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Assessing the Environmental Impact of Green Finance, Tourism, and Globalization in Pakistan

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ABSTRACT

The fast development of technology in the last several decades has created new problems for the environment. The current study evaluates how green finance, tourism, globalization, and GDP affect environmental sustainability in Pakistan during 1989 to 2022. This study utilized ARDL approach to probe the long run tie between studied variables. The empirical evidence of this study revealed that tourism, GDP and globalization deteriorate the environmental sustainability, yet green finance mitigate CO2 emissions. Policy suggestions are provided to regulate the environmental laws to control the adverse impact of globalization and tourism and to transit the economy towards green economy. The policymakers should encourage the green technology for sustainable environment.

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1. Introduction

Ecological disturbances, pollution, climate change, and global warming are some of the ways in which CO_2 emitting activities deteriorate the environment. Rising CO_2 levels in the atmosphere pose serious risks, and most countries are taking steps to lessen those risks in anticipation of climate-related disasters like extreme weather (Patel & Mehta, 2023). Sustainability in the environment is a hot topic right now, with people talking about it in all sorts of places: politics, society, health, and the economy. The inverse effects of climate change and global warming on our world are the primary cause of this increased focus (Farooq et al., 2023). Pakistan is responsible for about 0.8% of the world's CO_2. Pakistan has taken many steps to show its dedication to environmental protection. In order to reduce emissions of GHGs, several measures have been proposed, such as the use of renewable energy sources,

improvements to public transportation, extensive tree-planting programmes, new farming and livestock techniques, changes to city housing, and the introduction of environmentally friendly technology in industrial manufacturing zones (Ali et al., 2021). A critical issue with far-reaching repercussions is the environmental deterioration occurring on a worldwide scale. Disruptive weather patterns and fluctuating temperatures are affecting economies and quality of life. It is more important than ever for nations to prioritize environmental protection (Faheem et al., 2023). Loss of biodiversity, increased waste production, and worsening water and air pollution are just a few of the many environmental dangers that are intricately linked to climate issues (Farooq et al., 2023).

In order to measure the success of contemporary organizations, it is necessary to consider globalization and the interplay between economics, society, and politics. Thanks to the rapid development of communication and technology, it has become a major issue for countries around the world (Ajam et al., 2023). A worldwide phenomenon, globalization lowers barriers to trade across national borders, which in turn encourages more investment and freer flow of capital. With the help of FDI and the sharing of energy-saving technology, it boosts international trade and propels GDP. It improves environmental quality by reducing CO_2 and optimizing energy through the adoption of contemporary technology, which in turn reduces energy consumption (Le and Ozturk. 2020). Despite its positive effects on international trade, investment, and economic progress, globalization presents serious threats to long-term ecological stability. Increased energy consumption and environmental degradation are consequences of globalization's fast-paced economic operations. Furthermore, in areas where environmental controls are weak, the transfer of non-renewable resources across international borders frequently leads to an increase in pollution (Le and Ozturk, 2020). Consistent patterns in panel and time-series data analyses have been revealed by the substantial study of globalization's significance in practical energy research since the 1970s. In addition, the increasing focus on climate change and global warming reflects a real and present danger to society in the form of biodiversity loss, deforestation, rising sea levels, unpredictable rainfall, extensive crop failures, and unusual wind patterns (Jahanger, 2022). Environmental inequality is now a major issue for governments, academia, and policymakers around the globe. Those who support globalization say it improves environmental quality by reducing carbon emissions and is therefore good for economies (Jahanger, 2022).

The term "green finance" refers to the practice of lending money to businesses that do good for the planet, combat climate change, and reduce waste and increase efficiency in resource use. Environmental preservation, energy efficiency, renewable power, sustainable mobility, and green building are just a few of the many areas that could benefit from the financial services offered here. Although there are many different kinds of green finance, green credit is a typical way for researchers to measure the effect and breadth of this field (Huang, 2022). By providing environmentally focused projects with capital and individualized financial services, green finance is a vital tool for governments combating the climate catastrophe. It lays out a logical strategy for combating climate change by giving green projects top funding and investment priority. In order to steer project selection and funding towards sustainable objectives, leadership buy-in is essential (Wang et al., 2021). Environmental preservation and resource efficiency are two of the most important environmental concerns in green finance, which differs from traditional finance in its emphasis on these two factors. The ultimate objective is sustainable development, which it aspires to achieve by balancing economic activity with ecological preservation and ecological harmony. This groundbreaking method of financing ushers in a new age of sustainability-focused financial models by highlighting the integration of ecological preservation with economic growth (Wang et al., 2021).

An interesting trend has emerged over the past 20 years, according to statistics from the World Tourism Organization's annual reports: several countries have seen strong increase in tourism as a result of deliberate implementation of policies to promote the industry. Specifically, the number of international tourists surpassed the remarkable 1.4 billion mark in 2018, a 5% increase from the previous year. This upsurge in tourism is about more than simply figures; it's about possibilities. The expansion of tourist attractions has emerged as a major engine for new business formation and the generation of new jobs. Therefore, it's about more than just tourism; it's about boosting economies around the world (UNWTO 2011).The creation of job opportunities is one way in which tourism promotes economic growth. The growing impact it has on the environment, though, is a major concern (Muhammad et al. 2021). The environmental impacts of tourist development should be carefully considered, notwithstanding the fact that it contributes significantly to GDP. A large amount of fossil fuels like coal, natural gas, or oil is required to power a lot of tourist attractions and activities. Inadequate logistics frameworks also cause major environmental problems, which are a result of travel logistics, which include transportation infrastructure and specialised services (Wang & Wu, 2022). Emissions of carbon dioxide are expected to increase by 21% due to transportation-related factors in the tourism industry. We can no longer pretend that the tourist sector is "smokeless"; the growth of this sector has dramatically increased both energy consumption and carbon dioxide emissions. This highlights the sector's major contribution to climate change, as its operations are responsible for a considerable amount of CO_2 (Yıldırım et al., 2021). At present, the tourist industry is responsible for around 8% of the world's greenhouse gas (GHG) emissions, demonstrating its substantial impact on the environment. The use of fossil fuels is a key component of travel, which in turn increases the environmental impact of tourism. The hotel and food service industries, which are supplementary to tourism, also contribute significantly to the high levels of GHGs emissions, with the effect of transportation emissions being amplified (Dogru et al., 2020).

The growing environmental risks caused by economic growth and development projects have gone global, sparking heated discussions in sustainable development and environmental economics. As a result, maintaining a balance between economic development and environmental protection has become a critical issue for all communities around the globe. As a result of these shared worries, economists and environmentalists throughout the world have come together in an effort to figure out the complex bond between economic development and environment (Shoaib et al., 2020). The impact of economic expansion on pollution levels is a well-known phenomenon, among other things. There are a lot of economic operations that are driven by growth, but they unintentionally create pollution. Extensive economic activity throughout a wide range of industries and fields are part of this (Suhrab et al., 2023). The acceleration of economic growth has led to pollution from a variety of energy-intensive endeavors. The steady increase in average GDP per capita is a major driver of environmental degradation. Financial inclusion grows in tandem with GDP, which has the ability to increase both temperature and CO_2 levels (Faheem et al., 2023).

2. Literature review

Adopting the NARDL model, Rehman et al. (2023) documented the affinity between population growth, economic growth, globalization, alternate nuclear energy, and CO_2 emissions, covering the years 1985 to 2020. The outcomes revealed that globalization and economic growth exacerbated CO_2 in positive shocks, while, lessened CO_2 in negative shocks, while population growth enhanced CO_2 in both shocks, conversely alternate energy clean the environment. During 1995 to 2017, for developed nations, Ajam et al. (2023) asserted the correlation between agriculture, globalization, and CO_2. The empirical outcomes confirmed that agriculture and globalization played beneficial role in enhancing the environmental quality. Patel and Mehta. (2023), analyzed the interconnection between FD,

globalization, industrial growth, and CO_2, adopting the NARDL model, covering the years 1971 to 2019. The outcomes for India showed that globalization lessened CO_2, conversely, economic growth and industrial growth accelerated CO_2, while FD minimizes CO_2 in both shocks. For 78 developing countries, adopting the GMM approach, over the year 1990 to 2016, Jahanger, (2022) examined the bond between GDP, human capital, globalization, trade, urban population growth, energy consumption, and environmental sustainability. They found that FDI, human capital, and urban population growth cleaned the environment, while, GDP, and trade deteriorated environment. Mehmood and Tariq, (2020) underscored how globalization and CO_2 were correlated during the years 1972 to 2013 for South Asian countries. The assessment of the paper confirmed the positive linkage between globalization and environmental degradation. Le and Ozturk (2020) for 47 emerging markets and developing nations from 1990 to 2014, unfold the connection between FD, globalization, GDP, institutions, energy, and CO_2 emissions. The factual results of the research unveiled that globalization, FD, institutions, and energy consumption destroy the environmental quality, while GDP square reduced CO_2 level. Islam et al. (2021) for Bangladesh evaluated the influence of trade, GDP, FDI, innovation, globalization, and institutional quality on CO_2 from 1972 to 2016. They found that globalization, innovation, FDI, and institutional quality decrease CO_2, besides GDP, trade, and energy consumption demolished the condition of environment. For 19 most industrialized economies, Cao, (2023) underscored the connection between industrial upgrade, renewable energy, imports, exports, and CO_2 emissions, employing the NARDL model during the year 1995 to 2019. According to empirical findings GDP enhanced environmental pollution, while GDP square and renewable energy declined CO_2, while industrial upgrade and export enhanced environmental quality with positive shocks, while, in negative shocks reacted opposite. Wang and Ma. (2022) explored the connection between green finance, industrial structure, trade, education, wage level, income inequality, and CO_2 covering the years 2004 to 2018 for the Chinese province. The actual results of the article uncovered that GDP, trade, and wage level enhanced CO_2, while, income inequality, green finance, and industrial structure clean the environmental quality. The attachment between FDI, green finance, education, and CO_2, for BRICS countries, during the years 2000 to 2019 was tested by Ping and Shah. (2023). green finance and education amplify the environmental quality, while, GDP and FDI accelerated CO_2. From 2009 to 2018, for China Huang, (2022) identified the connection between environment regulation, green finance and low carbon technological. Environmental regulation positively connected with low carbon technological. Li and Fan. (2023) discovered the inverse relationship between green finance and CO_2 intensity for China during the 2011 to 2020. Zhou et al. (2020) explored the correlation between economic development, green finance and environment during the year 2010 to 2017 for China. Wang et al. (2021) for BRICS countries, covering the year 2000 to 2018, established the connection between FDI, trade, GDP, energy consumption, research development and CO_2. The empirical outcomes of the research disclosed green finance and non-fossil fuel energy boost environmental quality, while, trade, FDI, energy and GDP destroy the environmental quality. Wang and Wu. (2022) for the top 5 tourist arrival countries during the years 1995 to 2018 probed the connection between GDP, tourism, and CO_2. The verifiable outcomes of the research disclosed that tourism purifies the environmental quality, while GDP enhances CO_2. Jiaqi et al. (2022) during the period 2000 to 2017, for 70 Panel tourist countries investigated the affinity between tourism, and CO_2. The final results of the practical uncovered that population density, trade, and economic growth polluted the environmental quality, while tourism declines CO_2. For 15 Mediterranean countries, Yıldırım et al. (2021) documented the connection between tourism, and CO_2. They found that tourism mitigates the CO_2, while, GDP deteriorates the environmental pollution. The attachment between tourism, energy, governance, finance, FDI, and CO_2 for 13 Muslim countries covering the year 2002 to 2014, was investigated by Muhammad et al. (2021). The empirical findings of the research disclosed that tourism, energy, and FDI exacerbate the environmental quality, while

governance cleans the environmental quality. Li and Lv, (2021) for 95 countries, reported the connection between tourism and CO2. The estimated that tourism development damages the environmental quality. For OECD countries, Dogru et al. (2020) discovered the association between tourism development, economic growth, renewable energy, and the environment. The verifiable calculation of the research disclosed that tourism showed different impacts on different countries, while renewable energy lessens CO_2. GDP holds EKC. Dogan et al. (2017) tested the connection between energy, GDP, GDP square, tourism, and CO_2. The empirical findings of the research disclosed that GDP reduces CO_2, while GDP square, tourism, and energy consumption deteriorate the environmental quality. Shoaib et al. (2020) explored the interconnection between FD, energy, trade, GDP, and CO_2 for D8 and G8 countries, covering the year 1999 TO 2013, adopting PMG-ARDL. They figured out GDP accelerated the environmental sustainability, moreover trade, energy, and FD polluted the environment. Suhrab et al. (2023) for Pakistan explored the inverse correlation between GDP, renewable energy, and CO_2 covering the years 1985 to 2018. For Iran, adopting the ARDL model, Maroufi and Hajilary (2022) explored the connection between GDP, GDP square, FDI, and CO_2. They discovered that income, gas, and GDP disturbed the environmental protection, while GDP square and FDI enhanced the environmental preservation. Ali et al. (2021) for Pakistan, discovered the interrelatedness between net domestic credit, fossil fuel energy, GDP, energy use, and CO_2 during 1971 to 2014. The outcomes disclosed that GDP cleaned the environment, while energy use and net domestic credit deteriorated the environmental quality. Mirziyoyeva and Salahodjaev (2023) for 50 highly globalized countries, observed that how GDP and globalization affect CO_2. The GMM results displayed that trade and GDP increased CO_2, while, renewable energy, globalization of urban population, and women's power reduced environmental pollution. For Brazil, covering the years 1990 to 2019, employing the ARDL model, Raihan and Tuspekova probed the connection between fossil fuel, GDP, agriculture, tourism, urbanization, and CO_2. They detected that all studied variables exacerbated environmental pollution. Nosheen et al. (2021) during 1995 to 2017, adopting the DOLS model, explored the connection between GDP, tourism, energy, trade, FD, and CO_2 for Asian countries. They disclosed that GDP square minimized CO_2, while, FD, energy, trade, and tourism deteriorated the environmental quality.

The term "globalization" was first used by Ervin and Smith (2008) to describe the process by which national economies become interdependent on one another. As a result of globalization's promotion of economic, political, social, and cultural convergence, globalization, according to ecological modernization and world polity theories, encourages a decrease in CO_2 in all sectors globally. GHGs emissions are unequally distributed between industrialized and developing nations, according to the theory of unequal ecological exchange. This is because of globalization-related power inequalities (Ajam et al., 2023).

According to the hypothesis, large investments in green finance and energy transitions increase environmental quality during the second stage of development. Carbon trading and green finance schemes that promote environmental sustainability are vital in reducing carbon intensity. Green technology improvements are encouraged through environmental legislation and climate protection initiatives (Irfan et al., 2022). In their study, Sachs et al. (2019) demonstrated how GF investments motivate businesses to improve their environmental performance and decrease their CO_2. The significance of green finance in bolstering market-based environmentally friendly instruments for reducing carbon intensity was highlighted by Chen and Chen (2021). To fight environmental deterioration, there is a transition away from fossil fuels and towards renewable energy sources throughout Asia and around the world. It is contended that lowering carbon intensity and encouraging cleaner energy use are both achieved through increased consumption of renewable energy (Xin et al.,

2022).

The EKC Theory, developed by Grossman and Krueger and originally proposed by Griffin and Schiffel (1972), is used to examine the CO_2 GDP growth connection, Grossman and Krueger, (1991), According to this idea, there is a non-linear correlation between GDP and environmental quality; that is, pollution gets worse as GDP rises, but it gets better after a certain point in the income distribution. A country's ability to deal with environmental problems in their early stages improves in direct correlation to the growth of its economy (Kaika and Zervas, 2013). The Environmental Improvements Act was emphasized by Shafik and Bandyopadhyay (1992) as a means to encourage more environmentally friendly methods of economic growth.

3. Data Sources and Methodology

This study employed data from Pakistan during 1989 to 2022. Data is taken from different sources, data for CO_2, GDP, GFI and tourism is taken from World Development Indicator, while data for globalization is taken from Swiss economic institution. This study use CO_2 emission measures as (CO_2 emissions (kt)), Tourism is measured as (International tourism, number of arrivals), green finance is measured as renewable energy (% of total final energy consumption), globalization is measured as KOF index, GDP measured as GDP growth (annual %). This research endeavors to evaluate the association between CO_2, green finance, GDP, tourism and globalization.

When compared to more accustomed time series models, the ARDL model has a number of benefits (Pesaran et al., 1999; Pesaran et al., 2001). Due to its many benefits, the ARDL model is employed in this study. (a) ARDL model is ideal for small samples; (b) it works well when variables are stationary either at I(o)) or integrated at first order I(1) or both .(c) The ARDL acknowledge simultaneous computation of long-run and short-run coefficients. (d) From a statistical standpoint, it corresponds to the standard error correction term, enhancing its reliability. (e) It optimizes lag selection to yield significant results. (f) Employing ARDL transformation facilitates the extraction of error correction models via F-bounding statistics. (g) It yields impartial results for regression of dependent variables. Finally, the inclusion of the error correction term (ECT) serves as a reliable criterion for assessing the presence of long-run relationships among variables (Banerjee et al., 1998). The study found sustained co integration among the variables when examined ARDL bound tests. Then study used the ARDL model to look at the variables' long-term associations.

This study evaluated the linkage between CO_2, GDP, TOU, GLOB, and GFI. The econometric model of the present study is given below.

$$CO2 = f(GLOB, GFI, TOU, GDP) \quad (1)$$

Where CO_2 is carbon dioxide emissions, GLOB represents globalization, GFI represents green finance, TOU indicates tourism, and GDP for economic growth.

$$CO_{2_t} = \Diamond_0 + \Diamond_1 GLOB_t + \Diamond_2 GFI_t + \Diamond_3 TOU_t + \Diamond_4 GDP_t \quad \ldots\ldots(2)$$

The ARDL estimation equations are following:

$$\Delta CO_{2_t} = \Diamond_0 + \sum_{i=1}^{O} \Diamond_{1i} \Delta CO_{2_{t-1}} + \sum_{i=0}^{P} \Diamond_{2i} \Delta GLOB_{t-i} + \sum_{i=0}^{Q} \Diamond_{3i} \Delta GFI_{t-i} + \sum_{i=0}^{R} \hbar_{4i} \Delta TOU_{t-i} + \sum_{i=0}^{S} \hbar_{5i} GDP_{t-i}$$
$$+ \alpha_1 CO_{2_{t-1}} + \alpha_2 GLOB_{t-1} + \alpha_3 GFI_{t-1} + \alpha_4 TOU_{t-1} + \alpha_5 GDP_{t-1} + \mu_t \quad \ldots(3)$$

ECM equation

$$\Delta CO_{2t} = \hbar_0 + \sum_{i=1}^{O} \Diamond_{1i} \Delta CO_{2t-1} + \sum_{i=0}^{P} \Diamond_{2i} \Delta GLOB_{t-i} + \sum_{i=0}^{Q} \Diamond_{3i} \Delta GFI_{t-i} + \sum_{i=0}^{R} \Diamond_{4i} \Delta TOU_{t-i} + \sum_{i=0}^{S} \hbar_{5i} \Delta GDP_{t-i} + \lambda ECT - 1 + vt_t \quad ..(4)$$

An essential measure of the long-term correlations amidst the variables considered here is the F-statistic. To indicate long-run co-integration, the F-statistic must be greater than or equal to the given upper and lower bounds. F-statistic values between I(0) and I(1) indicates that there is no association between the research variables. Bounds tests usually do not take second-order integration into account, but mixed-order integration is acceptable.

4. Results and Analysis

Descriptive statistics, including their range, median, mean, standard deviation, probability, and Jarque-Bera values, are listed in Table 1. Among the averages, it is worth noting that TOU ranks highest and GDP ranks lowest. A normal distribution is shown by all values according to the Jarque-Bera statistics. CO_2, TOU and GDP are some of the variables that show negative skewness; on the other hand, GFI and GLOB are some of the variables that show positive skewness. Additionally, all variables have positive probability and kurtosis values.

Table 1: Descriptive statistics and Correlation Matrix

	CO_2	GLOB	GFI	TOU	GDP
Mean	11.6156	3.782708	3.903223	13.62228	1.339217
Median	11.62596	3.779438	3.893652	13.68339	1.444319
Maximum	12.20021	3.880699	4.062166	14.31465	2.058123
Minimum	10.9858	3.694682	3.740048	12.81855	0.014293
Std. Dev.	0.332073	0.061457	0.08056	0.49428	0.490603
Skewness	-0.24925	0.239719	0.16099	-0.2743	-0.83453
Kurtosis	2.103319	1.581605	2.437447	1.718068	3.472822
Jarque-Bera	1.227962	2.615324	0.49016	2.268357	3.510844
Probability	0.541192	0.270452	0.782642	0.321686	0.172834
Sum	325.2368	105.9158	109.2902	381.4239	37.49808
Sum Sq. Dev.	2.977363	0.101979	0.175228	6.596449	6.498654
Observations	28	28	28	28	28
	CO2	KOF	GF	TOU	GDP
CO_2	1				
GLOB	0.916085	1			
GFI	-0.9821	-0.85979	1		
TOU	0.969083	0.916629	-0.91827	1	

Unit root tests are used in the next unit for stationary. With the use of the (PP) and (ADF) criteria, we want to make sure that every variable is stationary at either level I(0) or first difference I(1).

Table 2: Unit Root Tests

Variable	ADF		PP	
	I(0)	I(1)	I(0)	I(1)
CO_2	-2.28	-4.74***	-2.26	-4.78***
GLOB	-1.19	-6.50***	-1.15	-6.50***

GF	-0.75	-5.47***	-0.31	-6.19***
TOU	-0.80	-6.29***	-0.74	-6.94***
GDP	-4.31***	-7.57***	-4.26***	-18.88***

The F-statistic is 5.73 with k (number of predictors) equal to 4. Since the F-statistic exceeds the upper bound critical values at all these levels, it suggests a significant long-run relationship between the variables in the model.

Table 3: Bound Test

F-statistics	K	Range	Critical values	
			I(0) bound	I(1) bound
5.73	4	1%	3.74	5.06
		5%	2.86	4.01
		10%	2.45	3.52

Examining the bond between tourism and CO_2, tourism has identified to be positively associated with CO_2 emissions. The direct correlation of tourism with environment shows the harmful impact of tourism on environmental protection. One unit rise in tourism will cause 0.17% surge in CO_2 emissions. The level of significance is found at 1% level indicating strong impact of tourism on environment. The adverse coefficient of green finance indicates that green finance play beneficial role in mitigating CO_2. The description of relationship indicates the favorable role of green finance in improving environmental preservation. The results display that one unit rise in green finance will cause 3.37% reduction in CO_2. This tie indicated significance at 1% level. Evaluating the connection between GDP and CO_2 was found to be positive implying that one unit rise in GDP will rise CO_2 by 0.20%. The nature of relationship indicates complementing role of GDP in up surging CO_2. This relationship is significant at 1% level indicating strong impact of GDP on environmental sustainability. The positive and significant coefficient of globalization indicates that globalization enhance CO_2 emissions. The kind of connection was found positive which shows calamitous impact of globalization on environmental quality.

Table.4: ARDL Estimation Results

Long Run			
Variables	Coefficient	[S.E]	{T-st}
TOU	0.17***	[0.01]	{10.22}
GLOB	0.20**	[0.07]	{2.82}
GFI	-3.37***	[0.15]	{-21.11}
GDP	0.20***	[0.02]	{9.87}
C	21.69***	[0.98]	{21.97}
Short Run			
	coefficient	[S.E]	{T-ST}
D(CO2(-1))	2.47***	0.60	4.08
D(CO2(-2))	2.12***	0.48	4.41
D(CO2(-3))	0.77**	0.20	3.83
D(GLOB)	1.61***	0.39	4.06
D(GLOB(-1))	0.88***	0.21	4.18
D(GFI)	-0.27	0.44	-0.63

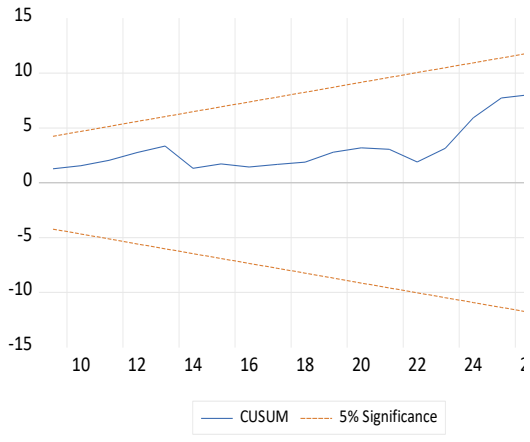
D(GFI(-1))	-0.03	0.37	-0.10
D(GFI(-2))	-3.77***	0.79	-4.76
D(TOU)	0.11***	0.02	4.69
D(TOU(-1))	0.36**	0.09	3.90
D(GDP)	0.12***	0.02	4.83
CointEq(-1)	-0.06**	0.01	-4.02

Table 5 is representing the diagnostic test results for a regression model. The R-squared (R^2) value is 0.999. The adjusted R-squared (Adj. R^2) is slightly lower at 0.998, accounting for the number of speculator in the model. The Durbin-Watson statistic is 2.726, suggesting no significant autocorrelation in the residuals. The LM test statistic is 1.922 with a p-value of 0.237, indicating no significant serial correlation. The Jarque-Bera test statistic is 0.370 with a p-value of 0.830, suggesting that the residuals are normally distributed. The heteroscedasticity test (Hetero) shows a statistic of 2.637 with a p-value of 0.143, indicating homoscedasticity. Finally, the Ramsey RESET test statistic is 0.784 with a p-value of 0.425, suggesting no significant model misspecification.

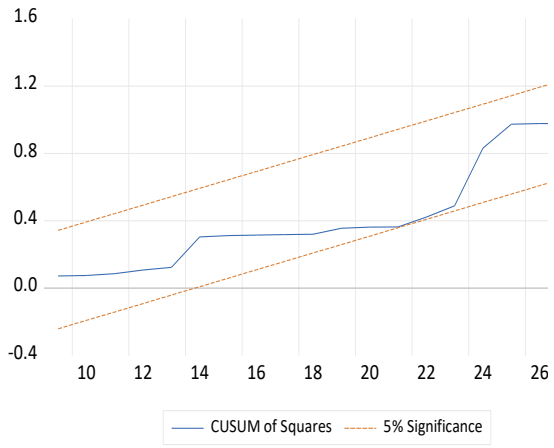
Table 5: Diagnostic Test Results

R^2	0.999
Adj. R^2	0.998
LM test	1.922(0.237)
Jarque-Bera	0.370(0.830)
Ramsey reset	0.784(0.425)
Hetero	2.637(0.143)
Durbin-Watson	2.726
CUSUM	Stable
CUSUMQ	Stable

Note: the values in () denotes p-values.



Graph: CUSUM



Graph: CUSUMQ

5. Concluding Remarks and Suggestions

Our study aims to analyze the impact of tourism, globalization, green finance, and GDP on environmental sustainability in Pakistan. We utilized the ARDL approach to analyze the long run association between studied variables during 1989 to 2022. The empirical findings showed that green

finance abate CO_2 emissions, while, tourism, GDP and globalization are catalysts for CO_2 emissions. The study suggested some useful suggestions to achieve environmental sustainability in Pakistan. The positive linkage between tourism and CO_2 indicates the disastrous role of tourism. Tourism development increases the energy use in term of transportation. Therefore, government of Pakistan should promote clean and eco-friendly energy and investing in green public infrastructure. Government should also allocate more funds for R&D to stimulate energy efficient technologies. To lessen the rate of environmental degradation, environmental policymakers should take advantage of globalization's economic opportunities. CO_2 in Pakistan are reduced by the use of green financing. In order to put policies into action that promote a clean environment, green financing is an essential component. To back renewable energy policy, the government can offer small incentives and use tactics like tax holidays to entice investors. Based on the findings, positive association between Globalization and CO_2 shows harmful impact of globalization on environment. The government should motivate the industries to shift their devotion to achieve economic growth through technological change, by adopting clean energy sources and climate action program (SDG13).

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