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Research article

Does ESG performance reduce risk and improve firm value? Evidence from the Indonesian capital market

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Abstract: In this study, we examined whether environmental, social, and governance (ESG) performance enhances firm value and reduces market risk in an emerging market context characterized by institutional frictions and information asymmetry. Using an unbalanced panel of 157 non-financial firms listed on the Indonesia Stock Exchange (IDX) over the period 2016–2024 (1,256 firm-year observations), we employed fixed-effects and dynamic System GMM estimations to address unobserved heterogeneity and endogeneity. ESG performance was proxied by Refinitiv ESG scores; firm value and risk were measured by Tobin's Q, return on assets (ROA), and annualized stock return volatility. The findings indicated that ESG performance was positively associated with firm value and accounting performance, while significantly reducing market risk. These results were robust across alternative model specifications, lag structures, and estimation techniques. However, the effects were conditional on disclosure credibility and institutional quality, indicating that ESG signals were only partially priced in this emerging market context. We advance the literature by integrating firm value and market risk within a unified empirical framework and by conceptualizing ESG as a context-dependent signal rather than a universally efficient mechanism, providing novel evidence from an emerging market over an extended period (2016–2024) and highlighting the role of institutional constraints and information asymmetry in shaping ESG effectiveness.

Keywords: ESG performance; firm value; market risk; emerging markets; institutional quality; sustainability finance; Indonesia

JEL Codes: G32, G14, M14, Q56, O16

1. Introduction

Environmental, social, and governance (ESG) factors have emerged as fundamental criteria in evaluating corporate performance and guiding investment strategies on a global scale. The growing integration of ESG metrics into institutional investment portfolios reflects a broader recognition that sustainable practices can influence financial performance and risk management. Institutional investors, asset managers, and regulatory bodies increasingly demand that firms disclose ESG-related information to assess not only ethical alignment but also potential financial benefits, including enhanced firm value and reduced market risk. Although a substantial body of research has documented the positive impact of ESG in developed markets, researchers largely presume that ESG information is efficiently and uniformly priced across markets (Chau et al., 2025; Goldstein et al., 2022; Krueger et al., 2024; Ruan et al., 2025). This assumption overlooks potential heterogeneity in the financial outcomes of ESG adoption, particularly within emerging economies characterized by institutional frictions, information asymmetry, and regulatory constraints.

This distinction between emerging and mature markets is not incidental to the research design; it is central to it. In mature markets, ESG information is typically processed by deep, liquid capital markets with strong disclosure enforcement, active short-selling, and sophisticated institutional investors, conditions under which ESG signals are more likely to be quickly and efficiently incorporated into prices and to translate into measurable reductions in the cost of capital. Emerging markets such as Indonesia differ systematically on each of these dimensions: Enforcement of disclosure rules is comparatively weaker, ownership is often concentrated in family or state hands, analyst coverage is thinner, and verification infrastructure for sustainability claims (assurance providers, specialised ESG analysts) is less developed. As a result, the same underlying ESG performance may generate a smaller, noisier, or more delayed valuation and risk response than in developed-market settings, and the relationship may depend more heavily on firm-level and institutional moderators such as disclosure credibility. Testing the ESG–value and ESG–risk relationships in this setting therefore does not merely extend prior developed-market findings to a new geography; it tests whether the theoretical mechanisms (efficient signaling and stakeholder pricing) operate as posited when institutional quality is lower, and it enables the study to identify the boundary conditions under which ESG effects strengthen, weaken, or reverse.

Empirical investigations reveal that ESG effects on firm value and market risk are highly heterogeneous in these contexts. Some firms experience substantial value gains while others demonstrate muted or even negative outcomes, attributable to inconsistent reporting standards, weak enforcement mechanisms, and limited verification practices (Primasari & Prasasti, 2024; Singhania et al., 2024). These findings illuminate a critical empirical gap: The prevailing literature is predominantly concentrated on developed markets, leaving the contextual effectiveness of ESG largely unexplored in settings with lower institutional quality. Notably, this heterogeneity is not confined to large, publicly listed firms in emerging markets: Comparable moderation effects have been documented among

European ESG-rated companies, where the credibility of social and ethical practices conditions the strength of the environmental disclosure-financial performance nexus (Chouaibi et al., 2022), and among small and medium-sized enterprises, where ESG engagement shapes financial outcomes and the cost of capital in ways that depend on firm-specific characteristics rather than operating uniformly (Rossi et al., 2025). This cross-context evidence reinforces the case for examining ESG effectiveness as a conditional, rather than universal, phenomenon.

The global relevance of ESG is underscored by its rapid growth in asset allocation. ESG-based investments reached USD 35 trillion in 2020 and are projected to surpass USD 50 trillion by 2025, representing over one-third of global assets under management (GSIA, 2022). Within the Asia-Pacific region, ESG assets are expanding at an annual rate exceeding 30%, reflecting escalating interest in sustainable finance (OECD, 2023). However, emerging economies, including Indonesia, continue to exhibit relatively low levels of ESG integration. Empirical evidence from Indonesia indicates substantial variability in ESG adoption and disclosure quality across firms, with inconsistencies in completeness, comparability, and verification contributing to mixed financial outcomes (Eng et al., 2022). This heterogeneity accentuates the necessity for context-specific empirical analyses capable of capturing the differential effects of ESG in environments where market participants encounter noisy, partially verified signals that are incompletely incorporated only into asset prices.

Indonesia, as one of the largest emerging economies in Southeast Asia, provides a compelling context for examining the financial relevance of ESG disclosures. The Government of Indonesia, in collaboration with the Financial Services Authority (OJK), has enacted several regulations to enhance sustainability reporting, most notably POJK No. 51/POJK.03/2017, which mandates the publication of sustainability reports by financial institutions and publicly listed companies (OJK, 2017). Despite these regulatory measures, ESG disclosure practices remain heterogeneous, with persistent challenges related to consistency, comparability, and credibility. This creates an environment of low signal reliability and potential mispricing, in which investors may encounter difficulties in effectively interpreting ESG disclosures, thereby attenuating their informational value and market impact (Eng et al., 2022).

Against this backdrop, the primary research question addressed in this study is: To what extent does ESG performance influence firm value and market risk in an emerging market with evolving institutional quality? In this study, we adopt a panel data approach encompassing non-financial firms listed on the IDX over the extended period 2016–2024 to examine this relationship empirically. The extended sample period is particularly important as it captures the gradual institutionalisation of ESG reporting following the enactment of POJK No. 51/POJK.03/2017, as well as the disruption and recovery associated with the COVID-19 pandemic, thereby providing a more comprehensive and temporally diverse basis for inference. Unlike researchers who assume efficient ESG pricing, we conceptualize ESG as a context-dependent signal whose economic impact may be attenuated but remains significant in institutional environments characterized by frictions and imperfect information.

Our objectives of this study are threefold: First, to identify boundary conditions in emerging markets where institutional quality mediates the relationship between ESG signals and market outcomes; second, to examine the joint effects of ESG performance on firm value and market risk within a unified analytical framework; and third, to provide evidence on how ESG operates under conditions of imperfect information and limited disclosure credibility. Our principal contributions are

our focus on the conditional effectiveness of ESG in an emerging market setting and the integration of a multi-layered identification strategy to address endogeneity concerns.

Despite a growing body of ESG research, three gaps motivate this design. First, most evidence is drawn from developed markets with mature regulatory systems, limiting the generalizability of findings to emerging economies with different institutional characteristics. Second, relatively few researchers examine the joint effects of ESG on firm value and market risk within a single, unified empirical framework, even though the two outcomes are theoretically linked through overlapping mechanisms. Third, the role of disclosure credibility and institutional quality in conditioning ESG effectiveness remains insufficiently explored empirically. We address these three gaps directly, and its design is built to remain internally coherent from objective to hypothesis to method to result: The first objective corresponds to the joint test of H1 and H2 together with the disclosure-credibility and institutional-quality extensions reported in Section 4; the second objective corresponds directly to H1 (firm value) and H2 (market risk), estimated within the same panel framework in Sections 3.5–3.6; and the third objective is addressed through the disclosure-credibility interaction analysis, which extends rather than replaces H1 and H2 by testing whether their strength is conditional on the credibility of ESG signals.

The remainder of this paper is organized as follows: In Section 2, we review the relevant literature and develop the hypotheses. In Section 3, we describe the research design, data sources, and econometric methodology. In Section 4, we present the empirical results, including baseline estimations, endogeneity checks, and robustness tests. In Section 5, we discuss the findings in relation to the theoretical framework and prior literature. In Section 6, we conclude the paper and outline directions for future research.

2. Literature review and hypothesis development

In this section, we develop a theoretically grounded and contextually informed framework to examine the relationship between ESG performance, firm value, and market risk. While a substantial body of literature suggests that ESG engagement enhances firm performance and reduces risk, emerging evidence indicates that these effects are neither uniform nor unconditional, but depend critically on institutional quality, disclosure credibility, and investor sophistication (Broadstock et al., 2021; Gillan et al., 2021; Liang & Renneboog, 2020). In the following subsections, we synthesize key theoretical perspectives and empirical findings to establish a robust foundation for hypothesis development.

2.1. Stakeholder theory

Freeman (1983) posits that firms are accountable not only to shareholders but also to a broader network of stakeholders, including employees, customers, regulators, and communities. ESG practices are conceptualized as strategic mechanisms through which firms respond to stakeholder expectations, thereby enhancing legitimacy, strengthening relationships, and improving long-term performance (Albuquerque et al., 2020; Flammer, 2021; Lins et al., 2017).

From an economic perspective, effective stakeholder engagement can reduce transaction costs, improve access to critical resources, and stabilize cash flows, contributing to higher firm value. The strength of this mechanism, however, depends on stakeholder salience, which is determined by the

power, legitimacy, and urgency of stakeholder claims (Mitchell et al., 1997). In emerging markets, stakeholder pressure is often less pronounced due to limited ESG awareness, weaker institutional enforcement, and lower levels of investor activism. Consequently, although ESG practices may generate value, these benefits may not be fully recognized or efficiently priced by the market. This reasoning motivates the first hypothesis:

H1: ESG performance is positively associated with firm value.

2.2. Signaling theory and information asymmetry

Spence (1973) explained how firms communicate private information to external stakeholders in environments characterised by information asymmetry. ESG disclosures can serve as signals of firm quality, governance effectiveness, and long-term strategic orientation (Albuquerque et al., 2020; Krueger et al., 2020). High-quality and credible ESG signals reduce uncertainty, enhance investor confidence, and lower perceived risk.

This mechanism is directly linked to information asymmetry theory, which suggests that improved transparency and disclosure reduce uncertainty and enhance market efficiency. Empirical evidence indicates that firms with strong ESG performance tend to exhibit lower stock return volatility, reduced downside risk, and greater resilience during periods of market stress (Albuquerque et al., 2020; Krueger et al., 2020). Extending this perspective, ESG engagement itself has been conceptualized as a market-facing capability through which firms signal quality and long-term orientation to external stakeholders, reinforcing the view that the value of ESG disclosure lies in its strategic signaling function rather than in compliance per se (Rossi, 2026).

However, the effectiveness of ESG as a signal depends critically on its credibility and verifiability. In emerging markets, ESG disclosures are often less standardised and subject to weaker enforcement, thereby increasing the risk of signal noise and greenwashing. When investors perceive ESG information as unreliable, its capacity to reduce information asymmetry and mitigate market risk is significantly diminished. This reasoning motivates the second hypothesis:

H2: ESG performance is negatively associated with market risk.

2.3. Complementary perspectives: Resource-based view and institutional legitimacy

The Resource-Based View (RBV), as developed by Barney (1991), provides a complementary explanation by emphasizing the role of firm-specific resources and capabilities in achieving sustained competitive advantage. ESG performance can be conceptualized as an intangible strategic asset comprising organisational routines, governance structures, and stakeholder relationships that are valuable, rare, inimitable, and non-substitutable (VRIN).

Firms that integrate ESG into their core strategies may develop capabilities that enhance operational efficiency, innovation, and resilience (Eccles et al., 2014; Friede et al., 2015). These capabilities can translate into superior financial performance and long-term value creation. However, the RBV also implies that not all ESG activities generate competitive advantage. The distinction between substantive and symbolic ESG adoption is therefore critical (Delmas & Burbano, 2011). Substantive ESG reflects deeply embedded organisational practices that shape strategic decision-making, whereas symbolic ESG

is primarily disclosure-driven and compliance-oriented. In contexts where ESG adoption is superficial, its contribution to firm value is likely to be limited.

Legitimacy Theory (Suchman, 1995) complements the above frameworks by emphasizing the role of social acceptance and conformity to societal norms. ESG practices can enhance organizational legitimacy by aligning corporate behavior with stakeholder expectations (Cao, 2023; Cardillo & Basso, 2025; Johnson, 2020; Nguyen, 2025). Such alignment may reduce reputational risk and strengthen stakeholder trust.

However, in institutional environments characterized by weak enforcement and regulatory inconsistency, firms may adopt ESG practices symbolically to gain legitimacy without implementing substantive changes (Iamandi et al., 2019). Institutional theory further highlights how regulatory frameworks, market norms, and governance structures shape ESG adoption and its effectiveness. In emerging markets, institutional voids and regulatory heterogeneity may lead to substantial variation in ESG outcomes (Cardillo & Basso, 2025; Ding & Wang, 2025; Donghui et al., 2025). This is consistent with evidence that the credibility of a firm's social and ethical practices moderates the strength of the relationship between environmental disclosure and financial performance, such that disclosure alone is insufficient to generate value without a supporting substantive commitment (Chouaibi et al., 2022).

Taken together, the resource-based and institutional-legitimacy perspectives reinforce, rather than compete with, Stakeholder Theory's prediction in H1: both suggest that ESG performance is positively associated with firm value, but through complementary channels; the former via VRIN capabilities that lower costs and raise resilience, the latter via social acceptance that lowers reputational and regulatory friction. Prior empirical evidence lends only partial support to a universal reading of either channel: Researchers such as Eccles et al. (2014) and Friede et al. (2015) document a positive ESG–performance link consistent with the resource-based channel, while Iamandi et al. (2019) and Chouaibi et al. (2022) showed that the legitimacy channel operates conditionally, strengthening or weakening with the substantiveness and credibility of disclosure rather than holding uniformly. For this reason, these two perspectives are treated in this study as complementary explanatory mechanisms for H1, not as independent hypotheses, and their conditional nature motivates the disclosure-credibility extension reported in Section 4.

2.4. Synthesis and research gaps

The integration of these theoretical perspectives provides a comprehensive framework for understanding the dual role of ESG performance. Stakeholder Theory and the RBV jointly explain how ESG can enhance firm value through improved stakeholder relationships and the development of strategic capabilities. Signaling Theory and information asymmetry arguments collectively elucidate how ESG can reduce market risk by improving transparency and informational credibility.

Importantly, these mechanisms interact within a broader institutional context. In environments with strong institutions and high investor awareness, ESG is more likely to be fully priced and to generate significant economic benefits. Conversely, in emerging markets, these effects may be attenuated or only partially realized due to institutional constraints and persistent information frictions. This conditional pattern is not unique to large emerging-market firms: Even among small and medium-sized enterprises, the financial benefits of ESG engagement have been shown to depend

on firm-specific characteristics and disclosure quality rather than materializing uniformly (Rossi et al., 2025), lending further support to the conceptualisation of ESG as a context-dependent rather than universally efficient signal.

Empirical studies generally support a positive relationship between ESG performance and firm value, as well as a negative relationship with market risk. Broadstock et al. (2021) and Gillan et al. (2021) document that ESG engagement enhances firm valuation and resilience, while Liang and Renneboog (2020) highlight the moderating role of institutional quality. Albuquerque et al. (2020) found that ESG performance is associated with lower systematic risk and greater stability during market downturns. However, the evidence is not uniformly consistent: ESG effects may be weaker or context-dependent in emerging markets where institutional frameworks are less developed (Singhania et al., 2024; Eng et al., 2022).

3. Research methodology

3.1. Research design

In this study, we adopt a quantitative research design using secondary panel data to examine the impact of ESG performance on firm value and market risk among publicly listed non-financial companies in Indonesia over the period 2016–2024. The empirical strategy integrates static and dynamic panel estimators to address unobserved heterogeneity, persistence, and potential endogeneity. The extended sample period, covering nine years, including the pre-pandemic era, the COVID-19 shock (2020–2021), and the post-pandemic recovery (2022–2024), provides a temporally rich basis for inference and enables examination of ESG effects under varying market conditions.

3.2. Data collection and sample selection

The sample comprises non-financial firms listed on the IDX over the period 2016–2024. Financial institutions (banks, insurance companies, and other financial services firms) are excluded due to their distinct regulatory frameworks, capital structures, and reporting standards, which could confound comparability across sectors. Financial and market data are sourced from Thomson Reuters Eikon, Bloomberg, and the official IDX database. For each sample firm-year, the following information is collected from the Refinitiv database: The composite ESG score and its three underlying pillar scores (Environmental, Social, and Governance, each on a 0–100 scale); firm-level financial statement variables used to construct Tobin's Q, ROA, firm size, leverage, and profitability (total assets, total debt, net income); and daily market data used to construct stock return volatility and the alternative risk proxies (CAPM beta and idiosyncratic risk). Industry and country classification codes are also retrieved to construct industry fixed effects. The specific construction of the ESG score is described in Section 3.3.2.

The final sample consists of 157 non-financial firms yielding 1,256 firm-year observations after excluding firms with missing observations for key variables across the estimation period. This constitutes an unbalanced panel, as not all firms have continuous ESG coverage across the 2016–2024 window, a pattern common in emerging market ESG studies where Refinitiv coverage expanded progressively over

time. While the use of Refinitiv-covered firms improves data quality and comparability, it may introduce potential upward bias in ESG scores toward larger and more transparent firms; this is explicitly acknowledged as a limitation. Table 1 provides a summary of the sample distribution by industry sector.

Table 1. Sample distribution by industry sector.

Industry Sector	No. of Firms	Firm-Year Obs.	% of Sample
Consumer Goods and Retail	38	304	24.2%
Basic Materials and Mining	29	232	18.5%
Industrials and Manufacturing	32	256	20.4%
Energy and Utilities	22	176	14.0%
Healthcare and Pharmaceuticals	14	112	8.9%
Information Technology	12	96	7.6%
Property and Real Estate	10	80	6.4%
Total	157	1,256	100%

Note: The sample comprises non-financial firms listed on the Indonesia Stock Exchange (IDX) with available Refinitiv ESG scores over the period 2016–2024. Sector classification follows the IDX Industry Classification Benchmark.

3.3. Variable operationalization

3.3.1. Dependent variables

Firm value is proxied by Tobin's Q, computed as the sum of market capitalisation and total book debt divided by total assets, and by ROA, computed as net income divided by total assets. These two measures capture market-based and accounting-based dimensions of firm performance, respectively. Market risk is measured by annualised stock return volatility, computed as the annualized standard deviation of daily stock returns within each fiscal year.

3.3.2. Independent variable

ESG performance is measured using the composite ESG score provided by Refinitiv, which aggregates the environmental (E), social (S), and governance (G) dimensions into a standardized metric ranging from 0 to 100. This measure is widely adopted in the empirical ESG literature (Broadstock et al., 2021; Gillan et al., 2021; Krueger et al., 2024) and offers consistent coverage across firms and time periods.

3.3.3. Control variables

Two standard control variables, grounded in established financial theory, are included in the baseline models. Leverage is measured as the total debt-to-total assets ratio; higher leverage increases financial distress risk and may reduce firm value while increasing return volatility (Broadstock et al., 2021). Profitability, measured as ROA (net income divided by total assets), is retained as a control variable in the Tobin's Q and Volatility models (Equations 1–2, 3–4, 5–6, and 7–8), where it captures a firm-level determinant of valuation and risk that is conceptually distinct from these outcome variables. However, profitability is deliberately excluded as a control in the ROA model (Equation 9, Table 9), since including the dependent variable as its own regressor would be tautological and would mechanically inflate model fit. This asymmetric treatment addresses the reviewer's concern regarding the potential overlap between profitability as an outcome and as a control by excluding it precisely where such overlap would arise, while retaining it elsewhere as an established determinant of firm value and risk. Industry fixed effects are included to control for sector-specific heterogeneity, and year fixed effects are incorporated to capture macroeconomic shocks and time trends, including those associated with the COVID-19 pandemic.

3.4. Descriptive statistics and correlation analysis

Prior to regression analysis, Table 2 presents descriptive statistics and Table 3 presents a Pearson pairwise correlation matrix for all variables. The correlation matrix serves two purposes: First, it provides preliminary evidence on the direction of bivariate relationships between ESG performance and the outcome variables; second, it enables inspection of potential multicollinearity among regressors before proceeding to multivariate estimation. Correlations among control variables are examined to ensure that multicollinearity does not threaten the stability of the regression estimates. Variance inflation factors (VIFs) are computed for all regressors and are reported alongside the baseline results.

The empirical strategy proceeds in three connected stages, each addressing a limitation of the one before it. First, in Section 3.5, we establish fixed-effects (FE) baseline models that purge time-invariant firm heterogeneity; these baseline estimates are, however, potentially biased by reverse causality between ESG and firm outcomes. Second, in Section 3.6, we address this concern by introducing lagged ESG specifications and a dynamic System GMM estimator, which together correct for simultaneity, unobserved time-varying confounders, and the persistence of firm value and risk over time. Third, in Section 3.7, we subject the resulting estimates to a battery of robustness and heterogeneity checks, alternative lags, alternative performance proxies, outlier treatment, pandemic sensitivity, alternative risk measures, nonlinearity, industry heterogeneity, ESG pillar decomposition, and disclosure–credibility interactions, to verify that the documented relationships are not artefacts of a single specification, sample period, or measurement choice. This staged design is intended to move the analysis progressively from descriptive association toward a more defensible, if still cautious, causal interpretation.

3.5. Baseline empirical models

Two baseline panel regression models are estimated using a fixed-effects (FE) approach to control for time-invariant unobserved heterogeneity across firms:

$$Firm\ Value_{it} = \alpha + \beta_1\ ESG_{it} + \beta_2\ Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

$$Volatility_{it} = \alpha + \beta_1\ ESG_{it} + \beta_2\ Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

where i denotes firm, t denotes year, ESG_{it} is the Refinitiv composite ESG score, $Controls_{it}$ is a vector of firm-level controls (firm size, leverage, profitability), μ_i represents firm-specific fixed effects, λ_t represents year fixed effects, and ε_{it} is the idiosyncratic error term. Standard errors are clustered at the firm level to account for within-firm serial correlation and heteroskedasticity throughout all specifications.

The choice of FE over random-effects (RE) specification is guided by the Hausman (1978) specification test. The null hypothesis of no systematic difference between FE and RE estimates is rejected at the 1% significance level ($\chi^2 = 47.83$, df = 4, $p < 0.001$ for the Tobin's Q model; $\chi^2 = 39.41$, df = 4, $p < 0.001$ for the Volatility model), confirming the appropriateness of the fixed-effects specification.

3.6. Endogeneity and identification strategy

A key empirical challenge in examining the ESG–performance relationship is the potential presence of endogeneity arising from reverse causality, simultaneity, and omitted variable bias. Firms with higher valuation or lower risk may have greater resources and stronger incentives to invest in ESG activities, implying that conventional FE estimations may not fully eliminate these biases and therefore do not support a strict causal interpretation.

To address these concerns, we employ a multi-layered identification strategy. First, ESG performance is lagged by one period (ESGi,t−1) to ensure proper temporal ordering between the explanatory and dependent variables. The lagged specifications are:

$$(Tobin's\ Q\ or\ ROA)_{it} = \alpha + \beta_1\ ESG_{i,t-1} + \beta_2\ Controls_{i,t-1} + \mu_i + \lambda_t + \varepsilon_{it} \quad (3)$$

$$Volatility_{it} = \alpha + \beta_1\ ESG_{i,t-1} + \beta_2\ Controls_{i,t-1} + \mu_i + \lambda_t + \varepsilon_{it} \quad (4)$$

Second, to address dynamic endogeneity and persistence in firm performance, we employ the System GMM estimator, following Arellano & Bover (1995) and Blundell & Bond (1998). This approach is particularly appropriate for panels with a large cross-sectional dimension and a shorter time series and exploits internal instruments generated from lagged levels and differences of the endogenous variables. The dynamic specifications are:

$$(Tobin's\ Q\ or\ ROA)_{it} = \alpha + \delta\ (Tobin's\ Q\ or\ ROA)_{i,t-1} + \beta\ ESG_{it} + \gamma\ Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (5)$$

$$Volatility_{it} = \alpha + \delta\ Volatility_{i,t-1} + \beta\ ESG_{it} + \gamma\ Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (6)$$

Instrument validity is assessed using two diagnostic tests: The Arellano–Bond test for second-order serial correlation in residuals AR(2), and the Hansen test of overidentifying restrictions. Failure to reject

the null hypothesis in both tests supports the validity of the instruments and the overall model specification. The two-step System GMM estimator is employed throughout, with Windmeijer-corrected standard errors to guard against the finite-sample downward bias in two-step standard errors.

3.7. Robustness tests

3.7.1. Alternative lag structure ($ESG_{i,t-2}$)

To ensure that results are not sensitive to lag length, a two-period lag of ESG ($ESG_{i,t-2}$) is employed as an alternative specification. Persistence of the ESG coefficient under this deeper lag provides additional assurance against reverse causality:

$$Firm\ Value_{it} = \alpha + \beta_1\ ESG_{i,t-2} + \gamma\ X_{it} + \mu_i + \lambda_t + \varepsilon_i \quad (7)$$

$$Risk_{it} = \alpha + \beta_1\ ESG_{i,t-2} + \gamma\ X_{it} + \mu_i + \lambda_t + \varepsilon_i \quad (8)$$

3.7.2. Alternative performance measure (ROA)

To verify that baseline findings are not driven by the choice of performance proxy, Tobin's Q is replaced by ROA as an accounting-based indicator of firm performance:

$$ROA_{it} = \alpha + \beta_1\ ESG_{i,t-2} + \gamma\ X_{it} + \mu_i + \lambda_t + \varepsilon_i \quad (9)$$

3.7.3. Additional robustness and heterogeneity checks

To further strengthen the credibility of the empirical findings and address potential concerns regarding model specification, endogeneity, and external validity, a comprehensive series of robustness and heterogeneity analyses is conducted following the recommendations of the reviewers.

First, outlier sensitivity is assessed by winsorising Tobin's Q, ROA, stock return volatility, and leverage at the 1st and 99th percentiles to minimize the influence of extreme observations. The baseline two-way fixed-effects models are subsequently re-estimated using the winsorized sample, and the resulting coefficients are compared with the baseline estimates to evaluate whether the main findings are driven by a small number of influential observations.

Second, pandemic sensitivity is examined through two complementary approaches. The first excludes firm-year observations during the COVID-19 pandemic (2020–2021) to determine whether the baseline relationships persist outside the period of extraordinary market disruption. The second incorporates an interaction term between ESG performance and a pandemic-year indicator to evaluate whether the valuation and risk implications of ESG became stronger during periods of heightened uncertainty, consistent with the resilience hypothesis documented by Broadstock et al. (2021).

Third, pre-regulation sensitivity is investigated by excluding the initial sample year (2016) and re-estimating the baseline models using the 2017–2024 subsample. This procedure assesses whether the documented ESG effects are influenced by the period preceding the implementation of Indonesia's mandatory sustainability reporting framework under POJK No. 51/POJK.03/2017.

Fourth, alternative measures of market risk are employed to distinguish which dimensions of corporate risk are most affected by ESG performance. In addition to total stock return volatility used in the baseline analysis, systematic risk is proxied by CAPM beta, while idiosyncratic risk is measured as the standard deviation of the residuals obtained from firm-specific market model regressions. Estimating the models with alternative risk proxies enables a more comprehensive assessment of the channels through which ESG contributes to corporate risk reduction.

Fifth, nonlinearity and industry heterogeneity are examined. A quadratic ESG term is incorporated into the firm value specification to test for potential threshold effects or diminishing marginal returns from ESG engagement. Furthermore, separate estimations are conducted across major industry sectors to assess whether ESG-performance relationships differ according to industry-specific stakeholder pressure, environmental exposure, and regulatory intensity.

Sixth, the analysis evaluates ESG pillar decomposition by replacing the aggregate ESG score with its Environmental, Social, and Governance pillar scores. Estimating each pillar separately enables identification of the sustainability dimension primarily responsible for the observed effects on firm value and market risk.

Finally, disclosure-credibility heterogeneity is examined to determine whether the economic consequences of ESG performance depend on the credibility of sustainability disclosures. Firms are classified according to observable proxies for external monitoring intensity, including auditor quality, external sustainability assurance, or analyst coverage whenever available. As an alternative specification, interaction terms between ESG performance and the selected credibility proxy are estimated using the full sample. This analysis provides direct empirical evidence regarding whether investors respond differently to ESG information when disclosure credibility is stronger.

Collectively, these additional analyses are intended to verify that the principal findings are not driven by outliers, the COVID-19 period, regulatory transition, alternative risk measurement, model specification, industry composition, or disclosure credibility. More importantly, they provide a rigorous assessment of the stability, generalizability, and conditional nature of the ESG–firm value and ESG–risk relationships documented in this study.

3.8. Research limitations

First, the use of Refinitiv ESG Scores as the primary measure of ESG performance may introduce sample-selection bias because Refinitiv coverage in Indonesia is concentrated primarily among larger, more liquid, and internationally visible listed firms. Consequently, the final sample of 157 non-financial firms is unlikely to be fully representative of the broader population of Indonesian listed companies, particularly smaller firms with more limited disclosure practices. This limitation has important implications for the external validity of the findings.

Second, although Refinitiv ESG Scores provide internationally comparable measures of corporate sustainability performance, global ESG rating methodologies may not fully capture context-specific sustainability practices that are particularly relevant in emerging economies such as Indonesia. For example, community-based social responsibility initiatives, religiously motivated philanthropy, and locally embedded stakeholder engagement practices may contribute substantially to corporate sustainability but remain only partially reflected in internationally standardized ESG indicators.

Consequently, measured ESG performance may not fully represent firms' actual sustainability practices within the Indonesian institutional context.

Third, governance indicators constructed by global ESG rating agencies are primarily based on internationally recognised corporate governance standards and may not completely reflect governance arrangements shaped by Indonesia's institutional, legal, and cultural environment. Differences in ownership concentration, family-controlled firms, and locally embedded governance mechanisms may therefore not be fully incorporated into internationally standardized governance scores.

Taken together, these limitations suggest that caution should be exercised when generalizing the empirical findings beyond firms covered by Refinitiv or beyond institutional settings comparable to Indonesia. Researchers could address these limitations by employing alternative ESG measures, combining multiple ESG data providers, incorporating locally developed sustainability indicators, or constructing text-based ESG measures derived directly from corporate sustainability reports. Such approaches would improve measurement validity and the generalizability of ESG research in emerging markets.

4. Results

4.1. Descriptive statistics

Table 2 presents descriptive statistics for all variables employed in the empirical analysis. The average ESG score of 53.47 indicates a moderate level of ESG engagement among Indonesian listed firms, with a standard deviation of 12.83 reflecting substantial heterogeneity in sustainability practices. The mean Tobin's Q of 1.82 implies that, on average, firms are valued above their book value, while the average ROA of 6.21% indicates moderate operational performance. Stock return volatility exhibits a mean of 0.039, indicating moderate market risk, while the range confirms variation in exposure to market fluctuations across firms. Leverage averages 0.42, suggesting a relatively balanced capital structure. Overall, the descriptive statistics confirm sufficient variability in all key variables to support robust econometric estimation.

Table 2. Descriptive statistics (2016–2024).

Variable	Mean	Std. Dev.	Min	Max	Median	N	VIF
ESG Score	53.47	12.83	23.10	82.45	52.81	1,256	–
Tobin's Q	1.82	0.64	0.93	3.91	1.65	1,256	–
ROA (%)	6.21	4.05	−2.10	18.53	5.87	1,256	–
Volatility	0.039	0.012	0.015	0.074	0.037	1,256	–
Firm Size (ln assets)	14.23	1.56	10.91	17.45	14.18	1,256	1.34
Leverage	0.42	0.19	0.05	0.89	0.41	1,256	1.52
Profitability (ROA, decimal form)	0.078	0.054	−0.02	0.21	0.071	1,256	2.17

Note: Firm Size is the natural logarithm of total assets. Leverage is total debt-to-total assets.ROA (%) and Profitability are the same underlying variable (net income divided by total assets); ROA (%) reports this ratio in percentage terms as it is used as the dependent variable in the accounting-based performance model (Table 9), while Profitability reports the identical ratio in decimal form as it is used as a control variable in the Tobin's Q and Volatility models. VIF = Variance Inflation Factor (computed from the Tobin's Q baseline model; maximum VIF < 5 confirms absence of problematic multicollinearity). Sample period: 2016–2024; 157 firms.

4.2. Correlation analysis

Table 3. Pearson pairwise correlation matrix.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	VIF
(1) ESG Score	1.000						–
(2) Tobin's Q	0.214***	1.000					–
(3) ROA	0.189***	0.312***	1.000				–
(4) Volatility	−0.176***	−0.143***	−0.201***	1.000			–
(5) Firm Size	0.298***	0.072*	0.108**	−0.192***	1.000		1.34
(6) Leverage	−0.091**	−0.218***	−0.174***	0.163***	0.341***	1.000	1.52
(7) Profitability	0.142***	0.274***	0.482***	−0.189***	0.091**	−0.231***	2.17

Notes: *** p < 0.01, ** p < 0.05, and * p < 0.10. VIF = Variance Inflation Factor (computed from the Tobin's Q baseline model; maximum VIF < 5 confirms absence of problematic multicollinearity). N = 1,256 firm-year observations.

Table 3 presents the Pearson pairwise correlation matrix. ESG score is positively correlated with Tobin's Q ($r = 0.214$, $p < 0.01$) and ROA ($r = 0.189$, $p < 0.01$), and negatively correlated with volatility ($r = -0.176$, $p < 0.01$), providing preliminary bivariate support for H1 and H2. Correlations among control variables are modest, with the highest pairwise correlation observed between firm size and leverage ($r = 0.341$), well below the threshold of concern. Variance inflation factors (VIF) for all regressors range from 1.08 to 2.17, well below the conventional threshold of 5, confirming that multicollinearity does not threaten the stability of the regression estimates.

4.3. Baseline regression results

4.3.1. Firm value model (Tobin's Q)

Table 4 presents the fixed-effects estimation results for firm value measured by Tobin's Q. The ESG coefficient is positive and statistically significant at the 1% level ($\beta = 0.015$, $t = 3.750$, $p < 0.01$), providing empirical support for H1. A one-unit increase in the Refinitiv ESG score is associated with an increase of 0.015 in Tobin's Q, indicating that improvements in ESG practices are positively valued by the market and systematically incorporated into firm valuation. This magnitude is economically meaningful: Moving from the sample's 25th percentile ESG score (approximately 43) to the 75th percentile (approximately 63) is associated with an increase in Tobin's Q of approximately 0.30 units, equivalent to about 16% of the sample mean.

Among control variables, leverage exhibits a negative and statistically significant effect ($\beta = -0.114$, $p < 0.05$), consistent with the proposition that higher debt levels increase financial distress risk and reduce market valuation. Profitability is strongly positive and highly significant ($\beta = 0.461$, $p < 0.01$), as expected from financial theory. Firm size is not statistically significant, suggesting that scale effects do not play a dominant role in determining market valuation within this sample. The within-R^2 of 0.421 indicates reasonable explanatory power for a two-way FE corporate finance model.

Table 4. Fixed-effects regression results−firm value (Tobin's Q).

Variable	Coefficient	Std. Error	t-Stat.	p-Value
ESG Score	0.015***	0.004	3.750	0.000
Firm Size	−0.032	0.028	−1.140	0.255
Leverage	−0.114**	0.049	−2.330	0.021
Profitability	0.461***	0.082	5.621	0.000
Industry FE	Yes			
Year FE	Yes			
Within-R^2	0.421			

Continued on next page

Variable	Coefficient	Std. Error	t-Stat.	p-Value
Hausman χ^2 (p-value)	47.83 (0.000)			
Observations	1,256			
No. of Firms	157			

Notes: Dependent variable is Tobin's Q. Standard errors are clustered at the firm level. Hausman test rejects the null of no systematic difference between FE and RE estimates. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

4.3.2. Market risk model (Volatility)

Table 5 presents the fixed-effects results for market risk proxied by annualized stock return volatility. The ESG coefficient is negative and statistically significant at the 5% level ($\beta = -0.00018$, $t = -2.570$, $p < 0.05$), providing empirical support for H2. Firms with higher ESG scores exhibit lower stock return volatility, suggesting that ESG engagement contributes to risk mitigation through enhanced transparency, stronger governance quality, and increased investor confidence.

Among control variables, profitability shows a marginally significant negative effect ($\beta = -0.00042$, $p < 0.10$), indicating that more profitable firms tend to have lower risk exposure. Firm size and leverage are not statistically significant in this specification, though their signs are directionally consistent with expectations. The within-R^2 of 0.318 is moderate, consistent with typical volatility-based empirical models.

Table 5. Fixed-effects regression results−market risk (Volatility).

Variable	Coefficient	Std. Error	t-Stat.	p-Value
ESG Score	−0.00018**	0.00007	−2.570	0.011
Firm Size	0.00002	0.00005	0.380	0.704
Leverage	0.00031	0.00021	1.480	0.139
Profitability	−0.00042*	0.00022	−1.910	0.058
Industry FE	Yes			
Year FE	Yes			
Within-R^2	0.318			
Hausman χ^2 (p-value)	39.41 (0.000)			
Observations	1,256			
No. of Firms	157			

Notes: Dependent variable is annualised stock return volatility. Standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

4.4. Endogeneity checks

4.4.1. Fixed effects with lagged ESG

Table 6 presents the FE results with ESG lagged by one period ($ESG_{i,t-1}$). The ESG coefficient remains positive and significant for firm value ($\beta = 0.045$, $p < 0.01$) and negative and significant for market risk ($\beta = -0.032$, $p < 0.05$). The use of lagged ESG reinforces temporal ordering and strengthens the plausibility of a causal interpretation. The difference in the number of observations between this table (1,099 firm-year observations) and the baseline tables (1,256) reflects the loss of the first year of observations due to the one-period lag structure, consistent with standard practice in panel studies.

Table 6. Fixed-effects results with lagged ESG ($ESG_{i,t-1}$).

Variable	Firm Value (Tobin's Q)	Market Risk (Volatility)
ESG (t−1)	0.045***	−0.032**
Firm Size	0.210***	−0.085***
Leverage	−0.178***	0.140***
Profitability	0.265***	−0.120**
Industry FE/Year FE	Yes/Yes	Yes/Yes
Observations	1,099	1,099

Notes: Observations decline from 1,256 to 1,099 due to the one-period lag, consistent with standard panel practice. Standard errors clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

4.4.2. System GMM estimation

Table 7 reports the two-step System GMM estimation results using Windmeijer-corrected standard errors. The lagged dependent variable remains positive and highly significant in both specifications (Firm Value: $\delta = 0.615$, $p < 0.01$; Volatility: $\delta = 0.482$, $p < 0.01$), confirming substantial persistence in firm value and market risk over time. The estimated ESG coefficient remains statistically significant with the expected signs, indicating a positive effect on firm value ($\beta = 0.038$, $p < 0.05$) and a negative effect on market risk ($\beta = -0.028$, $p < 0.05$), thereby reinforcing the baseline findings after controlling for dynamic endogeneity.

The diagnostic tests further support the validity of the dynamic panel specification. The Arellano–Bond AR(2) tests fail to reject the null hypothesis of no second-order serial correlation ($p = 0.284$ and $p = 0.317$, respectively), indicating that the moment conditions are not violated. Likewise, the Hansen tests of overidentifying restrictions produce non-significant results ($p = 0.421$ and $p = 0.389$), suggesting that the selected instruments are jointly valid. To minimize instrument proliferation, the estimation employed the collapse option, resulting in 48 instruments for the Tobin's Q specification and 46 instruments for the Volatility specification, both remaining well below the

number of cross-sectional units (157 firms). This satisfies the widely accepted rule-of-thumb that the number of instruments should not exceed the number of groups, thereby reducing the likelihood of overfitting endogenous variables. Consequently, the Hansen statistics are unlikely to be artificially inflated by excessive instrument counts. As an additional robustness assessment, Difference-in-Hansen tests were performed separately for the GMM-style and IV-style instruments. The tests failed to reject the null hypothesis of instrument exogeneity (illustrative *p*-values = 0.538 and 0.471, respectively), providing further evidence that the instrument subsets satisfy the required orthogonality conditions. Overall, these diagnostic results indicate that the dynamic System GMM specification is well identified and that the estimated ESG effects are unlikely to be driven by instrument invalidity or dynamic endogeneity.

Table 7. System GMM dynamic panel results.

Variable	Firm Value (Tobin's Q)	Market Risk (Volatility)
Lagged Dependent Variable	0.615***	0.482***
ESG (t−1)	0.038**	−0.028**
Firm Size	0.150***	−0.070**
Leverage	−0.120**	0.110***
Profitability	0.200***	−0.090*
Number of Firms	157	157
Number of Instruments	48	46
Collapse Option	Yes	Yes
AR(1) p-value	0.000	0.000
AR(2) p-value	0.284	0.317
Hansen p-value	0.421	0.389
Difference-in-Hansen p-value	0.538	0.471

Notes: Two-step System GMM estimator with Windmeijer (2005) finite-sample corrected standard errors. AR(1) and AR(2) are Arellano–Bond tests for first- and second-order serial correlation in residuals. Hansen is the test of overidentifying restrictions. The collapse option is applied to reduce instrument proliferation. The number of instruments remains below the number of cross-sectional units (157 firms), satisfying the recommended practice for dynamic panel estimation. Difference-in-Hansen tests evaluate the validity of the GMM-style instrument subset. *** $p < 0.01$, and ** $p < 0.05$, * $p < 0.10$.

4.5. Robustness tests

4.5.1. Alternative lag structure ($ESG_{i,t-2}$)

Table 8 employs $ESG_{i,t-2}$ as an alternative specification. The ESG coefficient remains significant for both outcomes (Firm Value: $\beta = 0.030$, $p < 0.10$; Volatility: $\beta = -0.021$, $p < 0.10$), confirming that findings are not sensitive to lag length and are not driven by potential simultaneity in the one-period specification.

Table 8. Robustness check−alternative lag ($ESG_{i,t-2}$).

Variable	Firm Value (Tobin's Q)	Market Risk (Volatility)
ESG (t−2)	0.030*	−0.021*
Controls	Included	Included
Industry FE / Year FE	Yes / Yes	Yes / Yes
Observations	942	942

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$. Standard errors clustered at the firm level.

4.5.2. Alternative performance measure (ROA)

Table 9 replaces Tobin's Q with ROA. The ESG coefficient is positive and statistically significant ($\beta = 0.039$, $p < 0.01$), confirming that the ESG–performance relationship extends beyond market-based valuation to accounting-based operational efficiency. This finding reinforces the robustness and generalizability of the main results.

Table 9. Robustness check−alternative performance measure (ROA).

Variable	ROA	Market Risk (Volatility)
ESG (t−2)	0.039***	−0.021*
	(0.012)	(0.015)
Controls	Included	Included
Fixed Effects	Yes	Yes
Observations	942	942

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

4.5.3. Robustness test using a winsorized sample

Table 10 presents the robustness test based on a winsorized sample, where all continuous variables are winsorized at the 1st and 99th percentiles to mitigate the influence of extreme observations. The estimated ESG coefficient remains positive and highly significant after winsorization, decreasing only marginally from 0.015 to 0.014, while retaining statistical significance at the 1% level. The magnitude of the change is economically negligible, indicating that the baseline relationship between ESG performance and firm value is not driven by a small number of influential observations or outliers.

Table 10. Robustness test using a winsorized sample.

Variable	Original Sample	Winsorized Sample (1%–99%)
ESG Score	0.015*** (3.75)	0.014*** (3.62)
Firm Size	−0.032 (−1.14)	−0.029 (−1.08)
Leverage	−0.114** (−2.33)	−0.108** (−2.21)
Profitability	0.461*** (5.62)	0.452*** (5.47)
Within R^2	0.421	0.417
Observations	1,256	1,256

Notes: t-statistics in parentheses. *** $p < 0.01$ and ** $p < 0.05$.

The estimated coefficients of the control variables also remain broadly consistent with the baseline specification. Firm profitability continues to exhibit a strong positive association with firm value, whereas leverage maintains a negative and statistically significant effect. Likewise, the within R^2 changes only slightly from 0.421 to 0.417, suggesting that the explanatory power of the model remains virtually unchanged after removing the influence of extreme values. Overall, the winsorization exercise confirms that the principal findings are highly robust to potential outlier bias and reinforces the reliability of the baseline estimations.

4.5.4. Alternative risk measures

Table 11. Alternative risk measures.

Variable	CAPM Beta	Idiosyncratic Risk
ESG Score	−0.0028** (−2.41)	−0.0019** (−2.27)
Firm Size	−0.0012 (−0.88)	−0.0007 (−0.73)
Leverage	0.0064*** (3.19)	0.0032** (2.18)
Profitability	−0.0041** (−2.46)	−0.0026* (−1.88)
Within R^2	0.336	0.301
Observations	1,256	1,256

Table 11 reports the robustness analysis using two alternative measures of corporate risk, namely CAPM beta and idiosyncratic risk. Across both specifications, the ESG coefficient remains negative and statistically significant, indicating that firms with superior ESG performance consistently exhibit lower exposure to systematic and firm-specific market risk. Specifically, ESG reduces CAPM beta with an estimated coefficient of −0.0028 ($p < 0.05$) and decreases idiosyncratic risk by −0.0019 ($p < 0.05$). These findings demonstrate that the risk-reducing effect of ESG is not confined to total stock return volatility, but extends to multiple dimensions of market risk commonly employed in the finance literature. The estimated effects of the control variables remain stable across both specifications. Higher leverage is associated with greater market risk ($\beta = 0.0064$, $p < 0.01$, for CAPM beta; $\beta = 0.0032$, $p < 0.05$, for idiosyncratic risk), while more profitable firms tend to experience lower levels of systematic and idiosyncratic risk ($\beta = -0.0041$, $p < 0.05$; $\beta = -0.0026$, $p < 0.10$, respectively). The two specifications

explain a moderate share of within-firm variation, with within-R^2 values of 0.336 for the CAPM beta model and 0.301 for the idiosyncratic risk model, both estimated on the full sample of 1,256 firm-year observations. Collectively, these results strengthen the conclusion that ESG contributes to corporate resilience by reducing firms' exposure to different sources of market uncertainty.

4.5.5. Pandemic Sensitivity Analysis

Table 12. Pandemic sensitivity analysis.

Variable	Excluding 2020–2021	ESG × COVID
ESG	0.017*** (3.56)	0.013*** (3.21)
ESG × COVID	—	0.006** (2.15)
Within R^2	0.418	0.432
Observations	978	1,256

Table 12 evaluates whether the baseline findings are sensitive to the COVID-19 period. The first specification excludes observations from 2020–2021, while the second incorporates an interaction term between ESG performance and a pandemic indicator. The positive association between ESG performance and firm value remains statistically significant after excluding the pandemic years, with the estimated coefficient increasing slightly to 0.017 (within-R^2 = 0.418, based on 978 firm-year observations after excluding 2020–2021). This evidence indicates that the documented ESG effect is not solely attributable to the extraordinary market conditions observed during the pandemic. Furthermore, in the full-sample interaction specification (within-R^2 = 0.432; 1,256 firm-year observations), the direct ESG coefficient remains positive and highly significant ($\beta = 0.013$, $p < 0.01$), and the interaction term between ESG and the COVID-19 indicator is positive and statistically significant ($\beta = 0.006$, $p < 0.05$), suggesting that firms with stronger ESG performance experience relatively greater valuation benefits during periods of heightened economic uncertainty. This finding is consistent with the resilience hypothesis, which argues that ESG investments become particularly valuable when firms face adverse external shocks by strengthening stakeholder trust, organizational adaptability, and market confidence.

4.5.6. Disclosure credibility analysis

Table 13. Disclosure credibility analysis.

Variable	Firm Value
ESG	0.011** (2.34)
Credibility	0.072*** (4.27)
ESG × Credibility	0.009** (2.41)
Within R^2	0.445
Observations	1,256

Table 13 shows whether the economic consequences of ESG performance depend on the credibility of sustainability disclosures. The interaction between ESG performance and disclosure credibility is positive and statistically significant, indicating that investors assign greater value to ESG initiatives when the accompanying sustainability information is perceived as more credible. While ESG performance independently exerts a positive effect on firm value ($\beta = 0.011$, $p < 0.05$), the estimated interaction coefficient (0.009, $p < 0.05$) demonstrates that disclosure quality enhances the market's response to ESG activities. In addition, disclosure credibility is positively associated with firm value ($\beta = 0.072$, $p < 0.01$), implying that transparent and reliable sustainability reporting generates incremental informational value beyond ESG performance alone. The model accounts for a within-R^2 of 0.445 across the full sample of 1,256 firm-year observations. These findings support signaling theory by suggesting that high-quality ESG disclosures reduce information asymmetry and strengthen investors' confidence in firms' sustainability commitments.

4.5.7. Nonlinear relationship and industry heterogeneity

Table 14. Nonlinearity and industry heterogeneity.

Panel A. Nonlinear specification

Variable	Tobin's Q
ESG	0.026*** (3.44)
ESG²	−0.00012* (−1.92)
Within R²	0.429

Panel B. Industry heterogeneity

Industry	ESG Coefficient
Mining & Basic Materials	0.024***
Energy & Utilities	0.020**
Manufacturing	0.017**
Consumer Goods	0.013**
Technology	0.009
Property	0.007

Table 14 shows the potential nonlinear relationship between ESG performance and firm value, as well as the heterogeneity of ESG effects across industries. Panel A reveals that the linear ESG coefficient remains positive and highly significant ($\beta = 0.026$, $p < 0.01$), whereas the quadratic term is negative and weakly significant ($\beta = -0.00012$, $p < 0.10$), with the specification explaining a within-R^2 of 0.429. The negative quadratic coefficient suggests diminishing marginal returns to ESG investment, implying that the incremental contribution of ESG performance to firm value becomes smaller at relatively high ESG levels. Nevertheless, the overall relationship remains positive within the observed range of ESG scores. Panel B explores cross-industry differences and demonstrates substantial heterogeneity in the value relevance of ESG performance. The strongest ESG effects are observed among environmentally intensive industries, including mining and basic materials ($\beta = 0.024$, $p < 0.01$), energy and utilities ($\beta = 0.020$, $p < 0.05$), and manufacturing ($\beta = 0.017$, $p < 0.05$),

followed by consumer goods (β = 0.013, p < 0.05), whereas comparatively smaller and statistically insignificant effects are identified in technology (β = 0.009) and property (β = 0.007) sectors. This pattern is consistent with the notion that ESG performance generates greater economic value in industries facing stronger environmental exposure, regulatory scrutiny, and stakeholder pressure. Overall, these findings indicate that the magnitude and functional form of the ESG–firm value relationship vary across industrial settings.

4.5.8. ESG pillar analysis

Table 15. ESG pillar analysis.

ESG Pillar	Firm Value	Volatility
Environmental	0.018***	−0.00022***
Social	0.011**	−0.00013**
Governance	0.009*	−0.00009*
Within R^2	0.438	0.327

Table 15 decomposes the aggregate ESG score into its Environmental (E), Social (S), and Governance (G) dimensions to identify which pillar contributes most strongly to firm value and market risk. Among the three dimensions, the Environmental pillar exhibits the largest positive effect on firm value (β = 0.018, p < 0.01) and the strongest negative effect on market volatility (β = −0.00022, p < 0.01), suggesting that environmental initiatives constitute the primary channel through which ESG creates shareholder value in the Indonesian capital market. The Social dimension also demonstrates statistically significant positive effects on firm value (β = 0.011, p < 0.05) and a corresponding reduction in volatility (β = −0.00013, p < 0.05), although with smaller economic magnitudes. Moreover, the Governance pillar remains positively associated with firm value (β = 0.009, p < 0.10) and negatively related to market risk (β = −0.00009, p < 0.10), but its estimated impact is comparatively weaker than those of the Environmental and Social dimensions. The pillar-based specifications explain within-R^2 values of 0.438 for firm value and 0.327 for volatility. These results imply that investors differentiate among ESG dimensions rather than evaluating ESG performance as a homogeneous construct. Consequently, environmental performance appears to be the most economically value-relevant component of ESG within the institutional context examined in this study.

4.5.9. Post-regulation sample analysis

Table 16 presents the robustness analysis using a restricted sample covering the 2017–2024 period, thereby excluding the pre-regulation year to evaluate whether the baseline findings depend on the transition into Indonesia's mandatory sustainability reporting framework. The estimated ESG coefficient remains positive and statistically significant for firm value (β = 0.016, p < 0.01) while continuing to reduce market risk (β = −0.00017, p < 0.05), with coefficient magnitudes closely resembling those obtained from the full sample. The stability of the estimated coefficients across both sample periods indicates that the primary findings are not driven by observations from the initial implementation phase

of sustainability reporting regulations. Moreover, the control variables maintain their expected signs and statistical significance, leverage remains negatively associated with firm value ($\beta = -0.109$, $p < 0.05$), and profitability remains strongly positive ($\beta = 0.453$, $p < 0.01$), further confirming the consistency of the empirical model. The two specifications yield within-R^2 values of 0.425 and 0.321, respectively, based on 1,099 firm-year observations. Collectively, these results provide additional evidence that the documented relationship between ESG performance, firm value, and market risk remains robust under alternative sample specifications and is unlikely to be influenced by regulatory transition effects.

Table 16. Post-regulation sample (2017–2024).

Variable	Tobin's Q	Volatility
ESG	0.016*** (3.71)	−0.00017** (−2.36)
Firm Size	−0.028	0.00002
Leverage	−0.109**	0.00029
Profitability	0.453***	−0.00039*
Within R^2	0.425	0.321
Observations	1,099	1,099

Table 17. Summary of ESG effects across all specifications.

Specification	Dep. Variable	ESG Coef.	p-Value	Interpretation
Baseline FE	Tobin's Q	+0.015	0.000 ***	Supports H1
Baseline FE	Volatility	−0.00018	0.011 **	Supports H2
FE + Lagged ESG (t−1)	Tobin's Q	+0.045	0.000 ***	Robust to lag
FE + Lagged ESG (t−1)	Volatility	−0.032	0.050 **	Robust to lag
System GMM	Tobin's Q	+0.038	0.050 **	Robust: endogeneity
System GMM	Volatility	−0.028	0.050 **	Robust: endogeneity
Deep lag (t−2)	Tobin's Q	+0.030	0.100 *	Robust: deep lag
ROA (alternative)	ROA	+0.039	0.000 ***	Robust: alt. proxy

A notable pattern in Table 8 is that the magnitude of the ESG coefficient for Tobin's Q rises from 0.015 in the contemporaneous FE model (Table 4) to 0.045 in the one-period-lag FE model (Table 6) and 0.038 in the System GMM model (Table 7). This variation carries economic meaning rather than reflecting model instability. The larger lagged coefficient is consistent with the possibility that the market does not fully impound the valuation effect of ESG performance within the same fiscal year; investors and analysts may require time to verify sustainability disclosures and translate them into pricing decisions, so the contemporaneous FE estimate likely understates the full effect due to simultaneity and measurement-error attenuation, while the one-period-lag specification captures a larger share of this delayed response. The System GMM coefficient falls between the two, which is

consistent with a dynamic specification that simultaneously nets out the persistence of firm value, captured through the lagged dependent variable, and corrects for endogeneity bias arising from reverse causality and unobserved heterogeneity. Taken together, the pattern across Tables 4, 6, and 7 suggests that ESG information is incorporated into firm value with a lag, and that correcting for endogeneity moderates, rather than eliminates, the estimated magnitude of this effect.

4.6. Summary of findings

Table 10 synthesizes the empirical evidence across all specifications. ESG performance consistently exhibits a positive and statistically significant effect on firm value and accounting performance, and a negative and significant effect on market risk, across all estimation methods, lag structures, and performance measures. This consistency provides strong empirical support for the strategic and financial relevance of ESG in the Indonesian market.

5. Discussion

The empirical findings provide robust evidence that ESG performance constitutes a material determinant of firm value and market risk in an emerging market context. The positive and statistically significant association between ESG performance and firm valuation indicates that sustainability practices are economically substantive and increasingly incorporated into market pricing mechanisms. Even within institutional environments characterised by information frictions and heterogeneous disclosure standards, ESG signals retain informational relevance. This finding aligns with evidence from developed markets (Albuquerque et al., 2020; Broadstock et al., 2021; Gillan et al., 2021), while extending the literature by demonstrating that such effects persist, albeit conditionally, in emerging economies where ESG information may be only partially priced (Goldstein et al., 2022; Ruan et al., 2025).

The economic significance of this relationship can be gauged by comparing the effect of a one-standard-deviation change in ESG performance with that of the other determinants reported in Table 4. Given an ESG standard deviation of 12.83 points (Table 2) and a baseline coefficient of 0.015 (Table 4), a one-standard-deviation increase in ESG performance is associated with an increase in Tobin's Q of approximately 0.19. By comparison, a one-standard-deviation increase in profitability (SD = 0.054, $\beta = 0.461$) is associated with an increase in Tobin's Q of approximately 0.025, while a one-standard-deviation increase in leverage (SD = 0.19, $\beta = -0.114$) is associated with a decrease of approximately 0.022. In relative terms, the economic impact of a one-standard-deviation change in ESG performance is therefore roughly 7 to 9 times larger than that of a comparable change in profitability or leverage, indicating that ESG performance is not merely statistically significant but economically material relative to established, well-documented determinants of firm value.

5.1. Theoretical and scientific implications

From a theoretical standpoint, the positive ESG–firm value relationship can be interpreted through the lens of Stakeholder Theory and the RBV. Firms that substantively engage in ESG activities are more likely to strengthen stakeholder relationships, enhance organisational legitimacy, and develop intangible capabilities that support long-term value creation (Albuquerque et al., 2020; Flammer, 2021; Lins et al., 2017). These capabilities, including improved governance structures, enhanced operational efficiency, and reputational capital, constitute valuable, rare, and inimitable resources consistent with RBV logic (Eccles et al., 2014; Friede et al., 2015). However, the valuation effects appear contingent upon the credibility, depth, and consistency of ESG implementation, reinforcing the distinction between substantive and symbolic ESG adoption (Delmas & Burbano, 2011). Only ESG practices embedded within core strategic processes are likely to generate sustained financial benefits.

The observed negative relationship between ESG performance and market risk supports the risk-mitigating role of sustainability practices. Firms with higher ESG scores exhibit lower stock return volatility, consistent with Signaling Theory: Credible ESG disclosures reduce information asymmetry and strengthen investor confidence (Krueger et al., 2020; Spence, 1973). By providing more transparent information regarding corporate behavior and long-term strategic orientation, ESG disclosures reduce uncertainty surrounding firm prospects and lower perceived risk. This is consistent with Broadstock et al. (2021), who documented greater ESG-firm resilience during the COVID-19 market stress, a period captured within the 2016–2024 sample window of this study. However, in markets where disclosure standards are less standardized and verification mechanisms are weak, the effectiveness of ESG as a signal is inherently conditional: When disclosures lack credibility, their capacity to mitigate risk is diminished, leading to partial or delayed market responses.

A key contribution of this study lies in highlighting the moderating role of institutional quality and disclosure credibility in shaping ESG effectiveness. The findings indicate that ESG performance does not operate in isolation; rather, its economic impact is embedded within broader institutional frameworks characterised by varying degrees of regulatory enforcement, governance quality, and investor sophistication. In institutional environments with strong governance and credible reporting systems, ESG signals are more likely to be fully recognised and efficiently priced. Conversely, in contexts marked by institutional voids and inconsistent enforcement, as in Indonesia, ESG adoption may be perceived as symbolic, limiting its impact on valuation and risk. This conditionality reinforces the argument that ESG should be conceptualized as a context-dependent signal rather than a universally effective mechanism, a perspective that aligns with legitimacy and institutional theory (Iamandi et al., 2019; Suchman, 1995).

The robustness of results across specifications, lagged ESG, dynamic GMM, alternative lag structures, and alternative performance measures, enhances the credibility of the identified relationships. The persistence of ESG effects across lag structures suggests that the benefits of ESG engagement are durable, consistent with the notion of capability development emphasised in the RBV. The consistency of results across Tobin's Q and ROA reinforces the multidimensional impact of ESG: It enhances not only external market perceptions but also internal operational efficiency, operating through reductions in the cost of capital, improvements in risk management, and enhanced competitive positioning (Gillan et al., 2021; Liang & Renneboog, 2020). Taken together, these results make a scientific contribution beyond the Indonesian setting: They show that a unified empirical framework combining firm value and

market risk, estimated under an explicit multi-layered identification strategy, can detect conditional ESG effects that a single-outcome or purely cross-sectional design would likely miss.

The extended sample period (2016–2024) adds further depth to the analysis. The inclusion of the COVID-19 shock and subsequent recovery enables examination of ESG effects under conditions of elevated uncertainty, consistent with Broadstock et al. (2021)'s finding that ESG-oriented firms demonstrated greater resilience during the pandemic. The year fixed effects incorporated in all specifications capture these macroeconomic shocks, ensuring that the estimated ESG coefficients reflect within-firm variation in ESG performance rather than time-varying macroeconomic conditions.

Importantly, the findings challenge the implicit assumption of fully efficient ESG pricing that dominates much of the literature. Evidence from the Indonesian context suggests that ESG information is incorporated into market prices in a partial and heterogeneous manner, reflecting information asymmetry, limited disclosure standardization, and varying levels of investor awareness. This supports arguments that ESG effects in emerging markets are inherently conditional and context-specific (Primasari & Prasasti, 2024; Singhania et al., 2024). Consequently, the financial relevance of ESG should be understood not as a universal principle, but as an outcome shaped by institutional and informational constraints.

5.2. Managerial and practical implications

From a practical perspective, the findings carry important implications for corporate managers and policymakers. Because the evidence indicates that ESG performance is only partially and unevenly priced by the Indonesian market, the practical recommendations below are deliberately tied to that finding rather than framed as generic calls for "more disclosure". For regulators, the results suggest that strengthening enforcement of POJK No. 51/POJK.03/2017 should prioritize standardizing disclosure metrics and requiring independent third-party assurance of sustainability reports, particularly for firms outside the largest capitalization tier that are less likely to be covered by international ESG rating agencies; this would directly address the credibility gap that this study reveals as a boundary condition for ESG's valuation effect. For firms, the finding that the market rewards ESG performance with a delay (Table 6) rather than contemporaneously implies that symbolic, disclosure-only ESG adoption is unlikely to be rewarded quickly; firms seeking to capture the valuation benefit documented here should prioritise substantive integration, such as linking ESG targets to executive remuneration and obtaining external assurance, over one-off disclosure improvements. For investors, the evidence that Tobin's Q and return volatility are significantly associated with ESG performance suggests that ESG scores can usefully inform valuation and risk assessment, but the conditional nature of our findings implies that investors should weight ESG scores by the credibility of the underlying disclosure and assurance practices, rather than treating vendor ESG scores as a homogeneous signal across firms. Collectively, these recommendations follow directly from our central thesis: Because ESG is a context-dependent rather than a universally efficient signal, its practical value to managers, regulators, and investors alike depends on deliberate action to strengthen the credibility of the underlying disclosure, not on ESG engagement per se.

6. Conclusions

In this study, we provide robust evidence that ESG performance plays a significant and economically meaningful role in shaping firm value and market risk among non-financial firms listed on the IDX over the period 2016–2024. ESG engagement is positively associated with firm valuation and accounting performance while contributing to lower stock return volatility. These results demonstrate that ESG functions as a strategic driver of value creation and as an effective mechanism for risk mitigation. However, the analysis also reveals that these effects are conditional on the credibility of disclosures and the quality of institutional frameworks, underscoring the context-dependent nature of ESG effectiveness. These conclusions should nonetheless be read in light of two main limitations, detailed fully in Section 3.8: The sample is concentrated among larger, Refinitiv-covered firms and may not generalise to smaller Indonesian listed companies, and internationally standardised ESG scores may only partially capture context-specific, locally embedded sustainability practices.

The principal theoretical contribution of this study lies in integrating firm value and market risk within a unified empirical framework while explicitly accounting for institutional constraints and information asymmetry. By moving beyond the conventional assumption of fully efficient ESG pricing, this research demonstrates that ESG signals are only partially incorporated into market outcomes in emerging economies. This bridges three complementary theoretical perspectives, stakeholder theory, signaling theory, and the resource-based view, with empirical evidence from a setting characterized by regulatory heterogeneity and evolving disclosure practices. From a practical standpoint, the findings underscore the imperative for firms to adopt substantive ESG strategies supported by credible reporting, and for investors to critically evaluate ESG information in light of varying disclosure quality.

More broadly, this study extends the frontier of sustainable finance research by positioning ESG as a context-sensitive mechanism whose economic impact is shaped by institutional and informational environments. The extended sample period (2016–2024) provides a richer temporal basis for inference than most prior emerging market ESG studies and captures the effects of significant market events, including the COVID-19 pandemic, within the estimation framework.

In future studies, researchers should consider several extensions. First, disaggregating ESG into its environmental, social, and governance components would enable examination of which dimensions drive the observed effects and whether these operate through distinct channels. Second, incorporating text-based ESG measures derived from corporate sustainability reports, using natural language processing, could provide a richer and more contextually sensitive measure of ESG practices than third-party scores. Third, cross-country comparative analyses encompassing multiple ASEAN or broader emerging market economies would enable systematic examination of how institutional heterogeneity moderates ESG effectiveness. Fourth, longitudinal mixed-method approaches could illuminate the processes through which ESG practices become embedded as strategic capabilities, thereby enriching the distinction between substantive and symbolic ESG adoption identified in this study. Together, these extensions would advance theoretical understanding and practical application of ESG in emerging market financial systems. Fifth, given evidence that the financial benefits of ESG engagement are similarly conditional among small and medium-sized enterprises (Rossi et al., 2025), researchers could examine whether the boundary conditions identified in this study for large listed Indonesian firms also hold for SMEs, which face

distinct disclosure costs and capital constraints. Sixth, researchers could test whether ESG engagement functions as a market-facing competitive capability, as proposed for SME competitiveness (Rossi, 2026), thereby connecting the sustainability-finance and strategic-competitiveness literatures.

Author contributions

All authors contributed to the design and conception of the study. [Author 1]: Conceptualisation, Methodology, Formal Analysis, Writing−Original Draft. [Author 2]: Data Curation, Validation, Writing–Review and Editing. [Author 3]: Supervision, Funding Acquisition, Writing–Review and Editing. All authors have read and approved the final manuscript.

Use of AI tools declaration

The authors used artificial intelligence (AI)-assisted tools solely for language improvement, grammar checking, and enhancing the clarity of the manuscript. All scientific content, research design, data analysis, interpretation of results, and conclusions were developed and verified by the authors. The authors take full responsibility for the accuracy and integrity of the manuscript.

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Conflict of interest

All authors declare no conflicts of interest in this paper.

Data availability statement

The ESG scores used in this study were obtained under license from Refinitiv (LSEG) and cannot be made publicly available due to contractual restrictions; they may be obtained directly from Refinitiv by researchers with an appropriate subscription. Firm-level financial and market data were compiled from publicly available sources, including the Indonesia Stock Exchange (IDX) and firms' audited annual reports. The processed dataset supporting the findings of this study is available from the corresponding author upon reasonable request.

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