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MEDIATING ROLE OF ESG RATINGS IN THE RELATIONSHIP BETWEEN GREEN FINANCE AND FINANCIAL PERFORMANCE: EVIDENCE FROM G20 COUNTRIES

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Abstract
Since the inception of green finance, it has gained considerable attention in academic, social, governmental, and financial sectors. Green financing enables firms to be perceived as environmentally friendly, socially responsible, and well-governed, which leads towards better financial outcomes. The purpose of this study is to examine the mediating role of ESG ratings in the relationship between green finance and financial performance. For this purpose, the study uses a panel of 489 firms issuing green finance from G20 countries. Generalized Method of Moments (GMM) technique is used for data analysis. Findings reveal that both green finance and ESG ratings lead to better financial outcomes. However, the impact of green finance is mediated by ESG ratings. This study contributes towards the extension of knowledge and provides a framework for firms and policymakers to show concern for sustainability. These dynamics can help corporate decision-makers to take strategic decisions aligned with sustainability goals and financial success.
Key Words: Green Finance, ESG Ratings, Financial Performance, Sustainability

1. INTRODUCTION

Green finance is an emerging concept in sustainable development. It refers to the financing of investments and projects that demonstrate environmental benefits and support sustainable development. The objective of green finance is not limited to climate change rather it has other wide range of environmental objectives to consider. These objectives may be water sanitation, protection of biodiversity and control in industrial pollution (Hohne, N., et al., 2012). Green finance focuses on environmental concerns and effective resource allocation as compared to non-green finance (Zho, Tang and Zhang, 2020). Green finance involves the mobilization of capital towards alternative energy resources and conservation of natural resources. It also includes decisions of environmental risk integration with financial decision-making. Consequently, transforming the financial system to support sustainable development goals (SDGs).

Since its inception, green finance has emerged and developed rapidly, hence, debated more academically, socially and politically. Moreover, it has growing and direct influence on corporate decision-making, particularly in financial decision-making. Because, the increasing concern towards the environment, social and governance (ESG) issues worldwide by governments and investment community has led corporations to address these issues in their operations. After Paris Agreement, governments formulate regulations in order to ensure that corporate world play a vital role in decreasing the temperature by mitigation of the carbon emission. In addition, investment community is more concern regarding the socially responsible investments (SRIs), and long term investors take ESG issues interestingly more important in their investment decisions (Amel-Zadeh and Serafeim, 2018; Eccles and Klimenko, 2019). Currently, the only effective way to meet the demands is the green financing. Green financing can be issuing of green securities (green bonds, green equity, green credit, guarantees, etc.) that help both public and private sector investments to support environment sustainability.

However, the basic and ultimate goal of a firm is to maximize the value of shareholders. This is reflected in the appreciation of firms' market performance. The internal factors of increasing market performance are reflected in firms' financial statements in the form of growth in revenue, reduction in costs, and efficiency in working capital management, net profits, and earnings per share. A positive reflection of such indicators builds confidence in shareholders, because these are the first numbers that are reported in company financials, and the first readers are the investors (Hong &Najmi, 2020). Hence investors' behavior always reflects management decisions (Berman, K. & Knight, J., 2013; Hong &Najmi, 2020). A firm with the essence of good financial performance possesses a sound rapport in the eyes of investors and other stakeholders. This rapport must be consistent over the period to maintain a

steady flow of capital considering the risk behavior of fund providers that have more options for investment diversification. This phenomenon makes investors employ control over the firms, especially in financial decisions. Furthermore, managers also try to take into account other stakeholders that are either directly or indirectly affected by firms' operations as suggested by Freeman's Stakeholder Theory (1984). Therefore, firms also engage themselves in addressing environmental, social, and governance (ESG) issues in their operations.

ESG practices are the corporate environmental practices derived from the magnitude of such practices that have a sound impact on the contribution towards the firm's environmental performance (Testa et al., 2016). Engaging in ESG issues by firms has grown exponentially worldwide. This is due to the pressure not only from main stakeholders like governments and the investment community but also from the public and media. Similarly, long-term environment-conscious investors take ESG issues more seriously in their investment decisions (Amel-Zadeh and Serafeim, 2018; Eccles and Klimenko, 2019). Therefore, the majority of firms worldwide try to engage in ESG practices so that they can be perceived as environment friendly; be able to gain competitiveness; and use resources effectively and efficiently. Since, these practices integrate the society and other stakeholders with a firm by creating a spirit of environment (Tarmuji, I., Maelah, R., &Tarmuji, N. H., 2016), the firms disclose this engagement of ESG practices in their annual financial or sustainability reports which epidemically increased in few decades back (Amel-Zadeh and Serafeim, 2018; Gillan et al., 2021).This disclosure is as important as engaging in such activities because it reflects the firm's engagement and users of financial and sustainability reports make decisions accordingly as per their interests.

Although, the issuance of green finance and consideration of ESG issues by firms takes all stakeholders into account, however, it costs the benefit of shareholders. Frideman's (1962) shareholder theory suggests that organizations should consider only the value maximization of shareholders while making organizational decisions. Therefore, the question arises whether issuing green securities by firms, sacrifices their financial performance, which is the right of shareholders, or its financial performance is improved. Instrumental Stakeholder Theory (Jones, 1995) suggests that organizations should be involved in such activities without sacrificing their ultimate goal, that is, shareholders' wealth maximization. As the literature is dichotomous regarding exploring the financial advantages and disadvantages of going green, most investors perceive going green as costly to the firms and reduce their confidence (Karltorp, 2016). Hence, they are reluctant to invest or require more high returns Nonetheless, it has been observed in many countries that firms issued green finance have shown significant financial benefits with lower cost (Ng and Rezee, 2015; Wong et al., 2021).

In the business landscapes of the current era, sustainability is a great concern as the basic expectations from consumers, investors and policymakers are the same. This increasing concern for sustainability has led to green finance and ESG activities on the front line, raising very critical questions considering the Instrumental Stakeholder Theory (Jones, 1995) in view: Do these activities affect a firm's financial performance? Do companies sacrifice their profitability for sustainability, or do firms boost their financial performances while issuing green finance and engaging in ESG activities?

Despite this growing concern and awareness, the financial implications of these efforts towards sustainability remain underexplored. Existing studies overlook the more inclusive context and focus narrowly, with either geographical or empirical limitations. Furthermore, studies show contradictory results in the relationship of green finance and financial performance. Both, negative and positive associations of green finance and financial performance present strong arguments. Studies with positive associations argue that green finance leads to firm performance, helps to reduce risk, and attracts environment-conscious investors. Instead, studies with negative association suggest that lower and short-term returns, and higher costs, might offset financial gains. These dichotomous results lead to identifying the factor that influences the direction of the results in the relationship between green finance and financial performance. We argue that ESG rating is a potential factor that might mediate the relationship because it shows the extent to which investors are conscious. Green finance does not necessarily ensure a positive impact, as suggested by the literature, on financial performance unless investors perceive it as a genuine effort towards sustainability. In addition, ESG as a standard indicator, is used as a metric by investors for portfolio screening and resource allocation. Firms with strong ESG rating can attract long-term investors with lower costs and enjoy higher financial benefits. Therefore, it can serve as a bridge through which the issuance of green finance can improve the financial performance. Catalyst to that the comprehensive and firm-level investigations are insufficient or sparse. Hence, an investigation with deeper insights specific to how green finance translates into financial performances of firms, particularly through ESG performance, needs to be conducted.

The present study takes into account these concerns by empirically examining the impact of green finance on the financial performance of a firm with the mediating role of ESG ratings. To fill the critical gap in the literature. The study uses a panel of 489 firms from G20 countries as these countries represent the largest economies worldwide, account for more than 80% of GDP globally, and are playing a leading role in issuing green finance, therefore, playing a vital role in shaping the agenda of global sustainability. The study sample covers the period of 10 years from 2012 to 2022.

2. LITERATURE REVIEW

The multifaceted relationships among green finance, ESG practices, and financial performance rest upon the core factors of motivation and discouragement, which influence the decisions of corporate managers and stakeholders regarding their involvement in ESG practices and the issuance of green securities. Notably, whether such engagement holds the promise of mutual benefit for both corporations and their stakeholders, or if it presents challenges and trade-offs.

Green Finance and Financial Performance

Numerous studies have explored the various factors influencing a firm's financial performance, both internal and external. Capon et al. (1990) identified three key categories—organizational, strategic, and environmental—that impact financial outcomes. The environmental factor, a crucial part of ESG practices, is addressed through operational improvements or by issuing green securities to promote environmental betterment (Amel-Zadeh & Serafeim, 2018; Zho, Tang & Zhang, 2020).

The rise in green bonds worldwide is attributed to their role in achieving carbon emission and climate change mitigation goals, aiding corporate sustainability, and regulatory compliance. Falcone (2020) supports this, but Levy (1995) and Appaurle et al. (1985) argue that going green may reduce corporate competitive advantage due to higher costs. Sue L. N. et al. (2018) add that green industries face challenges like perceived long payback periods and higher risks, deterring investment. However, researchers like Gianfrate & Peri (2019) found that European green bonds offer better profitability and lower capital costs for firms financing green projects.

An empirical comparative study conducted by Fatica, & Panzica, (2021) showed that green security issuers exhibit a reduction in carbon emission as compared to the conventional security issuers, which is more substantial and enduring, especially after the Paris Agreement. However, this reduction in carbon emission has been observed less in developing countries as compared to the developed countries (Wang, & Sueyoshi, 2018).

As far as market-based financial performance is concerned, the literature on green bonds mostly focuses on studying the relationships of green bonds with financial markets and bond prices, hence, the empirical evidence shows its close relationship with currency markets and fixed income, while weak correlation with stock and-high return corporate bond markets. Reboredo& Ugolini, (2020) found that green bonds are weakly associated with stock returns. Whereas, volatility, liquidity and returns of green bonds is less as compared to non-green bonds that involve higher interest rates (Bachelet et el., 2019). The breakdown of private and institutional green bonds in Bachlete et al., (2019) study explained that private bonds showed positive premiums whereas counterparts showed negative premiums. However, returns go higher if issuers commit the certification of greenness. Similarly, Hyun, Park, and Tian, (2020) explored empirically in the green bond market how green information is priced. They found that there is no strong and significant discount or premium for green bonds as compared to conventional bonds. However, the trading of green bonds is closer than their conventional counterparts (Zhou &Cui, 2019), and government bonds show marginally wider trading.

On the other hand, issuing green securities is positively linked to financial performance, as firms gain a stronger reputation within the investment community, leading to increased profitability. Several studies support this connection. Flammer (2015) found that going green improves shareholder gains. Wang Y. et al. (2020) also noted that going green enhances financial performance, though results vary by firm size and location, with smaller firms benefiting more. Loffler, Petreski, and Stephan (2021) compared green and conventional bonds, finding that while green bonds offer positive returns, they are slightly lower due to lower risk and the preference of institutional investors for green bonds despite higher prices (Wang J. et al., 2020).

Based on the contemporary trends in green finance, the issuing of green bonds, and their relationship with financial performance, following hypothesis asserts that the more the firms engage in issuing green finance the higher the financial performance will be.

H1: Green finance has a significant and positive impact on financial performance.

ESG Ratings and Financial Performance

The 2008 financial crisis heightened awareness of the importance of ESG performance, especially for long-term investors (Nicholson et al., 2011). As firms are being considered accountable regarding ESG issues, the perception that the investment community is not concerned about the firm's ESG performance is outdated. Eccles, & Klimenko, (2019) argue that the focus of researchers over the last few decades have also been shifted. Ambec & Leonie, (2008) further explain that this is because the growing concern about environmental performance can be related to better financial performance. This increased focus on ESG is driven by factors such as financial returns, the size of investment firms, rising demand, differing views on fiduciary duty, inter-firm relationships, and growing investor activism (Eccles & Klimenko, 2019). Interest in socially responsible investments (SRIs) has grown among investment analysts, portfolio managers, and investors, focusing on non-financial factors like ESG practices that impact a firm's behavior.

Various studies have identified the relationship of ESG with financial performance. For example, Kling et al., (2020) analysed one factor, climate vulnerability, of environmental pillar of ESG with the cost of capital and explored that the firms with more vulnerability to climate risk are unable to access debt, therefore, the cost of capital of these firms

increases. This in turn affects the economic growth of the company negatively because of lower profitability. However, these costs can be completely or partially offset by higher gains from any other means (Ambec & Lenoie, 2008). Nevertheless, Tarmuji, et al. (2016) found a positive impact of green finance on financial performance and stated that involving in such activities creates an integration of society with businesses, therefore, gaininga reputation and thereby increasing the confidence in investors. Nonetheless, Yusof et al., (2020) argued that an increase in firms' financial performance by ESG practices is heterogeneous across green practices and the size of a firm. Hence, larger firms may spend more on ESG practices than firms in smaller sizes.

Tarmuji, et al., (2016) analyzed 80 firms from Malaysia and Singapore and concluded that ESG practices showed significant returns, which increased the confidence of investors and let firms use resources efficiently, hence gaining competitive advantage. They used ESG score explored from Datastream in their analysis. Similar results were found by Miroshnychenko et al., (2017) and Ambec & Lenoie (2008), however, they used internal green practices to determine only one pillar (Environmental) of ESG in their analysis. Miroshnychenko et al., (2017) concluded that four green practices (ISO 14001; green product index; green supply chain management; and pollution prevention) are associated with the future market value of a firm as it has a significant positive impact on financial performance. Wong W. C. et al., (2021) also explored the same results while analyzing Malaysian firms and concluded that ESG score of a firm from a third party has a reputable impact on its cost and profitability. High rating reduces the firms' cost and increases its profitability that benefits its investors concerned in socially responsible investments or having concern in ESG practices.

These combinations of arguments emphasize the need for further investigation of whether green finance directly improves firms' financial performance or if it is the reputation of ESG rating that leads to better financial performances. The essence is to understand the effect of efforts towards sustainability in increasing financial performance through ESG ratings. The evidence from both government and corporate sectors supports this argument based on the notion that sustainable investments can draw the attention of environment-conscious investors through higher reputation, reduce financial costs, and improve the firm's financial performance. Firms with higher ESG ratings tend to outperform financially the firms with lower ESG ratings. ESG practices improve the efficiency of resource management, facilitate effective risk management, and gain the confidence of investors, all of which lead to better financial performance.

This persistent debate leads us to formulate the following hypothesis:

H2: ESG ratings play a mediating role in the relationship between green finance and financial performance.

3. METHODOLOGY

3.1 Data Description and Sample

Data has been collected from Thomson Reuters DataStream. For ESG ratings, the ESG index constructed by Thomson Reuters has been used as a proxy. Shaukat el al., state that the ESG index constructed by Thomson Reuters covers firms worldwide and this constructed index score is more comprehensive (Shaukat et al., 2016) and this index is using more than 900 parameters as compared to Bloomberg that uses 800 parameters (Miroshnychenko et al., 2017; Behl et al., 2021). Numerous researchers have used Thomson Reuters ESG and financial data in their analysis (For example, Halbritter and Dorfleitner, 2015; Shaukat et al., 2016; Tarmuji et al., 2016; Eliwa, Aboud and Saleh, 2021). Data on Green bonds (proxy of green finance) has also been collected from DataStream, which contains more than 1500 firms that issued green bonds from the year 2007. Similarly, the financial and accounting firm-level data was also collected from the same database.

The sample comprises of firms from G20 countries that issued green finance during the period of 2010 to 2022. Since, G20 countries represent the largest economies worldwide, account for more than 80% of GDP globally, and are playing a leading role in issuing green finance, therefore, playing a pivotal role in shaping the agenda of global sustainability. Initially, 1181 companies that had issued green bonds were identified. Following winsorization, the financial service companies lacking essential accounting and financial data (for example, return on assets) were excluded. Furthermore, the companies with missing observations were also removed from the dataset. Therefore, the final sample consists of 489 firms across 21 countries as presented in Table 3.1 below:

Table 3.1: Sample Representation Country Wise

Country	Sample Contribution
Japan	24.7%
UK	13.7%
China	8.6%
USA	8.6%
South Africa	8.0%
Korea	4.5%

France	4.1%
India	4.1%
Indonesia	3.5%
Italy	3.1%
Sweden	3.1%
Others	14.1%

3.2 Variables Description

As for as the dependent variable, financial performance, is concerned, numerous studies have used either market-based performance measures such as market price per share and Tobin's Q or accounting base performance measures such as return on assets, return on sales, or return on equity (Sanchez-Ballesta and García-Meca, 2007; Miroshnychenko et al., 2017). This study used return on assets (ROA and Tobins's Q) as the measures of financial performance. These measures capture both accounting- and market-based financial performances (Miroshnychenko et al., 2017). ROA is calculated as the ratio of residual income with total assets, and Tobin's q is estimated as the ratio of total market value and company replacement value (Miroshnychenko et al., 2017) and is calculated as:

$$QRatio = \frac{(BVofTotalAssets) - (BVofShareholder's Equity) + (MVofShareholders' Equity}{BVofTotalAssets}$$

As far as independent variables is concerned, multiple proxies have been used for green finance. Most of the available studies have used issuance of green bonds as a proxy for green finance (for example, Ng A. W., 2018; Loffler et al., 2019; Alonso-Conde and Rojo-Suarez, 2020; Wang et al., 2020; Meo and Karim, 2021) because the better tool to stimulate financial resources to achieve the target of Paris Agreement for mitigation of carbon emission (Gianfrate and Peri, 2019). This study also used green bonds issued by firms as a proxy for green finance. Log of the total market value of the bond at the period *t* has been used as a proxy for green finance.

Mediating variable, ESG ratings, is calculated as the aggregate score of ESG score by Thomson Reuters. Numerous third-party agencies rate firms on ESG such as Thomson Reuters, Bloomberg, MSCI (KLD), etc. Following the previous studies (Flammer, 2021; Fuente et al., 2021; Kim et al., 2021), this study used the ESG index score provide by Thomson Reuter Refinitive database as the proxy of ESG ratings. It is the quantifiable measure to assess the ESG performance of a firm (Berg et al., 2020). Thomson Reuters ESG index covers global firms and uses ten different categories for three main pillars; governance pillar, social pillar and environmental pillar to makeup the overall ESG score. It is all based on the public information provided by a firm or any other agency (media or regulatory agencies). It uses more than 400 company ESG measures that have been divided into 10 main categories that formulate the final combined ESG score.

As for **control variables**, Firm size, leverage, growth, firm age, and interest rate have been used as control variables in this study because these might influence the firm's financial and environmental performance.

Firm size is the natural logarithm of total assets of a firm in time *t,* which would be used to control its effect in the regression (Becker-Blease et al., 2010; Wahba &Elsayed, 2015). ***Leverage*** is used as a proxy to determine the financial distress of a firm (Miroshnychenko et al., 2017) because firms with lower leverage pay lower interest rate, hence, better level of solvency (Eliwa et al., 2021). ***Growth*** is another variable that is to be used as a control variable. Growth is measured as the increase in revenue of firm *i* at time period *t+1*(Li and Yung, 2020; Rahayu S. M., 2019).***Interest rate,*** a macroeconomic indicator, is also used as a control variable as the increase in the interest rates lead the firms to avoid debt financing and vice versa (Somoye et al. 2009). ***Firm age*** is measured either as number of years since firm is operating that reflect its characteristics (Li and Yang, 2022; Sun et al., 2023) or the number of years since it has been listed (C.-H. Yu et al., 2021). Since older firms have easy access to resources (Chang et al., 2002) and experienced in the industry, that may impact the firm performance, hence should be controlled (Fan and Wang, 2019; Yin et al., 2022).

Following Table 1 shows the summary of all constructed variables:

Table 1: Summary of Variable Construction

Variable	Description	Proxy	Source	References
1. ESG Rating	Involvement of firms in activities to address environmental, social, and governance issues.	ESG Index Score	DataStream	• Flammer, 2021 • Fuente et al., 2021 • Kim et al., 2021
2. Green Finance	The activities of financing that promote and endorse the environmental development,	Natural Logarithm of market-value	DataStream	• Ng A. W., 2018 • Loffler et al., 2019

	and mitigate the carbon emission.	of Green Bonds		• Alonso-Conde &Rojo-Suarez, 2020 • Wang et al., 2020 • Meo and Karim, 2021
3. Financial Performance (Accounting Base)	The measure of profitability that how efficiently firms use their assets and equity in generating profits.	Return on Assets	DataStream	• Sanchez-Ballesta & García-Meca, 2007 • Miroshnychenko et al., 2017
4. Financial Performance (Market Base)	Closing Price at period t, and the ratio of total market value and company replacement value – profitably measure how market value changes by adding products or markets.	Tobin's Q ratio	DataStream	• Miroshnychenko et al., 2017 • Cavaco & Crifo, 2010; Alshehhi et al., 2018 • Behl et al., 2021
1. Firm Size	Total amount of assets reported in Balance Sheet.	Natural Logarithm of Total Assets	Data Stream	• Drempetic et al., 2020 • Abdi et al., 2022
2. Leverage	Measure of financial distress.	Total Debt to Equity	Data Stream	• Miroshnychenko et al., 2017 • Fuente et al., 2022
3. Interest Rate	Return that debt holders demand.	Interest Rate at period *t*	Data Stream	• Somoye et al. (2009)
4. Growth	Measures the increase in sales revenue	Percentage of increase in revenue at period *t+1*	Data Stream	• Yin et al., 2022 • Rahayu, 2019 • Li and Yung, 2022
5. Firm Age	Number of years since firm is operating that reflect its characteristics or the number of years since it has been listed	Number of years since firm has established	Country Stock Markets	• Li and Yang, 2022; • Sun et al., 2023 • C.-H. Yu et al., 2021.

3.3 Econometric Models

Equation (1 and 2) represents the main explanatory models which has been used to test the impact of green finance and ESG ratings on financial performance. Since, the relationship is not unidirectional (Endriket et al., 2014; Miroshnychenko et al., 2017), this study has used lagged values of ESG variables in order to minimize the simultaneity issue (Miroshnychenko et al., 2017; Ng and Razaee, 2015). Only one lagged value has been used to avoid losing a considerable number of observations that might lead the sample size to reduce significantly.

$$FP_{i,t} = \alpha_o + \alpha_1 FP_{i,t-1} + \alpha_2 GF_{i,t} + \alpha_3 Lev_{i,t} + \alpha_4 Size_{i,t} + \alpha_5 GRTH_{i,t} + \alpha_6 IR_{i,t} + \alpha_7 FAF_{i,t} + \epsilon_{i,t} \quad (1)$$

$$FP_{i,t} = \beta_o + \beta_1 FP_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 Lev_{i,t} + \beta_4 Size_{i,t} + \beta_5 GRTH_{i,t} + \beta_6 IR_{i,t} + \beta_7 FAG_{i,t} + \epsilon_{i,t} \quad (2)$$

Where, $\mathbf{FP}_{i,t}$ in equation(1and 2)represent the financial performance (calculated as, ROA, and Tobins's Q)of *i* firm at period *t*, is a dependent variable used as a proxy for both accounting and market-based financial performance. The $\mathbf{GF}_{i,t}$, in equation (1) is used as an independent variable, representing the green finance of firm *i* at period *t*. $\mathbf{FP}_{i,t-1}$ in both equations represent the lag values of return on equity and Tobin's Q (proxies of financial performance) used as instrumental variables by GMM. $\mathbf{ESG}_{i,t-1}$ in equation (2) is used also as an independent variable and is calculated as the ESG index score of a firm *i,* at period *t-1*. $\mathbf{LEV}_{i,t}$, $\mathbf{SIZE}_{i,t}$, $\mathbf{GRTH}_{i,t}$, $\mathbf{FAG}_{i,t}$, and $\mathbf{IR}_{i,t}$ in equation(1 and 2)are the control variables representing leverage, size growth, firm age and,interest rate respectively. $\epsilon_{i,t}$ is the error term.

The generalized method of moments (GMM) has been used to estimate the econometric model. GMM technique is the most parsimonious technique that can be applied to the data, which is both cross-sectional and time series in nature. Moreover, its estimations are robust if the cross section and the time period is large (Qayyum, et al., 2019). GMM deals with the problems of measurement error, endogeneity, biasness due to omitted variables, and it eliminates the serial correlation and heterostedisticity problem (Caselli et al., 1996; Bond et al., 2001). Furthermore, it is efficient in both the presence and absence of heterostedisticity (Wintoki, Linck, & Netter, 2012). We can use either System Gmm

or difference GMM for estimation. However, System GMM is superior and efficient because it corrects the heterogeneity, measurement error, and endogeneity that remain unobserved (Bond et al., 2001; Qayyum et al., 2019). Verbeek, (2008), Kyereboah-Coleman, (2007) and Greene, (2003) argued that endogeneity issue arises when there is any unobserved effect that is specific to the firm. For example, some firms might spend more on ESG activities or issue more green bonds than others. Similarly, a heterogeneity problem arises when there is reverse causality between the dependent and independent variables. Both these problems are controlled in System GMM.

The validity of GMM is based on two criteria or assumptions. First, there is no serial autocorrelation, and the second, instrumental over-identifying restrictions valid. To test for serial autocorrelation, Auto Regressive Terms AR (1) and AR (2) have been added. For the validity of over identified restrictions, Sargan Test has been applied. Results from Table 3 to 5 shows that no serial autocorrelation is found (p-value at lag-2 is not statistically significant)[1]and Sargan test in all models show the validity of over-identifying restrictions of instrumental variable (p-value is not statistically significant).

3.4 Mediation Test

Following the Baron and Kenny (1986), this study uses assess the mediating role of ESG ratings in the four-step process, as shown in equations 3 to 6. Mediation is said to be existed if the coefficients of all estimators are significant at each step. The corresponding results are presented in Table 4 and 5. In the fourth step, mediator is included in the equation as an independent variable. It is also assumed that explanatory variable has indirect effect on explained variable through a mediator – third variable. When third variable (mediator) is added in the equation, it decreases the impact of explanatory variable and itself remains significant (Qayyum et al., 2019). Furthermore Hayes and Preacher (2013) approach has been applied to calculate the indirect and total effect.

Step 1 (Path-a): Impact of green finance on ESG ratings

$$ESG_{i,t} = \alpha_o + \alpha_1 ESG_{i,t-1} + \alpha_2 GF_{i,t} + \alpha_3 Lev_{i,t} + \alpha_4 Size_{i,t} + \alpha_5 GRTH_{i,t} + \alpha_6 IR_{i,t} + \alpha_7 FAF_{i,t} + \epsilon_{i,t} \quad (3)$$

Step 2 (Path-b): Impact of ESG ratings on Financial Performance

$$FP_{i,t} = \beta_o + \beta_1 FP_{i,t-1} + \beta_2 ESG_{i,t} + \epsilon_{i,t} \quad (4)$$

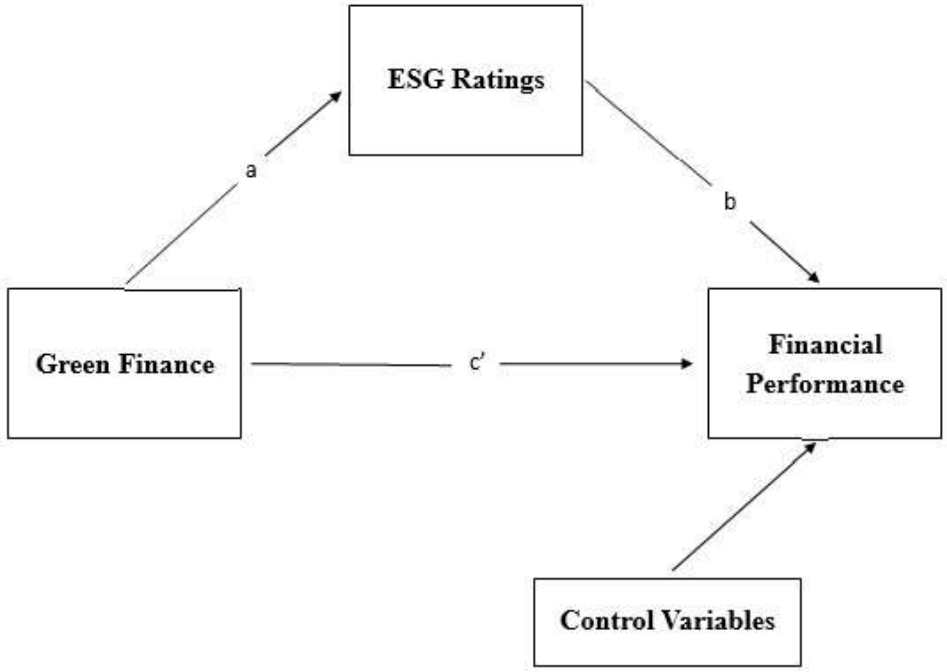
Step 3 (Path-c): Impact of green finance on Financial Performance

$$FP_{i,t} = \alpha_o + \alpha_1 FP_{i,t-1} + \alpha_2 GF_{i,t} + \alpha_3 Lev_{i,t} + \alpha_4 Size_{i,t} + \alpha_5 GRTH_{i,t} + \alpha_6 IR_{i,t} + \alpha_7 FAF_{i,t} + \epsilon_{i,t} \quad (5)$$

Step 3 (Path-c'): Impact of green finance and ESG ratings on Financial Performance

$$FP_{i,t} = \beta_o + \beta_1 FP_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 Lev_{i,t} + \beta_4 Size_{i,t} + \beta_5 GRTH_{i,t} + \beta_6 IR_{i,t} + \beta_7 FAG_{i,t} + \epsilon_{i,t} \quad (6)$$

Figure 1: Mediation Model



[1]AR(2) is significant in few estimated models, but this significance is at 90% confidence interval. At 95% confidence interval, it is statistically insignificant.

For robustness, Structural Equation Model (SEM) is applied as an alternative approach. It is an optimal technique to conduct mediation analysis, as suggested by Zhao et al. (2010) and Iacobucci et al. (2007). They argue that based on their simulations, the regression technique provides larger standard errors for coefficients in paths than SEM. They suggest replacing Baren and Kenny's with bootstrap testing to test the indirect effect, which is the matter to be statistically significant to identify the mediation. The bootstrapping technique allows to generate empirically the sampling distribution of statistics, resulting from computing the indirect effects from drawn samples with replacement from the existing sample data (Mehmetoglu M., 2018).

Jose (2013) suggests the Monte Carlo approach as the best bootstrapping procedure. It begins with the *a* and *b* coefficients, and standard errors of random variables associated with these coefficients (Kenny, 2016). We also use the bootstrapping approach after examining the statistical significance and magnitude of the coefficients of green finance, ESG, and financial performance using Baron and Kenny's (1986) three-step approach through SEM for robustness. Statistical package in Stata for mediation and post mediation for all steps suggested by Zho et. al., (2010) are used. Stepwise mediation model is explained as follows and the results are shown in Appendices:

Step 1

$$\mathbf{Y = \alpha 1 + bR + e} \quad (7)$$

Step 2

$$\mathbf{M = \alpha 2 + cR + e} \quad (8)$$

Step 3

$$\mathbf{Y = \alpha 3 + dM + e} \quad (9)$$

Step 4

$$\mathbf{Y = \alpha 4 + b'R + dM + e} \quad (10)$$

In Equations (8) and (9), Y is dependent variable that is financial performance (Tobin's Q and ROA), R is IV that shows green finance, M is ESG rating (mediator). $\boldsymbol{a_1}$ to $\boldsymbol{a_3}$ are intercepts and $\boldsymbol{e_1}$ to $\boldsymbol{e_3}$ are error terms. ***b*** in equation (11) shows the direct effect of green finance on financial performance (as captured in equation 1 and 2) while ***c*** is the parameter that captures the magnitude of effect of independent variable (green finance) on the mediator (ESG rating). The parameter ***b'*** shows the direct impact of green finance on financial performance with introducing third variable (ESG rating) in the equation. ***d*** is the coefficient shows the impact of mediator (ESG) on dependent variable after controlling IV, R (which is here green finance). The effect of mediation is calculated as the difference of ***b*** and ***b'*** which will show the real effect of green finance on financial performance after controlling the ESG rating. Here, we can conclude that the difference of ***b*** and ***b'*** is ***cd***. In which c indicates the magnitude of green finance impact on ESG (mediator) and d indicate the impact of ESG (mediator) on financial performance. Here the product of d and c indicate the indirect effect of green finance through mediator ESG rating.

To determine the effect size of an indirect effect, we use the following two formulas.

$$RIT = \frac{a*b}{(a*b)+c} \quad (11)$$

RIT is the ratio of the indirect effect to the total effect, *a, b* and *c* are paths. Value of RIT will show the mediated effect in percent of the total effect of the independent variable on the dependent variable (Mackinnon, 2008).

$$RID = \frac{a*b}{(a*b)+c} \quad (12)$$

RID is the ratio of the indirect effect to the direct effect, and the value will show the size of the mediated effect in times of the direct effect (Mackinnon, 2008).

4. RESULTS AND DISCUSSION

4.3.1 Descriptive Statistics and Correlation Analysis

Table 1 below reports the descriptive statistics of our study variables. For firms from G-20 countries, the average value of TQ is 0.107 and actual market-based returns tend to vary from average return is 45% as the mean and standard deviation of TQ can be found in Table 1. Similarly, the accounting-based returns (ROA) has an average percentage of 5.5% and its standard deviation is 8.2%. The minimum return that the firms from these countries show is 0.009 and negative 90% as far as TQ and ROA respectively are concerned. Maximum TQ found in these countries is 5.189, and the maximum ROA is positive 70.6%. Average value of green bonds (natural log taken) is 11.841 with standard deviation of 8.001. Minimum value of 0 shows no green bonds have been issued in some years, and the highest value of issued green bonds is 21.995 which represents the highest amount of issued green bonds. Variations in issuing is very large which is the indication that either few firms has issue more green bonds, or firms issue bonds in great variation in issuing green bonds from year to year. Minimum ESG score of the firms from our sample is 0 (all firms have not been rated from the same year) and highest score is 101.500 with the average value of 51.586. Similarly, the descriptive for control variables are reported in Table 1. Firm age (fage) shows that the minimum age of the firm in our sample is 0 years which means a firm established after 2010 and issued green bonds is included in the sample. Highest age is of a firm in our sample is 503 years.

Table 1: Descriptive Statistics

Variable	N	Mean	Std. dev.	Min	Max
TQ	6,357	0.107	0.450	0.009	5.189
ROA	6,357	0.055	0.082	-0.909	0.706
GB	6,357	11.841	8.001	0.000	21.995
ESG	6,357	51.586	21.838	0.000	101.500
Leverage	6,357	0.175	0.075	0.000	0.496
Growth	6,357	0.062	0.203	-1.673	1.935
Size	6,357	17.949	3.178	10.480	27.653
Fage	6,357	66.780	55.855	0.000	503.000
irate	6,357	0.028	0.073	0.008	0.249

The variable are as follows: GB is Natural Logarithm of market-value of Green Bonds, ROA is the ratio between net income and total assets, TQ is the ratio (book value of total assets – book value of shareholder's equity + market value of shareholder's equity) and (book value of total assets), ESG is the aggregate score index of ESG ratings, leverage is the ratio of total debt and common equity, size is the natural logarithm of total assets, growth is the measure of the increase in sales revenue, irate is rate of interest rate prevailing in the country at period 't', and Fage is the number of years since firm has established.

As the results from the correlation matrix show a weak correlation among all independent variables, it is confirmed that there is no concern of multicollinearity in the dataset. This is also confirmed by the values of the Variance Inflation Factor (VIF), which are below 5.

Table 2: Correlation Coefficient Matrix

		1	2	3	4	5	6	7	8	9	VIF
1.	TQ	1.00									
2.	ROA	-0.06	1.00								
3.	GB	0.47	0.35	1.00							1.04
4.	ESG	0.62	0.53	0.24	1.00						1.09
5.	Leverage	0.02	0.21	-0.02	0.09	1.00					1.04
6.	Growth	-0.01	0.25	0.02	-0.08	-0.01	1.00				1.01
7.	Size	-0.24	-0.57	0.27	0.14	0.07	0.41	1.00			1.18
8.	Fage	0.02	0.31	0.48	0.16	0.03	0.56	0.09	1.00		3.43
9.	irate	-0.21	-0.03	0.55	0.08	-0.06	-0.06	0.06	0.05	1.00	1.03

The variable are as follows: GB is Natural Logarithm of market-value of Green Bonds, ROA is the ratio between net income and total assets, TQ is the ratio (book value of total assets – book value of shareholder's equity + market value of shareholder's equity) and (book value of total assets), ESG is the aggregate score index of ESG ratings, leverage is the ratio of total debt and common equity, size is the natural logarithm of total assets, growth is the measure of the increase in sales revenue, irate is rate of interest rate prevailing in the country at period 't', and Fage is the number of years since firm has established.

4.3.2 Regression Analysis

4.3.2.1 Impact of green finance on financial performance (ROA and TQ)

Table 3 reports the main findings of GMM estimation. ROA (as an accounting-based measure) and TQ (as a market-based measure) are used as proxies of our dependent variable, financial performance. To estimate the results of both proxies of financial performance, green finance and control variables have been included. Results show that green bonds (GB) have a significant and positive impact on market-based financial performances. The coefficient of GB on ROA shows marginal statistical significance (t = 1.98), and exhibits a lower and negative slope (-0.016), which indicates an adverse effect of green finance on accounting-based financial performance. This result partially contradicts our hypothesis 1, in which we anticipated a positive relationship between green finance and financial performance.

However, in contrast, the coefficient of Tobin's Q (TQ) is positive and highly significant (β=0.045, SE = .016 with a p-value of 0.000). This suggests a positive and robust relationship between green finance and market-based financial performance. These findings are aligned with Karltrop (2016), who argues that issuing green finance is perceived as

costly by firms, and investors are either reluctant to invest in green bonds or demand higher returns. Consequently, this leads to a higher cost of capital, which can disturb the accounting-based profitability measures.
In contrast, the results also reveal that issuing green bonds improves the market-based financial performance of a firm. However, there are heterogeneous results based on size and location of the firm. Smaller firms may show positive and significant impact as financial constraints of such firms are comparatively more (Wang Y. et al., 2020). Another possible reason for these contradictory findings might be the environmental consciousness among investors that reflects in market performance (Loffler, Petreski, and Stephan, 2021).

Table 3: Impact of Green Finance on Financial Performance

Dependent Variable	**TQ**			**ROA**	
	Coefficients	**t-stat**		**Coefficients**	**t-stat**
Constant	0.0612*** (0.015)	4.12		0.253*** (0.058)	4.37
DV(-1)	0.798*** (0.038)	21.13		0.332*** (0.025)	13.55
GB	0.045** (0.016)	2.82		-0.016* (0.009)	1.98
Leverage	0.015 (0.022)	0.65		-0.251*** (0.061)	-4.11
Size	0.030*** (0.008)	3.74		0.014*** (0.002)	6.91
Growth	0.034*** (0.005)	6.63		0.087*** (0.011)	7.78
Fage	-0.007 (0.004)	-1.41		0.003*** (0.001)	2.81
IRate	-0.072*** (0.014)	-5.21		-0.016 (0.019)	0.85
N	5,868			5,868	
No of Instruments	161			111	
No of Groups	489			489	
AR(1)	3.17***			-7.74***	
AR(2)	1.45			2.16	
Sargan Test	167.08			373.80	
Hensen Test	117.60			122.55	

The variable are as follows: GB is Natural Logarithm of market-value of Green Bonds, ROA is the ratio between net income and total assets, TQ is the ratio (book value of total assets – book value of shareholder's equity + market value of shareholder's equity) and (book value of total assets), DV(-1) is the variable created in GMM as one lagged value of TQ and ROA, leverage is the ratio of total debt and common equity, size is the natural logarithm of total assets, growth is the measure of the increase in sales revenue, irate is rate of interest rate prevailing in the country at period 't', and Fage is the number of years since firm has established.
*p<,05; **p<,01; ***p<,001
Values in parenthesis are reported as standard errors of coefficients

Environment-conscious investors may tend to value green bonds more strongly and positively, leading to higher market values even when firms are showing weak accounting performances. This notion is also explained by Wang J. et al., (2020) that green bonds yield low but results in higher prices because investor prefer to hold such bonds as compared to non-green bonds. Furthermore, Bachelet et el., (2019) argue that volatility, liquidity and returns of green bonds is less as compared to non-green bonds that involve higher interest rates. Hence, the results confirmed the hypothesis that green finance positively impacts the financial performance of a firm. However, the confirmation is partial because accounting-based measures reflect negative and marginal effects on financial performance. Conclusively, we can say that the evidence supports the notion that green finance improves financial performance.

4.3.2.2 Mediating Role of ESG Ratings in the Relationship of Green Finance and Financial Performance Using Baron and Kenny (1986), and Hayes and Preacher (2013) Approach

Table 4 and 5 provides the results of mediation estimation. Table 4 represents the results with ROA as a proxy of financial performance and Table 5 with TQ as a proxy of financial performance. Both tables provide the path analysis from path-a to path-c. Path-c' presents the results for confirmation of mediation conditions. Finally, the last two columns of each table show the results of indirect and total effect using Hayes and Preacher (2013) approach. Results from Path-a in both tables show that green finance has a significant and positive impact on ESG ratings (β=0.212,

SE=.033) at 1% confidence interval. Similarly, in both tables, Path-b shows the significant and positive impact of ESG ratings on ROA (Table 4: β = 0.023, SE=.0045) and TQ (Table 5: β=.076, SE=.073) at 1% confidence interval. Path-c in tables 4 and 5 shows the impact of green finance on ROA and TQ respectively. Results are same as from the Table 3, that show the direct impact of green finance on financial performance.

Table 4: Mediating Role of ESG Ratings in the Relationship of Green Finance and Financial Performance (ROA)

Variables	**Path-a**	**Path-b**	**Path-c/DE**	**Path-c'**	**a*b**	**c'+(a*b)**
Dep. Variable	**ESG**	**ROA**	**ROA**	**ROA**	**IE**	**TE**
Constant	4.154** (1.44)	0.055* (0.030)	0.253*** (0.058)	0.273** (0.115)		
ROA(-1)		0.391*** (0.025)	0.332*** (0.025)	0.475*** (0.025)		
ESG(-1)	0.924*** (0.011)	0.023*** (.0045)		0.012** (0.006)		
GB	0.212*** (0.033)		-0.016* (0.009)	-0.085** (0.043)	0.0048	-0.0802
Leverage	-0.31** (0.16)		-0.251*** (0.061)	-0.250*** (0.016)		
Size	0.017 (0.081)		0.014*** (0.002)	0.003*** (0.006)		
Growth	1.60*** (0.321)		0.087*** (0.011)	0.064*** (0.003)		
Fage	-0.007 (0.005)		0.003*** (0.001)	0.003* (0.002)		
IRate	1.58* (0.872)		0.016 (0.019)	-0.015** (0.005)		
N	5,868	5,868	5,868	5,868		
No of Instruments	161	151	111	195		
No of Groups	489	489	489	489		
AR(1)	9.36***	6.54***	-7.74***	-6.12***		
AR(2)	2.29*	2.46*	2.16	2.15		
Sargan Test	266.86	468.06*	373.80	401.35		
Hensen Test	184.30	217.22	122.55	137.22		

The variable are as follows: GB is Natural Logarithm of market-value of Green Bonds, ROA is the ratio between net income and total assets, TQ is the ratio (book value of total assets – book value of shareholder's equity + market value of shareholder's equity) and (book value of total assets), DV(-1) is the variable created in GMM as one lagged value of ROA, ESG is the aggregate score index of ESG ratings, leverage is the ratio of total debt and common equity, size is the natural logarithm of total assets, growth is the measure of the increase in sales revenue, irate is rate of interest rate prevailing in the country at period 't', and Fage is the number of years since firm has established.
*p<,10; **p<,05; ***p<,01.
Values in parentheses are reported as standard errors of coefficients

As per Baron and Kenny (1986) approach, all three paths are significant, hence, partial mediation of ESG ratings in the relationship of green finance and financial performance is confirmed. In the final step, ESG is included in the equation simultaneously with green finance after controlling the firm specific and country specific variables. Results of path-c' in Table 4 and 4 represent that green finance and ESG ratings are have significant association with ROA and TQ. However, the magnitude of association between green finance and financial performance has increased (ROA: β = -.085, SE = .043; TQ: β = .082, SE = .027), whereas, the magnitude of association of ESG ratings with financial performance has decreased (ROA: β = .012, SE = .006; TQ: β = .048, SE = .017) with its inclusion in estimated equation. Therefore, this is confirmed that ESG ratings mediates the relationship between green finance and financial performance.

As per the mediation process of Hayes and Preacher (2013) using GMM, the indirect effect (ROA: 0.0048; TQ: 0.0161) and total effect (ROA-0.0802; TQ: 0.0981) are presented in Table 4 and 5. In ROA model, the RID (ratio of indirect effect to direct effect) is -0.30 and the RIT (ratio of indirect effect) is -0.0598. Similarly, in TQ model, the RID (ratio of indirect effect to direct effect) is 0.35 and the RIT (ratio of indirect effect) is 0.1641. These results depict that partial mediation of ESG ratings in the relationship of green finance exists. Values of RID in ROA (-.0598) and TQ (0.1641) represent that the mediated effect is about 0.0598 times and 0.1641 times as large as the direct effect of green finance on ROA and TQ respectively.

Table 5: Mediating Role of ESG Ratings in the Relationship of Green Finance and Financial Performance (TQ)

Variables	Path-a	Path-b	Path-c/DE	Path-c'	a*b	c'+(a*b)
Dep. Variable	**ESG**	**TQ**	**TQ**	**TQ**	**IE**	**TE**
Constant	4.154** (1.44)	0.012*** (0.002)	0.0612*** (0.015)	0.113** (0.021)		
TQ(-1)		0.797*** (0.002)	0.798*** (0.038)	0.75*** (0.005)		
ESG(-1)	0.924*** (0.011)	0.076*** (.013)		0.048** (0.017)		
GB	0.212*** (0.033)		0.045** (0.016)	0.082*** (0.027)	0.0161	0.0981
Leverage	-0.31** (0.16)		0.015 (0.022)	-0.06*** (0.015)		
Size	0.017 (0.081)		0.030*** (0.008)	0.005*** (0.001)		
Growth	1.60*** (0.321)		0.034*** (0.005)	0.006*** (0.001)		
Fage	-0.007 (0.005)		-0.007 (0.004)	0.0006 (0.0007)		
IRate	1.58* (0.872)		-0.072*** (0.014)	0.003* (0.002)		
N	5,868	5,868	5,868	5,868		
No of Instruments	161	161	161	161		
No of Groups	489	489	489	489		
AR(1)	9.36***	3.16**	3.17***	3.15***		
AR(2)	2.29*	1.44*	1.45	1.43		
Sargan Test	266.86	169.06	167.08	166.59		
Hensen Test	184.30	144.95	117.60	121.47		

The variable are as follows: GB is Natural Logarithm of market-value of Green Bonds, ROA is the ratio between net income and total assets, TQ is the ratio (book value of total assets – book value of shareholder's equity + market value of shareholder's equity) and (book value of total assets), DV(-1) is the variable created in GMM as one lagged value of TQ, ESG is the aggregate score index of ESG ratings, leverage is the ratio of total debt and common equity, size is the natural logarithm of total assets, growth is the measure of the increase in sales revenue, irate is rate of interest rate prevailing in the country at period 't', and Fage is the number of years since firm has established.
*p<,10; **p<,05; ***p<,01
Values in parentheses are reported as standard errors of coefficients

The Values of RIT in ROA (0.3) and TQ (0.35) indicate that 30% and 35% of the effect of green finance on ROA and TQ, respectively, is mediated by ESG ratings. Hence, the hypothesis that there is a mediating role of ESG ratings in the relationship between green finance and financial performance is accepted.

4.3.2.2 Robustness

Appendix 1 and 2, exhibit the results of mediation analysis using SEM. As path 'a', path 'b' and Sobel's test are significant, and path 'c' is also significant, there is partial mediation. This is consistent with the results of GMM, however, the value of coefficients are not same although the directions of the coefficients are consistent. In addition, the values of indirect and direct effect are almost consistent. Indirect effect is statistically significant in Sobel's, Monte Carlos's and Delta tests which confirms the mediation of ESG ratings in the relationship between green finance and financial performance. However, this mediation is partial as the path 'c' is significant as per Baron and Kenny (1986) approach. The effect size of indirect effect is also reported in Appendix 1 and 2, which shows that there are not much differences in the RIT and RID values. Hence, the robustness of our results are confirmed.

5. CONCLUSION

This study explicitly explored the mediating role of ESG ratings in the relationship between green finance and financial performance. The study found that ESG partially mediates the positive impact of green finance on market-based financial performance, while mediating the negative impact on accounting-based financial performance. These significant findings confirm the notion that issuing green finance or being involved in ESG activities leads to better financial performance. Furthermore, we argue that issuing green bonds is perceived positively by investors, which

increases the ESG ratings. Consequently, these firms tend to attract more investors who are environmentally conscious. This will lead to improved market-based financial performance.

This study contributes significantly to the literature in several ways. Firstly, the study is the first to investigate the mediating role of ESG ratings in the relationship between green finance and financial performance. Secondly, this study also enriches the literature by focusing on considering the firms from G20 countries, the leading world economic policy makers. Therefore, this study will encourage the firms to engage in issuing green securities and contribute to sustainability. Thirdly, the novelty and uniqueness of this study contribute as an extension of knowledge in the academic research and a source of information to firms, governments, and regulatory authorities for framing the financial and non-financial policies while considering the ESG issues.

The main limitations of this study will provide valuable directions for future investigations. Since the sample covered only those listed firms that have issued green bonds from G20 countries, the conclusions cannot be generalized to firms globally, and SMEs (small and medium enterprises). Future studies could address this limitation by applying the study's framework to a broader global sample.

Additionally, since this study utilized the composite ESG index created by the ASSET4 class, potentially, an empirical study can be conducted in the future by using a custom ESG index based on KPIs from various data sources, applying that index to explore the relationship further.

Moreover, future research can be conducted to investigate the mediating or moderating role of firms' cost of capital in the relationship between green finance and financial performance, using a similar sample size. This is specifically relevant as there are conflicting results regarding this relationship in the literature.

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Appendices

Appendix 1:
Mediating Role of ESG Ratings in the Relationship of Green Finance and Financial Performance (ROA) using SEM

Variables	**Path-a**	**Path-b**		**Path-c'**
Dep. Variables	**ESG**	**ROA**		**ROA**
Constant	47.154** (0.48)	0.048*** (0.002)		0.048** (0.002)
ESG		0.045*** (.0017)		
GB	0.139*** (0.027)			-0.021** (0.010)

The variable are as follows: GB is Natural Logarithm of market-value of Green Bonds, ROA is the ratio between net income and total assets, ESG is the aggregate score index of ESG ratings, leverage is the ratio of total debt and common equity, size is the natural logarithm of total assets, growth is the measure of the increase in sales revenue, irate is rate of interest rate prevailing in the country at period 't', and Fage is the number of years since firm has established.
*p<,10; **p<,05; ***p<,01
Values in parentheses are reported as standard errors of coefficients

Significance Testing of Indirect Effect

Estimates	**Delta**	**Sobel**	**Monte Carlo**
Indirect Effect	.0062	.0062	.0062
Standard Error	.002	.002	.002
Z-Value	3.425	3.428	3.428

P-Value	.001	.001	.001

Effect Size of Indirect Effect

Indirect Effect	0.0062
Direct Effect	-0.021
Total Effect	0.015
RIT	0.435
RID	0.303

Appendix 2:
Mediating Role of ESG Ratings in the Relationship of Green Finance and Financial Performance (TQ) using SEM

Variables	**Path-a**	**Path-b**		**Path-c'**
Dep. Variables	**ESG**	**TQ**		**TQ**
Constant	47.154** (0.48)	0.182*** (0.016)		0.182*** (0.016)
ESG		0.059*** (.0102)		
GB	0.139*** (0.027)			0.018** (0.009)

The variable are as follows: GB is Natural Logarithm of market-value of Green Bonds, TQ is the ratio (book value of total assets – book value of shareholder's equity + market value of shareholder's equity) and (book value of total assets), ESG is the aggregate score index of ESG ratings, leverage is the ratio of total debt and common equity, size is the natural logarithm of total assets, growth is the measure of the increase in sales revenue, irate is rate of interest rate prevailing in the country at period 't', and Fage is the number of years since firm has established.
*p<,10; **p<,05; ***p<,01
Values in parentheses are reported as standard errors of coefficients

Significance Testing of Indirect Effect

Estimates	**Delta**	**Sobel**	**Monte Carlo**
Indirect Effect	0.008	0.008	0.008
Standard Error	0.002	0.002	0.002
Z-Value	4.325	4.331	4.370
P-Value	0.000	0.000	0.000

Effect Size of Indirect Effect

Indirect Effect	0.0082
Direct Effect	0.018
Total Effect	0.0262
RIT	0.312
RID	0.449