = Greenhouse gas emissions; LNCEX = Government capital outlays; LNINF = Price level changes or inflation; LNMSS = Money in Circulation; LNTRV = Total tax earnings of the government.

Figure 1. Trend of CO_2 data and other study statistics

Sources: World Bank Development Indicators, Federal Inland Revenue Service and Central Bank of Nigeria Statistical Bulletin.

Previous studies have shown that a country's monetary easing is essential for lowering greenhouse gases as an environmental risk (Abbass *et al*., 2021; Kamal *et al*., 2021; Lopez *et al*., 2011; Muhafidin, 2020). In this study, these financial instruments were used to confirm the viability of the finance instruments mechanism for ecological tidying. There are still pending issues why Nigeria's fiscal and monetary measures have not yet addressed climate issues in the country. Although, in an effort to achieve a more environmentally friendly Nigeria, the 2023 Fiscal Policy Measures (FPM) includes two additional Environmental taxations: Excise Duty on Single Use Plastics (SUPs) and an Import Adjustment Tax (IAT) charge on automobiles

with engines of 2000cc and upwards. The FPM's ecological taxes are clouded in uncertainty, both in terms of execution and the use of monies collected. Furthermore, the legal foundation is debatable. To begin with, after establishing the fee structure and ambit of the proposed sustainable taxes, the FPM created a void in terms of their implementation. As a result, when to pay the appropriate tax base and the penalties for infringement remain unanswered. Also, there is not a clause describing how the cash earned would be applied or channelled into the country's environmental obligations. The four primary fiscal and monetary mechanisms used by the government to regulate the nation's economic system which are capital expenditure, taxation, broad money supply, and inflation have been applied in this study to confirm their efficacy in checking the country's environmental state with regard to climate change.

Thus, the particular goal of this research is to determine the impact of capital spending, taxation, broad money supply, and inflation on climate change in Nigeria. The introduction, literature review, methodology, findings, and closing remarks are the five components of this study. The introduction portion provides an overview of the study, whilst the literature review section provides details on the theoretical foundations of the work, including previous investigations. The nature of the datasets and the analytical tool used for the study are explained in the methodology section. The result section contains detailed information on the outcomes of the data analysis, and the closing remarks highlight the policy implications of the study's findings.

1. Literature review

Green financial policies are efficient and environmentally monetary and social structures that take priority are the safeness, protection, and equanimity of the environment and its dwellers. Scholars such as (Abbass *et al*., 2021; Kamal *et al*., 2021; Lopez *et al*., 2011; Muhafidin, 2020) have recently initiated and actively promoted the concept of green government financial mechanisms. Green economic ideas must consider cost-effectiveness, environmental goals, appropriateness and compliance motivating factors, the capacity to cope with uncertainty and provide venture capitalists with a reliable and transparent pricing system, equity implications, and structural and legal capability (OECD, 2022). According to Cox *et al*. (2022), the integration of an eco-friendly financial strategic approach will result in products such as hydrocarbons being taxed at more than 150 percent of their current overall price due to high greenhouse gas output, thus accelerating the transition to renewable sources of power. According to the United Nations Environment Programme (UNEP, 2019), reducing toxic gases, raw sewage in the

environment, and their health implications will result in the attainment of many SDGs and their related goals. This is supported by a decision made in 2017 by the United Nations Environment Assembly (UNEA-3) to request that the UNEP and WHO (World Health Organization) take action on integrating health and environmental issues associated with various SDGs.

Wiethe (2022) discovered that focusing on earlier changes reduced the likelihood of achieving reduction in emissions while limiting the cumulative carbon foot print. When compared to fixed subsidy programmes, total carbon emissions per financial instrument spent varied by up to 675 percent. Mahmood *et al*. (2022) revealed that, in the long run, money velocity had a negative impact on border region toxins and consumption-related smog, but had a positive impact in the short term.

A comprehensive set of initiatives and policies will be required to tackle and remove pollutants. Various stimuli, such as taxation and subsidies, can aid in lowering harmful greenhouse gas emissions and accelerate efforts toward a pollution-free world (UNEP, 2018). Taxes and levies on polluters and chemicals, as well as targeted subsidies, can provide incentives to discourage dangerous operations or the use of hazardous goods while stimulating the cost-effective deployment of less noxious replacements (UNEP, 2019; World Bank, 2019). Many governments have instituted fiscal plans to combat specific pollutants. Financial policies provide an industrial incentive for lowering harmful emissions by enforcing a clear and specific state charge on pollution that is visible to participants in the market, particularly polluters, making them one of the most effective and luxury metrics for mitigating and reducing toxins (UNEP, 2019).

During the 2015 Paris Climate Summit, green-finance concepts for financing low-carbon infrastructure and other weather patterns remedial measures were proposed (De Haas, Popov, 2019). Recently, a group of economists, including former Federal Reserve Board and Council of Economic Advisers Chairs, issued a statement calling for immediate better governance to confront the planet's rising temperatures calamity via carbon taxes (De Haas, Popov, 2019). Carbon taxes impose a surcharge on greenhouse gas emissions, encouraging companies to adopt low-carbon innovations or change to more environmentally friendly approaches (United Nations, 2021). Other scholars believe that, in addition to carbon pricing, green bond capital should be put in place as a fiscal strategic plan to create a low-carbon economy (Semmler *et al*., 2021).

Halkos and Paizanos (2016) examined the effects of economic programmes on harmful gases from 1973 to 2013. According to the findings, embracing inspiring state spending reduced harmful emissions from both sources of the toxic substances, but austerity tax cuts

increased the Ecological footprint. Maneerat and Fazal's (2020) findings revealed that all metrics, which include tax receipts, federal spending, liberalization, carbon pollution, and exporting, had a positive relationship with fast growing business flourishing.

Ike *et al*. (2020 discovered that fiscal policy efforts had a long-term relationship with environmental quality. The work of (Syaifudin *et al*., 2015) attempted to create a fiscal tool to aid in the commercial viability of hybrid vehicles in Indonesia. The test results suggested that providing a variety of financial metrics on gasoline engines to both the automobile industry and commerce was commercially feasible. Khan's *et al.* (2020) results of a diverse array designed to simulate ARDL demonstrated that stock market growth, FDI, industrial progress, and oil demand all had a positive impact on Air quality in Pakistan, but household debt had a negative effect on air quality both in the near and far term. Between 1973 and 2018, Muhafidin (2020) studied the effects of monetary and fiscal policy on ecological issues. The results of the ARDL bound estimation in Indonesia revealed a significant relationship between revenue trigger, banking regulation, wealth accumulation, and global warming potential.

Ullah *et al.* (2020) determined the impact of monetary procedure contrivances on air conservation in the ten largest Asian polluting industries between 1981 and 2018. According to the analysis, a genuine increase in public spending would harm atmospheric performance in Malaysia, the United Arab Emirates, Thailand, Indonesia, Turkey, Iran, India, and China while improving it in Japan. On the other hand, the research found that a low-spending culture would restore environmental quality in some countries while worsening it in others, but only in Japan.

Pradeep (2022) studied the impact of monetary policy on greenhouse gas emissions while controlling for income, commerce, overseas investment, and systemic discontinuities using annual data from 1971 to 2014. Financing costs, based on the data, have a good association with harmful gases in both the short and long haul. Bhowmik *et al*. (2022) investigated the impact of money supply uncertainty on fossil fuel emissions, as well as other factors such as fiscal and trade openness policies. The interactive ARDL was used in the study, which found that monetary policy fluctuation expanded greenhouse gas emissions, among so many other factors. Yilanci and Pata (2021) aimed to assess the validity of the green Kuznets curvature hypothesis and whether economic rule had an impact on the environment by analyzing long-term data sets for the G7 countries from 1875 to 2016. The findings suggested that environmental issues were not instantaneously resolved and that monetary dogma could aid in preventing weather modification at various times.

From 2000 to 2018, Akbar *et al*. (2021) discovered a significant relationship between fiscal policy instruments, per capita GDP, FDI, and global warming potential in industrial

production, power generation, and transportation industries. From 1976 to 2018, Abbass *et al*. (2021) looked into the impact of fiscal guidelines on biodiversity damage in Pakistan. The findings revealed that capital investment in government entities such as healthcare and education had a declining stimulus on noxious waste discharges, whereas public wealth gained through taxes encouraged economic output growth at the cost of ecological damage.

Mughal *et al*. (2020) showed that appropriate fiscal and monetary policy had a significant benefit on noxious pollutants, but in the short run, sharp slowdown in fiscal and monetary policies had little influence on the environment. In the age of globalization, Kamal *et al*. (2021) assessed the relationship between fiscal policy, foreign direct investment, financial widening, trade openness, urban population, gross capital formation, labour force, and greenhouse gases. The results that were reported showed that financial policies and globalization significantly exacerbated air pollution. Mahmood's *et al*. (2022) statistics showed that government spending had long-term positive effects on both jurisdictional and usage greenhouse gases in the location, in addition to comparatively short term positive effects on chemical pollutants. From 1990 to 2014, Qingquan's *et al*. (2020) study findings revealed a long-term powerful connection between monetary policy looseness and CO_2 emissions while improvements in intellectual resources had a positive impact on CO_2 emission decrement.

2. Methodology

The goal of this research is to look into the efficacy of fiscal and monetary policies in addressing climate change in Nigeria. As a result, the study hypothesized that fiscal and monetary instruments (capital spending, money in circulation, tax earnings, and inflation) have little impact on greenhouse gas emissions. The study used the Autoregressive Distributed Lag (ARDL) co-integration technique or bound co-integration technique. The ARDL technique is used in econometrics to determine the either short- or long-term connection between multiple variables in accordance with stationarity requirements. The ARDL bound-testing technique, as advocated by Peseran *et al*. (2001), was utilised to determine the long and short-term dynamics between financial policy instruments and the variable employed as a substitute for the country's climatic state. According to the classic cointegration approach, ARDL allows parameters to be stable at order [I(0) and I(1)] and regression factors to have varied optimum lag dimensions (Pesaran *et al*., 2001). If there is long run co-integration, the Error Correction Model (ECM) is used to estimate the speed of error compensation in the long run. The ECM determines the extent to which any imbalance in the near run may be addressed.

The unit root test of the Augmented Dickey-Fuller Test and Phillips Perron test were used to investigate the degree of integration in this research. This check was a guide to determine the best estimation methods for the evaluation. The data for this study were collected from the World Development Indicator, Federal Inland Revenue Service Nigeria and the Central Bank of Nigeria databases. The study spanned the years 1991 to 2021.

The model provided for this investigation is the highlighted Equation 1:

$$Y = \beta_0 + \beta X_1 + \beta X_2 + ... + \mu_{it} \tag{1}$$

where:

Y – greenhouse gas (CO_2) decrease,

X – green finance instruments,

β – coefficient,

μ_{it} – error term.

The above model can be unequivocally functional in this study as shown in Equation 2:

$$LNCO_2 = \beta_0 + \beta_1 LNCEX + \beta_2 LNINF + \beta_3 LNMSS + \beta_4 LNTRV + \mu_{it} \tag{2}$$

where:

LN – natural logarithm form of variables,

$LNCO_2$ – greenhouse gas emissions,

$LNCEX$ – government capital outlays,

$LNINF$ – price level changes or inflation,

$LNMSS$ – money in circulation,

$LNTRV$ – total tax earnings of the government,

β_0 – coefficient of the parameter estimate,

$\beta_{1–4}$ – intercept,

μ_{it} – error term.

The study used a bounds testing technique to co-integration advanced by (Pesaran *et al*., 2001) to evaluate the variables' short and long-term relationships. This approach can deliver better outcomes because it avoids the challenges associated with the sequence of integration that were discovered in the Johansen co-integration experiment. It is appropriate for use with small sample sizes and can estimate both short and long-run outcomes at the same time. There are two essential camera range characteristics that rationalize the existence of co-integration. They are I(0) and I, respectively (1). The former is the lower limit, and the latter is the upper

bound. If the F-statistics surpasses the topmost threshold level, the null hypothesis of a no long-run relationship is repudiated, regardless of the integration order of the series. Nevertheless, when the test statistic falls below the lower critical value, the study is unable to reject the null assumption, whereas when it is between the lower and upper critical bounds, the outcome is said to be uncertain (Pesaran *et al*., 2001).

To test the existence of a long-run relationship among the variables or otherwise, the bound test assumptions are depicted in Equation 3 and 4:

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0 \quad \text{(There is a long-run relationship in the series)} \tag{3}$$

$$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0 \quad \text{(No long-run relationship exists in the series)} \tag{4}$$

The ARDL model measurement is presented in Equation 5:

$$\Delta LNCO_{2t} = \beta_0 + \beta_1 LNCO_{2t-1} + \beta_2 LNCEX_{t-2} + \beta_3 LNINF_{t-3} + \beta_4 LNMSS_{t-4} + \beta_5 LNTRV_{t-5} +$$
$$+ \Sigma^{q}_{(t=1)} \emptyset_1 \Delta LNCO_{2t-1} + \Sigma^{q}_{(t=1)} \emptyset_2 \Delta LNCEX_{t-1} + \Sigma^{q}_{(t=1)} \emptyset_3 \Delta LNINF_{t-1} + \Sigma^{q}_{(t=1)} \emptyset_4 \Delta LNMSS_{t-1} +$$
$$+ \Sigma^{q}_{(t=1)} \emptyset_5 \Delta LNTRV_{t-1} + \mu t \tag{3}$$

where: Ø indicates the short run coefficents, Δ denotes the first differenced operator, *t* represents time, and μt implies the white-noise error term. Previous studies have validated the use of greenhouse gas emissions ($LNCO_2$) as a proxy for climate change (Abbass *et al*., 2021; Qingquan *et al*., 2020). Several studies, including (Abbass *et al*., 2021; Mahmood *et al*., 2022), support the use of government capital expenditure (LNCEX) as a component of government fiscal instruments in environmental pollution control. Mughal *et al*. (2020) utilized a money supply instrument (LNMSS) to symbolise a monetary policy tool that supports environmental sustainability, whereas Maneerat and Fazal (2020) used a tax revenue instrument (LNTRV) as a fiscal tool to help manage climate change. A prior economic expectation in this study is that all the predictor variables should be greater than 0 ($\beta_1, \beta_2, \beta_3, \beta_4 > 0$) indicating a positive influence on climate change (CO_2) control.

3. Results and discussion

This subsection provides descriptive statistics in Table 1 for the variables examined in this research. The mean, median, mode, standard deviation, variance, and minimum and maximum values are among the characteristics observed. Greenhouse gas (CO_2) emissions, government capital expenditure (CEX), inflation (INF), money supply (MSS), and tax revenue

(TRV) average are: 4.597; 6.113; 2.669; 8.046 and 6.523, respectively. The maximum values in Table 1 are 4.894, 7.833, 4.290, 10.60, and 8.764, while the minimum values are 4.361, 3.343, 1.609, 4.323, and 2.907. The kurtosis and Jarque-bera results provide evidence of the normal distribution of all datasets.

Table 1. Descriptive statistics

Variables	Mean	Median	Max.	Min.	Std. dev.	Skewness	Kurtosis	Jarque-Bera	No. of observation
CO_2	4.59	4.61	4.89	4.36	0.15	0.38	2.31	1.36 (0.51)	31
CEX	6.11	6.31	7.83	3.34	1.15	–0.81	3.01	3.39 (0.18)	31
INF	2.67	2.56	4.29	1.61	0.64	1.06	3.65	6.38 (0.41)	31
MSS	8.05	8.24	10.6	4.32	1.97	–0.32	1.76	2.52 (0.28)	31
TRV	6.52	6.81	8.76	2.91	1.71	–0.64	2.31	2.76 (0.25)	31

Source: author's own calculations, 2023.

In view of the disposition of the data sets and to completely remove erroneous regression results from the non-stationary statistics, a unit root test was performed with ADF and PP; the outcomes are shown in Table 2.

Table 2. Unit root result

Variables	ADF t-Stat.	ADF critical value @ 5%	ADF P-value	PP T-Stat.	PP critical value @ 5%	PP P-value	ADF & PP order of integration	Remarks
$LNCO_2$	–6.06	–2.97	0.00	–6.35	–2.97	0.00	I(1)	Stationary
LNCEX	–6.45	–2.97	0.00	–6.39	–2.97	0.00	I(1)	"
LINF	–4.42	–2.97	0.00	–5.83	–2.97	0.00	I(1)	"
LNMSS	–3.85	–2.96	0.01	–3.35	–2.96	0.02	I(0)	"
LNTRV	–3.43	–2.98	0.02	–4.12	–2.96	0.00	I(0)	"

Source: author's own calculations, 2023.

From the results displayed in Table 2, only LNMSS and LNTRV were integrated of order zero I(0), suggesting that they are stationary at level, whereas $LNCO_2$, LNCEX, and LNINF were integrated of order one I(1), clearly showing that they are stationary only after first differencing at the 5% threshold. Because none of the variables are integrated of order two, we can perform the ARDL analysis (Pesaran *et al*., 2001).

Table 3. VAR Lag Order Selection Criteria

Lag	LogL	LR (Likelihood Ratio)	FPE (Final Prediction Error)	AIC (Akaike Information Criterion)	SC (Schwarz Information Criterion)	HQ (Hannan-Quinn Information Criterion)
0	22.44	NA	0.018	–1.203	–0.967	–1.129
1	33.48	17.520*	0.009*	–1.896*	–1.613*	–1.807*
2	33.49	0.009	0.009	–1.827	–1.497	–1.724

* Represents lag length at 1 as chosen by all the criteria (LR, FPE, AIC, SC and HQ).

Source: author's own calculations, 2023.

Table 3 shows the results for the selection of the most acceptable lags. The Lag order selection criteria test is essential to validate the appropriate lag results and it helps to achieve a more accurate outcome and impartial result while attempting to avoid serial correlation problems. As shown in Table 3, the best lag to use is one, and this is supported by all of the criteria (LR, FPE, AIC, SC and HQ).

The results of further initial tests for errors and multicollinearity is displayed in Table 4. From the outcome in Table 4, the VIF is below the value of 10 and not above the value of 4 (Garson, 2012; Gujarati, Porter, 2009).

Table 4. Test for multicollinearity

Sample: 1991–2021

Variable	Coefficient variance	Variance Inflation Factors (VIF)
D(LNCO$_2$)	0.039314	1.051420
D(LNCEX)	0.003329	1.289443
D(LNINF)	0.001337	1.195224
D(LNMSS)	0.024263	1.187210
D(LNTRV)	0.003664	1.457340

Source: author's own calculations, 2023.

We can thus conclude that there is no multi-collinearity, instability of regression model, Heteroskedasticity and serial correlation. Table 4 made clear the unbounded ARDL outcome on the influence of financial instruments on greenhouse gas elimination in Nigeria.

The ARDL Bound test is conducted to investigate the presence of long-run or otherwise in the study.

Table 5. ARDL bounds test result

F-Statistic	Significance (%)	I0 Bound	I1 Bound
0.93	10.00	2.45	3.52
	5.00	2.86	4.01
	2.50	3.25	4.49
	1.00	3.74	5.06

Source: author's own calculations, 2023.

The ARDL bound test was used to determine the presence of a long-run association, and the outcomes are summarized in Table 5. As a result, the F-statistic value (0.93) is clearly less than the critical value of both the lower bound (2.86) and the upper bound (4.01) at the 5% threshold of significance, as established by (Pesaran *et al*., 2001). Following this result, we accept the null hypothesis, which specifies that the variables have no long-run relationship.

The ARDL short run estimation in Table 6, after the bound test has confirmed that fiscal and monetary instruments in Nigeria are yet to positively influence environmental integrity. These findings are in agreement with the studies of (Ullah *et al*., 2020; Pradeep, 2022; Yilanci, Pata, 2021) but conflict with (Akbar *et al*., 2021; Ike *et al*., 2020; Maneerat, Fazal, 2020) among others. Government spending on public welfare is proportional to government revenue, according to (Peacock, Wiseman, 1961). If government taxing of carbon emission is insignificant, then investment into green technology will be inconsequential.

Table 6. ARDL Short-term estimation result

Dependent Variable: D($LNCO_2$)

Variable	Coefficient	Std. error	T-statistic	Probability value
D($LNCO_2$)	–0.169	0.198	–0.852	0.403
D(LNCEX)	–0.019	0.058	–0.339	0.737
D(LNINF)	–0.007	0.036	–0.209	0.836
D(LNMSS)	–0.203	0.156	–1.302	0.206
D(LNTRV)	0.061	0.060	1.009	0.323
C	0.048	0.036	1.323	0.199

R-squared = 0.81; Adjusted R-squared = 0.76; S.E. of regression = 0.02; F-statistic = 15.43; P-value of F-statistic = 0.00; Durbin-Watson = 2.01.

Source: author's own calculations, 2023.

Green financial policy entails imposing high carbon taxes and other affiliated taxation to convince industry sectors to switch to more environmentally friendly sustainable energies (Cox

et al., 2022). This research highlighted the green-finance innovation proposed by (De Haas, Popov, 2019). As a result, green fiscal and monetary policy should increasingly emphasize on green bonds (Semmler *et al*., 2021) and other interest-free green-funding sources from external financing agencies that actively support a cleaner environment.

4. Diagnostic and stability examinations

Diagnostic and stability assessments using the Breusch-Godfrey serial correlation LM, Breusch-Pagan-Godfrey heteroskedasticity, Ramsey stability tests were performed to verify the ARDL model results, and the results are tabulated in Table 7, Figure 2 and Figure 3, respectively.

Table 7. Diagnostic test

Type	F-Statistic	P-value
Ramsey RESET Test	0.652	0.52
Breusch-Godfrey Serial Correlation LM Test	2.305	0.12
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.935	0.48
Jarque-Bera	1.141	056

Source: author's own calculations, 2023.

The p-values of the diagnostic tests for all the types identified in Table 7 are above 0.05 which connotes that the model used for the estimation is not suffering from structural breaks. In other words, there is stability of the model, a serial correlation is absent and there is an absolute normality of data set distribution. Further tests of model stability were conducted and the outcomes are shown in figures 2 and 3 which clearly show that the model applied for this study is stable.

The Breusch-Godfrey serial correlation LM test, presented in Table 7, with probability values higher than 5%, demonstrates no scientific proof of an autocorrelation problem, while the Heteroskedasticity screening test, shown in Table 7, also indicates no proof of Heteroskedasticity. Furthermore, the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) were used to check the model's solidity. The plots of the equation are within the 5% significance threshold (see Figure 2 and Figure 3). As a result, we can confirm that the model is steady.

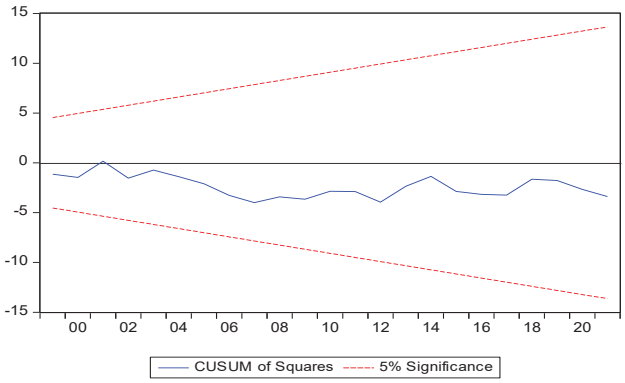


Figure 2. Cumulative sum of Recursive residuals

Source: author's own calculations, 2023.

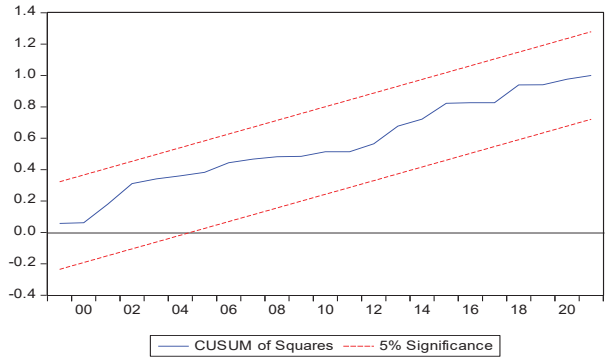


Figure 3. Cumulative sum of squares of Recursive residuals

Source: author's own calculations, 2023.

Conclusions and policy implications

The principal objective of this research is to ascertain the impact of financial policies on environmental protection in Nigeria. Numerous papers in this research area have championed eco-friendly financial regulation as the most effective approach to lowering environmental damage and restoring greenery in the ecosphere. As shown in Table 6, one item stands out as a result of this investigation's effect. The government budget instruments used in this study produced inconsistent results. For the purpose of emphasis, government spending has a marginal deleterious effect on dreadful environmental conditions. As a result, it appears

that the government is underspending on environmental protection as a primary concern. Furthermore, while taxation has an intangible positive impact, it is grossly inadequate to reduce carbon dioxide emissions. Carbon taxes, then, should be enacted as a component of a green fiscal and monetary programme.

The policy conclusion is that government budgetary investment in the country is not addressing CO_2 issues and will actually require green financial strategies to increase tax revenue collection, money supply management, and investment in green technology for environmental protection. Government spending on public welfare is proportional to government revenue. Thus, if the government makes a lot of money, the amount of money invested in social welfare and green infrastructure will be obvious and significant. Nonetheless, where available, the study recommends green-finance innovation. Carbon taxation is required to improve tax proceeds as a fiscal tool that would allow the government to address all ecological distresses. Fiscal and monetary policy reforms, including environmental taxes, are critical for lowering the country's carbon concentration. Through investments in clean initiatives and budgetary collaborative effort with ecologic experts, the eco-friendly government financial pathway will however guide budgeting process towards ecological sustainability, ensuring adequate input and output to repairing Nigeria's state of the environment.

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