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ESTIMATE THE IMPACT OF FINANCIAL SECTOR DEVELOPMENT ON CARBON EMISSIONS IN ALGERIA

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Abstract

This paper aims to assess the impact of financial sector development on carbon emissions in Algeria during the period 1990-2022 using the distributed lag autoregressive model. To achieve the research objective, carbon emissions were used as the dependent variable, while the independent variable representing the evolution of the financial sector was constructed by integrating indicators of financial sector development using the principal component analysis method. Additionally, two mediating variables, foreign direct investment and economic openness, were included to enhance the explanatory power of the model.

The study's results revealed a statistically significant positive relationship between the financial sector development index and carbon emissions in Algeria during the study period. Therefore, the study recommends that policymakers in Algeria strive to strike a balance between economic growth aspirations and environmental considerations.

✓ Keyword. Financial sector, Carbon emissions, Algeria.

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1. INTRODUCTION

The intertwining dynamics of financial sector development and environmental sustainability have become a focal point of contemporary economic discourse. In recent years, the global community has witnessed an unprecedented surge in concerns regarding climate change and its associated consequences. Against this backdrop, understanding the intricate relationship between financial sector development and CO2 emissions has emerged as a critical area of research.

The financial sector, as a cornerstone of economic activity, plays a pivotal role in shaping the trajectory of sustainable development. Its influence extends beyond the traditional realms of capital allocation and risk management, reaching into the broader realms of environmental responsibility.

Against the backdrop of global efforts to mitigate climate change, understanding how financial sector policies and practices impact environmental outcomes in a country like Algeria becomes imperative. As Algeria seeks to diversify its economy and enhance its financial infrastructure, questions arise regarding the potential consequences on carbon emissions. The intricate interplay between financial institutions, investment patterns, and carbon-intensive industries merits a comprehensive examination to inform policy decisions that balance economic growth with environmental sustainability.

Therefore, this research endeavors to unravel the nuanced connections between financial sector development and CO2 emissions, aiming to shed light on the potential synergies or conflicts that may exist. By delving into the intricate mechanisms through which financial institutions operate in the context of environmental concerns, we seek to contribute to a more comprehensive understanding of the interplay between economic progress and ecological sustainability.

As we navigate through the intricate landscape of financial markets, policy frameworks, and environmental imperatives, it becomes evident that the choices made within the financial sector resonate far beyond profit margins. Thus, this paper aims to explore the multifaceted dimensions of financial sector development and its impact on CO2 emissions, with the ultimate goal of informing policy decisions and fostering a more sustainable economic future. So, the study aims to address the following question:

What is the impact of financial sector development on CO2 emission in Algeria durinig the period 1990- 2022?

We decompose the impact of financial sector development into short- and long-run implications using the autoregressive distributed lag (ARDL) framework.

The next section outlines the literature review. Section 3 explains our data and estimation approach. Section 4 discusses the empirical findings, and Section 5 concludes with policy implications.

2. LITERATURE REVIEW

The relationship between financial sector development and environmental sustainability, particularly in the context of carbon dioxide (CO2) emissions, has garnered increasing attention in recent literature, started from the Environmental Kuznets Curve. The EKC hypothesis posits a non-linear relationship between per capita income and environmental degradation. Initially proposed by Simon Kuznets, the theory suggests that as economies progress, environmental quality deteriorates, reaching a tipping point where it subsequently improves. This U-shaped curve implies that economic development, initially associated with increased pollution, eventually leads to environmental restoration. This has been confirmed by several recent empirical studies (eg: (Mazzanti, Montini, & Zoboli, 2006), (Pidilla & Piaggio, 2012) that concluded that the negative impact of economic growth on carbon emissions is no longer a debatable issue in the economy and that high levels of carbon emissions are detrimental to economic growth. However, the validity of this hypothesis for financial sector development remains a subject of debate, necessitating a comprehensive analysis. Hence, this section reviews a range of studies investigating the impact of financial sector development on CO2 emissions, categorizing them under three strands. The first strand points out that financial sector development creates a negative impact on CO2 emissions. For example, the study by (Afzal, Rasoulinezhad, & Malik, 2022) explored the relationship between financial development, institutional frameworks, and environmental quality in Europe. Contrary to expectations, the results indicated a negative relationship between financial development and environmental degradation, urging a reconsideration of traditional notions.

Similarly, (Hasan, oudat, Alsmadi, Nurfahasdi, & Ali, 2021) investigated the causal relationship between financial development and carbon emissions in an emerging country. The study revealed a complex scenario where short-term impacts of financial development on carbon emission were observed, but no long-term association was established. These findings underscore the need for nuanced analyses when examining the nexus between financial sector development and CO2 emissions. The same results reported by (Yao & Tang, 2021) employed two way-fixed effects to examine the linkage of financial structure with CO2 emissions in G20 economies. They found that financial structure measured by stock market value to domestic credit may result in lower CO2 emissions. In the case of Malaysia, (Gill, Hassan, & Haseeb, 2019) by applying ARDL approach found that financial development has negative impact on carbon emission in Malaysia for the period (1970-2016). By applying simultaneous-equation panel data approach, (omri, daly, rault, & chaibi, 2015) revealed that financial development, as measured by domestic credit to private sector to GDP, decreases CO2 emissions in MENA countries.

The second strand points out that financial development creates a positive impact on CO2 emissions. (Ridzuan, Ismail, & Che Hamat, 2017) explored the impact of foreign direct investment (FDI) on sustainable development in Singapore. The results indicated that FDI inflows not only lead to higher economic growth and better environmental quality but also widen income disparity, highlighting the multifaceted nature of these interactions.

A global perspective was considered in the research by, (Thangaiyarkarasi & Vanitha, 2021) which delved into the impact of financial development on decarbonization factors. The study revealed that certain aspects of financial sector performance, such as bank assets and return on assets, contribute positively to renewable energy consumption and green growth while reducing carbon emissions. These insights illuminate potential avenues for aligning financial development with environmental sustainability.

The third strand points out the complexity inherent in the relationship between financial sector development and CO2 emissions, (Jinqiao, Maneengam, Sleem, & Mukarram, 2022) investigated the role of financial development and technology innovation in climate change. The study uncovered both adverse direct effects of financial development on climate change and positive indirect effects through technology innovation, adding layers of nuance to the ongoing discourse.

Similarly, (Gheraia, Saadaoui, Abdelli, & Almawishir, 2023) scrutinized the dynamic impact of financial development, trade openness, and economic growth on carbon dioxide emissions. While long-run cointegration relationships were identified, the short-run impacts exhibited a mixture of positive and negative effects, underscoring the intricate interplay of these variables.

This literature review synthesizes recent research on the impact of financial sector development on CO2 emissions. The divergent findings highlight the need for a nuanced and context-specific understanding of these relationships. As the global community intensifies efforts towards sustainable development, this review sets the stage for further inquiry into the complex dynamics shaping the environmental consequences of financial sector development.

3. METHODOLOGY

3.1. Data descriptive and variables

In term of approach, the study applied a quantitative approach where both econometric and descriptive techniques are applied to achieve the objective of the study. This research used primary data, collected from Bank of Algeria different issues and World Bank data development indicators. In term of coverage, the study focused on the case of Algeria from 1990 to 2022. Table 1 provide a clear explanation for all the factors included in our study.

Table 1. Description of variables

Variable	Acronym	Proxy	Source
carbon dioxide	CO2	CO2 emissions (kilotonnes)	World Bank
Financial sector development	FIN	Private domestic credit as percentage of GDP Broad money supply as percentage of GDP Bank deposit as percentage of GDP	World Bank World Bank Bank of Algeria
Foreign direct investment	FDI	Foreign direct investment as percentage of GDP	World Bank
Trade openness	OPEN	Trade as percentage of GDP	World Bank

Source. Prepared by the researchers

To overcome the constraints associated with employing singular indicators as substitutes for financial sector development and to steer clear of potential multicollinearity issues, this research formulated and implemented a comprehensive composite index. Three indicators were used to construct “financial sector development”: (bank deposit as percentage of GDP, private domestic credit as percentage of GDP, broad money supply as percentage of GDP). Subsequently, these indicators were utilized in a two-stage process to construct a composite index. To create the index, the data series underwent normalization through a min–max approach. This method effectively mitigates variations within the data, rendering the trend suitable for index development. The formula employed in this process is outlined below.

$$F_{i,t} = \frac{P\ i,t - Min\ i,t}{Max\ i,t - Min\ i,t}$$

Where $F_{i,t}$ represents the represents the normalized indicator *i* at time *t*, and $P_{i,t}$ an individual FIN indicator, $Max_{i,t}$ is the maximum and $Min_{i,t}$ is the minimum values of each indicator, respectively.

Next, the investigation employed the principal components analysis (PCA) technique to compute the Eigen values of the variance matrix for the indicators and craft the composite index. In this instance, the study utilized the following equations to formulate the composite index for Algeria.

$$FIN_i = W_{i1}X_1 + W_{i2}X_2 + W_{i3}X_3 + \ldots + W_{in}X_n$$

Where FIN_i = estimate of the *i*th factor of financial sector development; Wi = weight on the factor of score coefficient; Xi = variable of interest; n = number of variables. The following table shows the results PCA.

Table 2. Principal components analysis result

Principal Components Analysis
Date: 11/29/23 Time: 22:29
Sample: 1990 2020
Included observations: 31
Computed using: Ordinary correlations
Extracting 3 of 3 possible components

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.124375	1.316140	0.7081	2.124375	0.7081
2	0.808235	0.740845	0.2694	2.932610	0.9775
3	0.067390	---	0.0225	3.000000	1.0000

Source: Eviews 10 output

The table indicates that the initial base principal components is for 97.75% of the overall variance in the original data. Consequently, the financial sector development index derived from the second base principal components proves to be more suitable for gauging the financial sector development, given its substantial interpretive power.

3.2. Model specification

The empirical model for examining the relationship between financial sector development and Co2 emissions is expressed as:

$$CO2_t = \alpha_0 + \beta_1 FIN_t + \beta_2 FDI_t + \beta_3 OPEN_t + \varepsilon_t$$

The proxies of all variables used in the analysis have been pre-defined and established beforehand, except ε which is the error term, t represent the sample period, α_0 refers to the intercept, $\beta_{1..}$ β_3 are the coefficients.

3.3. Cointegration- autoregressive distributed lag bound testing procedure

The study employs the Autoregressive Distributed Lag (ARDL) bounds testing procedure to explore cointegration and investigate the short- and long-term impacts of selected independent factors on CO2 emissions. The ARDL model, as developed by Pesaran and Shin (1998) and Pesaran et al. (2001), is chosen for its advantages over alternative cointegration methods like fully modified OLS and Johansen. Notably, the ARDL technique is versatile, accommodating variables that are stationary at level I (0), first difference I (1), or both. It allows for variable-specific lags and proves effective even in studies with small sample sizes.

A bound test is performed to scrutinize the long-term relationship among the variables through an F-test. To accomplish this, the null hypothesis, positing no long-run relationship among the variables, is tested against the alternative hypothesis, stated as follows:

$$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$

$$H_1 : \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$$

The analysis employs two crucial bounds: the upper bound I (1) and the lower bound I (0) to assess the presence of cointegration. If the F-statistics surpass the upper critical bound, I (1), it signifies the existence of a long-term relationship. Conversely, if the F-statistics fall below the lower bound critical value, I (0), it indicates no cointegration. An inconclusive outcome is inferred when the F-statistics lie between the upper and lower critical bounds.

4. ANALYSIS RESULT AND DISCUSSION

4.1. Unit root test

To test for unit root, the augmented dickey-fuller (ADF) was applied. This test is performed at level I(0) and first deference (I1) as presented in table 3.

Table 3. Unit root test results

UNIT ROOT TEST RESULTS TABLE (ADF)
Null Hypothesis: the variable has a unit root

	At Level				
		CO2	FIN	FDI	OPEN
With Constant	t-Statistic	-0.4523	0.4111	-2.6654	-1.2279
	Prob.	***0.8872***	***0.9801***	***0.0918***	***0.6490***
		n0	n0	*	n0
With Constant & Trend	t-Statistic	-1.9059	-4.9373	-2.5955	-0.4128
	Prob.	***0.6266***	***0.0023***	***0.2847***	***0.9823***
		n0	***	n0	n0
Without Constant & Trend	t-Statistic	1.7214	0.3438	-1.1786	-0.2943
	Prob.	***0.9767***	***0.7780***	***0.2125***	***0.5713***
		n0	n0	n0	n0
	At First Difference				
		d(CO2)	d(FIN)	d(FDI)	d(OPEN)
With Constant	t-Statistic	-4.4175	-4.6665	-5.8523	-4.6839
	Prob.	***0.0016***	***0.0009***	***0.0000***	***0.0008***
		***	***	***	***
With Constant & Trend	t-Statistic	-4.2191	-4.8845	-5.9971	-5.0002
	Prob.	***0.0123***	***0.0027***	***0.0002***	***0.0019***
		**	***	***	***
Without Constant & Trend	t-Statistic	-4.0189	-3.4714	-5.9160	-4.7730
	Prob.	***0.0002***	***0.0011***	***0.0000***	***0.0000***
		***	***	***	***

Source. Eviews 10 output

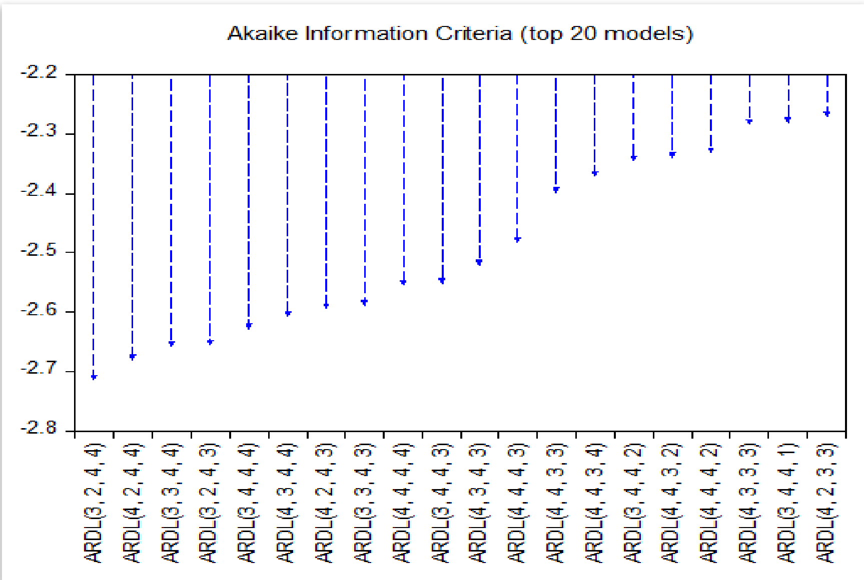
Based on the findings, it can be concluded that all variables are stationary at first deference I(1). Therefore, the ARDL method can be applied.

4.2. Lag length selection

For lag selection we depended on the value of akaike information criterion (AIC): (AKAIKE, 1974)

$$\text{AIC}= \hat{\sigma}^2 \exp\left[2\left(\frac{p+q}{N}\right)\right]$$

Fig.1. Lag order selection criteria results



Source. Eviews 10 output

Results showing in figure 1 recommend, ARDL (3,2,4,4). To delve into the long-term relationships and short-term dynamics of the variables, the ARDL model is expressed as follows:

$$\Delta \mathbf{Co2_t} = \mathbf{C_0} + \sum_{i=1}^{3} \propto_1 \Delta\, \mathbf{Co2_{t-1}} + \sum_{i=1}^{2} \propto_2 \Delta\, \mathbf{FIN_{t-1}} + \sum_{i=1}^{4} \propto_3 \Delta\, \mathbf{FDI_{t-1}} + \sum_{i=1}^{4} \propto_4 \Delta\, \mathbf{OPEN_{t-1}} + \beta_1\, \mathbf{Co2_{t-1}} + \beta_2\, \mathbf{FIN_{t-1}} + \beta_3\, \mathbf{FDI_{t-1}} + \beta_4\, \mathbf{OPEN_{t-1}} + \varepsilon_t$$

where Δ is the difference operator; C_0 is the intercept; $\alpha1$- $\alpha4$ and $\beta1$-$\beta4$ are short- and long run coefficients, respectively; ε is the error term.

4.3. Bounds testing for cointegration

The bounds testing analysis scrutinizes the long-term relationship between Co2 emission and financial sector development, Foreign direct investment, Trade openness. A shown in table 4 The bounds testing results suggest that at 5 % level of significance, the estimated F-statistics (8.968259) is upper critical bound value of 3.67.

Table 4. Bound test for cointegration relationship

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	8.968259	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source. Eviews 10 output

This suggests the presence of cointegration among the chosen variables. Consequently, the long-term relationship between Co2 emission and the independent variables is estimated. The estimation is guided by the Akaike information criterion (AIC), the ARDL (3,2,4,4) is selected.

4.4. Long-run estimation

After confirming the existence of a long-term cointegration relationship between the study variables, the long-term relationship factors described at 5% , 10% of significance in the table below:

Table 5. long-run estimates

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FIN	0.207618	0.074346	2.792589	0.0190
FDI	-46.06413	20.22982	-2.277041	0.0460
OPEN	3.510054	1.780877	1.970969	0.0770
C	1.669600	0.825114	2.023478	0.0706

EC = CO2 - (0.2076*FIN -46.0641*FDI + 3.5101*OPEN + 1.6696)

Source. Eviews 10 output

The results of the long-term relationship between the dependent variable and the independent variables indicate that there is:

- A positive relationship between (FIN) and (CO_2) over the long term at 5% of significance, i.e. an increase in the financial sector development of 1% increases CO_2 emission by about 21% . Financial sector development, characterized by increased access to capital, efficient financial intermediation, and robust institutional frameworks, plays a pivotal role in driving economic activities. One of the primary mechanisms through which financial sector development contributes to higher CO_2 emissions is the facilitation of industrial expansion. As financial institutions become more adept at allocating capital, industries experience greater ease in obtaining funds for expansion and technological advancements. While this fosters economic growth, it concurrently amplifies energy-intensive production processes and reliance on fossil fuels, thus escalating carbon emissions. Additionally, a well-developed financial sector tends to foster a surge in consumer spending and overall economic consumption. This heightened economic activity translates into increased demand for energy, much of which is still derived from non-renewable sources. The subsequent upswing in energy consumption directly corresponds to elevated CO2 emissions, creating a positive relationship between financial sector development and environmental impact. Furthermore, financial institutions often find lucrative investment opportunities in sectors with higher carbon footprints, such as traditional manufacturing and energy production. The pursuit of higher returns on investments may inadvertently drive capital towards industries that contribute significantly to CO2 emissions, reinforcing the positive correlation. This finding contradicts existing studies (Thangaiyarkarasi & Vanitha, 2021), (omri, daly, rault, & chaibi, 2015) who found that bank assets and return on assets and domestic credit to private sector to GDP, contribute positively to renewable energy consumption and green growth while reducing carbon emissions.

- A negative relationship between (FDI) and (CO2) over the long term at 5% of significance, i.e. an increase in the foreign direct investment of 1% increases CO2 emission by about 46% The negative relationship between Foreign Direct Investment (FDI) and CO2 emissions in Algeria is attributed to several factors. Firstly, increased FDI often leads to the adoption of advanced technologies and more efficient production processes. This technological transfer allows industries to produce goods and services with lower carbon intensity, consequently reducing CO2 emissions. Moreover, FDI tends to promote industries that are more environmentally friendly. Investors, especially in recent times, are increasingly concerned about sustainable practices. As a result, they are more likely to invest in industries that prioritize environmental considerations and adhere to stricter emission standards. Additionally, the influx of foreign capital may enable Algeria to diversify its economy, moving away from carbon-intensive industries towards cleaner and greener sectors. This shift in the industrial composition can contribute to a reduction in overall CO2 emissions. Furthermore, FDI often brings about improvements in energy efficiency. Foreign investors may introduce energy-efficient technologies and management practices, leading to a more sustainable use of resources and a decrease in emissions per unit of output. This result is consistent with the findings of the (Pao & Tsai, 2011) which recommends that developing countries in attracting FDI, should study the qualifications of foreign investment thoroughly or enhance environmental protection by coordinating know-how and technology transfer with foreign companies to avoid environmental damage.

- A positive relationship between (OPEN) and (CO2) over the long term at 10% of significance, i.e. an increase in the trade openness of 1% increases CO2 emission by about 3.5% . increased openness, in terms of international trade and investment, may lead to higher industrialization in Algeria. As the economy becomes more integrated with the global market, there could be a surge in industrial activities and manufacturing processes. These industries might heavily rely on fossil fuels, contributing to higher carbon dioxide emissions. Moreover, with increased trade and economic openness, there might be a rise in consumer demand for goods and services. This increased demand could lead to greater production and consumption, particularly in energy-intensive sectors, further driving up CO2 emissions. Additionally, while there is a significant presence of natural resources, such as oil and gas, in Algeria, the extraction and processing of these resources for export will contribute to higher carbon emissions. The revenue generated from these exports might fuel economic growth but also come at the cost of increased environmental impact.

4.5. Short-run estimation

The ECM error correction model shows us the short-term relationship between study variables. The results of this estimate are illustrated in table 6, where it is evident to us through the error correction model that all study variables are significance at 5% level of significance

Table 6. Results of short-run dynamic model

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CO2(-1))	-0.434509	0.116543	-3.728310	0.0039
D(CO2(-2))	-0.592749	0.110233	-5.377249	0.0003
D(FIN)	0.018772	0.033995	0.552208	0.5929
D(FIN(-1))	0.232471	0.039317	5.912710	0.0001
D(FDI)	-22.52282	3.013348	-7.474351	0.0000
D(FDI(-1))	-8.251113	3.668869	-2.248953	0.0483
D(FDI(-2))	-16.49909	3.398849	-4.854318	0.0007
D(FDI(-3))	-9.141484	2.125281	-4.301305	0.0016
D(OPEN)	-0.847335	0.263410	-3.216794	0.0092
D(OPEN(-1))	0.451144	0.321385	1.403747	0.1907
D(OPEN(-2))	-1.403365	0.310661	-4.517353	0.0011
D(OPEN(-3))	-0.641547	0.346687	-1.850508	0.0940
CointEq(-1)*	-0.328833	0.041502	-7.923245	0.0000

R-squared	0.926309	Mean dependent var	0.040741
Adjusted R-squared	0.863145	S.D. dependent var	0.124836
S.E. of regression	0.046182	Akaike info criterion	-3.006284
Sum squared resid	0.029858	Schwarz criterion	-2.382362
Log likelihood	53.58483	Hannan-Quinn criter.	-2.820759
Durbin-Watson stat	2.369682		

Source. Eviews 10 output

It's worth noting that the Error Correction Model (ECM) registers a negative and statistically significant value, well below 1%, precisely at 0.328833. This outcome is elucidated by the fact that the dependent variable, on-call Co2, necessitates approximately 3.04 years, equivalent to about 3years and 15 days, to rectify short-term imbalances and revert to the equilibrium at the long-term level. In practical terms, this implies that the deviation of on-call Co2 from their balanced state in the preceding period (t-1) will undergo a correction of 32.8% in the current period (t). The R-squared, standing at 0.926 aligns closely with the ideal value, signifying that the variables under consideration exert control over approximately 92.6% of the fluctuations in on-call Co2 emission.

4.6. Diagnostic tests results

In order to validate our findings, we conducted various diagnostic tests. As outlined in Table 7, our model demonstrates freedom from serial correlation, heteroscedasticity, and functional form misspecification at a 5% significance level. The Jarque–Bera value further confirms the normal distribution of our model.

Table 7. Diagnostic tests

Specification	F-statistics	Probability value
Breusch-Godfrey LM test	0.776443	0.4918
Breusch-Pagan (hetroscedasticity)	1.923399	0.1480
Arch (hetroscedasticity)	0.412549	0.5268
Jarque-Bera (normality)	0.809478	0.667151

Source. Eviews 10 output

Additionally, the stability of the model is affirmed through the results presented in Figures 2 and 3, depicting CUSUM and CUSUMSQ plots, respectively. Both plots reveal that the model remains stable, with CUSUM lines well within the critical boundaries at a 5% significance level.

Fig.2. Plots of CUSUM

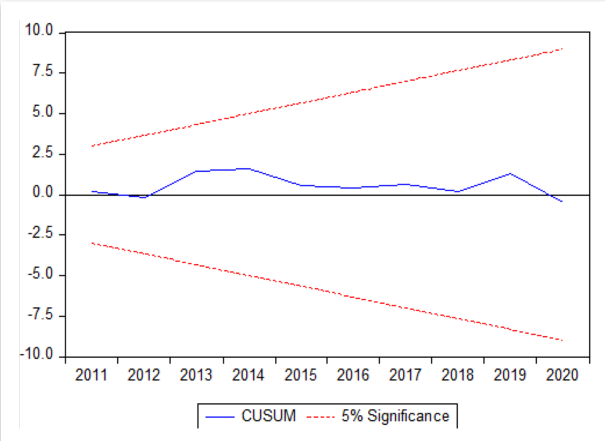
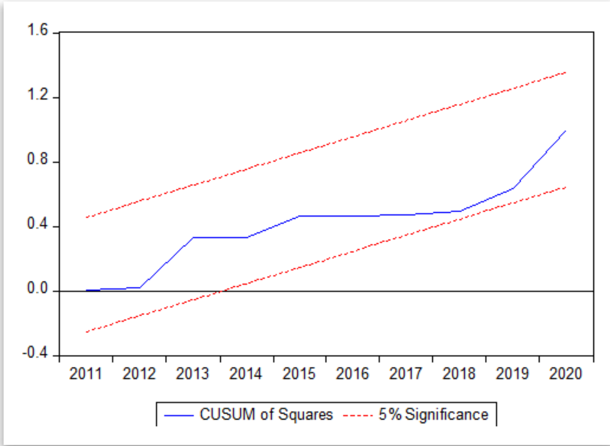


Fig.3. CUSUM of squares



Source. Eviews 10 output

5. CONCLUSION

In conclusion, our study sheds light on the intricate relationships between financial sector development (FIN), foreign direct investment (FDI), trade openness (OPEN), and CO2 emissions in the context of Algeria. The findings reveal a nuanced picture of the environmental implications associated with economic activities. The results of this study identified two main mechanisms by which financial sector development can increase CO2 emissions. First, the Substitution Effect refers to a phenomenon where progress in the financial sector may inadvertently lead to a shift in investment preferences. Specifically, as the financial sector develops, there could be a tendency for investors or businesses to favor less environmentally friendly or more polluting technologies over cleaner alternatives. This shift might occur due to perceived cost-effectiveness, market dynamics, or regulatory considerations. In essence, the substitution effect warns that, despite overall financial growth, there's a risk of redirecting investments towards technologies that have a more detrimental environmental impact. Second, the growth effect pertains to the potential consequences of financial sector development on overall economic growth. As the financial sector expands and becomes more robust, it can facilitate increased lending, investment, and economic activities. While economic growth is generally desirable, it may come at the expense of environmental sustainability. In this context, rapid economic growth can lead to higher levels of energy consumption and industrial production, increasing carbon dioxide (CO2) emissions. Thus, the growth effect underscores the dual challenge of achieving economic development while managing and mitigating the environmental impacts associated with increased economic activities.

Drawing upon the outcomes of this research, the study proposes the subsequent recommendations for decision-makers in Algeria:

- ✓ Enact policies geared towards fostering investment in sustainable technologies. These policies may involve the implementation of subsidies, tax incentives, or collaborative programs between the public and private sectors.
- ✓ Enhance environmental regulations with a focus on curbing CO2 emissions from both industrial and energy sources.
- ✓ Develop environmental awareness programs. These programs could aim to inform citizens of the issues of pollution and the measures they can take to reduce their environmental impact.

The significance of these recommendations lies in their contribution to ensuring the sustainability and eco-friendliness of the financial sector development in Algeria.

6. Bibliography List :

- **Afzal, A., Rasoulinezhad, E., & Malik, Z. (2022).** "*Green finance and sustainable development in Europe*". Economic Research-Ekonomska Istraživanja, 35, 5150- 5163.
- **AKAlKE, H. (1974)**. "*ANew Look at the Statistical Model Identification*". IEEE. Reprinted, with permiBaion, from IEEE transactions on Automatic control, 19, 716- 723.
- **Gheraia, Z., Saadaoui, S., Abdelli, H., & Almawishir, N. F. (2023)**. "*Does Financial Development Really Improve Environmental Quality in Al-Jouf Region? Empirical Contribution to the Environmental Politics"*. International Journal of Energy Economics and Policy, 13(4), 194- 201.
- **Gill, A. R., Hassan, S., & Haseeb, M. (2019)**. "*Moderating role of financial development in environmental Kuznets: a case study of Malaysia*". Environmental Science and Pollution Research, 26, 34468- 34478.
- **Hasan, H., oudat, M., Alsmadi, A., Nurfahasdi, M., & Ali, B. (2021)**. *"INVESTIGATING THE CAUSAL RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT AND CARBON EMISSION IN THE EMERGING COUNTRY*". Journal of Governance and Regulation, 10(2).
- **Jinqiao, L., Maneengam, A., Sleem, F., & Mukarram, S. (2022)**. "*Investigating the role of financial development and technology innovation in climate change: evidence from emerging seven countries"*. Economic Research-Ekonomska Istraživanja, 35(1), 3940- 3960.
- **Mazzanti, M., Montini, A., & Zoboli, R. (2006)**. "*Economic Dynamics, Emission Trends and the EKC Hypothesis New Evidence Using NAMEA and Provincial Panel Data for*

Italy". Universita Degli Studi di Ferrara, 1-26.

- **omri, a., daly, s., rault, c., & chaibi, a. (2015).** "*Financial development, environmental quality, trade and economic growth: What causes what in MENA countries"*. Energy Economics(48), 242- 252.
- **Pao, H.-T., & Tsai, C.-M. (2011)**. "*Multivariate Granger causality between CO2 emissions, energy consumption, FDI (foreign direct investment) and GDP (gross domestic product): Evidence from a panel of BRIC (Brazil, Russian Federation, India, and China) countries"*. Energy, 36, 685- 693.
- **Pidilla, E., & Piaggio, M. (2012)**. "*CO2 emissions and economic activity: Heterogeneity across countries and non-stationary series*". Energy Policy(46), 370- 381.
- **Ridzuan, A., Ismail, N., & Che Hamat, A. (2017).** "*Does Foreign Direct Investment Successfully Lead to Sustainable Development in Singapore?"* Economies, 1- 20.
- **Thangaiyarkarasi, N., & Vanitha, S. (2021).** "*The Impact of Financial Development on Decarbonization Factors of Carbon Emissions: A Global Perspective"*. International Journal of Energy Economics and Policy, 11(6), 353- 364.
- **Yao, X., & Tang, X. (2021, july)**. *"Does financial structure affect CO2 emissions? Evidence from G20 countries"*. Finance Research Letters, 41, 1-27.