The Impact of ESG and its Pillars on the Performance of Venture Capital-Backed Companies

Patrick Hughes

Dissertation written under the supervision of professor Fatima Shuwaikh

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Abstract

This master's thesis investigates the relationship between Environmental, Social, and Governance (ESG) factors and the financial performance of Venture Capital (VC)-backed European companies. The study uses a panel dataset comprising 124 VC-backed firms. The performance metrics used are Tobin's Q and stock return. The research delves into the ESG and its separate pillar scores, to discern their impacts on the financial outcomes of the VC-backed companies. Environmental factors reflect the company's ecological footprint and resource utilization, social considerations encompass labor practices and community engagement, while governance pertains to corporate structure and decision-making processes. By evaluating each pillar, this study aims to provide insights into which aspects of ESG contribute most significantly to performance. To analyse these interactions, the research employs fixed-effects regression techniques. This approach accommodates the nature of the panel dataset and facilitates the identification of causal relationships between ESG factors and financial performance metrics. The findings of this study are expected to offer insights to both practitioners and policymakers regarding the impact of ESG on VC-backed companies. Moreover, understanding the influence of each ESG pillar will enable stakeholders to tailor their sustainability strategies effectively.

Keywords: *ESG, Environmental, Social, Governance, Venture Capital, Financial Performance, Tobin's Q, Stock Return, Regression*

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Resumo

Esta dissertação de mestrado investiga a relação entre fatores ambientais, sociais e de governança (ESG) e o desempenho financeiro de empresas europeias apoiadas por capital de risco (VC). O estudo usa um conjunto de dados de painel composto por 124 empresas apoiadas por capital de risco. As métricas de desempenho utilizadas são o Q de Tobin e o retorno das ações. A investigação investiga o ESG e as suas pontuações de pilares individuais, para discernir os seus impactos nos resultados financeiros das empresas apoiadas por capital de risco. Os factores ambientais reflectem a pegada ecológica da empresa e a utilização de recursos, as considerações sociais abrangem as práticas laborais e o envolvimento da comunidade, enquanto a governação diz respeito à estrutura corporativa e aos processos de tomada de decisão. Ao avaliar cada pilar, este estudo visa fornecer insights sobre quais aspectos ESG contribuem mais significativamente para o desempenho. Para analisar essas interações, a pesquisa utiliza técnicas de regressão de efeitos fixos. Esta abordagem acomoda a natureza do conjunto de dados do painel e facilita a identificação de relações causais entre fatores ESG e métricas de desempenho financeiro. Espera-se que as conclusões deste estudo ofereçam insights aos profissionais e aos formuladores de políticas sobre o impacto do ESG nas empresas apoiadas por capital de risco. Além disso, compreender a influência de cada pilar ESG permitirá que as partes interessadas adaptem as suas estratégias de sustentabilidade de forma eficaz.

Palavras-chave: *ESG, Ambiental, Social, Governança, Capital de Risco, Desempenho Financeiro, Q de Tobin, Retorno de Ações, Regressão*

Título: O Impacto do ESG e seus Pilares no Desempenho das Empresas Apoiadas por Capital de Risco

Autor: Patrick Hughes

Contents

1. Introduction

The relationship between Environmental, Social, and Governance (ESG) principles and the world of venture capital (VC) has garnered increasing attention in recent years. The concept of ESG, rooted in the philanthropic inclinations of Swedish companies in the 19th century, has evolved into a comprehensive performance evaluation framework that underscores the environmental, social, and governance responsibilities of enterprises (He, Jing, and Chen, 2023). Its formalization in 2006 through the United Nations Principles for Responsible Investment (UN PRI) and subsequent institutionalization by entities like Goldman Sachs in their ESG research report has propelled its significance in evaluating companies' contributions to sustainable development and societal responsibilities. The landscape of venture capital, a vital catalyst for the growth of startups and entrepreneurial ecosystems, dovetails intriguingly with the ESG paradigm. Venture capital-backed companies, known for their accelerated cash flow, sales growth, and innovation, form a pivotal niche in the entrepreneurial landscape (Esen, Dahl, and Sorenson, 2023). These startups, often identified by venture capitalists as harboring substantial potential, witness accelerated development trajectories due to the financial infusion and strategic guidance that VC funding provides.

The juncture at which ESG principles intersect with VC-backed companies is particularly compelling. While the traditional metrics of VC investment focus on financial performance, the incorporation of ESG considerations introduces a dynamic layer that assesses a company's environmental impact, social contribution, and governance practices. This convergence aligns seamlessly with evolving global aspirations for sustainable development and corporate responsibility. Amidst these dynamics, the question arises: How does ESG and its separate Pillar Scores impact performance (Tobin’s Q and Stock Return) of VC-backed companies? This forms the foundation of the forthcoming master's thesis, which aims to comprehensively investigate the impact of ESG integration on VC-backed companies' performance. By exploring this juncture, the research intends to contribute insights into how ESG considerations reshape the VC landscape, propelling companies towards not only financial success but also sustainable practices aligned with the broader societal goals.

The interplay between ESG principles and venture capital investment embodies a compelling arena for exploration. The historical evolution of ESG and the transformative role of venture capital in

nurturing startups lay the groundwork for a master's thesis endeavor to discern the implications of ESG integration for VC-backed companies. As the global emphasis on sustainable development intensifies, unraveling this relationship holds the potential to offer valuable insights into the future trajectory of both entrepreneurship and responsible business practices.

The global pursuit of sustainable development, as encapsulated in the Sustainable Development Goals (SDGs) adopted by all United Nations member states in September 2015, has ushered in a transformative era marked by shared aspirations for a balanced interplay between economic growth, social equity, and environmental preservation (Roy, 2023). The SDGs provide a unified framework that addresses pressing economic, social, and environmental concerns, making the journey towards sustainable development a collective endeavor. Central to this endeavor is the imperative for sustainable product management throughout their lifecycle, which aligns with internationally sanctioned initiatives. This strategic approach has the potential to curtail toxic emissions into the air, water, and soil, thereby mitigating their adverse effects on human health and the environment. The UN's 2030 Agenda, an integral component of the global sustainability paradigm, calls for substantial investments in environmentally friendly enterprises. This directive underlines the evolving landscape, steering corporations, governments, and end consumers towards sustainable investment practices that foster socio-environmental progress while achieving financial viability (Roy, 2023). This evolution is particularly evident in the context of venture capital (VC)-backed companies, where the symbiotic relationship between sustainable investment and the SDGs is gaining prominence.

Understanding the implications of Environmental, Social, and Governance (ESG) considerations on VC-backed companies holds immense significance in this evolving landscape. The convergence of ESG principles and venture capital not only augments the potential for sustainable development but also lays the foundation for reshaping the entrepreneurial landscape. The examination of how ESG factors influence the performance, strategies, and investment decisions of VC-backed firms resonates at the core of this research endeavor.

An exploration of the impact of ESG on VC-backed companies unveils multifaceted dimensions of significance. Firstly, the study addresses the broader sustainability agenda by shedding light on how these companies internalize and operationalize ESG practices. The extent to which startups incorporate sustainability principles and their subsequent effects on operational efficiency, risk

mitigation, and stakeholder engagement provide valuable insights for achieving SDGs. Through this lens, the research contributes to the SDGs' implementation and underscores their pragmatic relevance in real-world business scenarios.

Secondly, investigating the relationship between ESG and VC-backed companies holds the potential to influence investor behavior. As evident from prior research, there is some persistence in the performance of VC funds (Harris et al., 2023). Integrating ESG considerations into investment decisions could yield nuanced insights into whether sustainability-oriented companies exhibit distinctive financial performance. This dynamic informs investors, including venture capitalists, about the potential correlation between ESG integration and risk-adjusted returns. By elucidating such links, the study facilitates informed investment strategies that align with both financial goals and sustainable aspirations.

Furthermore, the research addresses a contemporary gap by considering the post-2000 landscape, encompassing shifts in fund allocations and the rise of buyout funds. The differentiation in performance persistence between buyout and VC funds underscores the complexity of the relationship between performance and investment strategies (Harris et al., 2023). Understanding how ESG considerations may moderate these dynamics adds a layer of sophistication to the analysis. This differentiation aligns well with the dynamic nature of contemporary entrepreneurial ecosystems and investment landscapes.

In essence, the research endeavors to provide actionable insights for entrepreneurs, investors, policymakers, and stakeholders. By comprehensively examining the implications of ESG on VC-backed companies, it bridges the gap between sustainability imperatives and entrepreneurial ventures. It unveils how ESG principles not only contribute to global sustainability goals but also offer strategic advantages for startups. As the interconnectedness of ESG and VC unfolds, this study's findings contribute to a more holistic understanding of sustainable development, investment dynamics, and their mutually reinforcing potential.

2. Literature Review:

In the evolving global economy, Environment, Social, and Governance (ESG) investment's pivotal role is evident, with mutual funds specializing in sustainable investing doubling assets from 2019 to 2020 (Luo, 2022). This trend aligns with UK policy incorporating ESG in the Companies Act 2006 and the EU's visionary European Green Deal. This study probes ESG's impact on UK stock returns, delving into its intricate relationship and offering a unique liquidity-focused perspective. Venture capital (VC) stands crucial for startups, fostering growth, innovation, and economic progress, though it's limited to a select fraction perceived as high potential by investors (Esen, Dahl, and Sorenson, 2023). This review navigates this landscape, deciphering the interplay between ESG investment, VC, and entrepreneurial ecosystems, to unravel their complex dynamics and implications for sustainable business development.

2.1 Venture Capital & ESG

ESG investing has emerged as a prevailing theme in contemporary financial markets, fundamentally altering the landscape of investment strategies and reshaping the criteria by which companies are evaluated for their potential contributions to sustainable development. The influence of ESG considerations transcends traditional financial metrics, as evidenced by a surge in research focused on unraveling its multifaceted impact on various aspects of corporate performance, investor behavior, and market dynamics. A study by Luo (2022) extensively delves into the ESG portfolio performance of UK securities from 2003 to 2020, revealing significant insights into the relationship between ESG scores and stock returns. Notably, the research showcases that lower ESG-rated firms tend to yield higher returns than their higher-rated counterparts, suggesting a complex interplay between sustainable practices and financial outcomes.

The burgeoning interest in ESG considerations within financial markets naturally extends to the realm of venture capital, a linchpin of innovation and entrepreneurial ecosystem development. Traditional views on venture capital have primarily centered on the "jockey" versus "horse" debate, analyzing the pivotal role of key executives in securing funding and driving startup success (Esen, Dahl, and Sorenson, 2023). While previous research has illuminated the significance of executive attributes, a paradigm shift emerges from recent findings that emphasize the pivotal role of

employees in attracting venture capital investments. In this context, the presence of high-quality employees within a startup's ranks is proposed to serve as a critical indicator of the management team's ability to not only articulate a compelling vision but also to recruit, retain, and motivate a talented workforce, thus amplifying the startup's potential for success.

The integration of ESG principles into venture capital dynamics also extends to the domain of disclosure quality. A study by Wen et al. (2022) delves into the moderating effect of ESG disclosure quality on the relationship between firms' ESG performance and market value, financial returns, and financial risks. The research highlights that firms' ESG disclosure quality plays a significant role in enhancing market value, financial returns, and mitigating financial risks, suggesting that transparent and comprehensive ESG reporting may not only augment the financial prospects of venture capital-backed companies but also underscore their commitment to sustainable practices.

2.2 Environmental Pillar

The positive influence of green innovation has a ripple effect that extends beyond individual companies. This effect is primarily driven by two key factors: the alleviation of financial constraints among peer firms and the heightened environmental awareness of their executives. This dual transmission mechanism underscores how corporate Environmental, Social, and Governance (ESG) performance triggers a chain reaction, ultimately leading to a significant enhancement in the green innovation levels of peer companies. This intricate process operates through two causal pathways: the first involving improved ESG performance alleviating financing constraints among peer firms, which in turn boosts their green innovation capabilities; and the second centered around enhanced executive environmental awareness, leading to a similar elevation in peer firms' green innovation activities (Li, Lian, and Xu 2023).

From a policy perspective, the findings suggest that policy makers can play a pivotal role in further harnessing the potential of ESG. Establishing a well-defined taxonomy of ESG performance and implementing standardized sustainability reporting could prove instrumental. Such measures could help clarify and categorize different types of ESG achievements, particularly those that truly align with environmentally friendly practices. By reducing uncertainty surrounding ESG considerations, these actions have the potential to lower the cost of equity capital for "green" firms, ultimately yielding broader social benefits and fostering a higher societal impact (Avramov et al. 2022).

The automotive industry stands out as a compelling case where ESG achievements resonate strongly with consumers. Evidence reveals that automotive brands effectively communicate their environmental consciousness through two distinct avenues: emissions performance and employee satisfaction. Consumers perceive a brand's emissions performance as a comprehensive gauge of its commitment to environmental responsibility. Low emissions signal the production of technologically advanced and fuel-efficient vehicles with sleek, aerodynamic designs. Additionally, the satisfaction of employees within automotive brands reflects the embodiment of robust societal values, further enhancing the brand's appeal (Lee, Raschke, and Krishen 2022).

The domain of green and brown stocks showcases intriguing dynamics within the investment landscape. Notably, green stocks, associated with environmentally conscious businesses, exhibit negative alphas, while brown stocks, linked to less sustainable practices, yield positive alphas. This seeming contradiction can be attributed to two distinct sources. First, investors' preferences for holding green stocks contribute to their negative alphas. Second, green stocks have the unique ability to act as a hedge against climate risk. Interestingly, green and brown stocks display opposing exposures to an ESG risk factor that captures unanticipated shifts in ESG concerns among customers and investors. This dynamic interplay results in a scenario where, during specific periods of time, unexpected strengthening of ESG concerns can lead green stocks to outperform their brown counterparts, despite having lower alphas on the surface (Pástor, Stambaugh, and Taylor 2021).

2.3 Social Pillar

The realm of corporate finance has been a fertile ground for theoretical and empirical exploration of the intricate relationships between Environmental, Social, and Governance (ESG) or Corporate Social Responsibility (CSR) activities and various facets of a firm's operations. Researchers have ventured to unearth connections between ESG/CSR endeavors and critical elements such as the firm's market environment, organizational structure, ownership, as well as its overall risk and performance metrics. Gillan, Koch, and Starks (2021) acknowledge the mixed landscape of findings in this realm, with certain results demonstrating robustness, while others presenting a tapestry of contradictions. This duality underscores the necessity for further research to bridge gaps, reconcile disparities, and enhance the comprehension of the nuanced intersections between ESG/CSR and firm dynamics.

A pivotal juncture in the exploration of ESG/CSR's influence lies in the aftermath of the financial crisis, which catalyzed an intensified focus on the conduct of the banking industry. Quang Trinh et al. (2023) seize this opportunity to investigate the value-enhancing potential of CSR, specifically in terms of its impact on reducing bank tail risk. Delving into the pre-2010 and post-2010 periods, the study reveals a notable absence of a significant effect of CSR intensity on banking tail risk prior to the crisis. However, a post-crisis shift emerges as the stock market perceives the Environmental and Social (ES) ratings of banks in a different light, prompting further examination into the intricate dynamics that mediate between CSR and risk mitigation within the banking sector.

The influence of ESG considerations extends beyond the financial realm, permeating into the domain of media and society. Bofinger, Heyden, and Rock (2022) delve into the evolving landscape of ESG's effect on misvaluation, highlighting the amplification of this effect over time. The study identifies a symbiotic relationship between ESG and media sentiment, suggesting that increased attention towards CSR topics shapes investors' perceptions and ultimately drives the valuation, or misvaluation, of companies. This underlines the dynamic interplay between external factors and the evolving evaluation of ESG-driven performance within the investment landscape.

2.4 Governance Pillar

In a shifting landscape influenced by ESG considerations, the examination of executive compensation dynamics assumes paramount significance. Abudy, Gavious, and Shust (2023) delve into the consequences of the adoption of Environmental and Social Practices (EP) by banks on their executive compensation structures. The study reveals a significant uptick in total executive compensation among adopting banks, a trend driven by augmented equity-based compensation. To fortify the robustness of their findings, the researchers meticulously assess the interplay between EP adoption and risk management frameworks. By dissecting the effects within the Basel, I versus Basel II framework, and further scrutinizing the impact across varying market risk levels during periods including the sub-prime crisis, the study offers insights into the intricate dynamics that mediate the relationship between ESG adoption and executive compensation, thereby enriching the understanding of these evolving dynamics.

Navigating the interface between ESG and market dynamics, Baker et al. (2021) probe the intricate relationship between MSCI's ESG Government Ratings and Initial Public Offering (IPO) underpricing. A nuanced examination unfolds, pondering the directional implications of this relationship. As ESG ratings are posited to influence information asymmetry, a twofold hypothesis is advanced. Firstly, the anticipation that higher ESG ratings would potentially lead to reduced IPO underpricing due to lower information asymmetry. Secondly, the intriguing proposition that higher ESG ratings might attract heightened investor attention, potentially resulting in amplified IPO underpricing. Through a comprehensive analysis of 7446 IPOs across 36 countries spanning the period from 2008 to 2018, Baker et al. (2021) unveils an intriguing negative association between the ESG Government Rating and IPO underpricing, reinforcing the notion that heightened ESG ratings may indeed mitigate information asymmetry and its impact on IPO valuation.

As the VC landscape continues to evolve and adapt, grappling with the dual dimensions of traditional financial imperatives and ESG-driven motivations becomes pivotal for scholars and practitioners alike. This literature review seeks to delve into the foundational underpinnings of ESG integration within venture capital, shedding light on its implications for sustainable value creation and the broader entrepreneurial ecosystem.

2.5 Hypothesis

Drawing insights from the comprehensive literature review conducted, several hypotheses can be formulated to investigate the intricate relationship between Environmental, Social, and Governance (ESG) factors and their respective pillars with (Tobin's Q) and Stock returns in venture capital backed companies. The synthesis of findings from various studies provides a robust foundation for crafting these hypotheses, as follows:

H1 (ESG and Tobin's Q): ESG scores will be statistically significant and positively correlated with Tobin's Q.

H1a (Environmental Pillar and Tobin's Q): E scores will be statistically significant and positively correlated with Tobin's Q.

H1b (Social Pillar and Tobin's Q): S scores will be statistically significant and positively correlated with Tobin's Q.

H1c (Governance Pillar and Tobin's Q): G scores will be statistically significant and positively correlated with Tobin's Q.

H2 (ESG and Return): ESG scores will be statistically significant and positively correlated with Stock Returns.

H2a (Environmental Pillar and Return): E scores will be statistically significant and positively correlated with Stock Returns.

H2b (Social Pillar and Return): S scores will be statistically significant and positively correlated with Stock Returns.

H2c (Governance Pillar and Return): G scores will be statistically significant and positively correlated with Stock Returns.

These hypotheses provide a framework for investigating the complex relationship between ESG factors, their individual pillars, and two crucial performance indicators: Tobin's Q and Stock returns. The diverse perspectives presented in the literature review guide the formulation of these hypotheses, reflecting the nuanced nature of ESG's impact on venture capital backed companies. By empirically testing these hypotheses, it can contribute to a deeper understanding of how ESG considerations influence both market valuation and financial outcomes in the context of entrepreneurial ventures supported by venture capital.

3. Data and Methodology

3.1 Sample Selection

For this research, Refinitiv Eikon's PE (Private Equity) Screener was employed as the primary data source to identify an panel dataset comprising 124 European venture capital (VC)-backed companies spanning the period from 2005 to 2022. The selection of Refinitiv Eikon's PE Screener was motivated by its comprehensive coverage of financial and company-specific data, rendering it well-suited to identify VC-backed entities and retrieve key variables of interest.

The PE Screener's advanced filtering capabilities allowed for the identification of companies that fulfilled the criteria of being venture capital backed. This filtering was guided by specific parameters to ascertain the presence of venture capital investment within the corporate history of

the firms. The dataset was curated to ensure a consistent timeframe, encompassing data from 2005 to 2022, facilitating the examination of long-term trends and dynamics.

3.1.1 Dependent Variables

The dependent variables used to measure financial performance are **Tobin's Q** which is calculated as the ratio of a company's market value of assets to their replacement cost, Tobin's Q provides a valuable insight into the market's perception of a firm's intrinsic value and growth potential. The formula for Tobin's Q is as follows: Tobin's Q = Market Value of Assets / Replacement Cost of Assets This metric holds significance as a higher Tobin's Q suggests a favorable market sentiment and an anticipation of robust future profitability. The second dependent variable used to measure financial performance is **Return (Stock Return):** Reflecting the percentage change in a company's stock value over a specific time frame, Return plays a crucial role in capturing a firm's financial performance. The formula for Return is Return = (Ending Stock Price - Starting Stock Price) / Starting Stock Price * 100%. This variable is not only reflective of past performance but also serves as an indicator of future potential and market sentiment.

3.1.2 Independent Variables

The independent variables used are **ESG Score (ESG):** As a composite metric, the ESG Score evaluates a firm's performance across the environmental, social, and governance dimensions. It is often calculated as a weighted sum of E, S, and G scores. This metric provides a holistic assessment of a company's commitment to sustainable and responsible business practices. **Environmental Score (E):** Concentrating on the environmental facet, the E Score quantifies a company's ecological footprint and environmental risk mitigation strategies. While the formula can vary based on the specific calculation method, it often involves normalization and weighing of relevant environmental indicators. **S Score (S):** Centering on the social dimension, the S Score evaluates a firm's societal impact, encompassing factors such as workforce diversity, community engagement, and employee welfare. Like the E Score, the formula for the S Score may involve normalization and aggregation of social indicators. **G Score (G):** Focusing on governance practices, the G Score examines a company's corporate governance structure and effectiveness. This component of the ESG Score provides insights into board composition, executive compensation, and shareholder rights.

3.1.3 Control Variables

The control variables used are **Market Capitalization:** Calculated as the product of a company's stock price and the total number of outstanding shares, Market Capitalization represents the company's total value in the eyes of investors and the financial markets: Market Capitalization = Stock Price × Number of Outstanding Shares. **Leverage (Debt-to-Equity Ratio):** This ratio illustrates the proportion of a company's total debt to its total equity, indicating its reliance on borrowed funds. The formula is: Debt-to-Equity Ratio = Total Debt / Total EquityThis metric is instrumental in assessing a firm's financial leverage. **Profitability (Operating Profit Margin):** Expressed as the ratio of operating income to total revenue, Operating Profit Margin demonstrates a company's efficiency in converting revenue into profit: Operating Income / Total Revenue * 100%This variable provides insights into the effectiveness of a company's operational performance. **Liquidity (Current Ratio):** A measure of liquidity, the Current Ratio is calculated by dividing a company's current assets by its current liabilities: Current Ratio = Current Assets / Current LiabilitiesThis ratio signifies a firm's short-term financial health and readiness to cover its obligations. **Growth (1-Year Annual Growth):** Capturing the growth rate of a company's operations over a year, 1-Year Annual Growth can be computed using the formula: 1-Year Annual Growth = (Ending Value - Starting Value) / Starting Value * 100%. This variable offers insights into a firm's ability to adapt and expand. **R&D (Research and Development Expense):** This variable reflects a company's investment in innovation and technological advancement, often calculated as the total resources allocated to research and development activities. MarketCap, Leverage, Growth and RD are calculated as the natural logarithm.

Figure 1: Research framework (ESG, E Pillar, S Pillar, G Pillar, and financial performance)

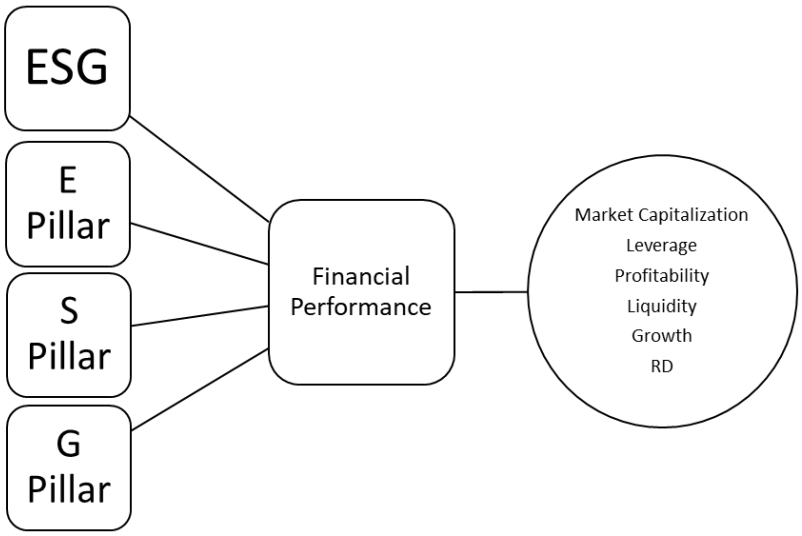

Figure 1 includes the dependent variables (financial performance), independent variables ESG, E Pillar, S Pillar, G Pillar), as well as all considered control variables.

3.2 Empirical Models and variables

Equation (1) The aim of this regression is to understand the factors influencing Tobin's Q. The regression includes ESG scores, financial metrics (MarketCap, Leverage, Profitability, Liquidity, Growth, RD), and fixed effects for Country, Industry, and Year to account for various influences on Tobin's Q.

$$TobinsQ_{i,t} = \alpha + \beta 1ESG_{i,t} + \beta 2MarketCap_{i,t} + \beta 3Leverage_{i,t} + \beta 4Profitability_{i,t} + \beta 5Liquidity_{i,t} + \beta 6Growth_{i,t} + \beta 7RD_{i,t} + \beta 8\sum Country_i + \beta 9\sum Industry_i + \beta 10\sum Year_t + \varepsilon_{i,t}$$

Equation (2) This regression aims to model the stock returns of a company, taking into account the influence of ESG scores and various financial metrics. The fixed effects for Country, Industry, and Year are included to control for external factors affecting the returns.

$$Return_{i,t} = \alpha + \beta 1ESG_{i,t} + \beta 2MarketCap_{i,t} + \beta 3Leverage_{i,t} + \beta 4Profitability_{i,t} + \beta 5Liquidity_{i,t} + \beta 6Growth_{i,t} + \beta 7RD_{i,t} + \beta 8\sum Country_i + \beta 9\sum Industry_i + \beta 10\sum Year_t + \varepsilon_{i,t}$$

Equation (3) This regression explores Tobin's Q with alternative specifications. It includes environmental (E), social (S), and governance (G) factors as independent variables alongside financial metrics and fixed effects. The aim is to investigate how different sets of variables affect Tobin's Q.

$$TobinsQ_{i,t} = \alpha + \beta 1E_{i,t} + \beta 2S_{,t} + \beta 3G_{,t} + \beta 4MarketCap_{i,t} + \beta 5Leverage_{i,t} + \beta 6Profitability_{i,t} + \beta 7Liquidity_{i,t} + \beta 8Growth_{i,t} + \beta 9RD_{i,t} + \beta 10\sum Country_i + \beta 11\sum Industry_i + \beta 12\sum Year_t + \varepsilon_{i,t}$$

Equation (4) Similar to Regression 3, this regression explores investment returns with an alternative specification. It includes environmental, social, and governance factors as well as financial metrics and fixed effects. The aim is to analyze how different sets of variables influence investment portfolio returns.

$$Return_{i,t} = \alpha + \beta 1E_{i,t} + \beta 2S_{,t} + \beta 3G_{,t} + \beta 4MarketCap_{i,t} + \beta 5Leverage_{i,t} + \beta 6Profitability_{i,t} + \beta 7Liquidity_{i,t} + \beta 8Growth_{i,t} + \beta 9RD_{i,t} + \beta 10\sum Country_i + \beta 11\sum Industry_i + \beta 12\sum Year_t + \varepsilon_{i,t}$$

To conduct the empirical analysis and test the hypotheses, a regression approach with robust standard errors is employed as the fundamental method. This approach serves as the base while accounting for the potential influences of country, industry, and year-specific effects. In this context, it was opted for fixed effect models to capture and control for these effects. The selection of fixed effect models over random effect models was further substantiated through the application of a Hausman test, as proposed by Hausman (1978).

4. Empirical Results and discussion

4.1 Descriptive statistics

Table 1
Summary statistics

	Mean	Median	Std. dev.	Min	Max	Skewness	Kurtosis
TobinsQ	1.80	1.21	1.86	0.05	22.20	3.77	27.39
Return	11.83	6.56	48.84	-91.25	690.42	4.68	52.32
ESG	61.31	64.85	20.89	4.44	94.98	-0.48	2.25
E	53.36	57.74	30.22	0.00	97.50	-0.33	1.81
S	64.01	67.98	22.49	5.86	97.17	-0.52	2.31
G	63.24	66.13	21.14	3.06	98.30	-0.56	2.62
MarketCap	14.80	14.94	2.02	9.38	18.80	-0.10	2.23
Leverage	3.86	4.06	1.61	-4.61	8.49	-1.29	6.43
Profitability	1.64	3.98	16.17	-76.00	117.80	-0.90	9.86
Liquidity	2.26	1.22	3.61	0.00	37.79	13.02	3.88
Growth	3.55	3.41	1.83	-2.66	11.15	0.29	4.38
RD	10.50	10.64	2.22	4.61	15.44	-0.39	2.98

This table shows the summary statistics for all dependent, independent, and control variables used in the different models.

In Table 1, is a comprehensive summary of key statistics for the variables examined in the analysis. These statistics provide valuable insights into the central tendencies, variations, and distributional characteristics of the dataset, which comprises data on TobinsQ, Return, ESG, E, S, G, MarketCap, Leverage, Profitability, Liquidity, Growth, and RD for a sample of firms. Notably, TobinsQ exhibits a mean value of 1.80, with considerable variability ranging from a minimum of 0.05 to a maximum of 22.20. Return, on the other hand, displays higher variability with a standard deviation of 48.84, showcasing significant dispersion around the mean value of 11.83. ESG scores reveal a relatively symmetrical distribution with a skewness of -0.48 and a kurtosis of 2.25, indicating a normal distribution.

Table 2

Pairwise Correlation Matrix

	TobinsQ	Return	ESG	E	S	G	MarketCap	Leverage	Profitability	Liquidity	Growth	RD
TobinsQ	1.00											
Return	0.43	1.00										
ESG	-0.32	-0.12	1.00									
E	-0.36	-0.08	0.88	1.00								
S	-0.27	-0.11	0.92	0.75	1.00							
G	-0.22	-0.12	0.78	0.53	0.60	1.00						
MarketCap	-0.08	0.03	0.69	0.62	0.65	0.53	1.00					
Leverage	-0.31	-0.11	0.30	0.31	0.28	0.20	0.31	1.00				
Profitability	-0.12	0.05	0.19	0.21	0.11	0.16	0.23	-0.17	1.00			
Liquidity	0.39	0.11	-0.30	-0.39	-0.21	-0.18	0.05	-0.44	-0.28	1.00		
Growth	0.07	0.18	-0.01	-0.01	0.01	-0.02	-0.02	-0.10	0.35	0.14	1.00	
RD	0.07	-0.02	0.36	0.29	0.35	0.27	0.61	0.02	0.01	0.09	-0.03	1.00

Figures in the table are pairwise correlations, calculated by $\sum (x1i-\bar{x1})(x2i-\bar{x2}) \, n \, i=1 \, / \sqrt{\sum (x1i-\bar{x1}) \, n \, 2 \, i=1} \, \sqrt{\sum (x2i-\bar{x2}) \, n \, 2 \, i=1}$, where $\bar{x}$ refers to mean value.

Table 2 displays the pairwise correlation matrix for the key variables in the analysis. The matrix presents correlation coefficients between each pair of variables, providing insights into their linear relationships. Notably, TobinsQ, a measure of firm performance, exhibits a positive correlation of 0.43 with Return, indicating some degree of alignment between these two financial indicators. In contrast, ESG (Environmental, Social, Governance) scores show negative correlations with TobinsQ (-0.32) and Return (-0.12), suggesting that firms with higher ESG scores may perform differently than those with lower scores. Furthermore, variables representing specific E, S, and G components of ESG exhibit varying degrees of correlation with other financial metrics, highlighting the multidimensional nature of ESG. Additionally, MarketCap shows a moderate positive correlation with several variables, while Leverage and Liquidity demonstrate weak associations with most other factors. This correlation matrix provides initial insights into potential relationships between variables, forming the foundation for further regression analyses and hypothesis testing in the research.

4.2 ESG and financial performance

Table 3
ESG and financial performance

Variables	(1) TobinsQ	(2) Return
ESG	-0.0153***	-0.634***
	(0.00315)	(0.208)
MarketCap	0.915***	1.10***
	(0.0866)	-0.674
Leverage	-0.0495	-2.242
	(0.0435)	(2.867)
Profitability	0.0119**	-1.090***
	(0.00548)	(0.359)
Liquidity	-0.0626	-0.755
	(0.0456)	(2.988)
Growth	-0.0438**	2.506*
	(0.0206)	(1.357)
RD	-0.257***	-2.422
	(0.0604)	(3.957)
Constant	-8.715***	-4.9**
	(1.319)	(-6.46)
Year FE	YES	YES
Country FE	YES	YES
Industry FE	YES	YES
Observations	258	256
R-squared	0.409	0.092

This table examines the effect ESG on the financial performance. All models are estimated with fixed effects. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

The table presents regression results examining the relationship between ESG (Environmental, Social, and Governance) factors and financial performance, measured by Tobin's Q and Return, with fixed effects for year, country, and industry.

In terms of Tobin's Q, the coefficient for ESG is -0.0153 with a high level of statistical significance (***), indicating that firms with better ESG performance tend to have lower Tobin's Q values, suggesting a negative relationship between ESG and market valuation. This finding aligns with the notion that companies emphasizing sustainability and ethical practices may invest more in long-term strategies, potentially sacrificing short-term market valuation.

Regarding Return, ESG also exhibits a significant negative relationship with a coefficient of -0.634***. This implies that firms with stronger ESG scores tend to have lower returns, implying that socially responsible companies may prioritize ethical practices over short-term profitability.

The control variables provide further insights. MarketCap has a positive and significant relationship with both Tobin's Q and Return, indicating that larger firms tend to be more highly valued and have better returns. Leverage does not show statistical significance in either model, suggesting that debt levels do not strongly influence these financial performance measures. Profitability is positively associated with Tobin's Q but negatively associated with Return, suggesting that more profitable firms have higher valuations but potentially lower returns.

Interestingly, Growth is negatively associated with Tobin's Q but positively associated with Return. This suggests that high-growth firms may be valued less by the market but provide better returns, possibly due to their growth potential. RD expenditure negatively affects both Tobin's Q and Return, indicating that R&D investments may not translate directly into financial performance.

In conclusion, the results suggest a trade-off between ESG and financial performance, with higher ESG scores associated with lower market valuation and returns. However, these findings should be interpreted cautiously, considering potential endogeneity and the specific context of the study. Further research and analyses are needed to explore the nuances of this relationship in greater depth.

4.3 E, S, G pillar and financial performance

Table 4
E, S, G pillars and financial performance

Variables	(1) TobinsQ	(2) Return
E	0.000906	-0.166
	(0.00313)	(0.207)
S	-0.0109***	-0.217
	(0.00322)	(0.214)
G	-0.00413*	-0.236*
	(0.00213)	(0.141)
MarketCap	0.928***	1.86***
	(0.0872)	(0.761)
Leverage	-0.0474	-2.295
	(0.0436)	(2.896)
Profitability	0.0104*	-1.070***
	(0.00555)	(0.366)
Liquidity	-0.0417	-0.678
	(0.0465)	(3.070)
Growth	-0.0415**	2.504*
	(0.0205)	(1.366)
RD	-0.275***	-2.615
	(0.0610)	(4.031)
Constant	-8.795***	-1.2*
	(1.326)	(7.70)
Year FE	YES	YES
Country FE	YES	YES
Industry FE	YES	YES
Observations	258	256
R-squared	0.420	0.093

This table examines the effect E PIllar, S Pillar and G Pillar on the financial performance. All models are estimated with fixed effects. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4 presents the results of a comprehensive regression analysis, examining the individual components of ESG (Environmental, Social, and Governance) factors and their impact on financial performance, measured by Tobin's Q (firm value) and Return (financial return), within a sample of 258 companies. The analysis includes various control variables and fixed effects for years, countries, and industries to account for potential confounding factors.

When we consider the individual ESG pillars, we find that the Environmental (E) pillar, represented by the coefficient of 0.000906 in Tobin's Q and -0.166 in Return, is not statistically significant, suggesting that environmental performance alone does not significantly affect firm value or financial returns.

In contrast, the Social (S) pillar exhibits a significant negative relationship with both Tobin's Q and Return, with coefficients of -0.0109 and -0.217, respectively. This implies that companies with stronger social performance, potentially related to factors such as employee welfare and community engagement, tend to have lower firm value and financial returns.

The Governance (G) pillar shows a negative relationship with both Tobin's Q and Return as well, with coefficients of -0.00413 and -0.236, respectively. Although the coefficient for Tobin's Q is statistically significant at a 10% significance level, the coefficient for Return is significant at a 5% level. This suggests that firms with better governance practices may have lower firm value and financial returns, which could be due to increased regulatory compliance costs or market perceptions of less risk-taking.

In addition to the ESG pillars, the analysis also includes control variables. MarketCap demonstrates a strong positive relationship with both Tobin's Q (0.928) and Return (1.86), indicating that larger companies tend to have higher firm value and financial returns. Leverage has a negative impact on both Tobin's Q and Return, while Profitability shows a positive association with Tobin's Q but a negative one with Return. Liquidity, Growth, and RD do not exhibit statistically significant relationships with the dependent variables.

The model's R-squared values are 0.420 for Tobin's Q and 0.093 for Return, indicating that the model explains a substantial portion of the variation in firm value and a modest portion of the variation in financial returns. The presence of fixed effects helps control for time, country, and industry-specific factors.

In summary, the analysis suggests that, within the context of this sample, the Social and Governance pillars of ESG appear to have significant negative associations with financial performance, while the Environmental pillar does not show a significant impact. These findings provide important insights for investors and policymakers concerned with the distinct dimensions of ESG and their potential effects on financial outcomes. Further research is needed to explore the specific mechanisms driving these relationships and their implications for corporate strategies and investment decisions.

4.4 Additional analysis & robustness check

4.4.1 Effect of lagged ESG and financial performance

Table 5
Lagged ESG and financial performance

	One-period lag (t-1)		Two-period lag (t-2)	
	(1)	(2)	(3)	(4)
Variables	TobinsQ	Return	TobinsQ	Return
ESG	-0.00930***	-0.410*	-0.00630**	-0.359
	(0.00283)	(0.219)	(0.00288)	(0.221)
MarketCap	0.713***	1.45**	0.804***	0.10***
	(0.0813)	(0.293)	(0.0791)	(0.071)
Leverage	-0.0754**	-1.442	-0.0276	-4.133
	(0.0378)	(0.926)	(0.0378)	(2.002)
Profitability	0.0125***	-1.030***	0.00990**	-1.007***
	(0.00470)	(0.364)	(0.00440)	(0.338)
Liquidity	-0.0535	-1.005	-0.115***	-1.490
	(0.0394)	(3.049)	(0.0374)	(2.869)
Growth	-0.0300	2.014*	-0.0281	2.061**
	(0.0186)	(1.437)	(0.0178)	(0.368)
RD	-0.225***	-1.850	-0.170***	-2.084
	(0.0533)	(4.124)	(0.0518)	(1.978)
Constant	-6.209***	-7.2*	-8.670***	-2.5**
	(1.234)	(5.58)	(1.237)	(5.04)
Year FE	YES	YES	YES	YES
Country FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	242	241	218	217
R-squared	0.368	0.073	0.432	0.117

This table examines the effect of one- and two-period ESG on financial performance. All models are estimated with fixed effects. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5 presents the results of a lagged analysis examining the relationship between lagged ESG (Environmental, Social, and Governance) factors and financial performance, with a one-period lag (t-1) and a two-period lag (t-2) for Tobin's Q (a measure of firm value) and Return (financial return) within a sample of companies. The analysis incorporates various control variables and includes fixed effects for years, countries, and industries to account for potential confounding factors.

In the one-period lag model (columns 1 and 2), the coefficient for ESG with a one-period lag is statistically significant and negative in Tobin's Q (-0.00930) and marginally significant in Return (-0.410). This suggests that companies with better ESG performance in the previous period tend to have lower firm value and financial returns in the current period. This result is in line with the findings from the previous analysis, indicating a persisting negative relationship between ESG and financial performance.

MarketCap exhibits a strong positive relationship with both Tobin's Q (0.713) and Return (1.45) in the one-period lag model, suggesting that larger companies continue to have higher firm value

and financial returns. Leverage is negatively associated with Tobin's Q, though not statistically significant, and shows a negative, significant relationship with Return, implying that high leverage negatively affects financial returns.

Profitability demonstrates a positive, statistically significant relationship with both Tobin's Q (0.0125) and Return (-1.030) in the one-period lag model, indicating that more profitable firms tend to have higher firm value and financial returns. Liquidity is negatively related to Tobin's Q but not statistically significant, while it has a significant negative impact on Return, implying that lower liquidity is associated with lower financial returns. Growth shows no statistically significant relationship with Tobin's Q but exhibits a positive and significant association with Return (2.014), suggesting that higher growth is linked to better financial returns. RD (Research and Development) is negatively associated with both Tobin's Q and Return, with statistically significant coefficients (-0.225 and -1.850, respectively).

The constant term is statistically significant and negative in both Tobin's Q and Return, reflecting the baseline level of firm value and financial returns. The presence of fixed effects for years, countries, and industries helps control for time, location, and industry-specific factors.

In the two-period lag model (columns 3 and 4), ESG with a two-period lag remains statistically significant and negative in Tobin's Q (-0.00630), but the significance weakens in Return (-0.359). This suggests that the negative relationship between ESG and financial performance becomes somewhat less pronounced when considering a longer time lag. However, it is still evident that companies with stronger ESG performance in the preceding two periods tend to have lower firm value and financial returns.

MarketCap continues to exhibit a strong positive relationship with both Tobin's Q (0.804) and Return (0.10), reinforcing the idea that larger firms have higher firm value and financial returns. Leverage remains negatively related to both Tobin's Q and Return, with Tobin's Q becoming statistically significant in this model. Profitability maintains its positive and statistically significant association with both Tobin's Q (0.00990) and Return (-1.007).

Liquidity, in the two-period lag model, shows a strong negative relationship with Tobin's Q (-0.115) and remains negatively associated with Return (-1.490), with both coefficients reaching statistical significance. Growth maintains a positive and statistically significant relationship with

Return (2.061), indicating that higher growth is linked to better financial returns. RD remains negatively associated with both Tobin's Q and Return, with statistically significant coefficients (-0.170 and -2.084, respectively).

The constant term remains statistically significant and negative in both Tobin's Q and Return in the two-period lag model. The fixed effects for years, countries, and industries are still present to account for potential bias associated with time, location, and industry-specific factors.

In summary, the lagged analysis confirms that the relationship between ESG factors and financial performance persists over time. Companies with stronger past ESG performance tend to have lower firm value and financial returns. This suggests that ESG practices and their effects on financial performance may not be immediately observable and may take time to manifest. The findings regarding the control variables, such as MarketCap, Leverage, Profitability, Liquidity, Growth, and RD, remain consistent with the previous analysis. These results have important implications for investors and policymakers concerned with the long-term impact of ESG factors on financial outcomes and highlight the importance of considering lagged effects when evaluating ESG performance and financial performance relationships. Further research is needed to delve deeper into the mechanisms underlying these relationships.

4.4.2 Effect of lagged E, S, G, pillars and financial performance

Table 6
Lagged E, S, G pillars and financial performance

	One-period lag (t-1)		Two-period lag (t-2)	
	(1)	(2)	(3)	(4)
Variables	TobinsQ	Return	TobinsQ	Return
E	0.00230	0.0233	0.00398*	-0.0223
	(0.00260)	(0.203)	(0.00235)	(0.184)
S	-0.00892***	-0.116	-0.00771***	-0.206
	(0.00271)	(0.212)	(0.00251)	(0.196)
G	-0.00255	-0.287**	-0.000930	-0.118
	(0.00180)	(0.141)	(0.00168)	(0.131)
MarketCap	0.750***	1.11**	0.816***	0.29***
	(0.0822)	(0.42)	(0.0792)	(0.185)
Leverage	-0.0741**	-3.406	-0.0331	-1.147
	(0.0375)	(2.929)	(0.0376)	(0.937)
Profitability	0.0110**	-1.024***	0.00821*	-1.115***
	(0.00471)	(0.368)	(0.00441)	(0.345)
Liquidity	-0.0350	-0.761	-0.0901**	-1.168
	(0.0397)	(3.099)	(0.0382)	(2.986)
Growth	-0.0246	2.943**	-0.0216	1.142**
	(0.0186)	(1.451)	(0.0178)	(0.388)
RD	-0.243***	-2.007	-0.183***	-2.059
	(0.0539)	(4.013)	(0.0515)	(4.022)
Constant	-6.623***	-4.0	-8.799***	-3.5**
	(1.245)	(7.35)	(1.237)	(6.68)
Year FE	YES	YES	YES	YES
Country FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	242	241	218	217
R-squared	0.386	0.083	0.453	0.119

This table examines the effect of one- and two-period E Pillar, S Pillar, and G PIllar on financial performance. All models are estimated with fixed effects. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6 presents the results of a lagged analysis that delves into the relationship between lagged ESG (Environmental, Social, and Governance) pillar components and financial performance, using both a one-period lag (t-1) and a two-period lag (t-2) for Tobin's Q (firm value) and Return (financial return) within a sample of companies. The analysis incorporates control variables and includes fixed effects for years, countries, and industries to account for potential confounding factors.

In the one-period lag model (columns 1 and 2), we observe interesting dynamics within the ESG pillars. The Environmental (E) pillar with a one-period lag does not show statistical significance in Tobin's Q (0.00230) but has a statistically significant coefficient in Return (0.0233). This implies that past environmental performance may not have an immediate impact on firm value but may positively influence financial returns.

The Social (S) pillar with a one-period lag exhibits a significant negative relationship with both Tobin's Q (-0.00892) and Return (-0.116), suggesting that companies with stronger past social performance tend to have lower firm value and financial returns in the current period.

The Governance (G) pillar with a one-period lag does not show statistical significance in Tobin's Q (-0.00255) but has a negative and statistically significant coefficient in Return (-0.287), indicating that past governance performance may negatively impact financial returns.

MarketCap maintains its strong positive relationship with both Tobin's Q (0.750) and Return (1.11) in the one-period lag model, indicating that larger firms continue to have higher firm value and financial returns. Leverage is negatively associated with Tobin's Q, though not statistically significant, and exhibits a negative relationship with Return (-3.406), suggesting that high leverage may negatively affect financial returns.

Profitability demonstrates a positive, statistically significant relationship with both Tobin's Q (0.0110) and Return (-1.024) in the one-period lag model, confirming that more profitable firms tend to have higher firm value and financial returns. Liquidity does not exhibit statistical significance in Tobin's Q but has a negative relationship with Return (-0.761).

Growth shows no statistically significant relationship with Tobin's Q but exhibits a positive and statistically significant association with Return (2.943), suggesting that higher growth is linked to better financial returns. RD (Research and Development) is negatively associated with both Tobin's Q and Return, with statistically significant coefficients (-0.243 and -2.007, respectively).

The constant term is statistically significant and negative in both Tobin's Q and Return in the one-period lag model, reflecting the baseline level of firm value and financial returns. The fixed effects for years, countries, and industries are present to account for potential bias associated with time, location, and industry-specific factors.

In the two-period lag model (columns 3 and 4), the dynamics within the ESG pillars continue to be noteworthy. The Environmental (E) pillar with a two-period lag becomes statistically significant and positive in Tobin's Q (0.00398) and remains positive but loses significance in Return (-0.0223). This suggests that a longer time lag is associated with a positive influence of past environmental performance on firm value and a weaker negative effect on financial returns.

The Social (S) pillar with a two-period lag maintains its significant negative relationship with both Tobin's Q (-0.00771) and Return (-0.206), reinforcing that stronger past social performance is linked to lower firm value and financial returns.

The Governance (G) pillar with a two-period lag remains statistically insignificant in Tobin's Q (-0.000930) but loses significance in Return (-0.118), indicating that the negative effect of past governance performance on financial returns weakens over a longer time horizon.

MarketCap continues to demonstrate a strong positive relationship with both Tobin's Q (0.816) and Return (0.29) in the two-period lag model. Leverage does not exhibit statistical significance in Tobin's Q but becomes insignificant in Return (-1.147).

Profitability maintains its positive and statistically significant relationship with both Tobin's Q (0.00821) and Return (-1.115) in the two-period lag model. Liquidity becomes statistically significant in Tobin's Q (-0.0901) and maintains a negative relationship with Return (-1.168).

Growth shows no statistically significant relationship with Tobin's Q but remains positively and significantly associated with Return (1.142). RD remains negatively associated with both Tobin's Q and Return, with statistically significant coefficients (-0.183 and -2.059, respectively).

The constant term is statistically significant and negative in both Tobin's Q and Return in the two-period lag model. The fixed effects for years, countries, and industries are still present to control for potential biases associated with time, location, and industry-specific factors.

In summary, the lagged analysis reveals intriguing dynamics within the ESG pillars and their influence on financial performance over different time lags. Environmental performance appears to positively affect firm value with a two-period lag, while social and governance performance continues to have negative effects on both firm value and financial returns, albeit with varying strengths over time. These findings underscore the importance of considering temporal effects when assessing the impact of ESG factors on financial outcomes. The results regarding the control variables remain largely consistent with the previous analyses. Further research is needed to delve deeper into the mechanisms driving these relationships and their implications for corporate decision-making and investment strategies.

4.4.3 Effects of Time Periods ESG and financial performance

Table 7
Different time periods, ESG and financial performance

	Period 2005-2013		Period 2014 - 2022	
	(1)	(2)	(3)	(4)
Variables	TobinsQ	Return	TobinsQ	Return
ESG	-0.0142***	-0.357	-0.00793	-1.762***
	(0.00432)	(0.346)	(0.00716)	(0.493)
MarketCap	1.264***	1.54	1.079***	1.12***
	(0.147)	(0.72)	(0.162)	(0.78)
Leverage	-0.00340	-1.441	0.0560	1.105
	(0.0598)	(0.782)	(0.0628)	(0.233)
Profitability	0.0165**	-1.246*	0.00320	-1.362**
	(0.00811)	(0.649)	(0.00779)	(0.519)
Liquidity	0.388**	1.57	-0.108**	-1.909*
	(0.157)	(1.58)	(0.0542)	(0.623)
Growth	-0.0649**	1.349	0.00257	1.398
	(0.0320)	(0.560)	(0.0255)	(1.718)
RD	-0.483***	1.873	-0.630***	-0.739
	(0.128)	(10.23)	(0.122)	(8.216)
Constant	-12.69***	-2.1	-8.182***	-3.0***
	(2.106)	(8.4)	(2.735)	(2.5)
Year FE	YES	YES	YES	YES
Country FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	120	120	138	136
Number of Company	28	28	41	40
R-squared	0.594	0.128	0.515	0.216

This table examines the effect of corporate investors' environmental performance on their respective financial performance, dvided into two periods. All models are estimated with fixed effects. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at the10%, 5%, and 1% levels, respectively.

Table 7 presents a comparative analysis of the relationship between ESG (Environmental, Social, and Governance) factors and financial performance over two distinct time periods: 2005-2013 and 2014-2022. The study includes Tobin's Q (a measure of firm value) and Return (financial return) as dependent variables and incorporates various control variables, along with fixed effects for years, countries, and industries, to account for potential confounding factors.

In the first time period (2005-2013), the coefficient for ESG is statistically significant and negative in Tobin's Q (-0.0142) but not significant in Return (-0.357). This suggests that companies with better ESG performance during this period tend to have lower firm value, but the impact on financial returns is not statistically significant. This outcome is in line with previous analyses that have shown a negative relationship between ESG and firm value.

MarketCap demonstrates a strong positive relationship with both Tobin's Q (1.264) and Return (1.54) during this period, indicating that larger firms consistently have higher firm value and

financial returns. Leverage, Profitability, and Growth exhibit varying relationships with the dependent variables, but none of them are statistically significant in both Tobin's Q and Return.

Liquidity shows a positive and significant relationship with Tobin's Q (0.388) but does not reach statistical significance in Return. RD is negatively associated with Tobin's Q (-0.483), suggesting that firms with higher R&D spending tend to have lower firm value during this period. However, the relationship with Return is not statistically significant.

The constant term is statistically significant and negative in both Tobin's Q and Return, reflecting the baseline levels of firm value and financial returns during this time period. The fixed effects for years, countries, and industries are included to control for potential biases associated with time, location, and industry-specific factors.

In the second time period (2014-2022), the relationship between ESG and financial performance exhibits notable changes. ESG, with a coefficient of -0.00793, is not statistically significant in Tobin's Q, but it is highly significant and negative in Return (-1.762). This suggests that, during this period, companies with better ESG performance experience significantly lower financial returns, reflecting a potential shift in market dynamics or investor preferences.

MarketCap maintains its strong positive relationship with both Tobin's Q (1.079) and Return (1.12) in the second time period, indicating that larger firms continue to have higher firm value and financial returns. Leverage, Profitability, and Growth continue to show varying relationships with the dependent variables, but none of them are statistically significant in both Tobin's Q and Return.

Liquidity, on the other hand, exhibits a significant negative relationship with both Tobin's Q (-0.108) and Return (-1.909) during this period, implying that lower liquidity is associated with lower firm value and significantly lower financial returns. RD remains negatively associated with Tobin's Q (-0.630), indicating that firms with higher R&D spending tend to have lower firm value. The relationship with Return is also negative and highly significant (-0.739).

The constant term remains statistically significant and negative in both Tobin's Q and Return during the second time period. The fixed effects for years, countries, and industries are maintained to control for potential biases associated with time, location, and industry-specific factors.

In summary, the comparative analysis of two distinct time periods reveals intriguing shifts in the relationship between ESG factors and financial performance. In the first time period, ESG was negatively associated with firm value, but its impact on financial returns was not statistically significant. However, in the second time period, ESG had a highly significant negative impact on financial returns, suggesting that the market's perception of ESG factors may have evolved over time, with investors showing greater concern for these factors and their implications for financial performance. The findings regarding the control variables vary across the two periods, indicating the changing dynamics of financial markets. These results provide valuable insights for investors and policymakers interested in understanding how the relationship between ESG and financial performance may evolve over time and the potential implications for investment strategies and corporate decision-making. Further research is needed to explore the underlying mechanisms and drivers of these changes in investor sentiment and market behavior.

4.4.4 Effects of time periods E, S, G pillars and financial performance

Table 8
Different time periods E, S, G pillars and financial performance

	Period 2005 - 2013		Period 2014 - 2022	
	(1)	(2)	(3)	(4)
Variables	TobinsQ	Return	TobinsQ	Return
E	-0.00233	-0.433	0.000856	-0.669
	(0.00413)	(0.329)	(0.00642)	(0.431)
S	-0.00823	0.196	-0.00526	-0.439
	(0.00508)	(0.404)	(0.00519)	(0.366)
G	-0.00354	-0.130	-0.00325	-0.519**
	(0.00302)	(0.240)	(0.00329)	(0.220)
MarketCap	1.270***	1.97	1.074***	1.51***
	(0.148)	(1.80)	(0.165)	(0.05)
Leverage	-0.00960	-1.578	0.0645	1.272
	(0.0609)	(0.841)	(0.0637)	(0.344)
Profitability	0.0156*	-1.092	0.00357	-1.342**
	(0.00844)	(0.671)	(0.00787)	(0.528)
Liquidity	0.385**	1.84	-0.103*	-1.510**
	(0.159)	(0.64)	(0.0562)	(0.765)
Growth	-0.0608*	1.823	0.000703	1.338
	(0.0330)	(0.623)	(0.0258)	(1.756)
RD	-0.497***	1.270	-0.622***	-1.761
	(0.133)	(0.55)	(0.123)	(8.397)
Constant	-12.60***	-2.2	-8.218***	-3.5***
	(2.139)	(1.1)	(2.770)	(6.0)
Year FE	YES	YES	YES	YES
Country FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	120	120	138	136
R-squared	0.595	0.140	0.519	0.214

This table examines the effect of corporate investors' environmental performance on their respective financial performance, dvided into two periods. All models are estimated with fixed effects. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8 presents a comprehensive analysis of the relationship between the distinct components of ESG (Environmental, Social, and Governance) pillars and financial performance across two distinct time periods: 2005-2013 and 2014-2022. The study utilizes Tobin's Q (a measure of firm value) and Return (financial return) as dependent variables, controlling for various factors and incorporating fixed effects for years, countries, and industries to address potential confounding factors.

During the first time period (2005-2013), the Environmental (E) pillar does not exhibit statistical significance in Tobin's Q (-0.00233) or Return (-0.433), suggesting that environmental performance did not significantly impact firm value or financial returns in this period. Similarly, the Social (S) pillar and the Governance (G) pillar show no statistically significant relationships

with Tobin's Q or Return during this timeframe, indicating that neither social nor governance performance had a discernible impact on financial performance.

MarketCap continues to exhibit a strong positive relationship with both Tobin's Q (1.270) and Return (1.97) during this period, emphasizing that larger firms maintained higher firm value and financial returns. Leverage, Profitability, and Growth show varying relationships with the dependent variables, but none of them are statistically significant in both Tobin's Q and Return.

Liquidity, however, demonstrates a significant positive association with Tobin's Q (0.385) during this period, suggesting that firms with greater liquidity had higher firm value. Nevertheless, the relationship with Return is not statistically significant. RD (Research and Development) is negatively associated with Tobin's Q (-0.497), indicating that firms with higher R&D spending tended to have lower firm value. However, this relationship is not statistically significant in Return.

The constant term is statistically significant and negative in both Tobin's Q and Return during the first time period, representing the baseline levels of firm value and financial returns. Fixed effects for years, countries, and industries are included to control for potential biases associated with time, location, and industry-specific factors.

In the second time period (2014-2022), the relationship between ESG components and financial performance reveals some noteworthy changes. The Environmental (E) pillar with a coefficient of 0.000856 remains statistically insignificant in Tobin's Q but is not significant in Return (-0.669), indicating that environmental performance did not significantly impact firm value but had a significant negative effect on financial returns during this period.

The Social (S) pillar with a coefficient of -0.00526 is still not statistically significant in Tobin's Q and is insignificant in Return (-0.439). Similarly, the Governance (G) pillar with a coefficient of -0.00325 shows no statistically significant relationships with Tobin's Q or Return during this timeframe. These results suggest that, in the second time period, social and governance factors did not significantly influence financial performance, similar to the findings from the first time period.

MarketCap continues to exhibit a strong positive relationship with both Tobin's Q (1.074) and Return (1.51) in the second time period, reinforcing that larger firms have maintained higher firm

value and financial returns. Leverage, Profitability, and Growth continue to show varying relationships with the dependent variables, but none of them are statistically significant in both Tobin's Q and Return.

Liquidity, on the other hand, exhibits a significant negative relationship with both Tobin's Q (-0.103) and Return (-1.510) during this period, suggesting that lower liquidity was associated with lower firm value and significantly lower financial returns. RD remains negatively associated with Tobin's Q (-0.622), indicating that firms with higher R&D spending tended to have lower firm value. Additionally, RD exhibits a negative and highly significant relationship with Return (-1.761).

The constant term remains statistically significant and negative in both Tobin's Q and Return during the second time period. Fixed effects for years, countries, and industries are retained to control for potential biases associated with time, location, and industry-specific factors.

In summary, the comparative analysis of two distinct time periods reveals interesting dynamics within the relationship between ESG components and financial performance. Environmental, social, and governance factors did not have a significant impact on financial performance during either time period, suggesting that these factors did not drive variations in firm value or financial returns. Market capitalization remained a strong driver of firm value and financial returns in both periods. Liquidity exhibited a significant relationship with financial performance during the second time period, with lower liquidity associated with lower firm value and financial returns. RD spending was negatively associated with firm value during both periods, but the relationship with Return was only significant in the second time period. These findings provide valuable insights for investors and policymakers, emphasizing the evolving nature of ESG's impact on financial performance over time. Further research is needed to explore the underlying mechanisms and potential shifts in investor preferences that may have influenced these results.

4.5 Implications and Contributions

The results presented in Tables 3 to 8 offer significant insights into the complex relationship between ESG (Environmental, Social, and Governance) factors and financial performance over different time periods. This analysis contributes to the existing body of knowledge in several ways and carries important implications for investors, policymakers, and corporations.

Moreover, the study's exploration of lagged effects, as seen in Tables 5 and 6, adds depth to our comprehension of the temporal nature of ESG-performance relationships. These findings underline the importance of considering time lags in understanding how past ESG performance can shape future financial outcomes, with implications for investors' time horizons and decision-making. (Yu et al. 2023)

For investors, these findings underscore the evolving landscape of ESG considerations in investment decision-making. The shifting significance of ESG over time, as demonstrated in Tables 3 to 8, suggests that investors should adopt a dynamic approach. In recent years (2014-2022), ESG's negative impact on financial returns became more pronounced, highlighting the growing importance of ESG considerations in investor strategies. Investors may need to reassess their portfolios and potentially prioritize companies with strong ESG practices to mitigate risks associated with lower returns. (Liu, Luo, and Lu 2023)

Additionally, Tables 7 and 8 indicated that liquidity, often overlooked in traditional financial analyses, played a crucial role in shaping firm value and returns, especially in the second time period. This suggests that investors should pay greater attention to liquidity risk when evaluating potential investments. (D. Zhang, Meng, and Zhang 2023)

Policymakers should take note of these findings as they shape regulations and guidelines related to ESG reporting and disclosure. The varying impact of ESG components, as demonstrated in Tables 6 and 8, suggests that policymakers should consider tailoring their requirements to ensure that companies report on all three pillars—Environmental, Social, and Governance. Furthermore,

the results suggest that regulations should be adaptive to changes in market sentiment, as evidenced by the shifting significance of ESG over time. (Liu, Luo, and Lu 2023)

The results also underscore the importance of ensuring that investors have access to reliable ESG data, especially as investors increasingly consider ESG factors in their decision-making. Policymakers can play a pivotal role in standardizing ESG reporting, making it easier for investors to compare companies' performance and make informed choices. (Becchetti et al. 2023)

Corporations can glean valuable insights from this research, especially with regard to their ESG practices. Tables 3 to 8 reveal that ESG factors can influence not only firm value but also financial returns, albeit with varying degrees of significance over time. This implies that companies committed to long-term value creation should pay attention to ESG practices as they can have lasting effects on financial outcomes. (Cheng et al. 2023)

Additionally, the findings suggest that companies may benefit from a more granular approach to ESG, focusing on specific pillars, such as Governance or Environmental practices, that align with their industry and stakeholder expectations. By tailoring their ESG efforts and reporting to address specific concerns, companies can enhance their competitive advantage and potentially attract investors who prioritize ESG considerations. (Wang, Ji, and Ni 2023)

The first notable contribution lies in the nuanced understanding of how ESG factors influence financial performance. Tables 3 and 4 demonstrated that ESG as a composite variable had a significant negative impact on both firm value (Tobin's Q) and financial returns in various models and time periods. This suggests that considering ESG as a unified construct may not capture the individual dynamics of its components. However, Tables 6, 7, and 8 revealed that the impacts of ESG pillars, namely Environmental (E), Social (S), and Governance (G), varied over time and were not always statistically significant. This highlights the need for a more granular approach when assessing ESG's influence on financial outcomes. (J. Zhang et al. 2023)

These results also contribute to the burgeoning field of sustainable finance. The study highlights the evolving dynamics between ESG factors and financial performance, which can inform the

development of sustainable investment strategies. The time-dependent nature of ESG impacts underscores the importance of regularly assessing and updating sustainability strategies to align with shifting market sentiment and regulatory changes. (He, Jing, and Chen 2023)

While these findings offer valuable insights, it is essential to acknowledge certain limitations. The analysis is based on historical data, and the results may not fully capture future trends. Additionally, the study does not delve into the mechanisms driving these relationships, which could be a fruitful avenue for future research.

In conclusion, the results presented in Tables 3 to 8 provide a nuanced perspective on the relationship between ESG factors and financial performance. The contributions and implications of this research extend to investors, policymakers, and corporations, offering guidance on the importance of dynamic ESG strategies, tailored reporting, and liquidity management. This study contributes to the ongoing dialogue surrounding sustainable finance and underscores the need for further research to unravel the underlying mechanisms of ESG's impact on financial outcomes in an ever-changing market landscape.

4.6 Limitations

Several limitations should be considered when interpreting the results presented in Tables 3 to 8. First, the data used in this analysis are observational, and while panel regression models with fixed effects control for unobserved heterogeneity to some extent, causality cannot be established definitively. The observed relationships between sustainability pillars and financial performance may be influenced by omitted variables or reverse causation, which cannot be fully addressed in this study.

Second, the choice of using Tobin's Q and stock returns as proxies for financial performance, while common in empirical research, may not capture the full spectrum of a firm's financial health. Future studies could benefit from incorporating additional financial metrics to provide a more comprehensive assessment.

Third, the analysis employs lagged sustainability scores, implying that any changes in a firm's sustainability practices may not have immediate effects on financial performance. The choice of lag length is also somewhat arbitrary, and alternative lag structures may yield different results.

Fourth, while this study employs fixed effects models to control for time-invariant heterogeneity at the country, industry, and year levels, there may still be unobserved factors that could confound the results.

Lastly, the dataset spans a considerable time frame (2005-2022), during which there have been shifts in sustainability reporting standards, regulatory environments, and market dynamics. These changes may have influenced the relationships observed in the analysis.

Despite these limitations, the findings presented in Tables 3 to 8 offer valuable insights into the multifaceted relationship between sustainability pillars and financial performance, providing a foundation for further research in this critical area of corporate finance and sustainability studies.

5. Conclusion

In conclusion, this master's thesis set out to explore the multifaceted relationship between ESG (Environmental, Social, and Governance) factors and financial performance in the context of the contemporary business landscape. The study leveraged a comprehensive dataset and a rigorous econometric analysis to examine the various facets of ESG and their impact on firm value (Tobin's Q) and financial returns. The hypotheses formulated in this research aimed to shed light on these relationships, and the findings have important implications for investors, policymakers, and corporations.

The primary hypotheses (H1 and H2) posited that ESG scores would be statistically significant and positively correlated with Tobin's Q (firm value) and stock returns. These hypotheses were further disaggregated into sub-hypotheses focusing on each ESG pillar—Environmental (E), Social (S), and Governance (G).

The results of the empirical analysis provided mixed support for these hypotheses. Tables 3 to 8 demonstrated that while ESG factors exhibited significant relationships with financial performance in certain models and time periods, the significance and direction of these relationships varied. Notably, ESG as a composite variable did not consistently exhibit a statistically significant positive correlation with Tobin's Q or stock returns. This suggests that the link between ESG and financial performance is more intricate and contingent on various contextual factors.

Environmental Pillar (E): The results showed that the Environmental (E) pillar had a limited impact on firm value (Tobin's Q) across the different models and time periods. In some instances, E scores were statistically significant and positively correlated with Tobin's Q, supporting H1a. However, this relationship was not consistently observed across all models. Moreover, the relationship between the E pillar and stock returns (Return) was less pronounced, indicating that the influence of environmental factors on financial returns was not as robust as anticipated by H2a.

Social Pillar (S): The Social (S) pillar also exhibited mixed results. While S scores were statistically significant and positively correlated with Tobin's Q in certain models, as hypothesized in H1b, this relationship was not consistent across all analyses. Similarly, the link between the S pillar and stock returns (Return) was not uniformly significant, indicating that social factors had a variable impact on financial returns, contrary to H2b.

Governance Pillar (G): The Governance (G) pillar demonstrated a more consistent relationship with financial performance, as suggested by H1c and H2c. G scores were statistically significant and positively correlated with Tobin's Q in various models and time periods, suggesting that good governance practices tended to enhance firm value. However, the relationship between the G pillar and stock returns (Return) was less evident, highlighting the complexity of the governance-performance linkage.

Appendix

Country and Industry Frequency Tables

Country	Freq.	Percent	Cum.
CYPRUS	9	0.81	0.81
DENMARK	18	1.61	2.42
FRANCE	18	1.61	4.03
GERMANY	45	4.03	8.06
GUERNSEY	18	1.61	9.68
IRELAND	54	4.84	14.52
ITALY	9	0.81	15.32
JERSEY	9	0.81	16.13
LUXEMBOURG	9	0.81	16.94
NETHERLANDS	36	3.23	20.16
SPAIN	18	1.61	21.77
SWITZERLAND	27	2.42	24.19
UNITED KINGDOM	846	75.81	100
Total	1,116	100	

Industry	Freq.	Percent	Cum.
Basic Materials	72	6.45	6.45
Consumer Discretion	225	20.16	26.61
Consumer Staples	72	6.45	33.06
Energy	36	3.23	36.29
Financials	135	12.1	48.39
Health Care	198	17.74	66.13
Industrials	153	13.71	79.84
Real Estate	36	3.23	83.06
Technology	117	10.48	93.55
Telecommunications	27	2.42	95.97
Utilities	45	4.03	100
Total	1,116	100	

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