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Enhancing Investment Efficiency Through ESG: The Mediating Role of High Quality of Financial Reporting

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Abstract: This study examines the influence of Environmental, Social, and Governance (ESG) performance on investment efficiency, with a focus on the mediating role of financial reporting quality (FRQ). We analyze a panel dataset comprising 85 non-financial firms listed on the PSX from Pakistan's emerging market, spanning the years 2010 to 2023. Our methodology incorporates OLS regression; the application of GMM mitigates endogeneity, whereas Sobel tests explicitly authenticate mediation, hence augmenting the reliability of results. This study presents three principal insights: First, the performance of ESG factors has a positive influence on investment efficiency, indicating that firms with robust sustainability practices allocate capital more effectively. Second, ESG disclosure markedly improves the quality of financial reporting, indicating a spillover effect from non-financial to financial transparency. Third the quality of financial reporting serves as a partial mediator in the relationship between ESG and investment efficiency, functioning as a crucial transmission mechanism that mitigates information asymmetry and agency costs. Robustness assessments employing alternative proxies for ESG, FRQ, and investment inefficiencies validate the consistency of our findings. This study contributes to the existing literature on sustainable finance by highlighting the importance of financial reporting quality as a key mechanism through which ESG actions yield tangible economic benefits. These findings have significant implications for company managers, regulators, and investors, underscoring the need to incorporate ESG and financial transparency into corporate governance frameworks to enhance capital allocation efficiency.

Keyword: ESG, Investment efficiency, FRQ, GMM, Mediating Analysis

INTRODUCTION

Environmental, social, and governance (ESG) practices have become integral to corporate strategy in recent years, influencing how stakeholders, investors, and regulators perceive businesses. Businesses with strong ESG performance are viewed as more sustainable and lower-risk investments, as climate risk, social equity, and corporate governance concerns gain prominence on the international agenda (Friede, Busch, & Bassen, 2015). The incorporation of Environmental, Social, and Governance (ESG) considerations into business strategy has garnered significant interest from scholars and professionals alike. According to Liu et al. (2021) and Lins et al. (2017), ESG performance is often viewed as a catalyst for enhanced sustainability, stakeholder trust, and effective risk management. Additionally, it is hypothesized that excellent financial reporting will enhance these advantages by increasing investor confidence, reducing information asymmetry, and increasing transparency (Biddle & Hilary, 2006; Biddle et al., 2009). Therefore, more effective investment choices may result from ESG initiatives that are openly shared through thorough financial reports. Empirical data support this theoretical relationship. According to Maiyarni et al. (2024), for example, financial reporting quality acts as a mediator between ESG performance and investment efficiency. Similarly, research from China has demonstrated that the relationship between ESG and investment efficiency is partially mediated by audit quality (Wang, Yu, & Li, 2022; Utama et al., 2024). Similar results in the UAE further support the complementary function of high-quality reporting and ESG disclosure in supporting investment outcomes. Existing research primarily relies on audit proxies or individual ESG score providers, without cross-referencing financial reporting quality metrics or triangulating data from various ESG sources. An important first step in overcoming this constraint is Maiyarni et al., (2024) use of both Retinitis and Bloomberg ESG scores; however, more comprehensive, multi-source evaluations of how ESG performance and reporting quality together influence investment efficiency on a cross-national level are still required. To clearly model how financial reporting quality mediates the relationship between comprehensive ESG performance and investment efficiency, there is a lack of cross-country empirical research that combines various ESG data sources with reliable financial reporting quality metrics. As a result, investors are gradually incorporating ESG considerations into their decision-making processes in the hope that companies that prioritize these factors will allocate capital more effectively and generate greater long-term value. Agency issues, information asymmetries, and external pressures can all jeopardize investment efficiency, which is defined as matching capital allocation with firm growth opportunities (Biddle, Hilary, & Verdi, 2009). Stakeholder scrutiny and decreasing managerial opportunism, ESG initiatives may help mitigate these inefficiencies (Lins, Servaes, & Tamayo, 2017). According to resource-based perspectives and stakeholder theory, companies with higher ESG scores have a better chance of securing favorable financing terms and establishing reputational capital, which enhances the quality of their investments. ESG performance and investment efficiency are positively correlated, according to empirical research. Chen et al. (2023), for example, found that Chinese companies with higher ESG scores achieved

better capital allocation outcomes. Likewise, Harjoto and Laksmana (2018) demonstrated that ESG practices mitigated the impact of corporate governance on investment behavior. Findings are still conflicting, though, with some studies showing no meaningful or even adverse correlations, especially in situations where ESG disclosure is optional or less regulated (Zhu et al., 2022).

Environmental, social, and governance (ESG) considerations are now crucial standards for evaluating ethical behavior, sustainability, and corporate responsibility. Stakeholders, investors, and regulators are expecting businesses to incorporate ESG practices into their operational and strategic frameworks. At the same time, the quality of financial reporting, defined by its accuracy, transparency, dependability, and adherence to established standards, remains a crucial element of market efficiency and corporate governance. Agency theory and legitimacy theory serve as the theoretical foundations for the relationship between ESG performance and the quality of financial reporting. Stronger internal controls, moral behavior, and transparency are all expected of businesses with strong ESG practices, and these attributes all help to produce high-quality financial disclosures (Dhaliwal et al., 2011).

Additionally, businesses that perform well in ESG may face increased scrutiny from regulators and stakeholders, which would encourage them to maintain more transparent and reliable financial reporting standards (Liu et al., 2022). There is now some empirical data supporting this relationship. For example, Christensen et al. (2017) proposed that ESG initiatives foster an ethical culture, which in turn improves the quality of reporting.

Meanwhile, Albuquerque et al. (2020) found that socially conscious companies were less likely to engage in earnings management. ESG performance may also lower discretionary accruals and increase financial transparency, according to research conducted in emerging markets (e.g., Liu et al., 2022; Maiyarni et al., 2024). However, according to some academics, companies may use ESG as a reputational or symbolic tool to hide underlying financial weaknesses, a practice known as "green washing," which compromises reporting integrity (Kim & Lyon, 2015). Limited analysis focused on mediation: The majority of research examines the direct relationship between ESG and investment efficiency, overlooking the role that financial reporting quality plays as a mediator. The majority of empirical research focuses on developed economies or China, which raises concerns about its applicability in other regulatory or cultural contexts. To model how financial reporting quality mediates the relationship between comprehensive ESG performance and investment efficiency, there is a lack of cross-country empirical research combining several ESG data sources and reliable financial reporting quality metrics.

OBJECTIVE

- To examine the influence of Environmental, Social, and Governance (ESG) performance on investment efficiency, with a focus on its role in enhancing transparent and value-maximizing capital allocation.
- To explore the extent to which ESG disclosure contributes to improved financial reporting quality, reflecting stronger corporate governance and reduced information asymmetry.
- To explore the association between financial reporting quality and investment efficiency, with implications for corporate governance and investor protection.
- To investigate the mediating role of financial reporting quality in the relationship between ESG performance and investment efficiency, thereby identifying a key mechanism through which sustainability initiatives translate into real financial outcomes.

LITERATURE REVIEW AND THEORETICAL BACKGROUND

One of the key factors influencing sustainable business performance is the incorporation of Environmental, Social, and Governance (ESG) considerations into corporate strategy. The relationship between ESG and financial performance was the primary focus of early research; however, more recent studies have shifted their attention to how ESG affects actual economic outcomes, particularly investment efficiency, which refers to the degree to which businesses invest in value-enhancing projects without exceeding or under budget (Richardson, 2006). According to a seminal study by Khan et al. (2016), companies with high ESG scores have lower levels of underinvestment and overinvestment, especially in settings with lax governance. They contend that ESG serves as an alternative to official oversight procedures. Using global data, Albuquerque et al. (2019) demonstrate that ESG integration results in lower idiosyncratic risk and a higher Tobin's Q, indicating more effective capital allocation. In nations with less robust legal systems, the effect is more pronounced. By enhancing internal control systems, ESG helps decrease R&D underinvestment, particularly in state-owned enterprises, analysis of Chinese companies' analysis (Tang et al., 2023). Zhang & Yang (2022), show that ESG performance reduces earnings management in Chinese A-share firms. The effect is amplified under mandatory ESG disclosure regimes. Dhaliwal et al,. (2021) demonstrate that voluntary ESG disclosure is linked to higher earnings persistence and lower cost of capital, mediated by improved FRQ.

ESG AND INVESTMENT EFFICIENCY

Investment efficiency, as defined by Biddle et al. (2009), is the capacity of a corporation to allocate capital optimally, investing more during favorable conditions and exercising restraint when returns are subpar. Environmental, Social, and Governance (ESG) performance is viewed as a key determinant of investment efficiency, as it can reduce risk, enhance transparency, and foster stakeholder confidence. ESG reduces managerial opportunism by increasing transparency

and aligning corporate goals with those of stakeholders. It acts as a monitoring tool to avoid overinvestment or underinvestment by reducing agency costs (Jensen & Meckling, 1976; Lins et al., 2017). Companies that employ ESG techniques to cater to stakeholders beyond shareholders generally gain access to an expanded array of resources, including reputation and trust, thereby enhancing strategic investment decisions (Freeman, 1984; Dhaliwal et al., 2011). Strong ESG performance enhances a company's social license and legitimacy, hence facilitating access to capital and reducing financing constraints, which promotes more efficient investment (Suchman, 1995; Liu et al., 2022). Albuquerque et al. (2019) demonstrate, using global data, which ESG integration leads to better capital allocation by increasing Tobin's Q and reducing idiosyncratic risk. The effect is more pronounced in nations with less robust legal systems, indicating that ESG makes up for institutional shortcomings. Liu et al. (2022) found that elevated ESG scores correlated with more efficient investments in Chinese enterprises, especially in the presence of high audit quality.

H1: A statistically significant positive relationship exists between ESG scores and investment efficiency, even after controlling for firm-specific factors.

ESG AND FRQ

The integration of Environmental, Social, and Governance (ESG) concepts into business strategy has redefined expectations for responsibility, ethics, and transparency in financial reporting. Businesses are assessed on their ESG performance alongside financial indicators, as global stakeholders, including investors, regulators, and civil society, need more comprehensive disclosures. The processes behind this connection have been investigated in further detail. As an illustration of their confidence in their financial accounts, Alfraih et al. (2024) showed that companies with higher ESG ratings typically hire Big Four auditors and obtain less modified audit opinions.. Zhang and Han (2023) noted that discrepancies in ESG ratings may heighten auditor mistrust and occasionally lead to more conservative audit judgments. According to agency theory, ESG-focused companies align managerial incentives with long-term stakeholder value, which lessens information asymmetry and opportunistic behavior (Jensen & Meckling, 1976). According to legitimacy theory, companies that participate in ESG initiatives are more likely to generate clear and excellent financial reports in order to maintain their social license to operate (Suchman, 1995).

Furthermore, according to stakeholder theory, ethical businesses increase disclosure to foster confidence among various interest groups (Freeman, 1984). Zhang (2022) examines Chinese A-share companies and demonstrates that ESG performance enhances accruals quality and reduces earnings management. They contend that aggressive accounting is discouraged by the integrity-promoting culture that ESG promotes. Chen et al. (2021) demonstrate that FRQ significantly improves when ESG disclosure is required (for example, in the EU or Hong Kong), particularly for companies that were previously lagging in transparency. According to a study by Ahmed et

al. (2023) on Pakistani companies, FRQ is only improved by mandatory CSR spending (under the Companies Act 2013) when paired with robust internal controls. Chen (2024) examines Indian companies and finds that green bonds and loans linked to sustainability require higher disclosure standards, which in turn improve overall financial performance. Velte (2025) identified a positive association between the quality of integrated reporting and carbon assurance, thereby reinforcing the connection between financial reporting requirements and ESG transparency.

H2: A statistically significant positive association exists between Environmental, Social, and Governance (ESG) performance and financial reporting quality (FRQ), indicating that firms with stronger ESG practices tend to produce more transparent, reliable, and timely financial disclosures.

FRQ and IE

The correlation between FRQ and investment decisions has recently been the focus of multiple research investigations (Assad & Alshurideh, 2020; Biddle et al., 2009; Houcine, 2017; Shahzad et al., 2019). This research indicates that FRQ significantly influences investment decisions from an economic perspective. Investor avoidance (IA) occurs when managers refrain from investing in initiatives with negative net present value (NPV) and choose to invest in projects with positive NPV (Biddle et al., 2009). Under-investment refers to the failure to allocate resources to projects with a positive Net Present Value (NPV). In contrast, over-investment pertains to the allocation of resources to initiatives with a negative NPV (Verdi, 2006). Moral hazard and adverse selection may provide self-serving managers the opportunity and incentive to pursue personal objectives, potentially resulting in either excessive or inadequate investment in the organization. Ultimately, the costs of such executive decisions would be borne by shareholders (Biddle et al., 2009; Verdi, 2006). Under mitigating asymmetric information, enhanced financial reporting quality (FRQ) is considered under the firm's agency theory to alleviate the issues of overinvestment and underinvestment. Previous studies suggest that enhanced FRQ may mitigate the conundrum of over- and under-investment articulated in three unique manners (McNichols & Stubben, 2008; Uwuigbe et al., 2018; Verdi, 2006). Initially, heightened FRQ enables prospective investors to identify optimal stocks through comparative analysis of financial data from companies, which is more straightforward if it is not fabricated.

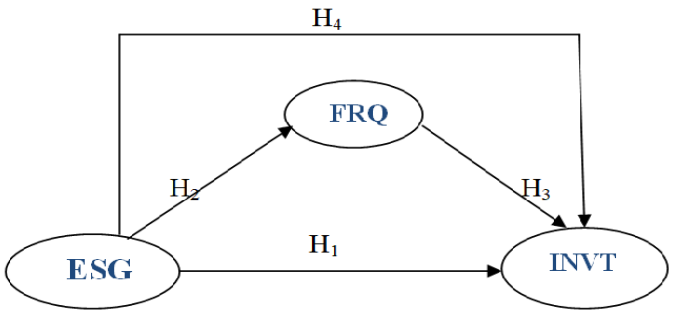
H3: A statistically significant and positive relationship exists between financial reporting quality and investment efficiency, even after controlling for firm size, leverage, profitability, and governance structures.

MEDIATING ROLE of FRQ

The ability of a company to allocate capital in a way that maximizes shareholder value by investing when opportunities arise and withholding when they do not is known as investment efficiency (Biddle, Hilary, & Verdi, 2009). ESG performance may increase this efficiency by increasing transparency, reducing agency costs, and boosting investor confidence (Liu et al., 2022). Robust ESG frameworks are perceived as more accountable and well-managed, which can lead to more effective capital allocation and fewer instances of under- or overinvestment. This relationship is not consistently uncomplicated, however. An increasing volume of research highlights the mediating role of financial reporting quality, specifically the accuracy and objectivity with which financial reports represent a company's economic reality. ESG can enhance investment efficiency by providing high-quality financial reporting, which reduces information asymmetry and aids in better decision-making for both internal and external stakeholders (Verdi, 2006; Maiyarni et al., 2024). Current empirical studies substantiate this complex relationship. Liu et al. (2022) found that, in a Chinese sample, audit and disclosure quality serve as a partial mediator between ESG performance and enhanced investment efficiency. Maiyarni et al. (2024) assert that, particularly in firms with proactive governance frameworks, the quality of financial reporting acts as a vital link between ESG and investment efficiency. Wang et al. (2022) established that enterprises emphasizing ESG benefit from more prudent profits reporting and enhanced audits, both of which facilitate superior capital allocation. By improving financial reporting quality and reducing information asymmetry, Dhaliwal et al. (2021) demonstrate that requiring ESG disclosure significantly enhances investment efficiency.

H4: Financial reporting quality (FRQ) mediates the relationship between ESG and investment efficiency (INVT).

CONCEPTUAL FRAMEWORK



METHODOLOGY

RESEARCH DESIGN

This study employs quantitative methodologies utilizing secondary data from companies listed on the Pakistan stock exchange (PSX) for the years 2010 to 2023. The current study utilized non-financial enterprises listed on the Pakistan Stock Exchange as its population. A total of 56 non-financial enterprises listed on the PSX were selected using purposive sampling. Data was gathered from the financial statements of the selected organizations in the current study from 2010 to 2023.

VARIABLES MEASUREMENT

INDEPENDENT VARIABLE

According to Minutolo et al. (2019), the measurement of ESG performance is conducted using Bloomberg's ESG score. The Bloomberg database offers investor access to CSR reporting levels, along with E, G, and S scores for individual indices, as well as a score derived from the comprehensive ESG index. The evaluation and computation of disclosure attribution have a significant impact on scoring. The scores are evaluated on a scale from 0 to 100. An increase in a firm's disclosed information correlates with an improvement in its ESG score. Investors can access Bloomberg's methodology and reports, which provide details on each firm's ESG scores, including the scoring methodology and underlying data. Reasons for Sullivan's selection of the Bloomberg Database as his primary information source are outlined below. Firstly, it possesses an advantage due to Bloomberg's ESG ranking being unbiased and derived from the company's sustainability and CSR documents, as well as other publicly available documents. Secondly, Bloomberg's escalated range statistics outperform other ESG ratings.

DEPENDANT VARIABLE

We developed an investment method based on the growth prospects of each company, as indicated by its sales growth. To identify deviations from anticipated Investment, the residuals were utilized as a firm-specific proxy. According to Boubaker et al. (2018), Biddle et al. (2009), and Chen et al. (2011), the study used sales growth as a proxy for investment potential. The model is elucidated.

$$Investment_{i,t+1} = \beta 0 + \beta 1 * Sales\ Growth_{i,t} + \varepsilon i_{,t+1}. \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Investment is the total capital expenditures adjusted by the lagged property, plant, and equipment at time t+1. The percentage change in sales from the prior year (t-1) to the present year (t) is referred to as sales growth. This metric has been commonly employed, despite its failure to account for non-capital inputs, such as R&D. The study categorized companies based on the extent of residuals (deviations from anticipated Investment), with the dependent variable ranked accordingly within these groups. The study categorizes businesses into two categories

each year based on the residuals from Equation 1: the first group, characterized by over-investment, comprises firm-year observations in the sample with positive residuals. The observations of the sample, namely the negative residuals, are classified as Under-investment in the second category. Overinvestment received a score of 1 (positive residuals), whereas underinvestment was assigned a score of 0 (negative residuals), as this classification for over- (or under-) Investment is treated as a dummy variable.

MEDIATING VARIABLE

FRQ serves as a mediating variable in this study, with its measurement based on accrual quality. Accrual quality refers to the degree of reliability in the relationship between cash flows and accruals. Accruals represent the underlying factor contributing to the variance between cash flow and reported earnings, indicating that profit does not equate to the cash available on hand. Dechow et al. (2010) established the criteria outlined below for the assessment of accrual quality:

$$\Delta WCAPi,t/TASSETSi,t-1=\beta 0+\beta 1CFOi,t-1/TASSETSi,t-1+\beta 2CFOi,t/TASSETSi,t-1+\beta 3CFOi,t+1/TASSETSi,t-1+\varepsilon i,t \ldots (2)$$

Δwcap represents the difference between the change in current assets and current liabilities for company i at time t. The cash flow from operations (CFO) of company i at times t and t+1 is denoted as $CFO_{i,t}$ and CFOi,t+1, respectively, while CFO$i,t-1$ represents the cash flow at time t−1.In the existing literature, Latif (2018), Jerubet, Chepng'eno, and Tenai (2017), Biddle et al. (2008), and Francis et al. (2005) have similarly approached the calculation of FRQ.

CONTROL VARIABLE

Rehman et al.,(2025), Bates (2005) asserts that Board Size (BSZ), Return on Assets (ROA), Free Cash Flow (FRCF), Firm Size (FRS), leverage (LEVR), and Firm Age (FAG) controllable factors.

- Board Size (BSZ): The natural logarithm of the number of directors serves as a logarithmic transformation of the count.
- Return on Assets (ROA): Net profit as a percentage of total assets.
- Free Cash Flow (FRCF): Proportion of free cash flow relative to total assets
- Firm Size (FRS): The natural logarithm of the total assets accumulated by the company.
- Leverage (LEVR): The ratio that compares total owned assets to incurred liabilities is expressed as (Total Assets / Total Liabilities).

ECONOMETRIC MODEL

$$INVT_{i,t}= \alpha_0+\delta_1 ESG_{i,t}+\delta_2 BSZ_{i,t}+ \delta_3 ROA_{i,t}+ \delta_4 FRCF_{i,t}+\delta_5 FRS_{i,t}+\delta_6 FAG_{i,t}+ \delta_7 LVRG_{i,t}+ \varepsilon_{i,t} \quad (3)$$

$$FRQ_{i,t}=\alpha_0+\delta_1 ESG_{i,t}+\delta_2 BSZ_{i,t}+\delta_3 ROA_{i,t}+\delta_4 FRCF_{i,t}+\delta_5 FRS_{i,t}+\delta_6 FAG_{i,t}+\delta_7 LVRG_{i,t}+\varepsilon_{i,t} \quad (4)$$

$$INVT_{i,t}=\alpha_0+\delta_1 FRQ_{i,t}+\delta_2 BSZ_{i,t}+\delta_3 ROA_{i,t}+\delta_4 FRCF_{i,t}+\delta_5 FRS_{i,t}+\delta_6 FAG_{i,t}+\delta_7 LVRG_{i,t}+\varepsilon_{i,t} \quad (5)$$

This study employs the Sobel test (1982) to assess whether the (FRQ) variable mediates the effect of ESG on investment efficiency (INVT). A significant test statistic indicates that an ESG has a direct effect on the INVT, mediated by another variable. The influence of a potential mediator on the overall effect (i.e., the effect of a ESG on INVT) is examined to determine if a statistical difference exists compared to the direct effect (i.e., the effect of a specified ESG on an INVT. The study employs the following dynamic panel data model:

$$INVT_{i,t}= \alpha_0 +\delta_1 ESG_{i,t}+\delta_2 FRQ_{i,t}\delta_3 X_{i,t} +\varepsilon_{i,t} \quad (6)$$

ANALYSIS

Descriptive Analysis

The descriptive statistics for the primary variables used in this analysis are presented in the following section. A sample of 1,190 firm-year observations from publicly traded companies, primarily in Pakistan emerging market contexts, comprises the dataset. The table reveals the data's central tendency, dispersion, and distributional characteristics, listing each variable's mean, standard deviation (SD), minimum, maximum, skewness, and kurtosis.

Table :1

S.no	Variable	Obs	Mean	SD	Min	Max	Skewness	Kurtosis
1	INEF	1190	0.715	0.35	0.117	1.65	0.276	2.54
2	ESG	1190	34.65	13.12	17.65	56.87	-0.265	2.78
3	FRQ	1190	4.76	1.76	0.345	0.234	0.763	1.765
4	BSZ	1190	2.56	0.876	1.098	3.45	0.265	2.17
5	LVRG	1190	20.65	2.76	14.54	26.54	0.182	2.76
6	FAG	1190	3.42	0.65	1.75	6.83	0.142	3.21
7	FRS	1190	0.254	0.165	0.045	0.185	0.356	2.65
8	FRCF	1190	0.056	0.045	0.023	0.156	1.432	3.65

Businesses generally show moderate levels of investment inefficiency, with some making excessive or insufficient investments. Variability in capital allocation practices is indicated by the standard deviation (SD = 0.35). This is consistent with Richardson (2006), who defines

investment inefficiency as deviations from the optimal course of action in terms of growth prospects. Although there is considerable variation among firms, the average firm moderately discloses ESG information. While some lag, others are proactive in their reporting on sustainability. The application of ESG as a crucial independent variable in elucidating financial and investment outcomes is supported by this variation.ESG enhances a company's value and transparency (Khan et al., 2016). Biddle et al. (2009) demonstrate that more effective reporting results. There is potential for improvement, as the average reporting quality is moderate. A concentration of businesses with below-average FRQ is indicated by skewness (0.763), while a small number of businesses meet high standards. A high FRQ boosts investor confidence and lessens information asymmetry. Biddle (2009) demonstrates how improved reporting results in more effective capital markets. The majority of businesses have a moderate amount of free cash flow, but some have much more. High skewness indicates possible agency issues, as excessive funds may be misappropriated. According to Jensen (1986), if FRCF is not appropriately managed, it raises the risk of overinvestment. Descriptive statistics indicate that important variables, such as investment inefficiency, financial reporting quality, and ESG disclosure, exhibit significant variation. Inconsistencies between the FRQ and FRS minimum and maximum values, however, suggest possible data entry errors that were corrected prior to analysis. A subset of firms holds disproportionately high liquidity, as indicated by the positive skewness of free cash flow, which calls for caution when defining the model. The variables' overall distribution lends credence to the reliability of the ensuing regression analyses.

Correlation Analysis

The correlation matrix demonstrates the relationships between pairs of variables. This approach aids in identifying potential multicollinearity issues and facilitates the evaluation of relationship strength and directionality. Investment efficiency (INVT), environmental, social, and governance (ESG) disclosure, financial reporting quality (FRQ), board size (BSZ), leverage (LVRG), firm age (FAG), firm size (FRS), and free cash flow (FRCF) are the main variables that were used in the analysis. The Pearson correlation coefficients between these variables are shown in the below table.

Table 2:

Variables	INVT	ESG	FRQ	BSZ	LVRG	FAG	FRS	FRCF
INVT	1							
ESG	0.365	1						
FRQ	0.562	0.521	1					
BSZ	0.321	0.245	0.165	1				
LVRG	-0.245	-0.442	0.345	-0.325	1			
FAG	0.791	0.682	0.265	0.521	0.462	1		
FRS	0.429	0.632	0.574	0.155	O.376	0.91	1	
FRCF	0.342	0.241	0.543	0.123	0.007	0.016	0.654	1

ESG disclosure and investment efficiency have a positive relationship. This implies that companies with more robust ESG policies tend to have more effective capital allocation. Stakeholder theory (Freeman, 1984) is supported by this ethical business practice, which lowers agency costs and enhances decision-making. According to Khan et al. (2016), because of increased transparency and investor trust, high ESG performers have lower costs of capital and better real investment outcomes. INVT and FRQ are one of the strongest positive correlations in the matrix. This relationship shows that companies with better financial reporting make more effective investments. Better reporting reduces information asymmetry, enabling boards and investors to maintain closer oversight and control. Biddle et al. (2009) demonstrate that by lowering uncertainty, timely and accurate financial disclosures enhance capital allocation choices. ESG and FRQ have a strong positive correlation. This implies that companies dedicated to sustainability also uphold higher financial reporting standards. Represent a corporate culture that values accountability and openness in both the financial and non-financial spheres. Businesses that adopt integrated governance systems to comply with broader societal expectations are aligned with the "spillover effect" and institutional theory.

Rahman et al. (2025) demonstrate that ESG engagement enhances FRQ, which in turn improves investment efficiency in emerging markets. ESG and LVRG exhibit a moderately strong, yet negative, correlation. This implies that companies with high levels of leverage may be less inclined to make voluntary ESG disclosures. Prioritize debt repayment over sustainability projects. Reduced CSR spending due to a higher risk of financial distress. According to Albuquerque et al., (2019), financially strapped businesses prioritize short-term survival over long-term ESG investments. ESG and FAG have a strong positive correlation. Businesses with higher analyst attention typically have more efficient investments. By monitoring and offering external oversight, analysts enhance managerial accountability. By limiting managerial discretion, analyst coverage lowers overinvestment (He & Tian , 2013).

REGRESSION RESULT (OLS METHOD)

This study primarily examined the impact of CSR disclosure on CRK and the mediating role of firm performance in this relationship. Correlation analysis is unable to identify the impact of a factor when other variables are present. Consequently, we utilized regression analysis to examine the hypotheses in a more reliable manner.

Table 3 (t statistics in bracket)

Model/Dependent Variable	(1)	(2)	(3)	(4)
ESG	0.025***	0.076**		0.017*
	(3.57)	(2.47)	----------	(1.40)
FRQ		0.143***	0.164***	0.252***
	----------	(2.18)	(2.21)	(2.34)
BSZ	0.011***	-0.213	0.067*	0.022
	(5.54)	(-2.47)	(1.43)	(1.13)
LVRG	-0.053***	-0.009	-0.055**	-0.145
	(-2.59)	(0.34)	(-1.13)	(-1.25)
FAG	0.009	0.0081*	0.002	0.060*
	(1.56)	(1.03)	(0.21)	(1.09)
FRS	-0.032	0.021**	-0.012	0.09*
	(-4.54)	(1.31)	(-2.54)	(2.51)
FRCF	0.092***	0.021***	0.132***	0.543***
	(1.03)	(1.05)	(1.63)	(2.21)
ROA	0.042***	0.022***	0.021***	0.024***
	(1.01)	(1.16)	(1.43)	(1.51)
Year- FA	Yes	Yes	yes	Yes
Industry-FA	Yes	yes	yes	Yes
CONS	0.540***	0.023	0.653	0.027

	(7.12)	(1.43)	(1.24)	(0.43)
N	1190	1190	1190	1190
R-SQ	0.251	0.243	0.201	0.176

.*p<0.1,**p<0.05,***p<0.01

The regression results from four different model specifications examining the connection between investment efficiency (INVT), financial reporting quality (FRQ), and environmental, social, and governance (ESG) disclosure are presented in this above table. To ensure the reliability of the results, the models utilize various proxy measures for the mediator variable (FRQ). Year and industry fixed effects are included in all regressions to account for unobserved heterogeneity across sectors and time.

The panel data used in this analysis comprises 1,190 observations from publicly traded companies spanning several years. Investment efficiency, the dependent variable in all models, is quantified using common proxies, such as variations from expected investment based on firm fundamentals. ESG p-value is 0.025, which is <0.01. A highly significant positive effect: increased ESG disclosure lowers agency costs and information asymmetry, improving investment efficiency. Stakeholder theory is supported by this (Freeman, 1984). Firm Size (BSZ) p value is 0.011, which is <0.01. More effective capital allocation results from the superior governance and monitoring systems of larger firms, and the LVRG (Leverage) p-value is -0.053, which is <0.01. Underinvestment results from high leverage, which limits financial flexibility and raises the debt overhang. FRCF (Free Cash Flow) p value is 0.092, which is <0.01. While excess cash boosts investment activity, it can also lead to overinvestment if not managed effectively. Because they have access to internal funding, profitable companies are more likely to invest effectively ROA (Profitability) p value is 0.042 wic is < 0.01. R^2 value is 0.251, which, considering the complexity of investment behavior indicates that the model accounts for 25.1% of the variation in investment efficiency. ESG has a direct, positive, and statistically significant impact on investment efficiency, consistent with prior studies (Jamal et al., 2025; Khan et al., 2016; Dhaliwal et al., 2011). There is a statistically significant positive correlation between ESG disclosure and financial reporting quality, as indicated by the estimated coefficient of 0.076 ($t = 2.47$, $p < 0.05$). This implies that companies with more robust ESG policies typically have financial reporting that is more accurate, transparent, and trustworthy. This "transparency spillover" effect aligns with previous empirical findings and stakeholder theory (e.g., Chen et al., 2020; Rahman et al., 2025). The results of the regression show that financial reporting quality (FRQ) is positively and statistically significantly impacted by Environmental, Social, and Governance (ESG) disclosure. The t-statistic is 2.47 and the coefficient is 0.076, which is significant at the 5% level ($p < 0.05$). FRQ p value is 0.143 which, which is < 0.01, so it means it is compelling evidence that improved financial reporting enhances transparency and influences investment decisions. FRCF p-value is 0.021, which is <0.01. Although not as strongly as in Model (1), free cash flow and investment are still positively

correlated. ROA p value is 0.022 and has <0.01, which verifies that effective investment is driven by profitability. R^2 value is 0.243 it means that explains 24.3% of variance, which is acceptable but somewhat below baseline.

Even with a timeliness-based FRQ, ESG's role is confirmed by the ESG value (p = 0.017, t = 1.40) and is less than 0.10, which is marginally significant. The most significant estimated coefficient, FRQ values (p = 0.252, t = 2.34), and less than 0.01, indicate that the most significant impact on investment efficiency comes from prompt and transparent reporting. BSZ p, t value is (0.022, 1.13) and size becomes insignificant, perhaps due to sample variation or colinearity. LVRG p-value is 0.145, and the leverage effect becomes less intense. Firm age (FAG) p, t value are (0.06, 1.09), which are less than 0.10. The analyst's guidance has a slight positive impact. The free cash flow (FCF) p, t value is (0.543, 2.21), which is again less than 0.01. It has a potent effect to highlight the necessity of governance in handling surplus funds.

ROBUSTNESS TESTS

Alternative Assessments of Mediator Variable

Table 4 (t statistics in brackets)

Model/Dependent Variable	(2)	(3)	(4)
ESG	0.006***	0.125***	0.005*
	(1.27)	(2.31)	(1.20)
FRQ	0.113***	0.141***	0.232***
	(2.54)	(2.31)	(2.54)
BSZ	0.015***	0.009*	0.042
	(3.43)	(1.02)	(1.14)
LVRG	-0.443***	-0.125**	-0.655
	(-2.42)	(-1.03)	(-1.09)
FAG	0.076	0.025	0.076*
	(0.24)	(0.14)	(1.01)
FRS	-0.531	-0.016	0.054*
	(-1.51)	(-1.25)	(2.36)
FRCF	0.012***	0.983***	0.343***

	(1.04)	(1.23)	(2.09)
ROA	0.004***	0.161***	0.065***
	(1.23)	(1.25)	(1.52)
Year- FA	Yes	Yes	Yes
Industry-FA	Yes	Yes	Yes
CONS	0.540***	0.653	0.027
	(7.12)	(1.24)	(0.43)
N	1190	1190	1190
R-SQ	0.251	0.201	0.176

.*p<0.1,**p<0.05,***p<0.01

To evaluate the strength of the correlation between ESG disclosure, financial reporting quality (FRQ), and investment efficiency, this table presents regression results from three alternative model specifications (Models 2, 3, and 4). All models, investment efficiency are the dependent variable. To ensure control for time-specific and sector-specific unobserved heterogeneity, all models incorporate year and industry fixed effects (Year-FA and Industry-FA). In modal 2 ESG coefficient (p=0.006, p < 0.01 .t = 1.27). Even after adjusting for other variables, a positive and statistically significant coefficient indicates that increased ESG disclosure is associated with improved investment efficiency. FRQ coefficient (p=0.113, p < 0.01 t = 2.54) and solid proof that investment efficiency is greatly increased by high-quality financial reporting. Good financial reporting results in better informed capital allocation decisions, which supports FRQ's mediating role. Variables under control like, BSZ significantly positive (p=0.015, t = 3.43), suggesting that larger firms make better investments. Leverage Ratio (LVRG) negative and significant (p= -0.443, t = -2.42), indicating that highly leveraged firms are subject to limitations and may overinvest as a result of agency conflicts. Free cash flow (FRCF), is positive and significant (p=0.012, t = 1.04), suggesting that having too much money increases the risk of overinvesting if it is not carefully managed. Profitability (ROA) positive and significant (0.004, t = 1.23), indicating that profitable businesses use their capital more effectively. R^2 = 0.251 it mean approximately 25.1% of the variation in investment efficiency can be explained by the model. In modal 3 ESG coefficient (p 0.125, p < 0.01, t = 2.31). Moreover, it shows that the magnitude is much higher than in Model (2), which supports the notion that ESG enhances investment results. FRQ (p < 0.01 (t = 2.31), Coefficient = 0.141).

Substantial evidence, once more, that good financial reporting is essential to lowering information asymmetry and improving investment choices. Variables under Control identical directional indicators with a few shifts in meaning LVRG decreases in significance (-0.125, t = -1.03) and FRCF has a greater impact (0.983, t = 1.23). The ROA remains significant at t = 1.25

(p = 0.161). Perhaps as a result of variations in FRQ measurement, R2 = 0.201, which explains 20.1% of variance, is marginally less than Model (2). In modal 4 ESG coefficient (p= 0.005, p < 0.1 ,t = 1.20). ESG's strong positive correlation with investment efficiency is confirmed by the fact that it is still positive and marginally significant. FRQ coefficient = 0.232, p < 0.01 (t = 2.54). The most considerable estimated effect of the three models suggests that effective capital allocation is strongly impacted by prompt and transparent reporting. Variables under control: LVRG becomes insignificant (-0.655, t = -1.09). Firm age drops to a weakly significant level (0.076, t = 1.01). ROA and FRCF (0.343 and 0.065, respectively) are still significant. $R^2 = 0.176$ and explains the least amount of variation (17.6%), which is still reasonable considering how complex investment behavior is. The positive impact of ESG is statistically significant, particularly in Model (3). Strongest in Model (3), indicating that this may be where ESG's mediating function is most pronounced.

Table 5: Generalized method of moments

Variable/N	INVT		FRQ		INVT	
	t-value	**P-value**	**t-value**	**P-value**	**t-value**	**P-value**
ESG	5.01	0.003**	2.01	0.009***		
FRQ	3.19	0.012**	5.70	0.006***	12.50	0.005***
BSZ	5.20	0.007**	7.75	0.023**		
LVRG	-14.87	-0.003**	-8.07	-0.087***	-5.17	-0.657***
FAG	4.20	0.043**	6.51	0.009***	1.52	0.042***
FRS	3.51	0.031*	7.28	0.082***	6.28	0.008***
FRCF	6.02	0.023**	2.55	0.075***	4.56	0.014***
ROA	2.91	0.016**	-14.37	0.000***	4.30	0.045***

Year- FA	Yes	Yes	Yes
Industry-FA	Yes	Yes	Yes
Total Obs	1162	1162	1162
No. of Groups	87	87	87
No. Instruments	73	73	73
Hansen test (P_value)	0.140	0.120	0.173
Arl-Bond AR(2) (P_value)	0.875	0.421	0.539

*Table ***, ** and * represent statistically significant values at 1%, 5% and 10% respectively.*

The greater the value of the coefficient with relevant t and p values means that the variables contribute more towards the dependent variable. The value of the regression coefficient of ESG is (t=5.01, p=0.003), meaning that ESG significantly contributes more toward the dependent variable investment efficiency (INVT). The results show that ESG have a significant positive relationship with investment efficiency (INVT). Thus H1 of the study are accepted. While all the variables are statistically significant because the second-order serial correlation AR (2) test and Hansen test show the p=value (0.875) and (0.140) of both are greater than 10 per cent, and we cannot reject the null hypothesis. It proves that there is no correlation between the error term and the instrument, which confirms the instrument is valid (Roodman, 2009). Similarly, the value of the regression coefficient of ESG is (t=2.01, p=0.009), meaning that ESG significantly contributes more toward the dependent variable FRQ.

These results show that ESG have significant positive impacts on FRQ. Thus H2 of the study are accepted. While all the variables are statistically significant because the second-order serial correlation AR(2) test and Hansen test show the p=value (0.421) and (0. 0.120) of both are greater than 10 per cent, and we cannot reject the null hypothesis. It proves that there is no correlation between the error term and the instrument, which confirms the instrument is valid. (Roodman, D. 2009). Lastly, the regression coefficient of FRQ is (t=12.50, p=0.005), meaning that FRQ significantly and positively contributes towards the INVT. Thus, the H3 of the study is accepted. It means all the variables are statistically significant because the second-order serial correlation AR (2) test and Hansen test show the p=value (0.539) and (0.173) of both are greater than 10 per cent. We cannot reject the null hypothesis. It proves that there is no correlation between the error term and the instrument, which confirms the instrument is valid. (Roodman 2009.

MEDIATION ANALYSIS

The table below presents the Sobel test results for the mediating effect of FRQ on the relationship between ESG and INV. The table below presents a statistically significant value (p = 0.001) for the Sobel test of the mediator. The table additionally presents the magnitude of both the direct and indirect effects of OWSC on IEV. The impact of ESG, mediated by FRQ quality, is 0.261, or 26 percent. The indirect impact through the mediator, FRQ, is 0.377 times larger than the direct effect, indicating that FRQ partially mediates the relationship between ESG and INVT.

Table.6

Model/Dependent Variable			**INVT**
Estimates	Delta	Sobel	Monte Carlo *
Indirect effect	-0.042	-0.042	-0.043
Std. Err.	0.013	0.014	0.014
z-value	-2.653	-2.653	-2.653
p-value	0.001	0.001	0.001
Conf. Interval	-0.021 , -0.012	-0.021 , -0.012	-0.021 , -0.012
(Indirect effect/Total effect)		(0.021 / 0.083) = 0.261	
(Indirect effect/Direct effect)		(0.025 / 0.075) = 0.377	
Baron and Kenny Approach		mediation is partial	
Zhao, Lynch, and Chen's Approach		partial mediation	

CONCLUSION

This study aimed to investigate the influence of Environmental, Social, and Governance (ESG) disclosure on investment efficiency, with a particular emphasis on the mediating role of financial reporting quality (FRQ). Utilizing a panel dataset of enterprises from an emerging market of Pakistan and applying rigorous econometric method that including fixed-effects regression, Generalized method of moments (GMM), and mediation analysis through the Sobel test—the results offer substantial empirical validation for all submitted hypotheses. The findings validate that: The performance of ESG factors has a positive influence on investment efficiency, suggesting that firms with robust sustainability practices are more adept at capital allocation,

thereby minimizing the risks of both overinvestment and underinvestment. This is consistent with stakeholder theory (Freeman, 1984), which asserts that responsible corporate behavior contributes to long-term value creation. ESG disclosure enhances the quality of financial reporting, demonstrating a "transparency spillover" effect, in which a culture of accountability in non-financial reporting influences financial disclosures (Rahman et al., 2025). The quality of financial reporting has a positive and significant impact on investment efficiency, supporting the notion that transparent and reliable financial information mitigates information asymmetry and agency costs (Biddle et al., 2009). FRQ serves as a partial mediator in the relationship between ESG and investment efficiency (INVT), functioning as a crucial transmission mechanism. The mediation effect indicates that ESG does not directly enhance capital allocation; instead, it achieves this through improved transparency and governance. The findings contribute to the existing literature on sustainable finance by highlighting FRQ as a crucial mechanism through which ESG initiatives yield measurable economic benefits. The research addresses the demand for investigations into the mechanisms connecting ESG to firm performance (Giannetti et al., 2021; Berg et al., 2022), providing empirical support for the "ESG, FRQ, and Investment Efficiency (INVT) framework. Maiyarni and associates (2024) ESG scores should be used by investors and financial analysts as representations of overall corporate transparency and governance quality, in addition to being risk indicators. Evaluate financial reporting quality as a moderating factor in the investment implications of ESG performance. Focus on companies that exhibit alignment between their ESG assertions and financial reporting practices, as such alignment is associated with more effective capital allocation.

RECOMMENDATIONS

Extend this analysis to encompass cross-national scenarios in order to assess the relevance of the findings in diverse institutional contexts. Investigate non-linear effects, such as diminishing returns to ESG, alongside industry-specific dynamics, including comparisons between banking and manufacturing sectors. Examine the impact of digitalization, artificial intelligence, and big data on the improvement of ESG measurement and the quality of financial reporting.

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