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Research Article

The Impact of Financial Development and Green Financing on Economic Growth: An ARDL Estimation

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Declaration of interests

The authors declare no financial or personal conflicts of interest.

Abstract

This research investigates the influence of financial development and green financing on Pakistan's economic growth. Financial development is assessed through two sub-dimensions: financial value added by manufacturing and financial value added by services. Additionally, population and education serve as control variables to assess their impact on economic growth. Data from 1990 to 2020 was utilized for analysis using EViews v10 in Time series. Statistical tests including descriptive statistics, F-bound cointegration tests, and ARDL models were employed to test hypotheses. Diagnostic tests were also conducted to ensure data clarity and generalizability. The findings reveal that financial development positively and significantly affects economic growth in both the short and long run. Moreover, green financing demonstrates a positive and significant impact on long-term economic growth but remains insignificant in the short term. Findings suggest that fostering financial development, and integrating green financing initiatives into economic policies can further bolster sustainable development efforts, aligning with global environmental goals. Policymakers can use these insights to design targeted strategies aimed at leveraging financial sector growth and sustainable financing practices to enhance Pakistan's economic resilience and prosperity. Nevertheless, this study is limited by its focus solely on Pakistan, with only 31 yearly observations. Future research could enhance the study's applicability by utilizing panel data from various countries.

Keywords: Financial Development, Green Finance, Economic Growth, ARDL Estimation.

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1 INTRODUCTION

Financial growth may expand economic competence by decreasing capital risk and financial costs, as well as encouraging unpolluted technology by increasing FDI inflows, activities of the stock market and banking (Shah et al., 2019). An increase in Foreign Direct Investment (FDI) can subsidize ecological degradation, because FDI frequently flows directly into resource exploitation, infrastructure, and industrial activities (Gök, 2019). The financial sector comprises financial institutions, markets, and legal and governing structures that facilitate credit transactions. Financial development occurs when financial markets and intermediaries cut the cost of "information, regulation, and transactions while also improving the performance of the financial sector's important role in the economy (World Bank 2016).

For sustainable development preferences, the level of financial flows from the public, private, and non-profit sectors should be increased. Currently, the industry has become the main energy consumer and carbon emitter; therefore, for sustainable development, economic growth, and safe environmental impacts, adopting green business practices such as green financing is becoming a priority. Green Financing has emerged in the past few decades, and companies have mainly focused on it. Green financing plays a vital role in achieving the environmental goals. Creating a green environment is the primary purpose of organizations. The economy grows if the financial sector develops. Not only does green economic growth necessitate economic development, it also necessitates social equity and long-term sustainability. Green economic development must consider the optimization of the ecological environment. The uncertain economic growth rate, payment crisis, import-oriented economy, lump sum debts, and deprived taxation structure have encouraged current account and fiscal deficits, which consequently depresses foreign investors' concentration in Pakistan. In the provision of FDI to Pakistan, it is compulsory to come up with an improved taxation policy and money laundry regulations to come off the FATF Gray list.

In the current economic situation, holding FDI is unavoidable for countries like Pakistan to lift the industrial and services sectors and generate jobs to aid the elimination of unemployment rates in the country. However, regardless of the improved security conditions in previous years, Pakistan's FDI plunged and did not record notable growth, which in the long run could hurt the economy of Pakistan. There is a set of economic and non-economic contributors that account for curtailed FDI inflows (Asif et al., 2018). FDI is measured as a building block in Pakistan's economy, as it has been focusing on increasing the GDP ratio by inviting foreign direct investment (FDI) for many years. Presently, Foreign Direct Investment in Pakistan attained an average point of 158.61 USD Million from 1997 to 2021, arriving at a matchless of 1262.90 USD Million highest in June 2008 and - 390.90 USD Million as the lowest recorded in October 2018. Pakistan's Foreign Direct Investment (FDI) expanded by 167.6 USD million in March 2021, contrasted with an increment of 155.1 USD million in the earlier month. The main economic sector in Pakistan is agriculture, which contributes 18.76% of the GDP, followed by the GDP share of 19.74% in the industrial sector. The service sector contributes 61.52% of Pakistan's GDP (Nawaz et al., 2021). There has been a steady decrease in the growth rate of Pakistan's GDP, mainly due to the poor performance of the economic sectors caused by various political and environmental issues (Hassan et al., 2019; Nawaz et al., 2021).

The awareness of eco-consciousness will spread and lead to green innovation (Nawaz et al., 2021), hence, development through green financing, in the form of green securities, green investments, and green credits, can improve Pakistan's ranking in the world economy (Zhang, Wang, & Wang, 2012). Financial development comprises the expansion and establishment of markets and institutions that can support this process of growth and investment. The governmental policies and regulations of financial institutions have a profound impact on a country's economic sectors' financial development, mainly because they affect the financial sources of an enterprise (Mahmood, 2013). Since the service sector covers a major portion of the country's economy, we see that it affects other economic sectors because it provides the required financial resources (Luqman et al., 2019). The government of Pakistan has been developing infrastructure to support macroeconomic policies for the financial sector, which has been strictly controlled. However, the money market was underdeveloped, with non-existent equity and bond markets and commercial banks' lending mostly to minor concerns instead of priority sectors (Mahmood, 2013).

This study has four sub-objectives i.e., to check the impact of financial development on the Economic Growth of Pakistan; to examine the contribution of manufacturing and servicing on the economic growth of Pakistan; to investigate the impact of green financing on economic growth; and lastly to study the short- and long-run effects of financial development and green financing on Pakistan's economic growth. Green financing is an emerging concept that has attracted scholars (Dörry & Schulz, 2018) to signify its importance in obtaining a sustainable economy that is nature-friendly. It should be noted that despite the literature, no study has examined the combined impact of FD and Green financing on the financial growth of Pakistan. To fill this gap, this study is the only to explore the relationship between

financial development, green financing, and financial growth in Pakistan. This study does not explore the link between these, but the main motive behind this effort is to understand how these enablers can be utilized at maximum. What tools can be used to ensure successful implementation of FD and green financing?

2 LITERATURE REVIEW

According to the finance theory, a well-developed and well-operating financial and economic industry plays an important role in the economic growth of a country. Effective and efficient incorporation of investment assets into the economic market is essential for a well-developed economic system. According to this theory, with the help of effective financial procedures, the economy's petrified assets largely move from savers to mortgagors (Lagoarde-Segot & Martínez, 2021). Savers offer spare revenue to the business mechanism with the potential to attain the largest rate of return (RoR) in the future. In contrast, mortgagors need capital from a similar procedure or method to forecast that they will be compulsory to repay the capital with the interest rate in the future (Ang, 2018). Therefore, financial development plays a significant and direct role in economic growth. This theory also states that the equity marketplace is fundamental in developing growth in which policy and plan phase modifications are spread across the entire region or state(Lakshmi, 2018). The SMI movement is one of the major dynamics which directly influence the financial evolution of a country and may also have some useful applications for macroeconomic variables to attain the desired results(Kayed et al.). This market index is largely impacted by macro variables, such as the inflation rate, exchange rate, and interest rate. Moreover, this theory proposes that there is a direct association between macro-variables in both the short and long run. For example, if the State Bank upturns the interest rate or ER from its earlier degree, the policy phase will hint at financiers determining the capital market for funds if further macro variables do not alter. (Львова et al., 2019). In contrast, if the ER is minimized by the State Bank from its previous level, this modification would also be a clue for creditors to move their capital into the SME, providing a reward, which directly affects the level of SMI.

2.1 Financial Development and Economic Growth

Numerous empirical investigations employing time series or panel data have consistently demonstrated a positive relationship between financial development and national economic growth. For instance, research conducted by Fathima Rinosha and Mohamed Mustafa (2021a) revealed a favorable association between financial development and economic growth in Sri Lanka. Mehmood et al. (2015) also identified a long-term bidirectional link between financial development and economic growth.

In a study spanning six ASEAN nations from 1995 to 2015, HO et al. (2021) provided evidence of a bidirectional relationship between financial development and economic growth, particularly when incorporating trade openness into their empirical model. Similarly, Fathima Rinosha and Mohamed Mustafa (2021b) found a positive association between financial development and economic growth in Sri Lanka. Moreover, Mehmood et al. (2015) identified a long-term bidirectional relationship between financial development and economic growth using data from 12 Asian nations spanning from 1970 to 2012, employing a panel autoregressive distributed lag (ARDL) model.

Assessment of institutional quality, encompassing aspects such as government size, taxes, property rights security, access to sound money, internal trade freedom, and regulatory frameworks, was conducted using the economic freedom indicator from the Fraser Institute, as detailed by Maier and Miller (2017). Conversely, Effiong (2015) did not find evidence of institutional intermediation affecting the finance-growth nexus in 21 Sub-Saharan African nations from 1986 to 2010. However, Effiong did note a positive impact of institutional quality on economic growth. Observations by Kacho and Dahmardeh (2017) indicated that both institutional and financial development contributed to economic growth in OECD nations from 2002 to 2014, with institutions playing an intermediating role in the finance-growth nexus

Furthermore, Vo and Zaman (2020) explored the mediating effects of energy consumption on carbon emissions in the relationship between financial development and economic growth across 101 countries from 1995 to 2018. Employing various statistical techniques, they found that while energy demand and foreign direct investment (FDI) inflows increased carbon emissions, financial development led to a reduction in emissions globally. An examination of 43 developed and developing nations conducted by Mishra and Narayan (2015) reveals that financial growth tends to positively (negatively) impact economic growth, particularly when a country's financial expansion surpasses the average. Moreover, Ibrahim and Alagidede (2017) provide additional evidence suggesting that a well-developed financial sector can help mitigate the effects of real (financial) shocks on the business cycle and diminish the components of long-term volatility.

In contrast, research by Ibrahim and Alagidede (2018b) conducted in sub-Saharan Africa indicates that although financial growth positively influences economic growth, its impact is less pronounced below a certain threshold, particularly affecting economic activities at regional borders. Additionally, the financial industry's role in promoting economic growth may inadvertently lead to increased energy consumption, potentially resulting in unforeseen environmental consequences, as noted by Shahbaz et al. (2018), Katircioglu and Taspinar (2017), and Cetin and Ecevit (2017). Studies by Abbasi and Riaz (2016) in Pakistan, Dogan and Seker (2016) focusing on the top-ranking nations in the renewable energy attractiveness index, and Shahbaz et al. (2018) in France, all suggest positive ecological impacts associated with financial development. However, Javid and Sharif (2016) in Pakistan, and Salahuddin et al. (2018) in Kuwait, argue that financial development may have adverse environmental consequences. Furthermore, the relationship between FDI and the environment is identified as another critical aspect to consider. With the ASEAN region experiencing a significant surge in FDI flows, expected to continue rising in the future (ASEAN Investment Report, 2018), it becomes imperative to scrutinize the environmental implications of such substantial FDI inflows in the region. In light of these discussions, several hypotheses are proposed for further exploration.

H1: Financial development has a positive and significant impact on economic growth.

H1a: Financial value added by manufacturing has a positive and significant impact on economic growth.

H1b: Financial value added by service has a positive and significant impact on economic growth.

2.2 Green Financing and Economic Growth

Green money is a new form of financial instrument designed to address environmental issues and spur financial progress in the field of environmental preservation (Wang et al., 2019). Many qualities of green money are similar to those of traditional monetary management. Therefore, financial and green financial growth may aid economic development. Owing to the short duration of green financial growth, relevant research (He et al., 2019). The growth of the green economy doubles when green investments in renewable energy are made. Long-term economic growth will be aided by green investments in green energy reforms. Green financing poses a broad challenge to existing legal financial systems in each corner of the world. According to this study, this can help solve environmental issues. In America, financial experts (Luo, Yu, & Zhou, 2021) have emphasized the importance of finance in protecting the environment and promoting long-term economic development. The research conclusions of domestic scholars (Yin & Xu, 2022) and (X. Wang & Wang, 2021) are the same as those of scholars. (Ou, 2005, He, Jiang, & Wang, 2006; X. Wang & Wang, 2021) while others hold similar views.

Assure (H. Zhou & Xu, 2022) consider green finance as a financing method for promoting long-term economic development, that is, investing funds raised in the financial market in the green sector to promote environmentally friendly economic development. (Li, Yuan, & Wang, 2019) The relationship between green finance development and ecological integration was discussed. Financial tools can be used to introduce more social resources into environmental protection industries, thereby altering the economic development model and promoting environmental protection. Economic growth is moving in the directions of sustainability and environmentalism. From the late 1960s to the early 1970s, Western academic research primarily focused on the mutual influence of the two, and on this basis, they once again emphasized the importance of financial development to economic growth.

Environmental issues began to play a large role in project financing in the 1990s. influincing and modifying the organizational processes that control borrowing decisions (Chowdhury et al., 2013). Green Financing is necessary for achieving green growth. During the current pandemic period, green financing has facilitated a green economy. The World Health Organization also considers climate change to be the most serious global health threat in the 21st century (Klioutchnikov & Kliuchnikov, 2021). Defense requires economic prosperity (Pradhan et al., 2018). Financial markets have grown more unpredictable and unstable since the 2008 financial crisis (Assaf, 2016) Excessive financial expansion, according to several research, is a barrier to economic growth (Ibrahim & Alagidede, 2018a). Consequently, whether green financing can promote the economy is currently being investigated. Consequently, whether green financing can promote the economy is currently being investigated.

H2: Green Financing has a positive and significant impact on Economic Growth.

Figure 1 presenting the graphical representation of research framework.

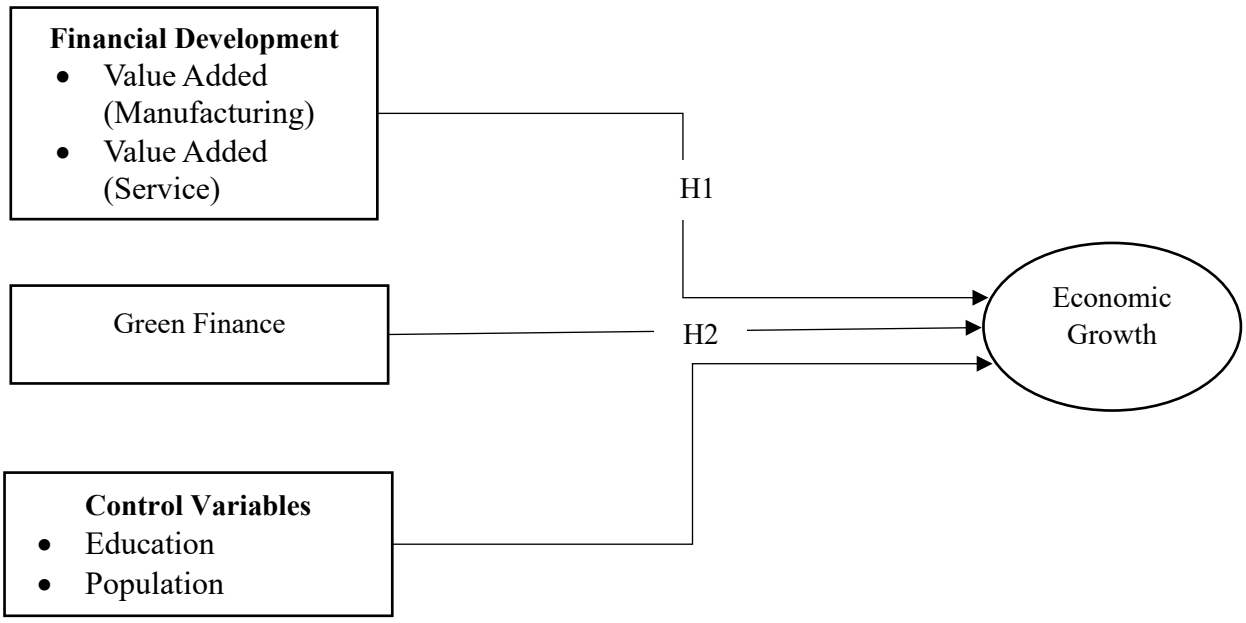

Figure 1. Research Framework

3 RESEARCH METHODOLOGY

In this study, we have three variables and two control variables: Green Financing and Financial development are the independent variables; Economic Growth is the dependent variable; and GF and FD influence economic growth. The time series data for Pakistan were collected from the World Bank Indicator for the years 1990 to 2020. According to (Etikan & Bala, 2017), a probability sampling approach knows the potential or probability of a topic or component being included in a sample, or even the probability of someone being selected. When the topic or element included in the sample is unknown, a nonprobability sampling approach is used. The use of a non-probability sample strategy, unlike sampling design approaches, restricts the generalization of the study results. This investigation is conducted from Pakistan time series panel data by applying the ARDL model number of observations is 31 and data from the year 1990 to 2020 total of thirty-one years' data is taken from the World Bank indicator.

3.1 Sampling Techniques

probability and non-probability Sampling are the main types of sampling processes employed by researchers. Probability sampling allows researchers to specify the likelihood of a particular element (participant) being included in a sample. With nonprobability sampling, there is no way to determine how likely an element is to be included in a sample. If the purpose of the researcher is to generalize the findings from a sample to the full population, probability sampling is far more useful and precise. Nonprobability sampling, On the other hand, is far more complicated and expensive. Other terminologies for probability sampling include random and deliberate sampling. Random selection is the method of selecting elements from a population (subjects and test objects).

3.2 Measurement of variables

Table 1 demonstrates the variables and their measurement proxies as collected for the data analysis to complete the study and test the hypotheses.

Table 1. Variable Measurement

Variables	Proxies
Financial Development	FVM = "manufacturing, value added (% of GDP)" FVS = "Services, value added (% of GDP)"
Green Financing	Renewable consumption in kilotons
Economic Growth	Gross domestic Products in USD
Population	Numbers of Heads in Pakistan
Education	Literacy rate, adult total (% of people ages 15 and above)

3.3 Econometric Model

Based on the theoretical framework of this study, the following econometric model was developed to run various regressions:

$$EG_t = \alpha_0 + \alpha_1 FD_t + \alpha_2 FVM_t + \alpha_3 FVS_t + \alpha_4 GF_t + \alpha_5 ED_t + \alpha_6 Pop_t + \varepsilon_t$$

The above equation is a generalized form of the model proposed in the current study. Where EG is the dependent variable FD, FVM, FVS, and GF are the independent variables, and ED and Pop are the control variables.

Additionally, the present study employed the Autoregressive Distributed Lag (ARDL) model using EViews to examine the interrelationships among the variables. The ARDL bond test was initially conducted to verify co-integration among the variables. The equation for the bond test is expressed as follows:

$\Delta EGt=\alpha 0+\sum\delta 1\Delta EGt-1+\sum\delta 2\Delta FDt-1+\sum\delta 3\Delta FVMt-1+\sum\delta 4\Delta FVSt-1+\sum\delta 5\Delta GFt-1+\sum\delta 6\Delta EDt-1+\sum\delta 7\Delta Pop t-1+\varphi 1EGt-1+\varphi 2EDt-1+\varphi 3FVMt-1+\varphi 4FVSt-1+\varphi 5GFt-1+\varphi 6EDt-1+\varphi 7Popt-1+\varepsilon 1$ ΔEGt=α0+∑δ1ΔEGt−1 +∑δ2ΔFDt−1+∑δ3ΔFVMt−1+∑δ4ΔFVSt−1+∑δ5ΔGFt−1+∑δ6ΔEDt−1+∑δ7ΔPopt−1+φ1EGt−1+φ2EDt−1+φ3 FVMt−1+φ4FVSt−1+φ5GFt−1+φ6EDt−1+φ7Popt−1+ε1

When co-integration is confirmed, the Error Correction Model (ECM) is estimated, with the equation represented as follows:

$\Delta EGt=\alpha 0+\sum\delta 1\Delta EDt-1+\sum\varphi 2\Delta FVMt-1+\sum\omega 3\Delta FVSt-1+\sum\theta 4\Delta GFt-1+\sum\phi 5\Delta EDt-1+\sum\zeta 6\Delta Popt-1+\delta ECMt +\nu t$ ΔEGt=α0+∑δ1ΔEDt−1+∑φ2ΔFVMt−1+∑ω3ΔFVSt−1+∑θ4ΔGFt−1+∑ϕ5ΔEDt−1+∑ζ6ΔPopt−1+δECMt+νt

Moreover, Granger causality tests were conducted to investigate the directional causality between the variables. The estimation models for the Granger causality test are outlined as follows:

$Yt=\beta 0+\sum j=1\beta 1jYt-1+\sum h=1\beta 2hYt-p+\varepsilon t$ Yt=β0+∑j=1β1jYt−1+∑h=1β2hYt−p+εt

$Xt=\alpha 0+\sum s=1\alpha 1sYt-s+\sum t=1\alpha 2tXt-m+\varepsilon t$ Xt=α0+∑s=1α1sYt−s+∑t=1α2tXt−m+εt

4 RESULTS AND ANALYSIS

A descriptive analysis of the data was performed to assess whether the descriptive features of the data were appropriate. In this regard, the mean values along with the minimum and maximum values of all variables were assessed to ensure that no outliers were present in the study.

Table 1. Descriptive Statistics

Indicators	GDP	FVA	FVS	GF	EDU	POP
Mean	1.46E+11	2.86E+10	7.55E+10	48.94240	56.24803	1.62E+08
Median	1.20E+11	2.39E+10	6.17E+10	47.96210	55.92563	1.60E+08
Maximum	3.15E+11	5.63E+10	1.66E+11	58.09129	60.83179	2.21E+08
Minimum	4.00E+10	8.94E+09	1.73E+10	41.09410	52.80589	1.08E+08
Std. Dev.	9.11E+10	1.67E+10	4.97E+10	4.536516	2.890323	34319723
Skewness	0.460329	0.356673	0.439345	0.153221	0.207782	0.092586
Kurtosis	1.728234	1.486248	1.738352	2.367626	1.514827	1.815873
Probability	0.203522	0.163894	0.217261	0.726938	0.215225	0.395460
Observations	31	31	31	31	31	31

Table 1 presented descriptive statistics where the kurtosis against each variable is 0.05 for all five variables of the study, and the skewness statistics of all five variables range from −1 to +1. Hence, these results indicate that the current data are normal and adequate; therefore, they can be used for the main analysis.

In this review, five (5) different data rules were used (Table 2): probability proportion (LR), final expectation blunder (FPE), Akaike data standard (AIC), and Schwarz data basis (Dörry & Schulz). Hannan-Quinn data standard (HC). The appropriate length of slacks for the integration test in this study was set to lag 3 because it was chosen by all five in the VAR specification.

Table 2. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	190.5937	NA	7.57e-14	-13.18526	-12.89979	-13.09799
1	484.3236	440.5949	8.17e-22	-31.59454	-29.59624	-30.98364
2	564.7132	86.13167	5.10e-23	-34.76523**	-31.05409**	-33.63069
3	680.9847	74.74595*	6.13e-25*	-40.49890*	-35.07493*	-38.84074*

F-statistics are calculated to measure the lag length under the UECM, which is adjacent to the upper and lower critical values. In Table 3, for the f-statistics above the critical upper value (5%) significance level, the variables are said to be cointegrated when the null hypothesis of no cointegration is disproved.

Table 3. F-bound test

F-Bounds Test		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	284.2540	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	30		Finite Sample: n=30	
		10%	2.407	3.517
		5%	2.91	4.193
		1%	4.134	5.761

Table 4. ARDL – Long Run

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP(-1)	-0.068452	0.033635	-2.035140	0.0553
FVS	0.754569	0.033908	22.25336	0.0000
FVA	0.256318	0.031666	8.094311	0.0000
GF	-0.107769	0.092586	-1.163995	0.2581
GF(-1)	0.290227	0.091847	3.159883	0.0049
POPULATION	11.69388	3.145489	3.717667	0.0014
POPULATION(-1)	-11.39682	3.196035	-3.565924	0.0019
EDU	-0.122978	0.044531	-2.761631	0.0120
EDU(-1)	0.123837	0.035052	3.532990	0.0021
C	-4.209792	2.203693	-1.910335	0.0705

R-squared	0.999863	Mean dependent var	25.53771
Adjusted R-squared	0.999801	S.D. dependent var	0.655030
S.E. of regression	0.009247	Akaike info criterion	-6.267860
Sum squared resid	0.001710	Schwarz criterion	-5.800794
Log-likelihood	104.0179	Hannan-Quinn criter.	-6.118442
F-statistic	16166.96	Durbin-Watson stat	1.966290
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for the model:
Dep: GDP

4.1 Hypothesis Testing

We proceeded to evaluate the long-term effects of these variables on GDP using the ARDL framework. The long-term assessments presented in Table 4 reveal that financial value services, financial value manufacturing, green financing, education, and population exert a positive influence on GDP. Specifically, the long-term estimates depicted in Table 3 suggest that a percentage increase in financial value services, financial value manufacturing, green financing, population, and education leads to a respective increase in GDP by 75%, 25%, while showing a decrease by 10.7%.

Furthermore, the table provides an R-squared value, indicating the degree to which variations in the dependent variable are explained by the independent variables. Here, the R-squared value exceeds 0.9, signifying a strong fit of the regression model and indicating that 99% of the variation in the dependent variable can be attributed to the independent variables. The adjusted R-squared, which accounts for the number of predictors in the model, also demonstrates a high correlation. The standard error of regression (SE) serves to gauge the average deviation of observed values from the regression line, offering insights into the accuracy of the regression model in terms of the response variable units.

Continuing from the earlier ARDL method results suggesting a long-term cointegrating relationship, the study proceeds to conduct a comprehensive short-term analysis. Table 4 presents key findings, notably highlighting the negative and statistically significant coefficient of the lagged ECMt-1 at the one percent level. This significant observation further reinforces the presence of cointegration among the variables, consistent with the model's indications. The integration of the ECM into the dynamic model is pivotal. Beyond merely identifying cointegration, the ECM serves a crucial function in adjusting and restoring equilibrium within the system. By accounting for short-term deviations from long-term equilibrium, the ECM enhances the model's accuracy in capturing dynamic relationships among the variables under scrutiny. Thus, it not only validates the long-term relationship but also provides insights into short-term dynamics, offering a more nuanced understanding of the phenomenon under investigation.

Table 4. ARDL Error Correction Regression

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Ringle et al.)	-0.107769	0.068193	-1.580364	0.1297
D(POPULATION)	11.69388	0.226402	51.65107	0.0000
D(EDU)	-0.122978	0.009061	-13.57272	0.0000
CointEq(-1)*	-1.068452	0.021008	-50.85972	0.0000

R-squared	0.990627	Mean dependent var	0.062718
Adjusted R-squared	0.989545	S.D. dependent var	0.079317
S.E. of regression	0.008110	Akaike info criterion	-6.667860
Sum squared resid	0.001710	Schwarz criterion	-6.481034
Log-likelihood	104.0179	Hannan-Quinn criter.	-6.608093
Durbin-Watson stat	1.966290		

Dependent Variable: D(GDP)

4.2 Granger Causality Tests

The Granger causality test is employed to assess causal relationships deliberately. It examines the interaction between two variables to determine Granger causality. The tests conducted, as shown in Table 6, elucidate the working relationship between these dependencies. This method is specifically utilized to gauge causality between variables and is formally recognized as the Granger causality test.

In the Granger causality test, the null hypothesis states that one variable does not causally influence the other, while the alternative hypothesis proposes the opposite. Rejecting the null hypothesis indicates that variable X causes a

significant effect on variable Y. This test is systematically conducted for the values of Y in Equation X. When variables are co-integrated, it is anticipated to observe either unidirectional or bidirectional Granger causality between them. This exploration helps unveil the directional relationships between the variables, shedding light on their interdependencies and causal dynamics.The results obtained from the Granger causality test indicate a unidirectional causal relationship, with FD influencing GDP positively, suggesting that increased investment in FD leads to a rise in GDP. Moreover, unidirectional causality is observed from GF to GDP, population to GF, GF to population, GDP to population, and population to GDP.

Table 5. Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
FVM →/EG	28	2.43964	0.1094
EG →/FVM		14.2054	0.0001
FVS →/EG	28	3.51057	0.0467
EG →/FVS		2.06826	0.1493
ED →/EG	28	5.17088	0.0140
EG →/ED		2.72601	0.0866
GF →/EG	28	10.7508	0.0005
EG →/GF		7.44887	0.0032
POP →/EG	28	2.07018	0.1490
EG →/POP		0.77086	0.4742
FVS →/FVM	28	1.86905	0.1770
FVM →/FVS		3.43340	0.0496
ED →/FVM	28	68.3990	2.E-10
FVM →/ED		0.82608	0.4503
GF →/FVM	28	31.9752	2.E-07
FVM →/GF		17.2119	3.E-05
POP →/FVM	28	4.12567	0.0294
FVM →/POP		0.81909	0.4533
ED →/FVS	28	4.66885	0.0199
FVS →/ED		0.28542	0.7543
GF →/FVS	28	0.02502	0.9753
FVS →/GF		9.84678	0.0008
POP →/FVS	28	4.08811	0.0303
FVS →/POP		1.31509	0.2879
GF →/ED	28	3.63188	0.0426
ED →/GF		24.3083	2.E-06
POP →/ED	28	2.53743	0.1010
ED →/POP		1.69060	0.2065
POP →/GF	28	17.5545	2.E-05
GF →/POP		1.15026	0.3341

Variables (GDP) and independent variables: financial development, green financing, education, and population.

4.3 Diagnostic Testing

Furthermore, in line with the methodology recommended by Pesaran and Smith (1998), the study utilized the CUSUM and CUSUMQ tests to rigorously examine the ongoing stability of the model's coefficients. By doing so, it not only strengthened the credibility of the analysis but also provided valuable insights into the robustness and reliability of the research findings.

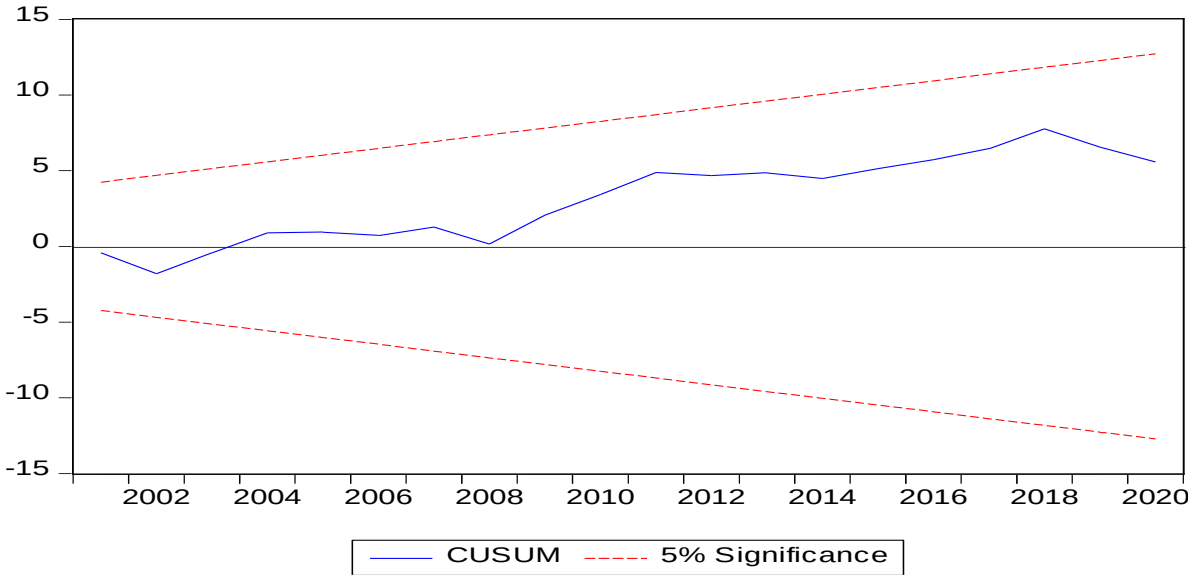

Figure 2. CUSUM

The CUSUM test plot illustrated in Figure 2 reveals a consistent stability in the recursive residuals over the entire study duration, as evidenced by the full coefficients of the estimated model consistently lingering near the 5% critical boundaries. This observation aligns with the explanation provided by Pesaran and Smith (1998), where the null hypothesis for this test asserts the constancy of the vector's coefficient over time.

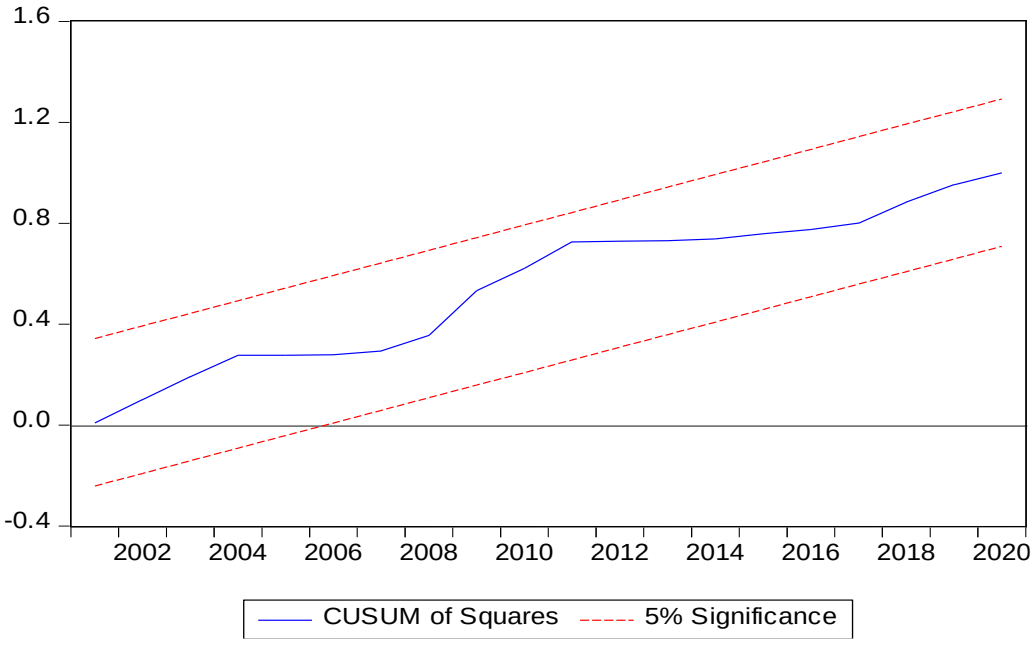

Figure 3 Square of CUSUM

Second, in Figure 3, the CUSUM of squares is plotted to determine whether the variance of the regression error is incorporated in the changing set of parameters, particularly near the conclusion of the sample, because the accumulative sum of squares is frequently inside the 5% significance lines, and the CUSUMSQ test results in Figure 3 suggest that the residual variance is very constant.

Table 7. Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.240962	Prob. F(9,20)	0.0638
Obs*R-squared	15.06298	Prob. Chi-Square(9)	0.0892
Scaled explained SS	4.498263	Prob. Chi-Square(9)	0.8757

The Breusch-Pagan test serves to identify the presence of heteroscedasticity in a regression model. It evaluates the following null and alternative hypotheses: H0 (Null Hypothesis): Homoscedasticity is present, indicating that residuals are distributed with equal variance. If the p-value derived from the test falls below a predetermined significance level (e.g., $\alpha = 0.05$), we reject the null hypothesis, suggesting the presence of heteroscedasticity in the regression model

5 DISCUSSION AND CONCLUSION

5.1 Discussion on Hypotheses Results

With industrial evolution, energy consumption has increased due to pollution. Thus, adapting to green financing in the current competitive economic culture has become crucial for organizations. However, a few challenges affect the applicability of green financing and financial development to increase economic growth. Thus, this study is an exertion led in Pakistan to see how financial value service and manufacturing impact economic growth. We also measure the impact of green financing on economic growth. By boosting the savings rate, mobilizing and pooling funds, creating investment information, enabling and promoting foreign capital inflows, and optimizing capital allocation, it fosters economic growth through capital accumulation and technical advancement TARIQ et al. (2020). As the economy grows, so does the need for financial services, which benefits financial development. FDI has an overall positive and significant impact on Pakistan’s economy, both in the long and short run. One of the reasons for the positive impact is that financial development brings about advanced technology and investment, enhancing the country's economy.

Bist (2018) also advocated for the positive impact of financial development on economic development in his study conducted in African low-income countries. The empirical data of Ahad et al. (2019) suggest that financial development and savings have favorable long-term and short-term influences on industrial expansion. Thus, financial development plays a significant role in understanding industrial production. According to Asteriou and Spanos (2019), financial development promotes economic development by creating goods and services, providing job opportunities, and improving GDP, which eventually helps boost economic growth in any country.

Increasing the proportion of green practices to enhance sustainable economic growth is not just a choice but a necessity. To investigate this, the relationship between green financing and economic growth is examined through the development of H2. The statistical results of our study reveal a positive correlation between green financing and economic growth, echoing the findings of Ngo et al. (2021), who similarly concluded that green finance positively impacts Vietnam's economic growth. Additionally, according to Volz (2018), green finance has spurred green investments in Asia, thereby bolstering economic development. Nawaz et al. (2021) further argue that green financing injects credit and investment into the market, thereby fostering economic expansion. Consequently, with regards to sustainable economic growth, the evidence suggests that "the implication of financial development and green financing presents a novel approach to curbing pollution resulting from industrial growth on the environment in Pakistan

5.2 Implications of the Study

This study’s contribution to the financial development and green finance literature is multidimensional. First, it responds to requests for more rigorous theory-based research to address the imprecision and scarcity caused by the lack of existing theoretical methods, thus expanding the authors' knowledge of financial development, particularly in Pakistan. Financial development has been extensively studied and has strong literature, but it has not been specifically studied in the manufacturing and service sectors. Thus, this study is one of its kind of study that is going to articulate financial values manufacturing and financial values service literature in the Pakistani context. Furthermore, green financing is predominantly viewed as a financial tool, but it is the least understood concept in the Pakistani context, particularly its relation to economic growth, which has not been fully explored.

The practical repercussions of this study are necessary, as they ratify many important useful contributions to environmental protection and economic growth. It is undeniable that in recent times working sustainably is inescapable

for the survival of sustainable economic growth. This study provides guidelines that direct business organizations to information on plans and schemes to overcome undesirable outcomes of energy consumption. Sustainable development has become a universal goal, with countries worldwide pursuing green finance initiatives. This research aims to align financial practices with environmental sustainability, a cornerstone of sustainable economic progress. Consequently, the study underscores the significance of green financial development in fostering economic growth. It advocates for the adoption of various green financing mechanisms, including green credit, securities, insurance, investment, and foreign direct investment, within Pakistan's manufacturing and service sectors. Importantly, it provides guidance to manufacturing firms on integrating green finance principles to promote eco-friendly business strategies, thus optimizing economic growth and productivity. Our findings offer valuable insights for companies seeking to minimize energy consumption and leverage financial tools conducive to economic advancement. Moreover, this serves as a guide for managers to equip employees with green training that steers them to craft their working practices in a way that follows green financing and economic growth.

5.3 Limitations and future research indications

Without denying that this research is highly beneficial in terms of both practice and theory, it is not devoid of flaws and limits. These flaws present an opportunity for scholars, which may be filled with more research. First, this study used a longitudinal time series design, which is a time-consuming approach and makes it difficult to generalize from a single study, trouble obtaining acceptable metrics, and difficulties precisely finding the right model to capture the data. However, future investigations can follow a cross-sectional design to avoid time consumption, as it obtains data in a shorter period and filters more generalized output. Additionally, the current study is directed only at Pakistan; another researcher can also explore more data by using the WDI for more countries. Future researchers can also plan study projects in other emerging nations, such as India and Bangladesh, where green industry is rapidly expanding. In addition, the current literature was based on common method bias, and the current research used only quantitative methods such as time series to capture the entire phenomenon owing to less expensive and accurate data, and the researcher is concerned that results may shuffle if a different approach is used.

5.4 Conclusion

The acceptance of green financing has become inexorable for businesses in the current changing environment, where sustainability and environmental protection are highly emphasized. The manufacturing and service industries have been heavily taped by this concept. These industries now strive for new approaches to achieve economic growth and maintain energy consumption and pollution by promoting sustainability through financial development and green financing. To establish a sustainable and ecological-proof industrial culture, organizations should be encouraged to adjust their operations according to environmental needs concerning suitability. The purpose of this study is to emphasize the importance of financial development and green financing in Pakistan's economic progress. For this purpose, this study collected data related to the financial and green financial development of Pakistan's economic growth from 1970 to 2020 from the World Development Indicators (WDI) database has been used. Different measures of financial development, such as financial value manufacturing and financial value services, have been used to arrest the development of economics. Financial development and green financing are the key enablers of economic growth. Keeping this view in mind, this study statistically studied the relationship between financial development (FVM, FVS), green financing, and economic growth, and concluded that financial development and green financing have a positive impact on the economic growth of Pakistan.

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