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Financialization of Sustainability: ESG Signalling, Market Valuation and the New Economics of Corporate Legitimacy

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Abstract
The integration of environmental, social, and governance (ESG) criteria into investment decision-making and corporate strategy has generated one of the most significant structural transformations in contemporary capitalism, creating new financial markets for ESG-linked securities, new information intermediaries rating corporate sustainability performance, and new institutional pressures on corporate management to demonstrate ESG credentials to investors, regulators, and other stakeholders. This paper investigates the financialization of sustainability through the lens of signaling theory and institutional legitimacy theory, examining how ESG ratings and disclosures function as market signals that generate measurable valuation effects independent of their underlying operational sustainability content. Using a global panel of 4,200 publicly listed firms across 48 countries and 12 years (2011–2022), we document that ESG rating upgrades generate statistically significant abnormal returns averaging 2.1 percent in the 5-day event window, while downgrades generate negative abnormal returns of -3.4 percent, with the valuation effects more pronounced for firms in high-ESG-salience institutional environments. Critically, we find that the information content of ESG rating changes differs systematically by rating agency, with inter-rater disagreement across the major ESG data providers generating significant valuation dispersion that is inconsistent with ESG ratings conveying precise information about underlying sustainability performance. We introduce the concept of ESG signaling efficiency the degree to which ESG disclosures and ratings accurately reflect operational sustainability characteristics and develop

an empirical measure of this efficiency at the firm-year level. The analysis reveals that the financialization of sustainability has generated a market equilibrium in which ESG signaling quality is highly heterogeneous, creating opportunities for sophisticated investors to exploit ESG signal mismatch while raising systemic concerns about the social welfare implications of resource allocation driven by informationally noisy sustainability signals.

Key Words: ESG Ratings, Signaling Theory, Corporate Legitimacy, Market Valuation, Sustainability Finance, Institutional Investors, Greenwashing, Information Asymmetry, Responsible Investment, Corporate Governance

Introduction

The emergence of environmental, social, and governance criteria as a mainstream framework for corporate evaluation and investment decision-making represents a structural transformation of financial markets without historical precedent in its speed, scope, and institutional depth [1]. From a niche concern of socially responsible investment funds managing modest assets in the early 2000s, ESG has evolved into a universal framework applied by institutional investors managing assets approaching $40 trillion globally, embedded into the lending criteria of major banks, incorporated into sovereign debt evaluation, and operationalized through an ecosystem of rating agencies, index providers, data vendors, consultancies, and audit firms whose collective revenues from ESG-related services have grown at compound annual rates exceeding 30 percent through the early 2020s [2].

The financialization of sustainability understood as the translation of ecological, social, and governance phenomena into financial metrics, prices, and instruments subject to the logic of financial markets raises fundamental questions about the relationship between ESG market mechanisms and actual sustainability outcomes [3]. The central theoretical tension is between an efficiency view, in which ESG markets accurately incorporate sustainability-relevant information into security prices and thereby channel capital toward genuinely sustainable activities, and a signaling distortion view, in which the combination of methodological heterogeneity across ESG data providers, strategic disclosure management by corporate issuers, and herding behavior by institutional investors generates ESG market dynamics that are partially decoupled from underlying sustainability performance [4].

Signaling theory, originating in the labor market context of Spence [5] and subsequently extended to financial markets by Ross [6] and to corporate disclosure by Verrecchia [7], provides a rigorous analytical framework for understanding the ESG disclosure and rating landscape as a signaling equilibrium in which firms with heterogeneous unobservable sustainability types choose disclosure strategies and engage with ESG rating processes in ways that communicate (or strategically misrepresent) their sustainability characteristics to information-demanding investors. The viability of signaling equilibria depends on the costliness of mimicry by low-type firms—if firms with poor underlying sustainability performance can cheaply acquire high ESG ratings or produce impressive ESG disclosures without incurring the operational costs of genuine sustainability improvement, separating equilibria in which ESG signals are informative cannot be sustained [8].

The institutional legitimacy perspective, drawing on Meyer and Rowan [9] and DiMaggio and Powell [10], offers a complementary sociological lens through which ESG adoption can be understood as a response to institutional pressures from investors, regulators, and civil society

that generate isomorphic adoption of ESG practices regardless of their operational effectiveness, creating decoupling between formal ESG credentials and actual sustainability management systems [11]. The financialization of sustainability may thus have generated a legitimacy-seeking dynamic in which corporate ESG engagement is driven primarily by the institutional rewards of perceived compliance with the ESG framework rather than by genuine commitment to sustainability objectives whose achievement would be costly and uncertain.

This paper makes three primary contributions to this literature. First, we provide large-scale global evidence on the market valuation effects of ESG rating changes, establishing the financial materiality of ESG signals and their heterogeneity across institutional environments. Second, we introduce and operationalize the concept of ESG signaling efficiency and document its distribution across firms and industries, identifying the structural determinants of signal informativeness. Third, we analyze the welfare implications of the current ESG market equilibrium through the lens of Hirshleifer's [12] theory of the social value of public information, identifying conditions under which the proliferation of ESG signals may reduce rather than enhance social welfare by generating noise trading and misallocation.

Ii. Objectives

Objective 1: To quantify the abnormal return consequences of ESG rating upgrades and downgrades across a global panel of publicly listed firms, establishing the financial materiality of ESG signals and documenting cross-sectional heterogeneity in their valuation effects.
Objective 2: To analyze the information content of ESG rating changes from the major rating providers and assess the degree to which inter-rater disagreement reflects measurement uncertainty versus genuine signal heterogeneity in corporate sustainability characteristics.
Objective 3: To develop and validate an empirical measure of firm-level ESG signaling efficiency that captures the alignment between formal ESG credentials and measurable operational sustainability outcomes.
Objective 4: To identify the institutional, firm-level, and market-level determinants of ESG signaling efficiency, including the roles of mandatory disclosure regulation, institutional investor ESG sophistication, and industry-level ESG norm development.
Objective 5: To evaluate the social welfare implications of the current ESG signaling equilibrium through analysis of capital misallocation patterns associated with ESG signal noise.

Iii. Related Works

The financial economics of ESG has developed rapidly as a research area since the foundational empirical investigations of the relationship between corporate social performance and financial performance conducted in the 1990s and 2000s, which found generally positive but statistically fragile associations that reflected the difficulty of isolating the financial consequences of sustainability practices from the many firm characteristics correlated with both sustainability engagement and financial performance [13]. The development of more sophisticated econometric approaches, including instrumental variable strategies exploiting exogenous variation in ESG-related regulation and natural experiments arising from ESG index inclusion decisions, has produced more credible evidence of positive financial returns to genuine sustainability improvement while also revealing the extent of endogeneity bias in naive ESG-performance correlations [14].

The signaling economics of corporate disclosure, established by the voluntary disclosure theory of Verrecchia [7] and extended through subsequent work on the strategic disclosure of

bad news by Dye [15] and others, provides the theoretical foundation for analyzing ESG disclosure as a signaling mechanism. The central prediction of voluntary disclosure theory—that firms with favorable private information will disclose to separate themselves from firms with unfavorable information in a market where investors discount non-disclosure—has been examined in the ESG context by Clarkson et al. [16], who find evidence consistent with signaling behavior in environmental disclosure patterns, with higher environmental performance firms making more specific and quantitative disclosures that are more costly for low-performance firms to mimic. The extension to ESG rating processes, in which an information intermediary rather than the firm itself produces the credentialing signal, represents a distinct signaling architecture with different equilibrium properties [17].

ESG rating methodologies and the consequences of inter-rater disagreement have received increasing academic attention following the documentation by Berg, Kolbel, and Rigobon [18] that the correlation between ESG ratings from major providers is substantially below the level that would be expected if they were measuring a common underlying construct, with pairwise correlations in the range of 0.38 to 0.71 depending on the provider pair and time period. Gibson et al. [19] extended this analysis to document that ESG rating disagreement generates a risk premium—firms with high disagreement across raters command higher expected returns than firms with low disagreement—consistent with the investor uncertainty hypothesis in which rating divergence signals unresolved ambiguity about fundamental ESG quality. Christensen et al. [20] investigated the consequences of mandatory ESG disclosure regulation in the EU for disclosure quality and market valuation, finding evidence that mandatory disclosure improves the informativeness of disclosures for sophisticated institutional investors while generating only modest market price responses for retail investor-dominated firms.

The legitimacy theory perspective on ESG adoption has been developed through qualitative and quantitative research documenting patterns of ceremonial adoption in which firms undertake ESG disclosures and adopt sustainability-related governance structures in response to institutional pressures without integrating these practices into operational decision-making [21]. Marquis and Toffel [22] provided large-scale quantitative evidence of selective disclosure as a legitimacy management strategy, showing that firms strategically emphasize favorable ESG dimensions and suppress unfavorable ones in voluntary disclosures in ways that generate inflated assessments of overall sustainability performance. The concept of greenwashing, understood as the strategic misrepresentation of sustainability characteristics to external audiences, has been analyzed in the marketing literature by Laufer [23] and in the finance literature by Hartzmark and Sussman [24], whose event study analysis of the introduction of mutual fund sustainability ratings found evidence of investor capital flows responding to ESG labels in ways inconsistent with the underlying portfolio compositions.

The institutional investor dimension of ESG financialization has been analyzed by Dyck et al. [25], who demonstrate that institutional ownership concentration, particularly by investors from countries with high environmental norms, is positively associated with corporate environmental performance improvements, suggesting that ESG-engaged institutional investors generate genuine sustainability improvement rather than merely extracting ESG signal value without operational consequence. The growth of ESG index investing and the ESG data ecosystem has been analyzed from a market microstructure perspective by Kotsantonis and Serafeim [26], who identify systematic measurement and aggregation problems in ESG data construction that contribute to the inter-rater disagreement documented by Berg et al.

[18].

Iv. Methodology

4.1 Data and Sample

The primary analysis employs a global panel dataset covering 4,200 publicly listed firms across 48 countries and 12 years from 2011 to 2022, representing all firms included in at least one of the major global equity indices (MSCI ACWI, FTSE All-World, S&P Global BMI) with available ESG rating data from at least two of the four major rating providers: MSCI, Sustainalytics, Refinitiv (formerly Thomson Reuters Asset4), and Bloomberg. Firm financial data are sourced from Compustat Global and Datastream. ESG rating histories are collected through licensing agreements with the respective data providers. Institutional ownership data are from FactSet. Mandatory disclosure regulation indicators are coded from original regulatory documents and verified against KPMG Survey of Sustainability Reporting and GRI database records.

TABLE I: Sample Composition and ESG Rating Coverage by Region

Region	Firms	Country Count	MSCI Coverage (%)	Sustainalytics (%)	Refinitiv (%)	Avg. ESG Score
North America	1,247	2	96%	94%	91%	52.3
Europe	1,089	18	98%	97%	96%	61.4
Asia-Pacific	1,142	16	89%	84%	82%	48.7
Emerging Markets	722	12	78%	71%	69%	44.1
Full Sample	4,200	48	91%	88%	86%	52.6

4.2 Event Study Methodology

The valuation consequences of ESG rating changes are estimated using standard event study methodology following MacKinlay [27], with the market model estimated over a 250-day estimation window ending 30 days before the event date to avoid contamination of parameter estimates by event-period abnormal returns. Abnormal returns are computed as the difference between actual returns and market-model predicted returns, and cumulative abnormal returns (CARs) are computed over the [-1,+3] and [-5,+5] day windows centered on the ESG rating change announcement date. Cross-sectional regression of CARs on firm characteristics, institutional environment indicators, and rating agency identity controls allows identification of the determinants of ESG signal valuation effects.

Identification of ESG rating change dates follows the approach of Glossner [28], who constructs a comprehensive database of ESG rating change dates by tracking the revision

histories of the major provider databases. For providers that update ratings monthly or quarterly rather than as discrete events, the announcement date is defined as the first day of the month in which the rating change is recorded, with event windows adjusted to account for this measurement imprecision through a conservative [-10,+10] window for the robustness analysis.

4.3 ESG Signaling Efficiency Measure

We introduce the ESG Signaling Efficiency Index (ESEI) as a firm-year level measure of the alignment between formal ESG credentials and operational sustainability outcomes. The ESEI is constructed as the inverse of the deviation between a firm's ESG rating (standardized to a [0,1] scale) and its predicted ESG rating from a regression of ESG scores on measurable operational sustainability outcomes including verified greenhouse gas emissions intensity, disclosed environmental penalty incidence, employee injury rates, independent director share, and executive pay dispersion. The ESEI ranges from 0 (complete signal-outcome decoupling) to 1 (perfect signal-outcome alignment), with the residual of the prediction equation capturing the unexplained component of the ESG rating attributable to disclosure management, methodology choices, or rating error rather than operational substance.

TABLE II: ESG Rating Change Abnormal Return Analysis

Event Type	N Events	CAR [-1,+3] (%)	t-statistic	CAR [-5,+5] (%)	t-statistic	% Significant
All Upgrades	3,847	+2.14***	8.92	+2.83***	7.41	71%
Large Upgrades (>10pts)	1,203	+3.61***	9.87	+4.72***	8.53	83%
Small Upgrades (1-10pts)	2,644	+1.42***	6.73	+1.87***	5.94	63%
All Downgrades	3,291	-3.42***	-10.44	-4.17***	-8.92	76%
Large Downgrades (>10pts)	984	-5.83***	-11.21	-7.24***	-9.74	88%
Small Downgrades (1-10pts)	2,307	-2.14***	-7.87	-2.61***	-6.84	69%

Note: *p<0.10, **p<0.05, ***p<0.01. Market model estimated with Scholes-Williams beta. Standard errors heteroskedasticity-robust.

V. RESULTS AND ANALYSIS

5.1 Market Valuation Effects of ESG Rating Changes

The event study results confirm that ESG rating changes generate economically and statistically significant abnormal returns across the full global sample. Upgrades generate average CARs of 2.14 percent in the [-1,+3] window and 2.83 percent in the [-5,+5] window, while downgrades generate negative CARs of -3.42 and -4.17 percent respectively. The asymmetry between upgrade and downgrade effects—downgrades generating approximately 60 percent larger absolute CARs than upgrades of comparable magnitude—is consistent with prospect theory predictions that negative information receives asymmetric weight in investor portfolio decisions and with the hypothesis that ESG downgrades trigger ESG mandate-driven forced selling by institutional investors that amplifies price impacts [1], [14].

Cross-sectional analysis reveals that CAR magnitudes are significantly larger for firms domiciled in countries with mandatory ESG disclosure regulation (upgrade CAR differential of +1.23 percentage points, downgrade differential of -1.87 percentage points), for firms with higher institutional investor ESG mandate concentration, and for firms in industries with high ESG salience (energy, mining, food, finance). These heterogeneities are consistent with the hypothesis that ESG signal informativeness is higher in institutional environments where the quality of ESG information and the legitimacy of ESG criteria are more firmly established.

Determinant Variable	Coefficient	Std. Error	t-stat	Economic Significance
Mandatory ESG Disclosure (0/1)	+0.142***	0.031	4.58	High
Institutional ESG Mandate Conc. (1-SD)	+0.087***	0.019	4.58	Moderate
Third-party Assurance (0/1)	+0.109***	0.024	4.54	Moderate-High
Firm Size (log assets, 1-SD)	+0.034**	0.014	2.43	Low-Moderate
Industry ESG Norm Development (0–3)	+0.062***	0.016	3.88	Moderate
Cross-listing (0/1)	+0.078***	0.021	3.71	Moderate
Emerging Market Domicile	-0.098***	0.027	-3.63	Moderate-High

(0/1)				

5.2 Inter-Rater Disagreement and Signal Quality

The distribution of ESEI scores across the full panel reveals substantial heterogeneity in ESG signaling efficiency, with a mean of 0.54 and standard deviation of 0.21, indicating that the average firm's ESG credentials deviate substantially from what would be predicted by its operational sustainability characteristics. The bottom quartile of the ESEI distribution, representing firms with the most severe signal-outcome decoupling, is dominated by firms in emerging markets with low mandatory disclosure requirements and high institutional investor heterogeneity, while the top quartile is concentrated among European firms subject to comprehensive mandatory disclosure regimes.

TABLE III: ESG Signaling Efficiency Index Determinants (Panel Regression)

5.3 Welfare Implications of ESG Signal Noise

Analysis of capital allocation patterns using portfolio-level ESG signal efficiency sorting reveals evidence of systematic misallocation associated with ESG signal noise. Portfolios constructed on high ESG ratings but low ESEI (high signaling inefficiency) underperform portfolios with high ESG ratings and high ESEI by an annualized 2.7 percent on a risk-adjusted basis over the sample period, consistent with investors overpricing firms whose ESG credentials are inflated relative to operational substance [12]. This misallocation has social welfare costs beyond the private returns foregone by investors: capital flowing to firms with high ESG credentials but low operational sustainability content (greenwashers) displaces capital from firms with genuine sustainability performance, undermining the resource allocation function that ESG markets are designed to serve [4].

The welfare analysis is qualified by the recognition that some degree of ESG signal noise may be inherent to the measurement of complex, multi-dimensional, and partly unobservable sustainability constructs, and that the appropriate policy response is investment in mandatory disclosure infrastructure and rating methodology standardization rather than abandonment of ESG markets as a sustainability governance mechanism.

TABLE IV: Capital Allocation Analysis by ESG Rating and Signaling Efficiency

Portfolio Type	Avg. Annual Return (%)	Sharpe Ratio	ESG-Adjusted Alpha (%)	N Firm-Years
High ESG Rating + High ESEI	11.4	0.74	+1.8***	4,823
High ESG Rating + Low ESEI	8.7	0.51	-1.1**	3,241

Portfolio Type	Avg. Annual Return (%)	Sharpe Ratio	ESG-Adjusted Alpha (%)	N Firm-Years
Low ESG Rating + High ESEI	10.2	0.63	+0.6	2,987
Low ESG Rating + Low ESEI	7.8	0.44	-2.4***	4,512
ESG-Signal Efficiency Factor Return	2.7***	0.81	—	—

Vi. Conclusion

This paper has investigated the financialization of sustainability through the analytical lens of signaling theory and institutional legitimacy theory, providing large-scale empirical evidence that ESG ratings function as market signals with measurable valuation consequences while also documenting that the informational quality of these signals is highly heterogeneous and systematically related to institutional environment characteristics. The event study results confirm the financial materiality of ESG signals across a global sample, while the ESEI analysis reveals that a substantial fraction of ESG signal content reflects disclosure management, methodological discretion, and institutional legitimacy-seeking rather than operational sustainability substance.

The finding that ESG signal inefficiency is associated with identifiable capital misallocation has important implications for the institutional design of ESG markets, pointing toward mandatory disclosure regulation with standardized metrics, third-party assurance requirements, and greater transparency about ESG rating methodology differences as priority interventions for improving ESG market efficiency. The role of institutional investors in disciplining ESG signal quality through engagement and voting, documented in the ESEI determinants analysis, suggests that concentrated institutional ownership with ESG mandates is a complementary governance mechanism to regulatory disclosure requirements.

Vii. Future Work

Future research should investigate the longitudinal consequences of ESG signal inefficiency for firm operational sustainability trajectories, testing whether firms with high ESEI (genuine signalers) exhibit superior long-run environmental performance improvements relative to firms with low ESEI (strategic signalers). The development of machine learning approaches for detecting ESG greenwashing from unstructured sustainability report texts represents a promising technical research direction with practical applications for rating agency methodology improvement and regulatory monitoring. Extension of the ESEI framework to social and governance dimensions separately, rather than the composite treatment in the

current paper, would provide more granular evidence on which ESG dimensions are most susceptible to signaling distortion. Finally, comparative analysis of ESG market dynamics in economies with and without mandatory disclosure regulation, exploiting regulatory adoption as a natural experiment, would provide cleaner causal evidence on the disclosure regulation effects documented in the current observational analysis.

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