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Nexus of Green Finance, Financial Development and Economic Growth: Empirical Evidence from Worldwide

by

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Dedicated to my family who dedicated their lives to teach me how to step forward...!

CERTIFICATE OF APPROVAL

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Abstract

The purpose of this study is to investigate the connection that exists between green finance, financial development, and economic development together with the macroeconomic elements that support these relationships. This study aims that financial development effectively integrates the mediation effect between economic growth and green finance. This study uses panel data estimation techniques to investigate the relationship between green finance, financial development, and economic growth worldwide from 2000 to 2021. Structural equation model and generalized method of moment incorporated. The impact of indirect effect on the growth of the economy with the help of financial development. The result shows green finance has a positive and significant impact on economic growth. Government should implement such polices which promote green finance. Green finance leads to economic growth and helps uplift the financial status of the country.

Keywords: Economic Growth; Green Finance; Financial Development; Exchange rate; Interest Rate; Inflation.

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Abbreviations

EG	Economic Growth
EX	Exchange Rate
FD	Financial Development
GF	Green Finance
INF	Inflation
INT	Interest Rate

Chapter 1

Introduction

1.1 Background of the Study

The relationship between green finance, economic growth and financial development is complicated and varied. Green finance basically refers to a financial instruments and services which encourage environmentally friendly practices and investments with the goal of addressing environmental concerns such as climate change, pollution, and resource depletion.

For the financial development around the worldwide, green finance is going to be the backbone of Economic growth of the modern era. Economic growth is crucial to the country's progress. With a strong economy, countries can compete for better resources, enhanced stability and can enjoy a reputable status on the globe. Economic expansion has raised living standards in developed countries, it has a vital role in increasing carbon emissions which is responsible for declining natural resources, (Mardani, Streimikiene, Cavallaro, Loganathan, & Khoshnoudi, 2019). Due to its keen importance, the variable has been studied by respective authors in different aspects. Along with that, the factors that influence the economic growth rate in countries have been examined thoroughly. Each country gives special importance to macro-level factors, i.e. inflation, interest rates, exchange rates and tax rates to improve the economic and financial health, as these variables have significantly affected economic growth within a country (Max Corden, 1990; King & Levine, 1993).

The intended study has a major chunk of target 8.4 of SDG 8 as scope of work. The idea of Green Finance is strengthening the background of decoupling the economic growth from environmental degradations. Goal no-08, Promote equitable and sustainable economic growth, full and productive employment, and decent work for all according to the 10-Year Framework of Programs on Sustainable Consumption and Production, developed countries should take the lead in gradually improving global resource efficiency in consumption and production through 2030 and working to decouple economic growth from environmental degradation. This is in line with goal 08 target 8.4, which sheds light on the accordance of Green Finance and economic growth.

SDGs goal-08 target 8.1, sustain per capita economic growth in conformity with national conditions; For the least developed nations, this entails sustaining yearly GDP growth of at least 7%, as measured by the real GDP per capita growth indicator. The country's financial sector is generally accountable for the economy's growth. Advancement in the economic sector greatly causes the whole financial growth, as there are strong links between financial and Economic growth (Sadorsky, 2010). Once the refer to financial constancy, that means they are declaring economic steadiness (Shahbaz, Nasir, & Roubaud, 2018), but with the segment of time due to increasing environmental concerns, the financial experts and econometrics focus diverted towards environmental factors that mainly affect is economic growth. Environmental factors had a great significance on Green Finance put effort on economic growth (Panayotou, 2016; Xepapadeas, 2005).

The developed economies such as European countries are putting importance on financial as well as environmental related factors and variables in enhancing their economic health and on improving economic growth for the sustainability of the environment because nations can attain financial and economic growth while avoiding environmental deprivation (Afzal, Rasoulinezhad, & Malik, 2021). Thus, the study focuses on economic growth in respective European economies investigating how a country's financial variables impact environmental factors which effect the economic development of the country. The number of variable studies include Green Finance, financial development, and economic growth concerning the following variable study, there is a study of macroeconomic variables to enhance

the economic growth variations which includes inflation, and exchange rate. Various variables have a great impact on economic growth. While shedding light on current and existing literature on economic growth and inflation shows, inflation affects economic growth (Akinsola & Odhiambo, 2017). Exchange rate also affects economic growth. Real exchange rate depreciation is closely tied to increased economic development (Hausmann, Pritchett, & Rodrik, 2005).

Simultaneously, due to rising environmental concerns, significant attention is being focused on environmental factors with mediating role of financial development while investigative the factors affecting economic growth. Green Finance is stated as a financial innovation, product designed to create mutually beneficial circumstances for both economic growth and development of environmental quality. It involves financing investments that yield environmental benefits, as stated by the international finance corporation (Zhang, Zhang, & Managi, 2019). Green finance, in contrast to traditional finance, places a higher priority on environmental issues and emphasizes environmental prevention as well as the effective use of efficient resources. Green finance eventually achieves environmental development by emulating the corresponding shift in financial practices, ecological balance, and environmental protection (Zhou, Tang, & Zhang, 2020). Y. Wang and Zhi (2016) highlights that the environment finance is novel financial model that links economic benefits and environmental protection. Khan and Senhadji (2003), the financial development stated as level of growth of the financial sector and economy, therefore more advanced countries more developed financial markets. Thus, the more advanced policies to develop the financial sectors would make to raise the economic growth.

Green finance leads to a green culture, modernization, globalization, a carbon-free economy, and reduces environmental concerns. On the other hand, the encouragement of nations to adopt the concept of a green economic recovery will cause an energy transition—decarbonizing the global economy by replacing fossil fuels with sustainable alternatives. This reduces dependency on non-renewable energy globally. There is a strong positive link between green financing and green economic growth. Consequently, with green financing tools, investments in green projects will increase, leading to more green economic growth.

This will create more job opportunities, improve welfare, develop economies based on green technologies, and reduce deaths caused by air pollution. Huang (2022) stated that green innovation can speed up with green finance support in countries with environmental problems. Therefore, this push for green innovation encourages countries to adopt green technologies, reduce their energy use, and move toward modernization.

In addition to helping to achieve social energy conservation goals, green finance whether in the form of institutional arrangements or market mechanisms also promotes sustainable economic growth (Soundarrajan & Vivek, 2016). Green finance is sluggish, which makes investors and financial institutions less enthusiastic about participating in the green field.

Therefore, through green finance quantity-constrained conditions coupled with firm reliance on market mechanisms, it will be a challenging task to achieve the potential needs of maintaining and upgrading the social ecosystem (Fang, Gao, & Sun, 2020; J. Frankel, Ma, & Xie, 2019).

Financial institutions have a great impact on environmental difficulties by acting as a worldwide engagement addressing the intensity of environmental sustainability. Green finance examined the relationship between financial development, carbon emissions, and Economic growth using various techniques (Fang et al., 2020; Hao, Wang, & Lee, 2020). The close link between economic growth and financial development encourages innovation and technological advancement Le and Ozturk (2020).

A research gap exists in understanding the indirect relationship involving financial development as a mediator between Green Finance and economic growth. Green finance, which directs capital towards environmentally sustainable projects, can be viewed as a form of capital growth that improves long term productivity and growth.

Green finance contributes to the development of a productive and sustainable capital stock through investing in energy efficiency, renewable energy, and other green technologies (Clark & Dickson, 2003). Research indicates that green investments lead to technological improvements and productivity gains, which are central to economic growth in the classical framework (Sadorsky, 2010).

1.2 Theoretical Background

The relationship between green finance, financial development, and economic growth can be effectively analyzed using both Classical Economic Theory and Endogenous Growth Theory. These theories offer different but comparable views on how these elements interact to drive economic progress. Harris (2007) Classical Economic Theory, which comes from Adam Smith and David Ricardo, focuses a lot on saving money and using resources well to make economies grow. According to classical economists, economic growth is largely driven by the growth of physical capital. Investments in capital goods, such as machinery, infrastructure, and buildings, enhance the productive capacity of the economy.

The framework is aligned with green financing, which provides funding for environmentally sustainable initiatives like energy-efficient technologies, renewable energy installations, and green infrastructure. These investments not only expand the economy's capital stock but also ensure that the growth is sustainable by minimizing environmental degradation (Smith, 1776; Ricardo, 1817). Another critical aspect of Classical Economic Theory is the efficient allocation of resources. Financial development plays a pivotal role in this process by mobilizing savings and channeling them into productive investments. Well-developed financial systems, characterized by deep and smooth markets, a variety of financial instruments, and strong regulatory frameworks, are better at assessing risks and returns. This efficiency ensures that resources are assigned to the most fruitful applications, including high- yield green projects. Empirical research supports this view, indicating that countries with advanced financial systems are more effective in directing resources towards sustainable investments, leading to better economic performance (Beck, Levine, & Loayza, 2000).

Classical Economic Theory also highlights the importance of financial markets in mobilizing savings and allocating resources efficiently (Ricardo, 1817). Financial development enhances financial markets' ability to mobilize and allocate capital to the most profitable uses, including green investments. Efficient financial markets reduce transaction costs and provide better information, leading to more optimal investment decisions (McKinnon, 1973). Studies suggest that financial

development helps economic growth by improving resource allocation, increasing productivity, and stimulating innovation (King & Levine, 1993).

This theory posits that economic prosperity is rooted in the productive use of resources and the accumulation of capital. For instance, Smith's concept of the "invisible hand" suggests that when individuals pursue their self-interest within a competitive market, resources are allocated efficiently, promoting overall economic growth (Smith, 1776).

Empirical research supports this view by showing that capital accumulation, particularly through investments in infrastructure and technology, significantly enhances economic productivity. Studies indicate that economies with higher rates of investment in physical capital tend to grow faster (Mankiw, 2010). Moreover, financial development, which raises capital allocation effectiveness, has been linked to higher economic growth rates (King & Levine, 1993)).

Endogenous Growth Theory, developed by economists such as Paul Romer and Robert Lucas, offers a more nuanced perspective by incorporating the roles of innovation, human capital, and knowledge spillovers in driving economic growth. Unlike classical theory, which treats technological progress as an external factor, endogenous theory considers it as an outcome of economic activities and investments. Endogenous Growth Theory posits that sustained economic growth arises from within the economy, primarily through innovation and technological advancements.

Green finance is crucial in this context as it funds research and development (RCD) in environmentally friendly technology, like energy storage systems, wind turbines, and solar panels. By supporting innovation, green finance fosters technological progress, which enhances productivity and promotes long-term growth (J. A. Frankel & Romer, 1999)(Lucas, 1988). Financial investments that promote environmentally sound activities are referred to as "green finance", renewable energy projects, and initiatives aimed at reducing carbon footprints. According to Endogenous Growth Theory, long-term growth depends on investments in technology and innovation. Green finance promotes innovation by funding research and development in clean technologies and sustainable practices, which can lead to more efficient resource use and new industries (Aghion et al.,1998).

1.3 Motivation of Study

Green finance and financial development have become more important in debates of economic strategies due to the pressing global concerns of climate change and environmental degradation, which have brought attention to the need for sustainable economic growth methods. Conventional economic development models are becoming less and less viable since they frequently rely on resource-intensive and ecologically harmful activities. Thus, it is important to investigate the ways in which financial development and green finance that is, financial investments in ecologically sustainable projects can work together to promote economic growth and reduce environmental dangers. Through investments in energy efficiency, renewable energy, and other green technologies, green financing promotes innovation and the creation of jobs. Concurrently, financial growth makes resource allocation more efficient, which supports these green investments and promotes stability in the economy. Despite the evident potential, the intricate connection between green finance, financial development, and economic growth remains underexplored. This research aims to bridge this gap by examining how these factors interact to promote sustainable economic development.

1.4 Problem Statement

The variables have been a center of attention in the past. The relationship between Green Finance and Economic Growth has been examined by Financial Development. Research has thoroughly highlighted the severe impact of clean energy on the environment and its implications. Digging deep, there come across literature where European and developed countries have coped with this dilemma by focusing on the economy and uplifting the standards of society as well as environment. Although this seems feasible, this would be much more convenient, and it would help us understand economic growth better if there is reducing carbon emissions and improving financial development together affect the environment. Similarly, Le and Ozturk (2020) studied the interconnectedness of Green Finance and Financial Development. Moving forward in literature, Eren, Taspinar, and Gokmenoglu (2019) also analyzed Economic Growth and Financial Development. All of this

has been deeply analyzed in the past but one factor that may be of great influence and may be integral is the impact of financial development as a mediator among green finance and economic growth.

Studying Financial development and its mediating role between Green Finance and Economic growth may explain the influence of stated variables on each other more clearly and effectively. Therefore, the mediating impact of mediator on green finance and economic growth can be pivotal in research. The research focuses on this very gap and addresses it by studying the mediating role of financial development between economic growth and green finance.

1.5 Research Questions

I. How green finance is related to economic growth?

II. What effect does financial development have on economic growth?

III. What impact does green finance have on financial development?

IV. Whether financial development affects green finance and economic growth with the help of mediating role?

V. How exchange rate influences the economic growth?

VI. Whether inflation affects economic growth or not?

VII. How interest rate influences the economic growth?

1.6 Research Objectives

I. To determine how financial development is impacted by green finance.

II. To figure out the effect of financial development on economic growth.

III. To determine the impact of green finance on economic growth.

IV. To find the mediating role of financial development between green finance and economic growth.

V. To investigate the exchange rate's role in economic growth.

VI. To investigate the effect of inflation on economic growth

VII. To investigate the impact of interest rates on economic growth.

1.7 Organization of the Document

The given research study consists of five chapters. The first three chapters consists of theoretical aspects of the study and the fourth & fifth chapter are of empirical interpretation. The first chapter includes background of study, theoretical background, motivation of study, problem statement, research question and research objective and the last is organization of documents. Chapter 02 present the general literature, as well as the individual literature of each variable with economic growth (dependent variable), hypotheses, literature summary, research model, gap analysis.

As the chapter 03 includes: data and methodology, variable information i.e. DV, IV, MED, CV (INF, INT, EX), description of variables, regression model, econometric specification and statistical techniques i.e. GMM and SEM. Chapter 04 explores the results and discussion which mainly consists of descriptive statistics, correlation, unit root test, GMM results and interpretations, regression analysis and sobel test. The last chapter discusses the overall paper's conclusions, limitation and practical implications. While ending with the research paper the references should be concluded.

Chapter 2

Literature Review

It is believe that only those economies that grow which focus on financial development and act responsibility towards their environmental rights, environmental right means their focuses towards green finance. Green Finance and Economic growth exert significant influence on daily life, establishing both positive and negative impacts on monetary perspectives. Green finance, explored by scholars such as Qiao, Fan, Sun, and Song (2021); Xie (2021), plays a vital part in shaping domestic environmental policies, stimulating enterprise innovation, and positively regulating technological advancement aligned with environmental regulations.

Y. Wang and Zhi (2016), define the market for green finance as a credit intermediary for environmental protection's capital, emphasizing its role in funding socially acceptable and environmentally sustainable economic growth drivers. Economic growth is distinct in an increase in a nation's overall output of goods and services, as demonstrated by a growth in the market value of locally produced goods and services, adjusted for inflation. The principal indication of economic growth is the Gross Domestic Product (GDP) reflecting the growing strength of a country's economy (Haseeb, Kot, Hussain, & Jermsittiparsert, 2019).

Lan, Kakinaka, and Huang (2012) argue that the degree of environmental pollution in a country is significantly influenced by economic considerations. The ASEAN countries, prioritizing health and research and development sectors, aim to address and improve health and environmental issues in tandem with significant economic growth (Haseeb et al., 2019).

The scholars argue that the presence of green finance creates a mutually beneficial scenario, simultaneously advancing Economic growth and enhancing environmental attributes. The well-established positive link between financial development and green finance, as confirmed by Beck et al. (2000); King and Levine (1993), is evolving with the incorporation of additional factors amid growing environmental concerns. He, Zhang, Zhong, Wang, and Wang (2019) emphasizes the multifaceted impact of renewable sources supported by green financing on a country's overall green economy. Their research suggests that green investments in renewable energy can spur green economic growth. Echoing this sentiment, Pradhan et al. (2018) recommend government support for financing investments from green resources, thereby contributing to economic growth.

The combination of green finance and economic growth has a big impact on our daily lives, both good and bad. Researchers like Qiao et al. (2021); Xie (2021) say that green finance is important for creating environmental policies, encouraging businesses to innovate, and advancing technology to meet environmental standards. (Y. Wang & Zhi, 2016) describe green finance as a way to direct money toward protecting the environment, which is crucial for supporting economic growth that is both socially and environmentally friendly. Economic growth means a country produces more goods and services, shown by the increase in their market value after adjusting for inflation. According to the government, GDP (Gross Domestic Product) is the main measure of economic growth and the country's economic strength, as stated by Haseeb et al. (2019).

Lan et al. (2012) believe that economic factors greatly affect the level of pollution in a country. In Oriental states, there is a focus on health and research and development to improve health and environmental issues while achieving significant economic growth. The use of renewable energy, economic growth, and financial development are all positively correlated, per the authors' Granger causality studies. Their results unequivocally show that a nation's economy can only be strengthened through sustainable financial development. In a similar Jalil and Feridun (2011) have highlighted that, for developing economies such as Pakistan, there is a positive casual linkage between the variables under study, namely financial development and economic growth. They clarify that financial development liquifies

the financial system by increasing diversity and lowering financial risks, and it also speeds up economic growth by creating a channel for money to move from savers to borrowers. Furthermore, Erdoğan, Yıldırım, and Gedikli (2020) discovered a robust association between advancements in the financial industry and economic growth.

Interest rates play a crucial role in the economy. A study highlights that changes in interest rates significantly impact people's investment decisions and the overall direction of economic growth (Smith & Jones, 2019). When interest rates change, it affects how people choose to invest their money and the cost of borrowing. The research shows the complex relationship between interest rates and other economic factors. However, the exact connection between interest rates and economic growth is still not fully understood. Different studies show that policymakers use interest rates in various ways to encourage economic growth. For instance, some researchers believe that lowering interest rates through relaxed monetary policies can boost economic growth by promoting more economic activity (Jelilov, 2016).

In summary, while interest rates are key to shaping the economy, the precise way they influence economic growth can vary and is still being studied. Soundarrajan and Vivek (2016), Green Finance encourages the spread of new technologies and creation of eco-friendly infrastructure. When money is invested in environmentally friendly technologies, like clean energy, it can help make these technologies cheaper and more widely available. This is good news, especially for developing countries, because it means they don't have to follow the old pattern of growing their economy first and then cleaning up the environment later. Instead, they can focus on building eco-friendly infrastructure right from the start. Governments play a vital role in this by developing infrastructure that helps manage resources better in the long term. This not only makes the country more competitive but also attracts private investment into green markets at home.

Economic dynamics are significantly shaped by interest rates (Smith & Jones, 2019). Their research indicates that interest rate changes have a big influence on people's decisions to invest and on the growth of the economy as a whole (Smith & Jones, 2019). Interest rates have an impact on investment choices and borrowing costs. The study highlights how interest rates and other economic

indicators are intricately related. It's still unclear exactly how interest rates and economic growth are related. The body of existing research indicates that there are significant differences in how interest rates are applied by policymakers as a tool to promote economic growth. On the one hand, research suggests that an easing of interest rates through an expansionary monetary policy could boost economic growth by boosting economic activity (Jelilov, 2016).

2.1 Green Finance and Economic Growth

The concept of Green Finance has gained attention due to the intertwined environmental and economic challenges of the modern world. Green Finance focuses on the financial impacts of environmental changes across various sectors and businesses, highlighting the need to transform the traditional economy. Studies by Linnenluecke, Smith, and McKnight (2016) and Tao et al. (2022) emphasize this interdisciplinary approach, reflecting how environmental and economic factors are increasingly connected. Green Finance, along with economic growth, significantly influences daily life, presenting both positive and negative monetary impacts. Green Finance is often studied alongside economic growth, considering their connection. Qiao et al. (2021) suggest that green finance plays a crucial role in supporting domestic environmental policies and stimulating enterprise innovation. Xie (2021) found that environmental regulations enhance commercial technological advancements through the development of green finance. Wang and Zhi define the green finance market as a system where environmental protection capital acts as a credit intermediary. This market dynamic distributes funds for socially acceptable and publicly financed economic growth drivers, emphasizing the importance of greening the financial system to ultimately green the economy.

Green Finance encompasses various segments related to energy, including energy-related taxes, carbon emissions, energy consumption, renewable energy, and air emissions. Studies by Zaman and Shamsuddin (2017) and Lee & Wu (2014) explore the relationship between energy expenditure and logistics operations within the global supply chain. Logistics activities, heavily reliant on fossil fuels, harm the environment and human health, while green logistics promote environmental

sustainability and encourage eco-friendly products (Zaman & Shamsuddin, 2017; Lu, Lai, & Cheng, 2007). Global logistics firms significantly contribute to greenhouse gas emissions, but the use of sustainable energy sources can mitigate this impact. Nassani, Aldakhil, Abro, and Zaman (2017) discovered that renewable energy enhances both environmental quality and economic prospects, especially in countries with strong environmental policies. For example, European nations like France, Germany, the Netherlands, Austria, and Finland have adopted measures to reduce pollution and encourage the use of renewable energy and eco-friendly logistics. Bhattacharya, Paramati, Ozturk, and Bhattacharya (2016) also explored the link between renewable energy usage and economic growth, concluding that renewable energy benefits both the environment and the economy. Additionally, Saboori, Sulaiman, and Mohd (2012) investigated the relationship between economic growth and carbon emissions in Malaysia, finding that economic growth consistently leads to higher carbon emissions. Emissions, which include gases and particles released into the air from various sources, vary annually due to fluctuations in the economy, industrial operations, technological advancements, traffic, and other factors (EPA, 2016).

Several scholars have studied air emissions in different contEXs. Gurjar, Butler, Lawrence, and Lelieveld (2008) estimated emissions and air quality in megacities by considering pollutants such as The Environmental Kuznets Curve (EKC) theory, as discussed by Dinda (2004), suggests that pollution levels, such as carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), and total suspended particles (TSP), initially increase with rising income but eventually decrease after reaching a certain income level, forming an inverted U-shape. Liu (2006) analyzed the relationship between GDP and air pollution in Norway, finding that economic growth significantly increases CO2 emissions.

Similarly, Chen and Huang (2013) studied the connection between CO2 emissions and economic growth, discovering that GDP, energy use, electricity consumption, and CO2 emissions are positively linked over the long term. The extensive study of air emissions has revealed significant findings, yet the specific relationship between air emissions and particular pollutants, such as PM10, requires further research. Green finance and economic growth have profound effects on everyday

life, influencing monetary perspectives in various ways. Scholars have explored the interplay between green finance and economic development, highlighting its role in shaping environmental policies and fostering innovation within enterprises. Qiao et al. (2021) emphasize the adaptive nature of green finance, positioning it as a constructive force in advancing domestic environmental agendas. Similarly, Xie (2021) explores the symbiotic relationship between environmental regulations and commercial technological advancements, demonstrating how green finance facilitates positive regulatory frameworks.

The integration of green finance with economic growth presents a complex but essential dynamic for addressing contemporary environmental and economic challenges. As studies have shown, green finance plays a critical role in supporting environmental policies, promoting innovation, and fostering sustainable economic growth. By continuing to explore these connections, the better understand how to effectively balance economic development with environmental sustainability.

The literature indicates a clear movement from recognizing the financial implications of environmental changes to actively using green finance as a tool for promoting technological advancements and sustainable practices across various sectors. Initial studies by Linnenluecke et al. (2016) and Tao et al. (2022) laid the groundwork by identifying the intertwined nature of environmental and economic challenges, underscoring the necessity of transforming traditional economic models to incorporate environmental concerns. This foundational understanding has led to a broader acceptance of green finance as a critical component of modern economic strategies.

Further research by Qiao et al. (2021) and Xie (2021) examines deeper into the practical applications of green finance, demonstrating its role in stimulating innovation within enterprises and enhancing the effectiveness of environmental regulations. These studies highlight how green finance acts as a catalyst for both economic and environmental progress, driving companies to adopt more sustainable practices. The definition provided by Y. Wang and Zhi (2016) emphasizes green finance as a credit intermediary focused on environmental protection, highlighting the market dynamics that facilitate the distribution of funds towards socially and environmentally responsible economic activities. This perspective underscores the

importance of developing a financial system that prioritizes environmental sustainability as a means to achieve broader economic greening.

Zaman and Shamsuddin (2017) and Lee & Wu (2014) explore the relationship between energy expenditure and logistics operations, revealing the environmental impact of traditional logistics reliant on fossil fuels. Their findings, supported by studies Zaman and Shamsuddin (2017); Lu et al. (2007) and (Fotis & Polemis (2018)) advocate for the adoption of green logistics to moderate environmental degradation and promote sustainability. Nassani et al. (2017) further illustrate the benefits of renewable energy, showing how it enhances environmental quality and creates economic opportunities in environmentally conscious nations. This aligns with Bhattacharya et al. (2016) who found that renewable energy use positively impacts both environmental and economic outcomes, reinforcing the case for integrating renewable energy into economic strategies. The study by Saboori et al. (2012) on the connection between economic growth and carbon emissions in Malaysia highlights the persistent challenge of balancing economic expansion with environmental sustainability. This is echoed in the findings of Gurjar et al. (2008) and Liu, He, and Tan (2021), who explored air emissions and their relationship with economic activity, revealing the complexities of managing environmental impacts in the contEX of economic development.

Chen and Huang (2013) provide further insight into the long-term correlations between GDP, energy consumption, electric power consumption, and CO2 emissions, emphasizing the importance of understanding these relationships to inform policy decisions. The Environmental Kuznets Curve (EKC) theory, as discussed by Dinda (2004), suggests that economic growth initially leads to increased environmental pressure, which eventually decreases as income levels rise and more sustainable practices are adopted. Despite the extensive research on air emissions, there remains a need to specifically investigate the relationship between air emissions and particular pollutants, such as PM10, to fully understand their impact on environmental and economic outcomes. Economic growth is a crucial indicator of a country's prosperity, measured primarily by the Gross Domestic Product (GDP). As countries produce more goods and services, their economies expand, reflecting increased economic activity and potential for development (Haseeb et

al., 2019). However, this growth often accompanies environmental challenges, particularly concerning pollution and resource consumption. Research by Lan et al. (2012) discusses how economic factors significantly influence environmental pollution levels within nations. They argue that as economies grow, so do the pressures on natural resources and environmental quality, necessitating careful management to mitigate negative impacts Lan et al. (2012).

Green finance has begun as a pivotal strategy in addressing these interconnected environmental and economic issues. Y. Wang and Zhi (2016) define green finance as a critical market mechanism that channels capital towards initiatives promoting environmental protection. They emphasize the importance of efficient capital allocation in fostering sustainable economic growth drivers, highlighting the role of financial systems in achieving broader environmental sustainability goals (Y. Wang & Zhi, 2016). This perspective underscores the need to integrate environmental considerations into monetary frameworks to support greener economic practices on a global scale.

Within the field of green finance research, scholars investigate various specific segments such as energy-related taxes, carbon emissions, energy consumption, renewable energy, and air emissions. Studies by Zaman and Shamsuddin (2017) and others explore the environmental implications of logistical operations heavily reliant on fossil fuels versus those embracing green practices within the global supply chain. These studies reveal how logistical activities contribute to greenhouse gas emissions and underscore the urgency for adopting renewable energy sources (Zaman & Shamsuddin, 2017) Lee & Wu, 2014). Nassani et al. (2017) highlight the economic benefits of renewable energy adoption, particularly in nations prioritizing environmental stewardship. Their research suggests that renewable energy not only stimulates economic growth also enhances environmental quality, supporting sustainable development objectives. European countries like France, Germany, the Netherlands, Austria, and Finland have implemented policies to incentivize the adoption of renewable energy and environmentally friendly logistics practices, illustrating a commitment to balancing economic growth with environmental sustainability. Bhattacharya et al. (2016) contribute to this discourse by examining the positive impact of renewable energy use on economic expansion. Their findings

indicate a favorable association between renewable energy adoption and improved economic and environmental performance, suggesting that renewable energy can drive sustainable development (Bhattacharya et al., 2016). This research reinforces the importance of integrating green finance strategies into economic policies to achieve long-term environmental and economic benefits.

In conclusion, the evolution of research from understanding the environmental impacts of economic growth to leveraging green finance as a solution reflects a growing recognition of the need for sustainable development practices. By integrating environmental considerations into financial systems and policy frameworks, countries can effectively manage economic growth while minimizing environmental degradation. Continued research in green finance will be crucial in shaping future strategies that promote both economic prosperity and environmental sustainability. The integration of green finance with economic growth represents a vital strategy for addressing the dual challenges of environmental sustainability and economic development. The literature demonstrates a clear evolution from recognizing the interconnectedness of these issues to actively leveraging green finance as a means to foster innovation, enhance regulatory frameworks, and promote sustainable economic practices. By continuing to build on this body of research, we can better navigate the complexities of achieving a balance between economic growth and environmental stewardship, ensuring a sustainable future for both the economy and the planet.

2.2 Green Finance and Financial Development

The primary contrasting perspective on the environment as consideration of green finance is the influence of financial development. One viewpoint contends that research and development (R & D) in the financial sector enhances environmental quality. J. A. Frankel and Romer (1999); Tamazian, Chousa, and Vadlamannati (2009) argue that contemporary financial arrangements attract foreign direct investment (FDI) and help expand R & D, resulting in higher environmental quality. Tadesse (2005) and Zagorchev, Vasconcellos, and Bae (2011) support this view, suggesting that financial development encourages technological improvements that

reduce environmental degradation while promoting economic growth. Research has long explored the impact of financial development on green finance in term of environment quality.

Beck et al. (2000) and King and Levine (1993) confirmed the beneficial connections between financial development and green finance. They found that a robust financial system facilitates technological advancements that mitigate environmental harm. As financial systems develop, they provide the necessary resources for investing in environmentally friendly technologies.

Afzal et al. (2021) furthered this perspective by highlighting the role of financial development in promoting a green economy. They determined that domestic credit to private and public sectors supports green environmental projects, contributing to the establishment of a green economy. This perception highlights the importance of a well-developed financial sector in encouraging sustainable economic practices. However, not all effects of financial development on the environment are positive. Shahbaz, Van Hoang, Mahalik, and Roubaud (2017) identified three potential ways financial development can lead to environmental degradation.

Firstly, as financial systems grow, they can drive economic growth, attracting FDI. This economic expansion often results in higher energy consumption, leading to environmental degradation. Secondly, thriving financial markets increase credit availability to consumers, boosting purchasing power and demand for energy-intensive products. The consumption of these products in greater quantities raises pollution levels. Lastly, financial development stimulates investment, particularly in power generation sectors. Increased investment in power infrastructure leads to higher power consumption, significantly contributing to environmental degradation. Agbloyor, Gyeke-Dako, Kuipo, and Abor (2016) also pointed out that financial development can lead to increased consumer credit. This boost purchasing power, driving demand for energy-intensive goods and services. As a result, pollution levels rise due to the higher consumption of these energy-intensive products. Despite these challenges, green finance has emerged as a crucial factor in balancing economic growth and environmental sustainability. Zhou et al. (2020) conducted a study on 30 Chinese provinces, comparing environmental quality, economic growth, and green finance. Their findings highlight the significant impact

of green finance in fostering economic expansion. Zhou et al. (2020) posit that green finance creates a win-win situation by promoting both economic growth and improving environmental attributes. He et al. (2019) expanded on this by examining the multifaceted effects of green finance on the green economy. Their research indicates that investments in renewable energy, backed by green finance, can foster green economic growth. This underscores the importance of green investments in driving sustainable development.

Pradhan et al. (2018) further emphasized the role of governments in supporting green finance. They suggested that governments should back investments from green resources, which contribute to economic growth. By highlighting green finance, governments can help to establish a green economy which balances economic growth with environmental protection. The literature on financial development and its impact on the environment presents a complex picture. On one hand, financial development can enhance environmental quality by fostering R & D and technological advancements.

On the other hand, it can lead to increased economic activity and energy consumption, resulting in environmental degradation. The emergence of green finance offers a promising solution by promoting sustainable economic growth and environmental preservation. By understanding and leveraging the dynamics of green finance, policymakers and financial institutions can create a more sustainable future.

2.3 Financial Development and Economic Growth

The correlation between economic growth and financial conditions has Notable achievements have been made in support of the development of economics. The global financial system plays a vital role in facilitating economic advancement (Taylor, 1996).

Eren et al. (2019) An analysis of annual time series data in India from 1971 to 2015 indicates that finance system development is critically important for promoting the use of renewable energy sources and economic growth. The utilization of renewable energy, economic growth, and financial development are all positively associated, per the authors' Granger causality investigations. Their findings clearly

indicate that a country requires to have sustainable financial development in order to enhance its economy. Similarly, Jalil and Feridun (2011) also has emphasized that there exists a positive casual linkage among the studied variables i.e, financial development and economic growth for developing economies like Pakistan. They explain that financial development accelerates economic growth by providing a channel for funds to flow from savers to borrowers, and liquifies the financial system by increasing diversification, thus reducing financial risks. In addition, Erdoğan et al. (2020) also found a strong relationship between progress in the financial sector and expansion in the economy.

On the other hand, Cheng, Chien, and Lee (2021) posits that economic growth and financial development are negatively correlated, regardless of the amount of national wealth. According to them, the negative relationship exacerbated specially in case of wealthy nations because excessive investments in the private sector within these countries which makes financial development detrimental to economic growth (Cecchetti & Kharroubi, 2012; Berkes, Panizza, & Arcand, 2012). The financial sector offers a framework for conducting various transactions and is a component of the economic environment.

The International Monetary Fund (2012) defined the financial sector as the central bank, national banks, insurance companies, pension funds, stock and securities markets, and stock exchanges. It is believed that the growth of these financial institutions and the services they provide are crucial to the prosperity of a nation.

Scholars from all around the world are paying close attention to the connection between financial development and economic growth, which is a basic idea in economics. A country's financial systems are improved and expanded through the creation of new markets, instruments, rules, financial institutions, and markets themselves.

This process is known as financial development. Conversely, the increase in a country's production of goods and services over time is referred to as economic growth. For economists, politicians, and financial institutions looking to promote sustainable economic development, it is essential to comprehend how these two factors relate to one another. Research on the relationship between financial development and economic growth highlights the importance of financial intermediaries,

including banks and non-bank financial firms, in effectively allocating capital and mobilizing savings. By serving as a bridge between savers and borrowers, financial intermediaries promote economic activity and investment.

Across a sample of nations, Levine and Zervos (1998) discovered empirical evidence in favor of a positive correlation between the development of the banking sector and economic growth. They argued that well- functioning banks help channel savings into productive investments, leading to increased capital accumulation and higher economic output. Through enabling the effective distribution of resources and risk management, financial markets are also essential for fostering economic growth. Development of the financial sector is critical to accelerating economic growth, especially when it comes to promoting entrepreneurship and innovation, as Rajan and Zingales (1998) noted. They argued that well-developed financial markets provide firms with access to capital, enabling them to invest in research, development, and new technologies, which are essential for long-term economic growth. Moreover, financial development can improve access to finance for households and firms, thereby promoting investment in human capital and productive assets. Through greater access to financing Demirgüç-Kunt and Maksimovic (1998) offered empirical evidence in favor of the beneficial effects of financial development on economic growth. They discovered that nations with sophisticated financial systems typically see faster rates of economic expansion. Such as access to credit and financial services enables households to invest in education, healthcare, and housing, while firms can invest in machinery, technology, and innovation. However, it is essential to acknowledge that the relationship between financial development and economic growth is complex and multifaceted, and several factors can influence this relationship. Mishkin (2009) highlighted the role of financial instability and excessive risk taking in disrupting economic activity and impeding long-term growth. Excessive financial development, characterized by speculative bubbles and financial crises, can have adverse effects on economic growth by diverting resources away from productive investments and causing economic instability.

The correlation between financial development and economic growth is a critical area of research in economics, with significant implications for policymakers and practitioners. Empirical evidence suggests that well-developed financial systems,

including both financial intermediaries and financial markets, can promote economic growth by facilitating investment, innovation, and risk management. However, policymakers must be mindful of the potential risks associated with excessive financial development and strive to maintain stability and resilience within the financial system. Overall, fostering financial development through sound policies and regulations can contribute to sustainable economic growth and development.

In conclusion, the relationship between financial development and economic growth is a critical area of research in economics, with significant implications for policymakers and practitioners. Empirical evidence suggests that well-developed financial systems, including both financial intermediaries and financial markets, can promote economic growth by facilitating investment, innovation, and risk management. However, policymakers must be mindful of the potential risks associated with excessive financial development and strive to maintain stability and resilience within the financial system. Overall, fostering financial development through sound policies and regulations can contribute to sustainable economic growth and development. Asteriou and Spanos (2019) has found that economic growth fosters due to financial development during the European crisis period, which has adverse effect on economic activity. Throughout the years from 2008 to 2009 indicates that the commercial banks assets plays a crucial role in preventing an economic downfall, Banks's capital abundance pushed the solidity of the monetary system.

2.4 Inflation and Economic Growth

Economists and financial scientists have long been interested in the relationship between inflation and economic growth. The subject has generated various perspectives over time, leading to a wealth of research exploring how these two critical factors interact. The ongoing discussion reveals a complex and multifaceted connection, influenced by several theories and empirical studies. Starting with classical economics, Adam Smith suggested that three main factors drive production: land, labor, and capital. This theory emphasized the importance of saving money for economic growth, proposing that savings lead to investments which

fuel economic development. In this view, inflation was not directly linked to the impact of taxes on profits and output. Classical economists believed that competition for workers among capitalists would drive wages up. Consequently, inflation could lead to higher wages but might also reduce company profits. They also suggested that in the short term, the amount of goods produced and jobs available depended on the utilization of labor and capital rather than the amount of money in circulation (Gokal & Hanif, 2004).

Moving forward, structuralists introduced a different perspective on inflation. They claimed that inflation could positively impact economic growth. According to structuralists, moderate inflation helps the economy function better by modifying resources. They observed that when prices rise due to inflation, wages do not increase as much, resulting in higher company profits. This shift in income from consumers, who tend to save less, to savers, who invest more, can boost government revenues and funding for development projects (Doguwa, 2012; Enejoh & Tsauni, 2017; Mankiw, 2010).

Furthermore, structuralists posited that inflation encourages people to seek better-paying jobs in growing industries rather than staying in traditional roles. This movement from basic to advanced industries enhances the efficient use of economic resources, leading to increased productivity and, subsequently, economic growth. By encouraging labor to transition to more productive sectors, inflation can facilitate better resource allocation and higher economic output (Dewett & Navalur, 2010).

In contrast, several empirical studies in the 1990s and early 2000s provided evidence of a more nuanced relationship between inflation and economic growth. Fischer (1993) suggested that moderate inflation could stimulate economic growth by lowering real interest rates, thus promoting investment and consumption. However, he cautioned that excessive inflation could lead to resource misallocation, uncertainty, and distortions in relative prices, ultimately delaying economic progress. Fischer's analysis highlighted the concept of an "inflation threshold," suggesting that mild inflation might be beneficial up to a certain point, beyond which it becomes detrimental. Barro (1995) conducted a comprehensive study on inflation and economic growth across approximately 100 countries. He found that higher

inflation rates were generally associated with lower economic growth. Specifically, inflation rates exceeding 10% annually were linked to reduced economic performance. Similarly, Sarel (1996) observed that high inflation negatively impacted economic growth, reinforcing the idea that there is a threshold beyond which inflation becomes harmful.

The concept of the inflation threshold was further explored by Khan and Senhadji (2003), who identified a nonlinear relationship between inflation and economic growth. They proposed an inverse U-shaped curve, indicating that moderate inflation levels could positively influence growth, whereas very low or very high inflation rates could be detrimental. This finding underscored the importance of maintaining inflation within an optimal range to support economic development. Research by Bruno and Easterly (1998) echoed these sentiments, arguing that high and volatile inflation rates could lead to resource misallocation, reducing productivity growth and investment. They emphasized the adverse effects of inflation volatility, which can create uncertainty and disrupt economic planning. Thus, while some inflation might be conducive to growth, its variability and unpredictability could pose significant challenges. Kryeziu and Durguti (2019) offered a more recent perspective, suggesting that inflation could positively impact economic growth under certain conditions. Their study indicated that the relationship between inflation and growth might be contEX-dependent, influenced by factors such as the structure of the economy, the effectiveness of monetary policy, and inflation expectations. This nuanced view recognizes that inflation's impact on growth is not uniform and can vary based on specific economic circumstances.

Overall, the literature reveals a complex interplay between inflation and economic growth. While early classical theories did not directly link inflation to economic growth, later structuralist views acknowledged the potential benefits of moderate inflation. Empirical studies introduced the concept of an inflation threshold, highlighting that mild inflation might be beneficial up to a point, beyond which it becomes harmful. The nonlinear relationship proposed by Khan and Senhadji (2003) and supported by subsequent research suggests that maintaining inflation within a moderate range is crucial for sustaining economic growth. Understanding this complex relationship is essential for policymakers. By knowing the optimal

inflation range and its impact on economic growth, they can formulate effective monetary policies to ensure macroeconomic stability and sustainable development. Further research is necessary to explore the underlying mechanisms and transmission channels through which inflation affects economic growth across different context and time periods. This ongoing inquiry will help refine our understanding of how to balance inflation and growth to achieve economic prosperity.

2.5 Exchange Rate and Economic Growth

Over the years, there has been a lot of discussion and investigation regarding the connection between exchange rates and economic growth. According to Aeniran, Yusuf, and Olatoke (2014), the exchange rate is the cost of a nation's money relative to other nations' currencies. Previous research has found the link between exchange rates and economic growth to be debatable. Different studies have examined the relationship between exchange rates and inflation, revealing various perspectives among economists. Some believe that fixed exchange rates can accelerate economic growth, while others argue that floating exchange rates result in faster growth. Still, some economists assert that exchange rates have no significant effect on economic growth J. Frankel et al. (2019). Akpan (2008) proposed that the exchange rate has a negative impact on long-term economic growth but a positive effect in the short term. Aliyu (2011) explained that when a country's currency appreciates (becomes more valuable compared to other currencies), it usually leads to an increase in imports and a decrease in exports. Conversely, when a country's currency depreciates (becomes less valuable), it tends to boost exports and reduce imports. This depreciation encourages people to buy more domestically produced goods rather than imported ones. The changes in imports and exports due to exchange rate fluctuations can significantly impact on the economic growth of both exporting and importing countries.

Research has shown a noteworthy association between exchange rate volatility and economic development. The amount that a currency's value changes in relation to other currencies over a given period of time is referred to as exchange rate volatility. Bahmani-Oskooee and Ratha (2004) found that excessive volatility in exchange

rates can have adverse effects on economic growth by creating uncertainty and instability in the economy. High levels of exchange rate volatility can disrupt trade flows, discourage investment, and impede long-term business planning, leading to suboptimal resource allocation and reduced productivity (Levy-Yeyati & Sturzenegger, 2003).

Studies examining the impact of exchange rate volatility on various aspects of economic performance provide empirical evidence supporting this link. Bahmani-Oskooee and Ratha (2004) discovered that exchange rate volatility had a statistically significant negative impact on economic growth in a sample of developing nations. Similarly, Levy-Yeyati and Sturzenegger (2003) found that countries with more stable exchange rate regimes experienced higher levels of investment, trade, and economic growth compared to those with variable exchange rates. These findings highlight the negative consequences of exchange rate fluctuations for macroeconomic stability and growth prospects. The mechanisms through which exchange rate volatility affects economic growth are multifaceted and interconnected. Firstly, volatile exchange rates can disrupt international trade by making it difficult for exporters and importers to predict future exchange rate movements and plan accordingly (Rose & Yellen, 1989). This uncertainty can lead to a decline in trade volumes, reduced export competitiveness, and increased transaction costs, all of which can weigh on economic growth. Secondly, exchange rate volatility can deter foreign direct investment (FDI) by raising the perceived risks and costs associated with investing in a particular country (Edward, 2018). Investors may hesitate to commit capital to projects or ventures in an environment characterized by unstable exchange rates, fearing potential losses due to currency fluctuations.

Exchange rate volatility can also have indirect effects on economic growth by influencing domestic macroeconomic conditions. For instance, sharp fluctuations in exchange rates can fuel inflationary pressures by increasing the cost of imported goods and services, leading to higher consumer prices and reduced purchasing power (Razin & Collins, 1997). Inflationary instability can erode consumer confidence, disrupt business planning, and undermine macroeconomic stability, all of which can hinder economic growth in the long run. The relationship between exchange rate volatility and economic growth represents a significant area of research

in economics, with implications for policy formulation and economic management. Empirical evidence suggests that high levels of exchange rate volatility can hamper economic growth by creating uncertainty, disrupting trade flows, and exacerbating macroeconomic instability. Addressing exchange rate volatility requires a comprehensive approach that combines monetary policy, regulatory measures, and structural reforms to promote exchange rate stability and enhance resilience to external shocks. In recent years, research has continued to explore the nuanced effects of exchange rate changes on economic growth. Hausmann et al. (2005) found that countries with more flexible exchange rates tend to grow faster, suggesting that flexibility can sometimes be beneficial. They also discovered that when a country's currency depreciates, the economy tends to grow faster. This is because depreciation makes a country's goods cheaper for international buyers, boosting exports and stimulating economic activity.

Previous studies have shown different results regarding how exchange rates affect a country's economic growth. For example, Edward (2018) found that countries with more flexible exchange rates tend to experience faster economic growth. They also discovered that when a country's currency depreciates, the economy tends to grow faster. Similarly, Hausmann et al. (2005) identified a link between faster economic growth and a decrease in the value of a country's currency. Hausmann et al. (2005) argued that when a country's currency is undervalued, it can actually promote economic growth. He explained that undervaluation makes a country's goods cheaper for other countries to buy, which can increase profits for businesses that produce and sell internationally. This, in turn, encourages businesses to invest more in production and sales, leading to increased economic growth.

The relationship between exchange rates and economic growth is complex and multifaceted. Research has shown that exchange rate volatility can negatively impact economic growth by creating uncertainty, disrupting trade flows, and discouraging investment. Stable exchange rate regimes are generally associated with higher levels of investment, trade, and economic growth. Addressing exchange rate volatility through a combination of monetary policy, regulatory measures, and structural reforms is crucial for promoting economic stability and growth. While the exact nature of the relationship between exchange rates and economic

growth remains contentious, there is substantial evidence that prudent exchange rate management can enhance economic performance.

2.6 Interest Rate and Economic Growth

Interest rates play a pivotal role in shaping economic underlying forces. Smith and Jones (2019) highlight that fluctuations in interest rates significantly impact investment decisions and overall economic growth (Smith & Jones, 2019). Their study emphasizes the complex relationship between interest rates and various economic indicators, yet the discussions abound over the precise relationship between interest rates and economic growth. There are significant differences in how interest rates are applied as a tool for policy to promote economic growth, according to existent research. The relationship between interest rates and economic growth is a fundamental aspect of macroeconomic analysis, with significant implications for monetary policy, investment decisions, and overall economic performance. From a research perspective, numerous studies have explored the intricate dynamics of this relationship, shedding light on the multiple channels through which changes in interest rates can impact economic activity.

Barro (1995) was one of the early researchers to explore this topic, focusing on how interest rates influence investment and spending, two key drivers of economic growth. He found that lower real interest rates are associated with higher levels of investment and economic growth across a sample of developed and developing countries. Lower interest rates typically result in lower borrowing costs for businesses to finance investment projects and for consumers to purchase durable goods such as homes and automobiles (Bernanke & Gertler, 1995). This stimulates investment in productive capital, such as machinery and equipment, and encourages consumption, both of which contribute to increased aggregate demand and economic growth. Conversely, higher interest rates can reduce investment and consumption activity by raising the cost of borrowing for businesses and households. Businesses may decide to delay or reduce investment projects when interest rates are high since the increased cost of capital lowers the projected returns on investment (Christiano et al., 1999). Similarly, consumers may defer large purchases,

such as homes or vehicles, as higher interest rates increase the cost of financing these purchases through loans or mortgages. This reduction in investment and consumption expenditure can lead to a slowdown in economic activity and hinder long-term growth prospects. Empirical evidence supporting this relationship comes from studies that have examined the effects of changes in interest rates on various economic indicators, including investment, consumption, and overall economic growth. Bernanke and Gertler (1995) highlighted the importance of the credit channel of monetary policy transmission, showing how changes in interest rates influence borrowing conditions and investment decisions, thereby impacting economic activity. Moreover, the relationship between interest rates and economic growth is influenced by factors such as the monetary policy stance, inflation expectations, and financial market conditions.

In the late 1990s, Bernanke et al. (1999) elaborated on the role of monetary policy in raising economic growth and preserving price stability. They noted that macroeconomic goals, including price stability, full employment, and sustainable economic growth, are attained in large part through the management of monetary policy and interest rate setting by central banks. Central banks can affect borrowing costs, expectations in the financial markets, and overall economic activity by modifying policy rates in reaction to shifts in the economy.

This emphasizes how important it is for central banks to strike a careful balance when determining interest rates between promoting economic growth and stopping inflation. Blanchard and Fischer (1989) also emphasized the need for central banks to communicate their policy aims openly and transparently to manage market expectations and promote financial market stability. While accommodative monetary policy can support growth by lowering borrowing costs and stimulating investment and consumption, policymakers must remain vigilant against the risk of inflationary pressures and financial imbalances that may arise from excessively low interest rates (Taylor, 1996). Moving into the 21st century, studies have continued to build on these foundational insights. For instance, (Jelilov, 2016) found that an expansionary monetary policy that lowers interest rates can stimulate economic growth by increasing economic activity. This effect on economic growth is both positive and statistically significant. Jaymeh and Drabi (2010) examined

how Jordan's economy performed in relation to important macroeconomic factors, including inflation and interest rates. Their study found that while the interest rate impacted the Jordanian economy, the inflation rate had a more significant impact on the actual growth rate.

Further supporting this relationship, Moyo and Le Roux (2018) analyzed the performance of SADC nations from 1990 to 2015 in relation to interest rate changes. They demonstrated that interest rate adjustments positively affect the health of the economies of SADC member states. This finding suggests that even in different economic environments, the fundamental relationship between interest rates and economic activity holds true. However, not all studies have found a clear-cut relationship between interest rates and economic growth. Bosworth (2014) attempted to investigate the impact of interest rate fluctuations on economic growth within the Kenyan environment. His findings demonstrated that, in the case of Kenya, there was a statistically insignificant relationship between real interest rates and economic growth. This indicates that the relationship may vary depending on country-specific factors and economic conditions. The relationship between interest rates and economic growth is a central theme in economic research, with significant implications for monetary policy, investment decisions, and overall economic performance. Lower interest rates tend to stimulate investment and consumption, thereby boosting aggregate demand and economic growth, while higher interest rates can have the opposite effect, dampening investment and consumption activity. Empirical evidence supports these relationships, highlighting the importance of monetary policy in shaping macroeconomic outcomes and fostering sustainable economic growth. As research continues to evolve, it is clear that the influence of interest rates on economic activity remains a critical area of study for economists and policymakers alike.

2.7 Financial Development, Green Finance and Economic Growth

The relationship between financial development and economic growth has been a significant focus of economic research for many years. Early theorists such as

Schumpeter (1911) highlighted the crucial role of financial institutions in promoting economic growth by efficiently allocating resources to productive investments. This idea was foundational, suggesting that a well-developed financial system is essential for fostering economic development (Schumpeter, 1911). Building on this, Goldsmith (2012) showed that countries with more advanced financial systems tend to experience higher rates of economic growth. His work provided empirical evidence that supported the notion that financial development acts as a catalyst for economic growth, creating a base for future research on the interplay between these variables Goldsmith (2012). In the late 20th century, the relationship between financial development and economic growth continued to be a central topic. Svirydzenka 2016, proposed that financial liberalization, which includes removing financial repression, could enhance economic growth by improving capital accumulation and allocation. They argued that an open and liberalized financial system encourages savings and investments, which are crucial for economic growth (McKinnon, 2016; Shaw, 2015).

King and Levine (2018) furthered this understanding by conducting cross-country analyses that confirmed a strong correlation between financial development and economic growth. According to their research, nations with highly developed financial markets typically experience quicker economic growth, highlighting the critical role that financial development plays in raising economic advancement (Guo, Wang, Cao, & Hou, 2022).

In the early 21st century, the focus began to shift towards integrating environmental sustainability into financial practices, giving rise to the concept of green finance. Green finance involves investments that support sustainable development projects and initiatives aimed at creating a more sustainable economy (UNEP, 2011). This concept gained importance with the identification that economic growth must be sustainable to be truly beneficial. The Demanding review on the Economics of Climate Change (Stern, 2006) was pivotal in this context, highlighting the economic risks of climate change and promoting the addition of environmental considerations into economic policies. This report highlighted that sustainable financial practices are essential for long-term economic growth, marking a significant shift towards green finance (Stern, 2006). Recent studies have increasingly examined

green finance as an independent variable, exploring its impact on economic growth. These studies suggest that green finance raises economic growth by fostering innovation and creating new market opportunities., Tang, Yan, and Wang (2021) found that green finance positively impacts economic growth by encouraging technological innovation and energy efficiency. They argue that investments in clean technologies and renewable energy, facilitated by green finance, drive sustainable economic development (Zhou et al., 2020). As the understanding of green finance evolved, researchers began to explore how financial development mediates the impact of green finance on economic growth. This mediation perspective contends that by offering the services and infrastructure required for green investments to succeed, a robust financial system may increase the efficacy of green financing.

Aye and Edoja (2017) examined this mediating role in African countries, finding that financial development enhances the positive effect of green finance on economic growth by improving access to capital and facilitating efficient resource allocation. Their study highlights the crucial role of financial development in leveraging green finance to achieve sustainable economic growth (Aye & Edoja, 2017). The studies often use advanced econometric techniques and large datasets to provide more detailed insights. Y. Wang and Zhi (2016); Zhang et al. (2019) investigated the effect of green finance on G20 countries' economic growth using panel data analysis. According to their findings, green financing greatly stimulates economic growth, particularly in nations with advanced financial systems. They conclude that financial development not only enhances the direct effects of green finance but also amplifies its indirect benefits by fostering a supportive environment for green investments (J. Wang, Tian, Kang, & Guo, 2023).

Furthermore, Mertzanis and Kazandjian (2022) explored the role of institutional quality in the green finance-economic growth nexus. Their research suggested that strong institutions are critical for maximizing the benefits of green finance by confirming transparency, reducing investment risks, and promoting investor confidence. This study highlights the importance of an enabling environment for green finance to actually contribute to economic growth (Mertzanis & Kazandjian, 2022). The literature on green finance, financial development, and economic

growth has evolved significantly over time. Early studies focused on the foundational role of financial development in economic growth. As the concept of green finance occurred, it introduced a new dimension, highlighting the need for sustainable financial practices. Understanding the interplay between these variables is crucial for promoting sustainable economic development in the face of global environmental challenges.

2.8 Hypotheses

The study composed of:

H1: Green finance has a positive impact on economic growth.

H2: Green finance has a positive impact on financial development

H3: Financial development has a positive impact on economic growth.

H4: Inflation has a significant impact on economic growth.

H5: Exchange rate has a significant impact on economic growth.

H6: Interest rate has a significant impact on economic growth.

H7: Financial development mediates the relationship between green finance and economic growth.

TABLE 2.1: Summary of Literature

Authors	Country and Period	Methodology	Variables	
Rahman, Saidi, and Mbarek (2020)	UK 2007-2018	SEM	Renewable Energy, Economic growth, Environmental performance, Health expenditure	L si ef ev
Saidi and Omri (2020)	Tunisia 1990-2014	FMOLS, Panel unit root test	Renewable energy, Environmental function, Economic growth, carbon emission	**R co p ec a o**
Guru and Yadav (2019)	India, China 1993-2014	SYS-GMM	Financial development, renewable enery, green bond, economic growth	T G th a
J. Wang, Zhang, and Zhang (2021)	China 1990-2018	ADRL Model	Economic growth, financial development	T re co fi de ec in

Authors	Country and Period	Methodology	Variables
R. Wang and Wang (2022)	China 1997-2017	ADRL Model	Renewable energy, Consumption, Economic growth, financial development
Hysa, Kruja, Rehman, and Laurenti (2020),	Sweden 2000-2017	GMM, Regression Analysis	Circular economy; sustainability; innovation; environmental dimensi economic growth; panel data
Anton and Nucu (2020)	Romania 1990-2015	SYS-GMM	Financial development renewable enery, green bond, economic growth

2.9 Research Model

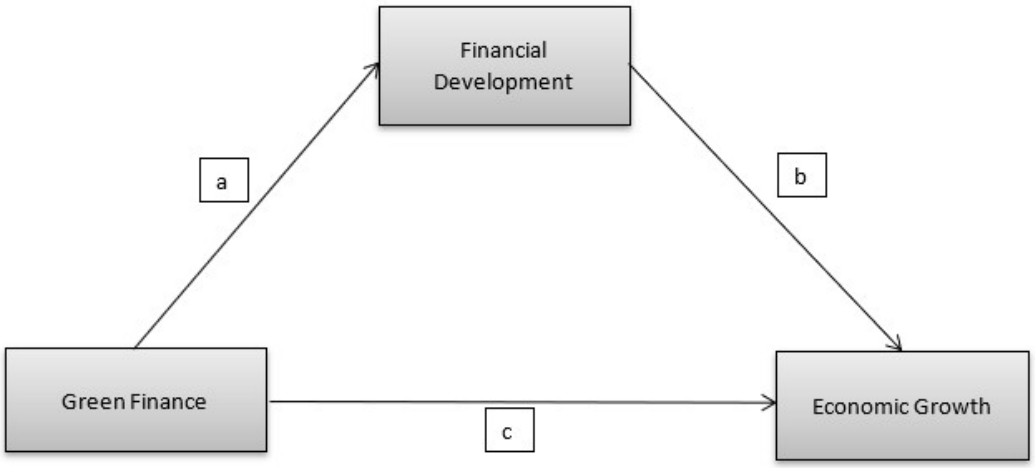

FIGURE 2.1: Research Model

Description: Model explains the relationship between dependent and independent variables with the mediation effect. As economic growth term as dependent variable, green finance is in light of independent variables and the middle effect term as financial development which known as mediator to channelize the dependent variable and independent variables. The other control variables which support the model are inflation, interest rate and exchange rate.

Dependent Variable: Economic Growth

Independent Variable: Green Finance

Mediator: Financial Development

Control Variables: Inflation, Exchange Rate, Interest Rate

2.10 Gap Analysis

For the purpose of economic growth, the government and policy makers are concerned with financial development, and macroeconomic factors such as inflation, exchange rate and interest rate. To achieve the economic growth, developed countries have enhanced their industrial productions (such as China) that has resulted in the emission of excessive carbon dioxide Therefore, several scholars have looked

into the factors that contribute to carbon emissions, such as population growth, urbanization and trade openness. Rahman et al., (2020). Researchers have conducted multiple studies on the relationship between financial development and carbon emissions using a range of techniques, indices and samples. They believe that Economic growth is another important factor that has a significant impact on carbon emissions (Jiang et al., 2019). Economic growth and financial development are closely related to each other (Fang et al., 2020; Hao et al., 2020), encouraging financial growth by altering technology invention. Zhuang et al. (2020) showing the internal financial development, enterprise invention and economic growth transmission mechanism. With the confidence of green economy promise prematurely, research on the relationship between Economic growth, environmental adaptation, and technological improvement has gradually become more noticeable (Pan et al., 2019). As per studies most of the scholars studied Green Finance, green finance, and financial development are directly related, Le & Ozturk (2020) and also have studied the relationship between financial development and economic growth Eren et al., (2019). But no relevant literature could be found regarding the indirect relationship involving financial development as mediator between our stated variables i.e. Green Finance and Economic growth. Therefore, our research gap throws light on the mediating influence of financial between Green Finance and economic growth.

Chapter 3

Data and Methodology

Primarily, the 101 countries data were collected through world bank and Our World in data of developed and developing countries for given variables for 36 years, from 1986 to 2022. However, due to non-availability of data, missing values and variables, the data reduced from 36 years to 21 years and countries reduced to 77. The data collected for green finance, financial development, economic growth and for control variables as well which includes inflation, interest rate and exchange rate, as the control variables mainly impact over economic growth.

According to a study, the economic growth is dependent variable. Hence, the proxy for economic growth is real GDP per capita used. Regarding the independent variable of Green Finance, it has used as International financial flows to developing countries in support of clean energy R&D and renewable energy production as proxy variables for given factors.

Additionally, financial development is crucial as an intermediary and the proxy used as a capital market, bond market, and FDI. The sample size for this study exclusively included the number of developed countries worldwide and the data should be collected on generalizability.

Panel data estimation techniques have been used in this research to study the relationship between Green Finance, Financial Development, and Economic Growth. A population sampling technique used to ensure accuracy. The study comprises data from over 77 countries globally, after a year of 2000- 2021.

3.1 Dependent Variable

In this study, the dependent variable is used as a economic growth. For this study the mainly two proxies used as GDP per capita, GDP. The GDP per capita aline with the study of Awan and Azam (2022); Bickenbach, Bode, Nunnenkamp, and Söder (2016). The analysis of economic growth as a dependent variable involves a thorough econometric approach, using panel data to achieve changes across countries and over time.

3.2 Independent Variable

In this study the independent variable is a Green Finance. The proxies for green finance use to be as proxy such as International financial flows to developing countries in support of clean energy R&D and renewable energy production (Kirikkaleli & Adebayo, 2022) by using a source of http://Ourworldindata.org. Green finance, which encompasses financial investments flowing into sustainable development projects and initiatives, has developed as a fundamental factor changing economic and environmental outcomes.

It involves financial products and services, including sustainability-linked loans and green bonds, designed to support projects that aim to mitigate climate change and promote environmental sustainability Tang et al. (2021). Research indicates that green finance not only facilitates the transition to a low-carbon economy but also drives technological innovation and enhances the efficiency of resource use (Campiglio, 2016).

3.3 Mediating Variable

This study applies Financial Development as a mediating variable. Financial development enhances how study canalized the relationship of green finance and economic growth. Most of the studies used financial development as dependent variable and independent variable, which not to canalize the relation which just tell the positive and negative impact on each other. Financial development acts

mediator in the relationship between economic growth and green finance by developing the productivity of capital allocation and development of an environment beneficial to investment and innovation. The proxy used to measure financial development are include as Domestic credit provided by financial sector (% of GDP).

Robust financial systems allow the mobilization of savings and lower transaction costs through enhanced financial intermediation, and provide better risk management tools, thereby supporting sustainable economic expansion (Beck et al., 2000).

3.4 Control Variable

This study includes control variables commonly used in empirical research. In the light of previous studies (Assaf, A. A. (2014)), the following control variables are used in a study: exchange rate, inflation and interest rate. The proxies will be used are as follows, LCU per US$ period average, Consumer Prices (annual %age) period average, Real Interest Rate (%age).

Controlling variables like inflation, exchange rate, and interest rate helps to isolate the effect of the primary variables of interest. It's important to manage inflation to keep price fluctuations from skewing the results. Inflation is the general rate of increase in the prices of goods and services (Smith & Jones, 2019).

Similarly, the variations in the exchange rate, which establishes the value of one currency in relation to another, are important to take into consideration as they can have a substantial impact on economic consequences (Johnson, 2018). To prevent variations in borrowing costs from distorting the study's findings, interest rates, the price of borrowing money must be managed. Interest rates are an important component of economic activity (Lee, 2019).

The study clarified the causal links between the independent and dependent factors by holding these variables constant and investigating their effect on the dependent variable. More precise and constant results were possible since this method reduced the possible effects of varying borrowing costs, price points, and currency values.

TABLE 3.1: Description of Variables

Variables	Proxy	Source	Referen
Economic Growth (DV)	GDP per capita,	WDI	Awan and Azam (2022) Bickenbach et al. (2016) Bickenbach et al. (2016)
Financial Development (Med)	Domestic provided by financial sector (% of GDP),	WDI	Edward (2018)
Green Finance (IV)	International financial flows to developing countries in support of clean energy R&D (and renewable energy production),	OWID	Kirikkaleli and Adebayo (2
Control Variables			
Exchange Rate	Official exchange rate (LCU per US$ period average)	WDI	Goda and Priewe (2020)
Inflation	Consumer Prices (annual %age)	WDI	Andrews, Oberoi, Wirjanto Zhou et al. (2020)
Interest Rate	Real Interest Rate (%age)	WDI	Canarella, Gil-Alana, Gupt

3.5 Econometric Specification

The present study examines the impact of green finance on economic growth using the GMM methodology Gong et al. (2023). The subsequent model in which equation estimate how economic growth influences the green finance.

$$EG_{it} = \beta_0 + \beta_1 GF_{it} + \beta_2 INT_{it} + \beta_3 INF_{it} + \beta_4 EX_{it} + \epsilon_{it}$$

The variable EG represents the economic growth for country i at time t, whereas a vector GF measure as green finance with three control variables such as: interest rate, inflation and exchange rate. To analyze whether the financial development mediates the relationship between green finance and economic growth, is following by the paths as follows:

3.5.1 Path-a

Path-a is established to test the two main factors: such economic growth and green finance affect financial development.

$$FD_{it} = \beta_0 + \beta_1 GF_{it} + \epsilon_{it}$$

If the coefficient of the green finance is significant, which means that financial development is significantly impacted by economic growth. It will definitely conclude the ever first condition of mediation. In the case if results are insignificant, it may result that the financial development has not play a part as mediator between economic growth and green finance.

3.5.2 Path-b

The second phase as path-b, the effect of financial development on dependent variable and over control variables as well, i.e. the proxy as GDP per capital for economic growth is analyzed.

$$EG_{it} = \beta_0 + \beta_1 FD_{it} + \beta_2 INT_{it} + \beta_3 INF_{it} + \beta_4 EX_{it} + \epsilon_{it}$$

If the coefficient of financial development is significant, it means financial development may be used as mediating role.

3.5.3 Path-c

The third phase in light of path-c, the financial development stated as mediating role is testing with a proxies of Domestic credit provided by financial sector (% of GDP), Domestic credit to private sector by bank (%age of GDP), Broad of money (%age of GDP). To analyze the mediating effect the following equation used:

$$EG_{it} = \beta_0 + \beta_1 GF_{it} + \beta_2 FD_{it} + \beta_3 INT_{it} + \beta_4 INF_{it} + \beta_5 EX_{it} + \epsilon_{it}$$

If the coefficient of green finance, financial development is significant , which means that the financial development mediates their relation among the economic growth and green finance.

3.6 Statistical Techniques

3.6.1 Generalized Method Moments

A statistical method called the Generalized Methods of Moments (GMM) is used in econometrics and other study domains to estimate parameters in statistical relationships or econometric models, (Lars Peter Hansen and Robert J. Hodrick). Suitable for both linear and nonlinear econometric and statistical models, GMM is a versatile and all-encompassing estimate technique. Suitable for both linear and nonlinear econometric and statistical models, GMM is a versatile and all-encompassing estimate technique. When the data is not normally distributed or when the assumptions of conventional estimating techniques, such as least squares, are broken, it is very helpful. These days, applying the Generalized Method of Moments (GMM), which Hansen (1982) developed, is the standard procedure for dealing with heteroskedasticity of uncertain form. The orthogonality criteria are used by GMM to enable effective estimate even in the case of unknown heteroskedasticity. Over the past two decades since its inception, GMM has grown to be a highly

valued tool for empirical researchers, Baum, Schaffer, and Stillman (2003). It is an excellent heuristic tool as well. When compared to other techniques such as ordinary least squares (OLS), GMM offers a more versatile and reliable estimating approach. It is especially helpful in situations when the data may not match the linearity, homoscedasticity, or normalcy of errors assumptions that are fundamental to OLS. Models with endogeneity, measurement error, and other problems that may occur in empirical research can also be handled using GMM. GMM is frequently used by researchers to estimate parameters for panel data analysis, time series analysis, and dynamic economic models.

In this study, research employed Generalized Method of Moments to estimate the results. GMM is a well-known statistical method that can handle complex models with problems such as endogeneity and heteroskedasticity. The study found the correct instruments and exercised the orthogonality conditions under the GMM model to give robust parameter estimates. These estimates can hence be used as reliable measures of how changes in one variable bring about changes in another variable.

Specifically, the study focused on understanding the relationships between green finance, financial development and economic growth. Difference GMM used to indicate the effect over economic growth. Difference GMM, introduced by Arellano and Bond (1991), is particularly useful for dynamic panel data models where lagged values of the dependent and independent variables serve as instruments. This method relies on first-differencing the data to remove unobserved time-invariant effects and mitigate bias from omitted variables, difference GMM is suitable for less persistent data. By using GMM, the research was able to explore how financial development acts as a mediator between economic growth and green finance. The study examined how changes in green finance performances influence FD, which in turn affects economic growth. Generally, the use of GMM in this study provided effective understandings into the dynamics of economic development by explaining the complex connections between financial development, green finance, and economic growth.

For the first- and second-order relationships under the GMM, the Sargan test and the Arellano-Bond test are used as post-estimation tests to identify the proper

econometric model. The instruments are assumed to be exogenous by GMM. This implies that the GMM's results won't be valid if the instruments are determined endogenously. The Sargan test is used to assess the instrument's correctness and the validity of the econometric model. A rejection of the null hypothesis suggests that the study's model or tools need to be reevaluated. If the Sargan test yields an insignificant result, it indicates that the study's instruments were exogenous. To further ascertain whether the error terms of two distinct periods are uncorrelated, the Arellano Bond test is utilized. Three endogeneity sources are accommodated by the GMM methodology: simultaneity, dynamic endogeneity, and unobserved heterogeneity. The superiority of GMM is indicated by the nature of panel data and the nature of the link among economic growth, financial development and green finance (Wintoki, Linck, & Netter, 2012).

Endogeneity occurs in research when an explanatory variable is correlated with the error term, leading to biased and inconsistent estimates. This can happen due to omitted variable bias, measurement error, or reverse causality. Generalized Method of Moments (GMM) is a statistical technique used to address endogeneity. It does this by using instruments, which are variables that are correlated with the problematic explanatory variable but not with the error term. GMM uses these instruments to create more accurate estimates, improving the reliability of the research findings. In simple terms, GMM helps fix problems in data analysis caused by hidden factors, errors, or mixed-up cause-and-effect relationships (Wooldridge, 2010).

3.6.2 Structural Equation Modeling

Structural Equation Modeling (SEM) is a statistical technique that allows researchers to test relationships among variables. By integrating aspects of factor analysis and multiple regression, SEM can handle intricate interrelationships among multiple variables simultaneously, making it particularly useful in fields like social sciences, psychology, education, and business research. The core components of SEM include observed variables, which are directly measured, and variables, which represent theoretical constructs inferred from the observed variables. Relationships among these variables are represented through paths. Structural

Equation Modeling (SEM) is a method used to study relationships between various variables, including those we can directly observe and those that are hidden or not directly measured. SEM consists of two main components: the structural model, which shows how different variables influence each other, and the measurement model, which connects hidden variables with the ones we can observe. This technique is particularly useful because it can analyze many variables simultaneously, takes measurement errors into account, and uses different methods to check how well the model fits the data. Overall, SEM helps researchers understand complex data patterns and is valuable for testing detailed theories in fields like marketing and psychology. In recent studies, researchers have combined Structural Equation Modeling (SEM) with the Generalized Method of Moments (GMM) to improve their research. GMM is a method used to estimate parameters in economic models, especially when dealing with issues like variables affecting each other (endogeneity) and different error amounts across data (heteroskedasticity). By using GMM within SEM, researchers can better understand the complex relationships between hidden factors, like attitudes or perceptions, and things we can measure. This combination helps to get a clearer picture of how theoretical ideas influence real behaviors or outcomes, making research findings more reliable and accurate in practical situations (Preacher, 2014). In this study, SEM has been used to investigate how green finance affects economic growth through financial development. By linking SEM with the Generalized Method of Moments (GMM), which deals with issues like how things change over time, the study gets better results. Using GMM with SEM lets the study figure out connections among the variables. Overall, this study used SEM to understand how green finance influences economic growth with the help of financial development. By using SEM to study both realized and hidden factors, the research got more perfect estimates and a better understanding of how economies grow. This provides a better understanding of the interplay between these significant economic issues and strengthens the basis for future research.

Chapter 4

Result and Analysis

The study used mediation effect as a financial development with a help of green finance and economic growth. For this purpose of study the different techniques used to evaluate the results in respect of descriptive statistics which valuate the data in form of mean, standard deviation and maximum & minimum, as per statistics the correlation and unit root test also used to test the data variability and the GMM also run for the given study, these all tested through EViews. With this context the regression analysis and sobel test also run through R-Studio to check the mediation impact for the study.

4.1 Descriptive Statistics

Table no. 4.1 defines the descriptive statistics for developed and developing countries. To list and explain the fundamental characteristics of the data in a study, descriptive statistics are employed. About the sample and the measurements, they offer brief summaries, typically through measures like mean, median, mode, standard deviation, and range i.e. maximum and minimum. The following result shows in the given descriptive statistics table that the economic growth has a mean value of 23.163, with the standard deviation of 4.7019. The given stated value indicates that the average value of economic growth may differ upto 4.70% from year to year and country to country. Thus the minimum value of economic growth is 23.7765 and the maximum value is 43.7587. The financial development

has a mean value of 51.7671, with the standard deviation of 31.17702. The given stated value indicates that the average value of financial development may differ up to 31.17702% from year to year and country to country. Thus the mini- mum value of financial development is 42.1006 and the maximum value is 211.8916. The green finance has a mean value of 12.2996, with the standard deviation of 3.9176. The given stated value indicates that the average value of green finance may differ up to 3.92% from year to year and country to country. Thus the minimum value of green finance is 0.000 and the maximum value is 0.24545. Similarly, the mean values of other control variables, including interest rate, inflation and exchange rate in table no.01 along with other factors includes standard deviation, maximum and minimum. Finally, the number of observations (1628 for each variable) signifies the size of the dataset used for analysis. This sample size ensures that the descriptive statistics accurately represent the population being studied, providing confidence in the reliability and generalizability of the findings. In conclusion, these descriptive statistics from the methodology section of the research provide a clear and concise summary of the data's distribution, central tendencies, variability, and sample size. They serve as foundational information for subsequent statistical analyses and interpretations in the study, guiding researchers in understanding the characteristics and nuances of the variables under investigation.

Table 4.1: Descriptive Statistic

Column	**EG**	**FD**	**GF**	**INF**	**INT**	**EXR**
Mean	23.163	51.7671	12.2996	6.30354	7.07929	707.929
Median	27.605	64.8096	0.01004	6.34501	5.01102	17.5832
Maximum	43.7587	211.8916	0.24545	8.33831	7.24594	23208.37
Minimum	23.7765	42.1006	0.0000	3.1137	4.3271	0.0000
Std. Dev.	4.7019	31.17702	3.9176	7.97829	9.58999	2638.646
Skewness	-0.0667	1.53995	0.20109	7.9936	1.01545	5.85621
Kurtosis	16.7977	6.2888	2.8327	125.9237	13.2644	40.6483
Jarque-Bera	12915.29	1377.203	12.87002	1042315	7426.60	105452.3
Probability	0.0000	0.0000	0.0016	0.0000	0.0000	0.0000
Sum	3771.055	84276.94	20023.87	10262.17	11525.08	1152510
Sum Sq. Dev.	35970.95	1581455	24970.64	103563.8	149632.1	11300000
Observations	1628	1628	1628	1628	1628	1628

Note: EG=Economic Growth, FD=Financial Development, GF=Green Finance, EX=Exchange Rate, INF=Inflation, INT=Interest.

4.2 Correlation Analysis

The correlation analysis results for developed and developing nations are displayed in Table no. 4.2. The findings indicate that there is a negative association between economic growth and the interest rate, inflation, and exchange rate, and a positive correlation between economic growth, financial development, and green finance. There is positive correlation of financial development with green finance and exchange rate and negative correlation with inflation and interest rate. Multicollinearity is not a significant issue because control variables have modest correlations with one another. Multicollinearity may arise when explanatory variables have a strong correlation (¿ 0.90), according to Hair, Ringle, and Sarstedt (2011).

TABLE 4.2: Correlation Analysis

Column	**EG**	**FD**	**GF**	**INF**	**EXR**	**INT**
EG	1					
FD	0.0284	1				
GF	0.0428	0.1095	1			
INF	-0.0223	-0.2338	0.0241	1		
EXR	-0.0630	0.0372	0.1302	-0.0090	1	
INT	-0.0483	-0.1092	-0.0285	-0.2430	0.0129	1

Note: EG=Economic Growth, FD=Financial Development, GF=Green Finance, EX=Exchange Rate, INF=Inflation, INT=Interest.

4.3 Unit Root Test

Finding the stationarity of a time series data collection can be done statistically using a unit root test. The time series' statistical characteristics, such as its

variance and mean, remain constant over time when it is said to be stationary. It is indicative of non-stationarity when a time series has a unit root, and its values are highly dependent on time. This can lead to problems in analysis and forecasting. By conducting a unit root test, we can check for this non-stationarity. If the test indicates the existence of a unit root, it suggests that the time series needs to be transformed (e.g., by differencing) to make it stationary before further analysis.

The table provides the results of two-unit root tests, Levin, Lin & Chu (LLC) and Im, Pesaran and Shin (IPS), applied to various economic variables: Economic Growth (EG), Financial Development (FD), Government Finance (GF), Inflation (INF), Exchange Rate (EX), and Interest Rate (INT). Both tests aim to determine whether these time series data sets are stationary.

For each variable, the LLC and IPS test statistics are highly negative, and the corresponding p-values are 0.032, 0.011, 0.037, 0.023 and 0.0000, , which is significantly below the conventional significance level of 0.05. Hence, the results suggest that the time series for EG, FD, GF, INF, EX, and INT are stationary, meaning their statistical properties do not change over time. Consequently, these variables do not require further transformation to achieve stationarity and are suitable for subsequent analysis and modeling.

Table 4.3: Unit Root Test

Variables	**Levin, Lin & Chu t***		**Im, Pesaran and Shin W-stat**	
	Statistic	**Prob.**	**Statistic**	**Prob.**
EG	-23.2077	0.000	-22.2956	0.000
FD	-13.1608	0.032	-12.74832	0.037
GF	-26.8828	0.000	-22.7976	0.000
INF	-35.1095	0.000	-19.4162	0.000
EX	-5.18677	0.011	-9.42586	0.023
INT	-21.2172	0.000	-20.3079	0.000

Note: EG=Economic Growth, FD=Financial Development, GF=Green Finance, EX=Exchange Rate, INF=Inflation, INT=Interest.

4.4 Impact of Green Finance on Economic Growth

The Equation are as follows:

$$\mathrm{EG}_{it} = \beta_0 + \beta_1 EG1_{it-1} + \beta_2 GF_{it} + \beta_3 INT_{it} + \beta_4 INF_{it} + \beta_5 EX_{it} + \epsilon_{it}$$

The given above equation has the following variables which are closely related to each other. There is a relationship between economic growth (EG) and green finance (GF). The term ($\beta_1 EG1_{it-1}$) includes the lagged value of the dependent variable, indicating that past economic performance affects current performance. With respect to other control variables such as there is relationship between economic growth (EG) and interest rate (INT), inflation (INF), and exchange rate (EX). In the given equation model, economic growth is treated as dependent variable which being as (i) for country and (t) for a time. The baseline level of economic growth represented by (β_0) when all variables are treated as zero. As per given equation each and every variable having related coefficient ($\beta_2, \beta_3, \beta_4, \beta_5$) which having impact of one unit change in each variable on economic growth while other variables kept constant. As the error term (ϵ_{it}) catches all the factors that affect the dependent variable that is economic growth. The study uses statistical methods to measure how many different factors affect economic growth. It looks at the importance and size of the impact from things like green finance, exchange rate, inflation, and interest rates on the economy. The following table shows the results which is given and measured by using GMM method through Eviews.

Table 4.4: Impact of GF on EG

Variable	**Coefficient**	**Std.Error**	**t-Statistic**	**Prob.**
EG(-1)	0.3928***	0.00062	632.575	0
GF	0.0171***	0.00072	23.6665	0
INT	-0.0378***	0.00652	-5.79662	0
INF	-0.1155***	0.00537	-21.5233	0
EX	-0.9557***	0.03548	-26.9368	0
Mean dependent Var	-0.022508	S.D. dependent var	1.267922	
S.E. of regression	1.475085	Sum squared resid	1031.365	
J-statistic	112.4533			
Prob. (J-statistic)	0.0067			

Note: $0.01 < ***, 0.05 < **, 0.10 < *$

The above table shows the results of the given analysis, which shows that there is the impact of various variable on economic growth (EG). The coefficient for the lagged value of economic growth (EG(-1)) is 0.3928, indicating that past economic growth positively influences current growth. This result is statistically significant with a p-value of 0.0000 which is less than 0.01, supported by a very small standard error of 0.00062 and an Extremely high t-statistic of 632.575. A higher absolute value of the t-statistic indicates a more significant relationship between the independent variable and the dependent variable.

On other hand the one-unit change in variable green finance (GF) holding other variables constant, the economic growth increase by around 0.0171 units. As the positive sign shows that there is a significant and positive relationship between green finance and economic growth. The small standard error of 0.00072 and t-statistic of 23.6665 confirm its statistical significance with a p-value of 0.000 which is less than 0.01. Similarly, the interest rate (INT) shows a negative impact on economic growth with a coefficient of -0.0378, and it is highly significant (p-value 0.0000) as well, indicated by a t-statistic of -5.79662 and a standard error of 0.002.

The variable INF represents inflation in the analysis. The coefficient for INF is -0.1155, which means that for each one-unit increase in inflation, the dependent variable (economic growth) is expected to decrease by 0.1155 units, assuming all other factors remain constant. The standard error for this coefficient is 0.00537, indicating that this estimate is quite precise. The t-statistic for INF is -8.549, which is a very large value in absolute terms, and the p-value is 0.000. These statistics show that the negative relationship between inflation and economic growth is statistically significant, meaning it is very unlikely to have occurred by random chance. The negative coefficient indicates that lower the inflation is linked to increase economic growth. This strong statistical evidence highlights the important role that inflation plays in affecting economic growth, showing that changes in inflation have a significant and predictable impact on economic performance.

For the variable EX, the coefficient is estimated at -0.9557, representing the expected change in the dependent variable for a one-unit increase in EX while holding other variables constant. The standard error associated with this coefficient

is 0.03548, indicating a relatively precise estimate. A t-statistic of -26.9368 and a prob- ability (p- value) of 0.000 demonstrate strong statistical significance, implying that EX significantly affects the dependent variable. The negative coefficient suggests that an increase in EX is associated with a decrease in the dependent variable.

These findings indicate that the observed relationship between EX and the dependent variable is unlikely to have occurred by random chance alone, highlighting the importance of EX in explaining the variation observed in the dependent variable.

The regression analysis gives us important numbers that help us understand how well the model works and the nature of the data. The average economic growth rate in the dataset is -0.022508. The standard deviation is 1.267922, which shows that there is a lot of variation in economic growth rates. The standard error of regression is 1.475085, meaning the model's predictions are fairly precise, with smaller numbers indicating better precision. The sum of squared residuals is 1031.365, showing how well the model fits the data, with lower numbers indicating a better fit.

The J-statistic is 112.453, which tests if the instruments used in the regression are valid. A higher number means the instruments are likely valid. There are 88 instruments used in the analysis, as shown by the instrument rank. The probability associated with the J-statistic is 0.0067, meaning it is likely that the instruments are valid and there are no issues with overidentifying restrictions. These numbers together help us understand the model's accuracy, the variability in economic growth, and the reliability of the instruments used.

4.5 Interpretation of Green Finance & Economic Growth

The analysis shows how various factors like past financial development, green finance, inflation, interest rates, and exchange rates influence the dependent variable. Positive coefficients for EG, and GF suggest that increases in these variables are associated with increases in the dependent variable. In contrast, the negative

coefficient for INT, INF, EX suggests that an increase in inflation and exchange are associated with a decrease in the dependent variable. All variables are statistically significant, emphasizing their importance in explaining the variation in the dependent variable. The additional summary statistics and specification tests provide confidence in the model's precision and the validity of the instruments used.

4.6 Impact of Green Finance on Financial Development

The Equation are as follows:

$$FD_{it} = \beta_0 + \beta_1 GF_{it-1}$$

The given above equation has the following variables which are closely related to each other. There is a relationship between Financial Development (FD) and green finance (GF). The term ($\beta_1 FD_{1it-1}$)includes the lagged value of the de- pendent variable, indicating that past economic performance affects current performance. In the given equation model, Financial Development is treated as dependent variable which being as (i) for country and (t) for a time.

The baseline level of Financial Development represented by (β_0) when all variables are treated as zero. As the error term (it) catches all the factors that affect the dependent variable that is economic growth. The study uses statistical methods to measure how many different factors affect Financial Development. It looks at the importance and size of the impact from things like green finance, on the economy. The table 4.5 shows the results of given analysis, which shows that there is the impact of various variable on Financial Development (FD). The coefficient for the lagged value of economic growth (FD(-1)) is 0.40751, indicating that past Financial Development positively influences current growth. This result is statistically significant with a p-value of 0.000 which is less than 0.01, supported by a very small standard error of 0.00029 and t-statistic of 1408.43. The following table shows the results which is given and measured by using GMM method through Eviews.

Table 4.5: Impact of GF on FD

Variable	**Coefficient**	**Std.Erroe**	**t-Statistic**	**Prob**
FD(-1)	0.40751***	0.00029	1408.43	0
GF	0.03753***	0.00023	161.049	0
Mean dependent Var	-0.01473	S.D. dependent var	1.37547	
S.E. of regression	1.43627	Sum squared resid	1588.41	
J-statistic	73.8937			
Prob. (J-statistic)	0.48162			

Note: $0.01 < ***, 0.05 < **, 0.10 < *$

A higher absolute value of the t-statistic indicates a more significant relationship between the independent variable and the dependent variable. On other hand the one unit change in variable Green Finance (GF) holding other variables constant, the Financial Development increase by around 0.03753 units. As the positive sign shows that there is a significant and positive relationship between green finance and Financial Development. The small standard error of 0.00023 and high t-statistic of 161.049 confirm its statistical significance with p-value of 0.000 which is less than 0.01. The regression analysis gives us important numbers that help us understand how well the model works and the nature of the data.

The average Financial Development rate in the dataset is -0.01473. The standard deviation is 1.37547, which shows that there is a lot of variation in Financial Development rates. The standard error of regression is 1.43627, meaning the model's predictions are fairly precise, with smaller numbers indicating better precision. The sum of squared residuals is 1588.41, showing how well the model fits the data, with lower numbers indicating a better fit. The J-statistic is 73.8937, which tests if the instruments used in the regression are valid. A higher number means the instruments are likely valid. The probability associated with the J-statistic is 0.4816, meaning it is likely that the instruments are valid and there are no issues with overidentifying restrictions. These numbers together help us understand the

model's accuracy, the variability in economic growth, and the reliability of the instruments used.

4.7 Interpretation of Green Finance & Financial Development

The analysis shows how various factors like past financial development, green finance, influence the dependent variable. Positive coefficients for FD, GF, suggest that increases in these variables are associated with increases in the dependent variable. All variables are statistically significant, emphasizing their importance in explaining the variation in the dependent variable. The additional summary statistics and specification tests provide confidence in the model's precision and the validity of the instruments used.

4.8 Impact of Financial Development on Economic Growth

The Equation are as follows:

$$EG_{it} = \beta_0 + \beta_1 EG1_{it-1} + \beta_2 FD_{it} + \beta_3 INT_{it} + \beta_4 INF_{it} + \beta_5 EX_{it} + \epsilon_{it}$$

The given above equation has the following variables which are closely related to each other. There is a relationship between Economic Growth (EG) and Financial Development (FD). The term ($\beta_1 EG1_{it-1}$) includes the lagged value of the dependent variable, indicating that past economic performance affects current performance. With respect to other control variables such as there is relationship between Economic Growth (EG) and interest rate (INT), inflation (INF), and exchange rate (EX). In the given equation model, Economic Growth is treated as dependent variable which being as (i) for country and (t) for a time. The baseline level of Economic Growth represented by (β_0) when all variables are treated as zero. As per given equation each and every variable having related coefficient ($\beta_2, \beta_3, \beta_4, \beta_5$) which having impact of one unit change in each variable on Economic Growth while other variables kept constant. As the error term (ϵ_{it}) catches

all the factors that affect the dependent variable that is economic growth. The study uses statistical methods to measure how many different factors affect economic growth. It looks at the importance and size of the impact from things like financial development, exchange rate, inflation, and interest rates on the economy. The following table shows the results which is given and measured by using GMM method through Eviews.

TABLE 4.6: Impact of FD on EG

Variable	**Coefficient**	**Std.Error**	**t-Statistic**	**Prob.**
EG(-1)	0.37818	0.00047	808.152	0
FD	1.82412	0.03946	46.2284	0
INF	-0.03602	0.00114	-31.5403	0
INT	-0.07172	0.00226	-31.8039	0
EX	-1.00643	0.03025	-33.2694	0
Mean dependent Var	-0.02543	S.D. dependent var	1.26423	
S.E. of regression	1.48944	Sum squared resid	1060.41	
J-statistic	61.3737			
Prob. (J-statistic)	0.4625			

Note: $0.01 < ***, 0.05 < **, 0.10 < *$

The above table shows the results of the given analysis, which shows that there is the impact of various variable on economic growth (EG). The coefficient for the lagged value of economic growth (EG(-1)) is 0.37818, indicating that past economic growth positively influences current growth. This result is statistically significant with a p- value of 0.000 which is less than 0.01, supported by a very small standard error of 0.00047 and an extremely high t-statistic of 808.152. A higher absolute value of the t-statistic indicates a more significant relationship between the independent variable and the dependent variable.

On other hand the one unit change in variable Economic Growth (EG) holding other variables constant, the Financial Development increase by around 1.82412

units. As the positive sign shows that there is a significant and positive relationship between Economic Growth and Financial Development. The small standard error of 0.03946 and high t-statistic of 46.2284 confirm its statistical significance with p- value of 0.000 which is less than 0.01. The interest rate (INT) shows a negative impact on Economic Growth with a coefficient of -0.07172, and it is highly significant (p-value 0.000) as well, indicated by a t-statistic of -31.8039 and a standard error of 0.00226. The coefficient for the variable INT is 0.07172, suggesting the expected change in the dependent variable for a one-unit increase in INT, holding other variables constant. With a standard error of 0.00226, this estimate exhibits a high level of precision. A t-statistic of 44.939 and a probability (p- value) of 0.000 indicate strong statistical significance for INT, highlighting its substantial impact on EG. The variable INF represents inflation in the analysis. The coefficient for INF is -0.03602, which means that for each one-unit increase in inflation, the dependent variable (economic growth) is expected to decrease by - 0.03602 units, assuming all other factors remain constant. The standard error for this coefficient is 0.00114, indicating that this estimate is quite precise. The t- statistic for INF is -31.5403, which is a very large value in absolute terms, and the p-value is 0.000. These statistics show that the relationship between inflation and Financial Development is statistically significant, meaning it is very unlikely to have occurred by random chance. The negative coefficient indicates that lower inflation is linked to increase Economic Growth. This strong statistical evidence highlights the important role that inflation plays in affecting Economic Growth, showing that changes in inflation have a significant and predictable impact on economic Growth performance. The regression analysis gives us important numbers that help us understand how well the model works and the nature of the data. The average Financial Development rate in the dataset is -0.02543. The standard deviation is 1.26423, which shows that there is a lot of variation in Financial Development rates. The standard error of regression is 1.48944, meaning the model's predictions are fairly precise, with smaller numbers indicating better precision. The sum of squared residuals is 1060.41, showing how well the model fits the data, with lower numbers indicating a better fit. The J-statistic is 61.3737, which tests if the instruments used in the regression are valid. A higher number means the instruments are likely valid. The probability associated with the J-statistic

is 0.4625. These numbers together help us understand the model's accuracy, the variability in economic growth, and the reliability of the instruments used.

4.9 Interpretation of Economic Growth & Financial Development

The analysis shows how various factors like past financial development, green finance, inflation, interest rates, and exchange rates influence the dependent variable. Positive coefficients for EG(-1),FD suggest that increases in these variables are associated with increases in the dependent variable. In contrast, the negative coefficient for INT, INF and EX suggests that an increase in inflation is as- sociated with a decrease in the dependent variable. All variables are statistically significant, emphasizing their importance in explaining the variation in the dependent variable. The additional summary statistics and specification tests provide confidence in the model's precision and the validity of the instruments used.

4.10 Impact of Green Finance and Financial Development on Economic Growth (Mediation)

The Equation are as follows:

$$EG_{it} = \beta_0 + \beta_1 EG1_{it-1} + \beta_2 GF_{it} + \beta_3 FD_{it} + \beta_4 INT_{it} + \beta_5 INF_{it} + \beta_6 EX_{it} + \epsilon_{it}$$

The given above equation has the following variables which are closely related to each other. There is a relationship between Economic Growth (EG), Green Finance (GF) and Financial Development (FD). The term ($\beta_1 EG1_{it-1}$) includes the lagged value of the dependent variable, indicating that past economic performance affects current performance. With respect to other control variables such as there is relationship between Economic Growth (EG) and interest rate (INT), inflation (INF), and exchange rate (EX). In the given equation model, Economic Growth is treated as dependent variable which being as (i) for country and (t) for a time.

The baseline level of Economic Growth represented by (β_0) when all variables are treated as zero. As per given equation each and every variable having related coefficient ($\beta_2, \beta_3, \beta_4, \beta_5, \beta_6$) which having impact of one unit change in each variable on Economic Growth while other variables kept constant. As the error term (ϵ_{it}) catches all the factors that affect the dependent variable that is economic growth. The study uses statistical methods to measure how many different factors affect economic growth. It looks at the importance and size of the impact from things like green finance, financial development, exchange rate, inflation, and interest rates on the economy. The following table shows the results which is given and measured by using GMM method through Eviews.

TABLE 4.7: Impact of GF&FD on EG

Variable	**Coefficient**	**Std.Error**	**t-Statistic**	**Prob.**
EG(-1)	0.37578***	0.0009	200.93	0
GF	0.02372***	0.0282	25.2334	0
FD	1.99225***	0.0489	29.7407	0
INT	-0.03723***	0.003	-6.92395	0
INF	-0.09137***	0.0018	-8.60963	0
EX	-1.00212***	0.0125	-11.4569	0
Mean dependent Var	-0.02251	S.D. dependent var	1.26792	
S.E. of regression	1.49619	Sum squared resid	1058.85	
J-statistic	59.7727			
Prob. (J-statistic)	0.44742			

Note: $0.01 < ***, 0.05 < **, 0.10 < *$

The above table shows the results of the given analysis, which shows that there is the impact of various variable on economic growth (EG). The coefficient for the lagged value of economic growth (EG(-1)) is 0.37578, indicating that past economic growth positively influences current growth. This result is statistically

significant with a p- value of 0.000 which is less than 0.01, supported by a very small standard error of 0.0009 and an Extremely high t-statistic of 200.93. A higher absolute value of the t- statistic indicates a more significant relationship between the independent variable and the dependent variable.

On other hand the one unit change in variable Economic Growth (EG) holding other variables constant, the Financial Development increase by around 1.99225 units. As the positive sign shows that there is a significant and positive relationship between Economic Growth and Financial Development. The small standard error of 0.0489 and high t-statistic of 29.7407 confirm its statistical significance with p-value of 0.000 which is less than 0.01. Similarly, the one unit change in variable Economic Growth (EG) holding other variables constant, the Green Finance increase by around 0.02372 units. As the positive sign shows that there is a significant and positive relationship between Economic Growth and Green Finance. The small standard error of 0.0282 and high t- statistic of 25.2334 confirm its statistical significance with p-value of 0.000 which is less than 0.01.

The interest rate (INT) shows a negative impact on Economic Growth with a coefficient of -0.03723, and it is highly significant (p-value 0.000) as well, indicated by a t-statistic of -6.92395 and a standard error of 0.003. The coefficient for the variable INT is 0.1057, suggesting the expected change in the dependent variable for a one-unit increase in INT, holding other variables constant. With a standard error of 0.001, this estimate exhibits a high level of precision. A t-statistic of -6.92395 and a probability (p- value) of 0.000 indicate strong statistical significance for INT, highlighting its substantial impact on EG. The variable INF represents inflation in the analysis. The coefficient for INF is 0.09137, which means that for each one-unit increase in inflation, the dependent variable (economic growth) is expected to decrease by -0.09137 units, assuming all other factors remain constant. The standard error for this coefficient is 0.0018, indicating that this estimate is quite precise. The t- statistic for INF is -8.60963, which is a very large value in absolute terms, and the p-value is 0.005. These statistics show that the relationship between inflation and Economic Growth is statistically significant, meaning it is very unlikely to have occurred by random chance. The negative coefficient indicates that lower inflation is linked to increase Economic Growth. This strong statistical

evidence highlights the important role that inflation plays in affecting Economic Growth, showing that changes in inflation have a significant and predictable impact on economic Growth performance. For the variable EX, the coefficient is estimated at 1.00212, representing the expected change in the dependent variable for a one-unit increase in EX while holding other variables constant. The standard error associated with this coefficient is 0.0125, indicating a relatively precise estimate. A t- statistic of -11.4569 and a probability (p-value) of 0.000 demonstrate strong statistical significance, implying that EX significantly affects the dependent variable. The negative

coefficient suggests that an increase in EX is associated with a decrease in the dependent variable. These findings indicate that the observed relationship between EX and the dependent variable is unlikely to have occurred by random chance alone, highlighting the importance of EX in explaining the variation observed in the dependent variable. The model uses cross-section fixed effects with first differences to account for stable characteristics across different cross-sections over time. The mean of the dependent variable is -0.02251, and the standard deviation is 1.26792, indicating the average level and variability of economic growth in the dataset. The standard error of regression is 1.49619, reflecting the precision of the model's predictions, while the sum of squared residuals is 1058.85, measuring the model's overall fit to the data. The J-statistic of 59.7727 tests the validity of the instrumental variables used, with a probability of 0.44742 suggesting that the instruments are likely valid and overidentifying restrictions are not violated. Overall, the analysis provides robust insights into the significant factors influencing economic growth, highlighting the roles of green finance, financial development, interest rates, inflation, and exchange rates.

4.11 Interpretation of Green Finance, Financial Development & Economic Development

The analysis shows how various factors like past financial development, green finance, inflation, interest rates, and exchange rates influence the dependent variable as economic growth. Positive coefficients for EG, GF and FD suggest that

increases in these variables are associated with increases in the dependent variable. In contrast, the negative coefficient for INT, INF and EX suggests that an increase in inflation is associated with a decrease in the dependent variable. All variables are statistically significant, emphasizing their importance in explaining the variation in the dependent variable. The additional summary statistics and specification tests provide confidence in the model's precision and the validity of the instruments used.

4.12 Regression Analysis

Table 4.8: Regression Analysis

Path	**Estimate**	**Std.Err**	**z-value**	**p (>—z—)**
c	0.064	0.029	2.165	0.030
a	1.014	0.196	5.165	0.000
b	0.042	0.034	1.246	0.023

Note: EG=Economic Growth, FD=Financial Development, GF=Green Finance, EX=Exchange Rate, INF=Inflation, INT=Interest.

The statistical technique of regression analysis is utilized in study to look at the link between DV, IV, and Med. Understanding the relationship between changes in the independent variables and changes in the mediator and dependent variables is made possible by it. As path indicates the relationship between variables in structural equation model. In this specific context, each line represents the relationship between two variables.

The estimate represents the coefficient of the relationship between the variables specified by the path. It shows how the dependent variable should vary in response to a one-unit change in the independent variable. The estimate for the path- c from GF to EG is 0.064. This means that for each one-unit increase in GF, the researchers expect EG to increase by an average of 0.064 units, holding all other variables constant. The estimate for the path-a from GF to FD is 1.014. This means that for each one-unit increase in GF, the researchers expect EG to

increase by an average of 1.014 units, holding all other variables constant. Same as the respective formulation, the estimate for the path-b from FD to EG is 0.042.

This means that for each one-unit increase in GF, the researchers expect EG to increase by an average of 0.042 units, containing all other variables constant. The standard error is an estimate of the variability of the estimate. It indicates the precision or consistency of the coefficient estimate. A less significant standard error suggests a more precise estimate. On the contrary, a larger standard error suggests more uncertainty in the estimate. The standard error associated with the estimate is 0.029. This value represents the variability of the estimate due to sampling error. A smaller standard error indicates a more precise estimate. The z-value is the ratio of the estimate to its standard error. It indicates the number of standard deviations the estimate is from the null hypothesis. A higher z-value suggests that the estimate is further from the null hypothesis and is more likely to be statistically significant. The z-value is a measure of the number of standard deviations that the estimate is away from zero. In this case, the z- value is 2.165, suggesting that the estimate is approximately 2.165 standard errors away from zero. Contrary, the z-value is 5.165, suggesting that the estimate is approximately 5.165 standard errors away from zero. Lastly the z-value is 1.246, suggesting that the estimate is approximately 1.246 standard errors away from zero. The p-value is the probability of observing the estimate if the null hypothesis were true. It indicates the statistical significance of the estimate. A p- value less than the chosen significance level (often 0.05) suggests that the estimate is statistically significant. The P- value associated with the estimate is 0.030. This p-value indicates the probability of observing an estimate as one obtained if the null hypothesis were true (i.e., if the true coefficient were zero). In this case, a p- value of 0.030 suggests that the relationship between GF and EG2 is statistically significant at the 0.05 significance level, as it is less than 0.05. The p- value associated with the estimate is 0.000. This p-value indicates the probability of observing an estimate as the one obtained if the null hypothesis were true (i.e., if the true coefficient were zero). In this case, a p-value of 0.000 suggests that the relationship between FD and EG is statistically significant at the 0.023 significance level, as it is less than 0.05. The p-value associated with the estimate is 0.023. This p-value indicates the probability

of observing an estimate as the one obtained if the null hypothesis were true (i.e., if the true coefficient were zero). In this case, a p-value of 0.023 suggests that the relationship between GF and FD is statistically significant at the 0.02.

4.13 Sobel Test

TABLE 4.9: Sobel Test

Path	**Estimates**	**Std.Err**	**z-value**	**p (>—z—)**
ab	0.037	0.018	2.14	0.046

The Sobel test is a statistical method used to determine if a mediator variable significantly explains the relationship between an independent variable (cause) and a dependent variable (effect). This test is crucial in research when trying to understand the underlying mechanisms that link variables together. For instance, if a study aims to examine how study habits (independent variable) influence academic performance (dependent variable) through self-discipline (mediator), the Sobel test helps confirm if self-discipline significantly mediates this relationship. By combining the effects of the independent variable on the mediator and the mediator on the dependent variable, the Sobel test evaluates whether the indirect pathway through the mediator is significant. This provides deeper insights into how and why certain variables are connected, supporting the research hypothesis and enhancing the validity of the study. Therefore, the Sobel test is a valuable tool for researchers seeking to clarify the roles of mediators in their theoretical frameworks and ensure the robustness of their findings.

The Path-ab specific the mediation model. Path-b indicates the effect of the mediator on the dependent variable, showing how much the mediator influences the outcome. Path-a, on the other hand, represents the effect of the independent variable on the dependent. The standard error values for Path-ab (0.018) indicate the precision of these estimates, with lower values suggesting more accurate measurements. This path exhibits remarkably high z-values (2.14), signifying the strength and significance of the observed effects. Furthermore, the p-values for Path-ab is 0.046, indicating that these effects are highly statistically significant.

These findings from the Sobel test underscore that the mediator variable plays a substantial role in mediating the relationship between the independent and dependent variables in the studied model. This statistical approach not only validates the theoretical framework of mediation but also enhances the understanding of how variables interact within the research Context, thereby contributing to more robust and reliable study outcomes.

Chapter 5

Discussion and Conclusions

5.1 Conclusion

By using the GMM and SEM methodology, this study examine the relationship between financial development, green finance and economic growth. The nexus of green finance, financial development, and economic growth has gained significant consideration in recent years, given the critical need for sustainable economic practices in the face of environmental challenges. This research has empirically examined the relationship between these significant components across various countries worldwide, providing a complete analysis of how green finance can drive both financial development and economic growth.

Our findings indicate a positive and significant relationship between green finance and economic growth. Countries that have invested in green finance have not only witnessed substantial developments in their financial sectors but have also experienced robust economic growth. This highlights the dual benefits of sustainable financial practices adopting environmental sustainability and strengthening economic performance. Qiao et al. (2021) supports with results that green finance having significant impact over the economic growth. The empirical evidence supports the hypothesis that green finance can act as a money for financial development. By channeling investments into environmentally friendly projects, green finance has motivated innovation and efficiency in financial markets. This has led to enhanced financial services, better risk management, and increased capital

mobilization, all of which provide a more robust and dynamic financial sector. Moreover, the positive correlation between financial development and economic growth in a study. Well-developed financial systems facilitate effective distribution of resources, reduce transaction costs, and support entrepreneurial activities, all of which are essential for sustained economic growth. The combination of green finance within these systems further increases these benefits by promoting sustainable development. Future research should explore deeper into the specific ways through which green finance impacts different sectors of the economy.

5.2 Limitation

The quality and accessibility of data on green finance, financial development, and economic growth are critical factors that influence the validity of the findings reached in this research. Many areas, particularly developing nations have old, inconsistent, or insufficient data, which might distort the findings. Due to differences in financial systems, legal frameworks, and economic structures, the effects of green finance and financial development on economic growth might range greatly throughout nations and regions. The findings' potential to be applied broadly may be constrained by these Contextual variations. The study's main areas of interest include financial development, green finance, and a few macroeconomic factors including interest rates, inflation, and currency rates. Nonetheless, a plethora of additional variables, including but not limited to political stability, technical progress, and worldwide economic conditions, also significantly influence economic growth and were not thoroughly examined in this research. Worldwide for current study, researcher can investigate and segregate the developed and developing countries further and work on other variables with respect of green finance.

5.3 Practical Implication

There are several significant practical implications for policymakers, financial institutions, and other stakeholders in the interaction between economic growth, green finance, and the mediating function of financial development. For green

investments, policymakers can offer incentives like lower lending rates, tax breaks, or subsidies. Economic development will result from more companies and private investors funding environmentally friendly initiatives. Financial inclusion, regulatory frameworks, and financial infrastructure are all important areas for policy development. To ensure that objectives for environmental sustainability are met by economic growth, governments should include green finance and sustainability into their larger plans for economic planning and development.

Green financial products, such sustainability-linked funds, green bonds, and green loans, can be created and marketed by financial institutions. These goods might draw in investors who want to make money while promoting sustainable development. Financial institutions should improve their ability to evaluate the risks and benefits of investing in green projects. This entails gaining proficiency in assessing projects' long-term viability and environmental effect. The banking industry should support green finance innovation by promoting the use of fintech solutions to simplify green investments, increase transparency, and lower transaction costs. Given that investments in green finance have the potential to produce large long-term economic and environmental benefits, stakeholders should have a long-term outlook. In order to promote robust economic growth, this strategy supports sustainable behavior.

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