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The Dubious Dollar: A Methodological Exploration of the ESG-Performance Nexus in a Simulated Corporate Environment

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Abstract

This study critically evaluates the widely debated relationship between corporate Environmental, Social, and Governance (ESG) performance and corporate financial performance (CFP). Amidst conflicting theoretical predictions and the methodological challenges of real-world data, we conduct a methodological exploration of this relationship in a controlled, synthetic environment. The study employs a quantitative methodology using a large, synthetic panel dataset modeling 1000 public companies over an 11-year period. Utilizing Ordinary Least Squares (OLS) regression with firm, industry, region, and year fixed effects, we analyze the impact of a composite ESG score and its disaggregated Environmental (E), Social (S), and Governance (G) components on both an accounting-based metric (Profit Margin) and a market-based metric (Market Capitalization). The empirical results present a highly nuanced perspective. While the composite ESG score shows a marginally significant negative relationship with profit margin and no significant relationship with market capitalization, disaggregation reveals distinct effects: the Governance pillar exhibits a statistically significant positive relationship with both profitability and market value. Conversely, the Environmental pillar is significantly and negatively associated with profit margin, suggesting high adjustment costs, while the Social pillar shows no significant relationship. These findings challenge the utility of aggregated ESG scores and suggest that managers and investors should focus on the distinct E, S, and G dimensions, highlighting the primacy of governance in value creation.

Keywords

ESG, Corporate Social Responsibility, Financial Performance, Governance, Environmental Performance, Stakeholder Theory, Agency Theory, Synthetic Data

1. Introduction

The paradigm of corporate value creation has undergone a seismic shift over the past two decades. Once confined to the fiscal orthodoxy of shareholder-primacy, the discourse has expanded to embrace a more holistic and complex understanding of corporate purpose. Central to this evolution is the concept of Environmental, Social, and Governance (ESG) performance, a framework that has ascended from a niche concern to a cornerstone of modern investment analysis and corporate strategy. Trillions of dollars in assets are now managed under ESG mandates (Global Sustainable Investment Alliance, 2021), propelled by a compelling, if contentious, investment thesis: that corporations are adept at managing their environmental impact, fostering positive social relationships, and maintaining robust governance will ultimately deliver superior financial returns.

This proposition—often distilled into the mantra "doing well by doing good"—is both intuitively appealing and theoretically grounded in frameworks like stakeholder theory (Freeman, 1984). Proponents argue that strong ESG performance mitigates risk, enhances brand reputation, and fosters innovation, thereby creating durable competitive advantages (Eccles, Ioannou, & Serafeim, 2014). However, a rival school of thought, rooted in agency theory (Jensen & Meckling, 1976), posits that ESG initiatives can represent a diversion of corporate resources—an "agency cost"—that ultimately harms profitability.

This theoretical tension has fueled a voluminous body of empirical research, yet a definitive consensus remains elusive (Friede, Busch, & Bassen, 2015). This ambiguity stems from significant methodological challenges, including the pervasive issue of endogeneity, omitted variable bias, and severe measurement error arising from the divergence of ESG ratings across data providers (Berg, Kölbel, & Rigobon, 2022).

This study seeks to contribute to this critical debate by addressing the core research question: What is the relationship between a firm's ESG performance and its corporate financial performance? We address this by: 1) Examining the impact of a composite ESG score on both profitability and market value, and 2) Disaggregating the ESG score to test the distinct effects of the Environmental, Social, and Governance pillars.

To isolate these relationships from the significant noise of real-world data, this paper takes a novel approach by utilizing a large, publicly available synthetic dataset. This choice is deliberate. Rather than attempting to make a definitive claim about real-world markets, this study's primary contribution is methodological: to demonstrate an analytical framework in a controlled environment where the confounding effects of data gaps and measurement inconsistencies are eliminated. It serves as an exploratory analysis to understand the baseline theoretical relationships as modeled in the dataset, providing a foundation upon which studies using more complex real-world data can be built.

Our findings underscore the importance of this disaggregated approach. While the composite ESG score yields ambiguous and slightly negative results, the indi-

vidual pillars tell a much clearer story. We find a robust positive relationship between the Governance score and both financial metrics. Conversely, the Environmental score is negatively associated with profitability, and the Social score is statistically insignificant. These results introduce a critical, data-driven counterpoint to the prevailing ESG discourse, suggesting that the aggregation of E, S, and G into a single score masks fundamentally different value-creation mechanisms, and that the link between virtue and value is more dubious and complex than often assumed.

This paper proceeds as follows. Section 2 provides a comprehensive review of the theoretical frameworks and empirical literature. Section 3 details the data source, variable construction, and the econometric model. Section 4 presents the core regression results and offers an in-depth discussion. Finally, Section 5 concludes with a summary of the findings and suggestions for future research.

2. Literature Review

The inquiry into the financial relevance of corporate social and environmental performance is built upon a rich and often contentious theoretical and empirical foundation. This section first explores the primary theoretical lenses through which the ESG-CFP relationship is viewed—Stakeholder Theory, Agency Theory, and the Resource-Based View—and then reviews the vast body of empirical work that has attempted to adjudicate between these competing predictions.

2.1. Theoretical Frameworks

2.1.1. Stakeholder Theory: The Case for a Positive Relationship

Stakeholder theory, most prominently articulated by Freeman (1984), posits that a firm's long-term success depends on its ability to manage and balance the interests of its diverse stakeholders. ESG performance is the practical embodiment of stakeholder theory. Strong environmental practices address the concerns of communities, robust social policies cater to employees and customers, and sound governance ensures accountability. Cumulatively, these actions are hypothesized to create a virtuous cycle: satisfying stakeholder needs builds trust and loyalty, which enhances brand equity and operational resilience, ultimately leading to superior, sustainable financial performance (Edmans, 2011; Porter & van der Linde, 1995).

2.1.2. Agency Theory: The Case for a Negative Relationship

In stark contrast, agency theory (Jensen & Meckling, 1976) focuses on the principal-agent problem, wherein managers may act in their own self-interest. From this viewpoint, many ESG-related expenditures are viewed as a manifestation of agency costs. Friedman (1970) famously argued that the only social responsibility of business is to increase profits. Any expenditure on social or environmental causes beyond what is required by law or what directly contributes to profit is seen as a misallocation of shareholder capital. Thus, agency theory predicts a negative relationship between ESG performance and CFP, especially for accounting-based measures of profitability.

2.1.3. The Resource-Based View (RBV) and Signaling Theory

The Resource-Based View (RBV) of the firm (Barney, 1991) suggests ESG can create value by cultivating unique, inimitable resources, such as a reputation for environmental stewardship or being an excellent employer (Surroca, Tribó, & Waddock, 2010). Similarly, signaling theory (Spence, 1973) suggests that high ESG standards can signal management quality and a long-term orientation, reducing perceived risk and potentially leading to a higher market valuation.

2.2. Empirical Evidence

The empirical literature testing these theories is vast and characterized by a lack of consensus.

2.2.1. Evidence of a Positive Relationship

A significant portion of the literature finds a positive link. The most influential meta-analysis by Friede, Busch, & Bassen (2015) found that roughly 90% of over 2200 studies show a non-negative relationship between ESG and CFP. A seminal study by Eccles, Ioannou, and Serafeim (2014) found that firms with strong sustainability policies significantly outperformed their counterparts over the long term.

2.2.2. Evidence of a Negative or Neutral Relationship

Despite the positive trend, a substantial body of work finds conflicting results. Brammer, Brooks, and Pavelin (2006) found mixed effects depending on the dimension of social performance measured. More recently, studies on "sin stocks" (e.g., tobacco, alcohol) have found that these low-ESG firms historically provided higher stock returns, implying a potential financial penalty for high-ESG portfolios (Hong, Karolyi, & Scheinkman, 2020).

2.2.3. The Measurement Challenge and Motivation for Disaggregation

Much of the variation in results can be attributed to the "measurement challenge" (Chatterji et al., 2016). ESG data providers use different methodologies, leading to low correlations between their ratings for the same company (Berg, Kölbel, & Rigobon, 2022). This "rater divergence" means study results can depend heavily on the data source. Furthermore, the aggregation of diverse indicators into a single ESG score can mask important trade-offs between the E, S, and G pillars. For instance, agency costs may be more pronounced in discretionary environmental or social spending, while good governance is almost universally seen as value-enhancing. This review demonstrates that the empirical evidence remains deeply divided, motivating the present study's approach to use a clean, controlled dataset to test these fundamental relationships in a disaggregated manner.

3. Data and Methodology

3.1. Data Source and Rationale for Use of Synthetic Data

The choice to use a synthetic dataset is a deliberate methodological decision, align-

ing with a growing trend in quantitative and sustainable finance (Assefa et al., 2019; Tkachenko, 2024). Empirical research in the ESG domain is fraught with challenges, including significant missing data, inconsistent reporting standards, and, most critically, low correlation among real-world ESG rating providers. These issues introduce substantial noise and potential bias, making it difficult to isolate true economic relationships.

This study leverages a comprehensive and uniform synthetic dataset, featuring balanced panel data for 1000 firms drawn from the Kaggle platform, labeled the "ESG and Financial Performance Dataset", covering the years 2015 to 2025. While the specific data generation algorithm is not detailed by the source, the dataset's variables were modeled to reflect the statistical distributions and correlational structures commonly observed in real-world financial data from large public firms, providing a realistic, albeit controlled, testing ground for our hypotheses.

This study conducts methodological exploration in a controlled environment. This approach is motivated not only by the desire to eliminate measurement error but also by broader challenges in the financial sector. The use of synthetic data is a key method for overcoming barriers such as regulatory restrictions on data sharing, a lack of historical data for rare events, and the need to protect confidential information (Assefa et al., 2019). Specifically within sustainable finance, synthetic data is emerging as a critical tool for modeling future environmental uncertainties and addressing the profound data scarcity that hinders a holistic assessment of investment opportunities (Tkachenko, 2024).

This study, therefore, does not claim external validity for its findings; rather, it offers a baseline analysis and a clear demonstration of a robust analytical framework that can later be applied to more complex empirical data.

3.2. Variable Measurement

The variables used in this study are defined in Table 1 below.

Table 1. Variable definitions.

Variable Category	Variable Name (Code)	Description
Dependent Variables (CFP)	ProfitMargin	Calculated as Net Income divided by Revenue. An accounting-based indicator of operational efficiency and profitability.
	Log_MarketCap	A market-based indicator of firm value (natural logarithm of MarketCap).
Independent Variables (ESG)	ESG_Overall	A composite score representing overall ESG performance.
	ESG_Environmental	A score representing performance on environmental dimensions.
	ESG_Social	A score representing performance on social dimensions.

Continued

	ESG_Governance	A score representing performance on governance dimensions.
Control Variables	Log_Revenue	A proxy for firm size (natural logarithm of Revenue).
	GrowthRate	Measured as the annual percentage growth in revenue.
	Fixed Effects	Dummy variables for firm, industry, region, and year used to control for unobserved heterogeneity.

3.3. Descriptive Statistics and Correlation

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ProfitMargin	10,000	10.05	10.23	−20.00	45.00
MarketCap (M)	10,000	25,000.00	50,000.00	100.00	500,000.00
ESG_Overall	10,000	65.00	15.00	20.00	100.00
ESG_Environmental	10,000	65.00	15.00	20.00	100.00
ESG_Social	10,000	65.00	15.00	20.00	100.00
ESG_Governance	10,000	65.00	15.00	20.00	100.00
Revenue (M)	10,000	15,000.00	30,000.00	50.00	350,000.00
GrowthRate (%)	10,000	5.00	10.00	−15.00	30.00

The descriptive statistics (Table 2) for the E, S, and G components are identical, a feature of the synthetic data's normalization. However, the correlation matrix (Table 3) confirms that the variables are not perfectly collinear and can be analyzed separately.

Table 3. Correlation matrix of ESG components.

	ESG_Environmental	ESG_Social	ESG_Governance
ESG_Environmental	1.000		
ESG_Social	0.452	1.000	
ESG_Governance	0.189	0.205	1.000

The matrix shows moderate positive correlation between the E and S pillars, and weak correlation between Governance and the other two pillars. This confirms that despite their similar distributions, the variables are distinct and can be analyzed separately.

3.4. Econometric Model

To investigate the relationship between ESG and CFP, we employ a panel data

regression model with multiple fixed effects. The model is specified as follows:

$$CFP_{it} = \beta_0 + \beta_1 ESG_{it} + X_{it}\beta + \alpha_i + \delta_j + \lambda_k + \gamma_t + \varepsilon_{it}$$

where CFP_{it} is the financial performance metric for firm i at year t; ESG_{it} is the relevant ESG score (overall, E, S, or G); X_{it} is a vector of control variables; and α_i, δ_j, λ_k, γ_t represent firm, industry, region, and year fixed effects, respectively. Standard errors are clustered at the firm level.

4. Regression Results

The results from the regression models are presented in Table 4. Panel A shows the results using the aggregated ESG_Overall score, while Panel B presents the results from the disaggregated model with the separate E, S, and G scores.

Table 4. OLS regression results of ESG on corporate financial performance.

	(1) Profit Margin	(2) Log (Market Cap)	(3) Profit Margin	(4) Log (Market Cap)
Panel A: Aggregated ESG				
ESG_Overall	−0.0313*	−0.0017		
	(0.019)	(0.001)		
Panel B: Disaggregated ESG				
ESG_Environmental			−0.0582***	−0.0021
			(0.021)	(0.002)
ESG_Social			0.0045	0.0003
			(0.018)	(0.001)
ESG_Governance			0.0811***	0.0152***
			(0.025)	(0.003)
Controls				
Log_Revenue	0.2802	1.0141***	0.2798	1.0139***
	(0.255)	(0.019)	(0.255)	(0.019)
GrowthRate	−0.0152	−0.0030**	−0.0150	−0.0031**
	(0.018)	(0.001)	(0.018)	(0.001)
Fixed Effects	Yes	Yes	Yes	Yes
Observations	10,000	10,000	10,000	10,000
R-squared	0.222	0.749	0.228	0.752

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

5. Discussion

5.1. Discussion of Findings

The empirical results provide a compelling case for the disaggregation of ESG metrics.

As shown in Panel A, the aggregated ESG_Overall score yields results consistent with our initial analysis: a marginally significant negative relationship with profit margin and no significant relationship with market value. This finding, on its own, would suggest that the costs of ESG outweigh the benefits.

However, Panel B reveals a dramatically different and more insightful story. When the composite score is broken down, we find that the ESG_Governance pillar has a positive and highly statistically significant relationship with both profit margin ($\beta = 0.0811$, $p < 0.01$) and market capitalization ($\beta = 0.0152$, $p < 0.01$). This strongly supports the theoretical literature arguing that well-governed firms are more efficient and are valued more highly by investors (Bebchuk et al., 2009). The move from the aggregated to the disaggregated model also increases the explanatory power (R-squared) of the models, confirming the value of this more granular approach.

In sharp contrast, the ESG_Environmental pillar has a negative and statistically significant relationship with profit margin ($\beta = -0.0582$, $p < 0.01$). This aligns with the agency cost perspective, suggesting that the expenditures required to improve environmental performance directly reduce short-term profitability. The effect on market cap is negative but not statistically significant, implying investors may view these costs as necessary long-term investments rather than pure value destruction.

Finally, the ESG_Social pillar is statistically insignificant in all models. This suggests that, within this dataset, the wide range of activities captured under the "S" umbrella do not have a systematic, discernible impact on either profitability or market value. This statistical insignificance could be attributed to several factors. The "Social" pillar is an aggregation of highly diverse and often intangible activities (e.g., employee satisfaction, community engagement, data privacy), whose financial impacts may be heterogeneous, effectively canceling each other out in a broad statistical analysis. Furthermore, any potential benefits from strong social performance, such as enhanced human capital or brand loyalty, may only materialize over longer time horizons than the 11-year period captured in this dataset.

Together, these disaggregated results suggest that the weak negative finding for the composite ESG score is an artifact of aggregation. The positive effect of strong Governance is being offset by the negative effect of Environmental spending, with the Social component adding little more than noise.

This interpretation is further nuanced by the results of the control variables. The coefficient for Log_Revenue is positive and highly significant for market capitalization, which is expected; larger firms naturally command higher market values. However, its effect on Profit Margin is statistically insignificant. This is surprising, as larger firms are often presumed to benefit from economies of scale, greater bargaining power, and operational efficiencies that should translate into higher profitability. This finding may suggest that, within this synthetic dataset, the benefits of scale are perfectly offset by countervailing diseconomies, such as increased bureaucracy or complexity, resulting in a neutral net effect on profit

margins.

The coefficient for GrowthRate is negative and statistically significant in its relationship with Log (Market Cap). While this result appears counterintuitive, as financial markets are expected to reward growth, it can be explained by established financial theories that distinguish between the *quantity* and the *quality* of that growth. When investors perceive that growth is funded by projects where the return on invested capital is lower than the cost of capital, they will logically assign a lower valuation to the firm, as each dollar reinvested is eroding future cash flows (Penman, 2013).

A negative relationship suggests the market is identifying growth as value-destructive. This aligns with the agency theory framework, where managers might pursue "empire building"—increasing revenues through overpriced acquisitions or unprofitable market share grabs—to enhance their own prestige rather than shareholder value. When investors perceive that growth is funded by projects where the return on invested capital is lower than the cost of capital, they will logically assign a lower valuation to the firm, as each dollar reinvested is eroding future cash flows.

Furthermore, the negative coefficient could reflect a market premium for risk. Rapid growth may be occurring in highly volatile or speculative sectors. In such cases, investors would apply a significantly higher discount rate to future earnings, which would suppress the firm's present value (MarketCap) despite a high projected growth trajectory. Therefore, rather than defying financial logic, this finding suggests the model reflects a market sophisticated enough to penalize growth that is either unprofitable or excessively risky.

5.2. Economic Significance

While the statistical significance is clear, it is important to consider the economic magnitude of these effects. A 10-point increase in a firm's Governance score (equivalent to moving from average to good) is associated with a 0.81 percentage point increase in profit margin. For a company with $1 billion in revenue, this translates to an additional $8.1 million in profit. To contextualize this, for S&P 500 companies, annual fluctuations in profit margin of 1 - 2 percentage points due to market conditions are common, placing the governance effect within a realistic, albeit not massive, range of impact. Conversely, a similar 10-point increase in the Environmental score is associated with a 0.58 percentage point decrease in profit margin, representing a tangible cost of a similar economic magnitude.

5.3. Robustness and Additional Analysis

To address concerns of reverse causality, we re-estimated the models using a one-year lag for all ESG variables. The results (not tabulated for brevity) were qualitatively consistent: lagged Governance scores remained a positive and significant predictor of both financial metrics, while the lagged Environmental score remained negatively related to profitability. This provides some assurance that the

direction of the relationship flows from ESG performance to financial outcomes. We also tested for a key interaction effect between the Governance and Environmental scores to investigate whether good governance might moderate the negative profitability impact of environmental spending. The interaction term was not statistically significant, suggesting that, within this dataset, the short-term costs associated with environmental initiatives are not significantly mitigated by the presence of stronger governance structures.

6. Conclusion and Future Research

6.1. Conclusion

This study sets out to explore the ESG-CFP relationship within a controlled, synthetic environment. Our analysis yields two primary conclusions. First, aggregated ESG scores are a poor and potentially misleading indicator of financial performance, as they mask the distinct and opposing effects of their underlying components. Second, after disaggregation, we find that strong corporate governance is robustly associated with superior financial performance, both in terms of profitability and market value. Conversely, environmental initiatives appear to impose a net cost on short-term profitability, while social performance has no discernible financial impact.

These findings contribute a skeptical but important perspective to the ongoing debate, suggesting that the "G" in ESG is the primary driver of the positive results found in some parts of the literature, while the "E" and "S" components are far more complex and do not offer a clear path to financial outperformance.

6.2. Implications

For corporate managers, the implication is that resources should be prioritized towards strengthening governance structures, as this has the clearest link to value creation. For investors, the study serves as a strong caution against using aggregated ESG scores for capital allocation. A more granular analysis focusing on the individual pillars, particularly governance, is likely to be more fruitful.

6.3. Future Research

The robust analytical framework demonstrated in this study on a clean, synthetic dataset provides a valuable baseline for subsequent empirical work. Future research should build on this foundation by applying this disaggregated framework to real-world data to test the validity of these baseline findings amidst market noise and explore industry-specific contexts, such as the environmental-profitability link in carbon-intensive sectors. Advanced techniques like instrumental variables or quasi-experimental methods could be employed to more rigorously address endogeneity. Additionally, expanding the set of control variables—such as R&D intensity, leverage, and capital expenditures—could enhance model robustness. Finally, investigating the dynamic interplay and potential lagged effects between ESG dimensions over longer time horizons could provide deeper insights

into long-term value creation.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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