THE IMPACT OF ESG SCORES ON STOCK PERFORMANCE: THE CASE OF BORSA ISTANBUL

A Master's Thesis

by
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March 2024

To my family

THE IMPACT OF ESG SCORES ON STOCK PERFORMANCE: THE CASE OF BORSA ISTANBUL

The Graduate School of Economics and Social Sciences
of
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by

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by Ekin Bayram

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science in Business Administration.

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ABSTRACT

THE IMPACT OF ESG SCORES ON STOCK PERFORMANCE: THE CASE OF BORSA ISTANBUL

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March 2024

This thesis investigates the impact of Environmental, Social, and Governance (ESG) scores on the returns of stocks listed on Borsa Istanbul (BIST). The analysis incorporates yearly differences and percentage changes in ESG scores, along with ESG ratings. The sample consists of 62 Turkish companies from 2007 to 2022. Despite ongoing debates in the literature regarding the relevance of sustainability metrics on stock performance, this study provides robust evidence supporting a negative relationship between changes in ESG scores and stock returns. This relationship is more pronounced in yearly differences in ESG scores compared to percentage changes. The findings remain consistent after accounting for firm and industry characteristics, and conducting various robustness checks. The negative impact of changes in ESG scores on stock returns suggests that these changes in scores indicate stock riskiness. Specifically, a decline in yearly difference in ESG scores corresponds to an increase in stock risk, leading to an increased premium demanded by investors and impacting stock returns.

Keywords: Sustainability, ESG, Borsa Istanbul, Emerging Markets, Stock Returns.

ÖZET

ESG PUANLARININ HISSE PERFORMANSI ÜZERINE ETKISI: BORSA ISTANBUL

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Tez Danışmanı: Assoc. Prof. Dr. Ahmet Şensoy

Mart 2024

Bu tez, Çevresel, Sosyal ve Yönetişim (ESG) skorlarının Borsa İstanbul'da (BIST) işlem gören hisse senetlerinin getirileri üzerindeki etkisini incelemektedir. Analizde, ESG puanlarındaki yıllık farklılıklar ve yüzdesel değişimlerin yanı sıra firmaların ESG derecelendirmeleri de kullanılmıştır ve data 2007 ile 2022 yılları arasında 62 Türk şirketinden oluşmaktadır. Literatürdeki sürdürülebilirlik ölçütlerinin hisse senedi getirilerini açıklamadaki uygunluğuna ilişkin tartışmalara rağmen, bu araştırma ESG puanlarındaki değişiklikler ile hisse senedi getirileri arasındaki negatif ilişkiyi destekleyen güçlü kanıtlar bulmuştur. Bu ilişkinin ESG puanlarındaki yıllık farklılıklarda daha belirgin olduğu gözlemlenmiştir. Firma ve sektör özellikleri kontrol edildikten ve çeşitli dayanıklılık kontrolleri yapıldıktan sonra sonuçlar tutarlı kalmıştır. ESG puanlarındaki değişimlerin hisse senedi getirileri üzerindeki olumsuz etkisi, derecelendirmelerdeki değişimin hisse senedi riskliliğini belirttiğine işaret etmektedir. ESG skorundaki yıllık düşüş, hisse senedi riskindeki artışı gösteriyor, bu da yatırımcıların talep ettiği primin ve hisse senedi getirilerinin artmasına neden oluyor.

Anahtar sözcükler: Sürdürülebilirlik, ESG, Borsa İstanbul, Gelişmekte Olan Piyasalar, Hisse Senedi Getirileri.

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CHAPTER 1

INTRODUCTION

This thesis investigates the impact of ESG scores on the returns of stocks listed on Borsa Istanbul (BIST). Over the past decade, there has been a surge in interest in sustainable investment, driven by a growing global awareness of sustainability issues and the expanding literature on sustainability within the business domain (Schröder, 2020). The Environmental (E), Social (S), and Governance (G) pillars have emerged as pivotal outcomes of this heightened sustainability awareness, with an increasing number of stakeholders expecting companies to demonstrate a strong commitment to ESG initiatives, coupled with transparent reporting. However, this dedication requires firms to make significant investments and go to great lengths to align with the ESG criteria, leading to questions about the relevance of ESG scores in stock pricing.

Nevertheless, the ESG approach to sustainability gained remarkable recognition within the corporate and investment landscapes in the late 2010s (Consolandi et al., 2022). The United Nations Principles for Responsible Investment (UNPRI) had garnered over 2,300 signatories by 2019, collectively managing an impressive $86 trillion in assets under management (AUM). Furthermore, 90% of S&P companies released sustainability reports in the same year, emphasizing the increasing integration of ESG considerations in corporate practices. Additionally, a

global survey conducted by FTSE Russell in 2018 further highlights that most asset owners actively evaluate and integrate ESG considerations in their investment strategies. Simultaneously, within the Turkish context, the nation has committed to a 41% reduction in its emissions by 2030 and aims to achieve net-zero carbon emissions by 2053 (UN, 2023). Moreover, insights from Bain & Company's 2023 interview with 22 CEOs from 10 different sectors shed light on the growing significance of ESG in Turkey (Prioreschi & Guastella, 2023). According to the findings, ESG is increasingly becoming a core business concern, with 90% of CEOs prioritizing sustainable efforts. A notable 63% of CEOs believe that having an ESG agenda helps them predict risks, build resilience, and discover new opportunities to grow their business. However, 26% of respondents cited a lack of regulatory clarity and government incentive schemes as impediments to expediting change. Despite these challenges, 82% of CEOs believe they are ahead of their peers in incorporating ESG principles, a sentiment especially prevalent in companies with a global footprint, as international standards are considered more stringent. Thus, studying the impact of ESG scores on stock returns holds significance. As sustainable investing continues to gain momentum, understanding the dynamics between ESG considerations and stock performance becomes crucial for investors, analysts, and policymakers. ESG factors are no longer viewed merely as ethical considerations; they are increasingly recognized as drivers of financial success and risk mitigation for companies. Exploration of these dynamics provides invaluable insights into the evolving investor landscape and equips stakeholders with an understanding of the financial implications of corporate sustainability efforts. This knowledge is instrumental for making informed investment decisions, fostering corporate responsibility, and shaping the future trajectory of financial markets.

Despite the increasing prominence of ESG considerations in corporate spheres, a contentious debate persists within the finance literature regarding the relevance of sustainability metrics. Literature has presented conflicting findings, with some asserting a significant impact of ESG scores on stock performance (Albuquerque

et al., 2020; Díaz et al., 2021; Engelhardt et al., 2021), while others have found no relationship between ESG scores and returns (Demers et al., 2021; Limkriangkrai et al., 2017; Torre et al., 2020). However, this debate is predominantly centered on developed markets, resulting in a notable gap in the literature and leaving the dynamics of emerging markets relatively unexplored. In addressing this gap, this thesis contributes to the literature by extending the debate beyond developed markets and exploring the distinctive context of an emerging market, specifically Turkey. This study uses several multivariate linear regression models to explore the impact of changes in ESG scores on the stock returns of firms listed on BIST. The findings reveal a statistically significant negative relationship between changes in ESG scores and stock returns, while the ESG scores exhibit a positive impact on stock returns.

Given the ongoing debate, a comprehensive exploration of the historical evolution of sustainable investing and ESG principles is essential to contextualize the discourse better. Sustainable investment has taken different definitions across different time periods. The earliest occurrence dates back to the 1800s in the United States, involving the avoidance of investments conflicting with personal values, such as tobacco companies (Townsend, 2020). This informal practice persisted among socially conscious investors until the 1960s, when sustainable investment began to form into its modern shape. Termed socially responsible investment, it mirrored traditional practices by incorporating non-pecuniary benefits into investment decisions based on business activities alongside wealth maximization. However, this approach was susceptible to misjudgments due to limited public information on social responsibility. To address this, the United Nations launched the Global Compact in 2000, offering detailed principles contributing to the ESG framework and encouraging firms to adopt sustainable practices and report their efforts (UN, 2020). This initiative transformed socially responsible investment into a structured and comprehensive approach. The UN further advanced sustainable investment with the *"Who Cares Wins"* report by emphasizing the importance of ESG integration in investment decisions (UN, 2004). These initiatives defined the

contemporary approach to sustainable investment. Subsequently, the UN introduced the Sustainable Development Goals in 2015 as part of the 2030 Agenda for Sustainable Development, elevating the significance of ESG principles in both the public and private sectors (UN General Assembly, 2015).

The popularity of sustainable investing surged as a consequence of these global initiatives, and ESG has become the main driver of sustainable investment. Although the origins of the three pillars remain debatable, many researchers associate them with the Brundtland Report, Agenda 21, and the 2002 World Summit on Sustainable Development (Purvis et al., 2018). The Environmental Pillar includes climate change, deforestation, water scarcity, and pollution, while the Social Pillar focuses on human rights, labor standards, employee engagement, and diversity. The Governance Pillar focuses on topics such as lobbying, whistleblowing, bribery, and corruption. Providing a comprehensive approach to sustainability, ESG is a quantifiable assessment of sustainability and business practices.

The literature on sustainable finance has evolved significantly, tracing back to early debates on whether corporations bear Corporate Social Responsibility (CSR) responsibilities. In the early stages of CSR exploration, scholars viewed CSR as an agency cost, asserting that the primary responsibility of businesses is to maximize shareholder wealth (Friedman, 1970). However, early adopters such as Wartick and Cochran (1985) and Wood (1991) challenged this view, emphasizing that businesses are not isolated entities but moral agents within society. The literature evolved to introduce the concept of the stakeholder corporation, emphasizing the broader impact of operating a business (Godfrey, 2005; Magill et al., 2015). However, contrasting views have persisted in recent decades as some studies consider socially responsible investing weak corporate governance, potentially increasing agency costs (Barnea & Rubin, 2010; Brown et al., 2006; Masulis & Reza, 2015).

The literature also delves into specific financial aspects of CSR, exploring the cost of capital (Ghoul et al., 2011; Heinkel et al., 2001; Richardson & Welker, 2001;

Wong et al., 2021) and the cost of debt (Huynh & Xia, 2021; Goss & Roberts, 2011; Kiesel & Lücke, 2019; Nandy & Lodh, 2012). These papers present mixed results. Moreover, the risk-return perspective, exemplified by Lee and Faff (2009), suggests that lagging Corporate Social Performance (CSP) firms may experience higher returns, compensating for higher idiosyncratic risk.

Exploring times of uncertainty, recent studies delve into the impact of CSR practices on financial performance during uncertain periods (Albuquerque et al., 2020; Demers et al., 2021; Engelhardt et al., 2021; Ferriani & Natoli, 2021; Gianfrate et al., 2021). Additionally, the emerging focus on ESG factors, as highlighted by Díaz et al. (2021), Hübel and Scholz (2020), and Naffa and Fain (2022), further enriches the ongoing discourse in the literature.

This thesis extends this debate by focusing on the companies listed on Borsa Istanbul. The sample consists of 61 firms spanning the years 2007 to 2022. The analysis employs Bloomberg ESG scores to measure firm social responsibility performance, while current and subsequent year stock returns serve as performance indicators.

The analysis incorporates yearly differences and percentage changes and uses multivariate linear regression models to capture the impact of ESG performance on stock returns. The main findings reveal a negative relationship between changes in ESG scores and stock returns, with the influence of yearly differences being particularly prominent. The negative impact of ESG score changes implies that investors price the stock riskiness signaled by fluctuations in ESG scores.

Furthermore, the results remain consistent after robustness checks. The first robustness test uses market risk-adjusted returns as performance indicators, based on the capital asset pricing model. This method ensures that the returns do not reflect other risk factors and captures the impact of ESG scores. The second test follows Albuquerque et al. (2021) and utilizes ES scores, the average of environmental and social scores as a sustainability measure. This approach focuses on the

corporate social responsibility aspect of sustainability and omits the governance effect, which has been studied extensively. The findings in both robustness tests are consistent with the main results, reinstating the negative impact of changes in ESG scores. Consistently, the magnitude of the impact is more emphasized on yearly differences in scores.

The remainder of this thesis is structured as follows. Chapter 2 presents background information and a literature review, Chapter 3 describes the dataset and methodology employed in the analysis, Chapter 4 discusses the results and robustness tests, and Chapter 5 concludes.

CHAPTER 2

LITERATURE REVIEW

This thesis is directly related to the growing literature on sustainable finance, an interdisciplinary field that explores these topics from various perspectives. This section provides background information on the evolution of sustainable finance. While the field originates from areas such as firm valuation and corporate governance, its scope has broadened to include portfolio management and risk mitigation. Recent studies aim to explore the significance of ESG measures as a risk factor in various markets and present mixed results (Díaz et al., 2021; Ferriani & Natoli, 2021; Hübel & Scholz, 2020; Naffa & Fain, 2022; Lee & Faff, 2009).

Early discussions on sustainability and businesses revolved around Corporate Social Responsibility (CSR) and whether corporations should engage in such activities (Kitzmueller and Shimshack, 2012). Friedman (1970) takes a stance against CSR and emphasizes that businesses cannot have responsibilities as they are artificial people. Unlike businesses, corporate executives are real individuals who may feel social responsibilities beyond mere compliance with regulations and taxation. However, the author argues that investments in social responsibility are made at the expense of shareholders and other stakeholders. For instance, shareholders fund these investments, which reduce their returns. Product prices increase to compensate for this reduction, placing an added financial burden on customers. Moreover, Friedman (1970) anticipates that these changes may reflect negatively

on workers' wages, ultimately reducing the income of the working class. Overall, the article argues that investments in CSR beyond regulatory requirements are costlier for stakeholders than the benefits derived from CSR activities. Additionally, he argues that relying on managers to make appropriate socially responsible investment decisions is challenging because individuals have diverse perceptions regarding the significance of various social issues. Contrary to Friedman (1970)'s perspective, Wartick and Cochran (1985) were early adopters of CSR. This paper critiques the notion that businesses are entities that are detached from the context in which they exist. The authors assert that businesses are inherently meant to serve society; thus, they should adhere to the standards set by society in their conduct and operations. Consequently, businesses bear the responsibility of acting as moral agents within society, possessing the capacity to make moral decisions and exercise control over corporate acts. In light of this perspective, the paper develops a Corporate Social Performance (CSP) model that incorporates economic and public policy responsibility within its definition of social responsibility. Wood (1991), another early adopter, further extends Wartick and Cochran (1985)'s CSP model by offering an extensive definition of CSR and examines the topic in the context of Social Issues in Management (SIM). This study is crucial in demonstrating that SIM had a coherent structure in the early 1990s. As the concept of CSR continued to gain prominence in the early 2000s, businesses increasingly recognized the importance of adopting such practices. The Economist's 2008 article[1], *Just Good Business*, sheds light on the shifting attitudes towards CSR. It highlights that CSR has become a mainstream business activity driven by the pressure placed on firms following international scandals involving global industry leaders. As a result, corporate responsibility has surged in priority for global executives. According to a 2004 McKinsey survey, 95% of CEOs expressed that society's expectations for social responsibility from businesses had grown over the past five years. Consequently, $1 out of every $9 managed by US firms includes an element of CSR.

[1]https://www.economist.com/special-report/2008/01/19/just-good-business

As the significance of CSR grew, the academic discussions evolved from whether firms should engage in such activities. Instead, scholars turned their attention to assessing the impact and efficacy of CSR involvement (Kitzmueller and Shimshack, 2012). As a result, the literature evolves to deliberate on the stakeholder approach in contrast to the traditional shareholder approach. Scholars like Godfrey (2005) and Magill et al. (2015) introduced the concept of the stakeholder corporation. Magill et al. (2015) state that large corporations are exposed to endogenous risks that generate externalities impacting stakeholders that are not internalized by shareholders, leading to insufficient investment in risk prevention. Godfrey (2005) demonstrates that corporate giving generates positive moral capital for corporations, acting as "insurance-like" protection for a firm's relationship-based assets, ultimately contributing to shareholder wealth. However, it is worth noting that some scholars view socially responsible investing as weak corporate governance, associating it with increased agency costs (Barnea & Rubin, 2010; Brown et al., 2006; Masulis & Reza, 2015). For instance, Brown et al. (2006) show that firms with larger boards of directors tend to engage in more cash giving and are more likely to establish corporate foundations. Similarly, Masulis and Reza (2015) reveal that shareholders reduce their valuation of firm cash holdings as corporate giving increases because they anticipate a greater misuse of cash reserves. Furthermore, they observe that a CEO's connection to charitable organizations results in a 21.5% increase in corporate giving. On the other hand, Servaes and Tamayo (2013) offer a different perspective on the impact of CSR on firm value. They investigate the role of customer awareness in the firm's CSR efforts and find a positive relationship between CSR and firm value for firms with high customer awareness. Thus, the authors conclude that CSR activities can increase firm value, but only under certain conditions.

Another branch of the literature focuses on the impact of CSR on the cost of capital. Heinkel et al. (2001) propose an equilibrium model that explores the effect of exclusionary ethical investing on corporate behavior. This investment practice leads to polluting firms being held by fewer investors, which lowers their

stock prices, ultimately raising their cost of capital. The findings of the paper demonstrate that social investing can influence a firm's ethical behaviors since the firm would be compelled to reform if the rising cost of capital exceeds the cost of reforming. This study reveals that approximately 25% of the investor population must consist of green investors to overcome the cost of reforming. Building on the theoretical groundwork established by Heinkel et al. (2001), Ghoul et al. (2011) investigate the effect of CSR on the cost of capital and find consistent evidence. This paper shows that US firms with better CSR scores have higher valuation, lower risk, and lower cost of capital. Wong et al. (2021) extend this study by investigating the effect of ESG certification on Malaysian firms. Similarly, they observe that ESG certification reduces the cost of capital and significantly increases Tobin's Q. In particular, when a firm obtains an ESG rating, its cost of capital diminishes by 1.2%, and its Tobin's Q increases by 31.9%. In contrast, Richardson and Welker (2001) report opposing results. Their study demonstrates a significant positive relationship between social disclosure and the cost of equity capital. However, the authors emphasize that the content of the disclosures does not drive these results; the disclosure scores merely signal the completeness of the firm's financial and social disclosure without indicating the quality of the information. Thus, the authors highlight a crucial issue related to social disclosures, detecting significant biases in reporting as firms tend to self-promote through social disclosures. Moreover, it is possible that social responsibility investments consistently result in negative present value, thereby raising the overall risk associated with the firm.

Concurrently, scholars such as Goss and Roberts (2011), Nandy and Lodh (2012), Kiesel and Lücke (2019), and Huynh and Xia (2021) demonstrate the impact of CSR activities on the cost of borrowing. In their study, Goss and Roberts (2011) assign banks as monitors of firms. Their findings yield mixed results, revealing that low CSR firms tend to pay between 7 and 18 basis points more in borrowing costs compared to their more responsible counterparts. Notably, engaging in discretionary CSR spending does not lead to improved loan terms for low-quality borrowers who encounter higher loan spreads and shorter maturities

instead. Moreover, the study suggests that lenders are indifferent to CSR investments made by high-quality borrowers. Taking a different perspective on the cost of borrowing, Kiesel and Lücke (2019) explore the ESG consideration in rating reports published by credit rating agencies. Their contribution to the literature introduces a unique method, the latent Dirichlet allocation (LDA) approach, which serves as a topic modeling tool capable of classifying large corpuses into distinct topics. The study's findings include a small but present consideration of ESG in rating decisions. Furthermore, Huynh and Xia (2021) delve into the relationship between climate change news risk and US corporate bonds. Their research reveals that bonds associated with higher climate change news risk exhibit lower future returns. Notably, this relationship is particularly pronounced during periods characterized by high climate change risk.

While there are studies that provide evidence linking CSR investments to firm valuation, cost of capital, and borrowing costs, others delve into the causal relationship, probing whether companies invest in CSR because they are performing well or if there are external factors at play. Hong et al. (2012) contribute to this discourse by stating that variability in a company's financial constraints leads to a misleading association between profits and CSR investments, even if non-profit motives primarily drive these actions. The authors show that firms tend to do good when they perform well through investigating corporate CSR behavior during the Internet bubble. The results demonstrate that previously constrained firms experienced a temporary relaxation during the Internet bubble, and their goodness temporarily increased. Further, when compared to a less-constrained counterpart, a constrained company experiences a more substantial boost in its sustainability score when its equity valuation increases and its cost of capital reduces. On the other hand, Liang and Renneboog (2017) criticize the prevailing approach to the foundations of CSR activities. They note that the existing literature identifies two prevalent explanations for corporate investment in CSR: the notion that CSR enhances profitability and firm value and that only financially strong companies can afford to engage in CSR initiatives. However, these theories do not explain the

cross-firm or cross-country variation in CSR. The authors challenge these views, suggesting that external factors, particularly legal origin, are more significant in driving CSR activities. Specifically, firms in civil law countries have higher CSR scores compared to their counterparts in common law countries.

Corporate finance literature presents mixed evidence regarding the impact of corporate giving on firm value. Studies in this field often debate whether CSR is a value-enhancing factor or an indicator of increased agency costs, which, in turn, affect the perceived riskiness of firms. Corporate finance theories typically view high risk as a value-diminishing factor. On the other hand, the risk-return tradeoff perspective suggests that greater risk should yield higher returns. For example, Lee and Faff (2009) illustrate this perspective in their study, revealing that the leading Corporate Sustainability Performance (CSP) portfolio underperforms its lagging counterpart. Notably, the leading CSP portfolio does not underperform the market portfolio, but the lagging portfolio outperforms both. Additionally, the authors find that the lagging CSP portfolio exhibits higher idiosyncratic risk, which leads to higher returns compensating for the increased risk.

In the late 2010s, the ESG approach to sustainability gained remarkable traction within the corporate and investment landscapes (Consolandi et al., 2022). By 2019, the United Nations Principles for Responsible Investment (PRI) had garnered over 2,300 signatories, collectively managing an impressive $86 trillion in assets under management (AUM). The number of S&P companies that published sustainability reports reached 90% in the same year. Furthermore, a 2018 global survey by FTSE Russell reveals that most asset owners actively incorporate or assess ESG considerations in their investments. During this period of boom, several asset pricing theory papers have emerged. For instance, Pedersen et al. (2021) develop a theory that states firms' ESG scores have two roles: serving investors by providing information on firm fundamentals and affecting investor preferences. The paper proposes an ESG-efficient frontier, which indicates the optimal Sharpe ratio for each ESG level, and they demonstrate that an investor optimally chooses

a portfolio on this ESG-efficient frontier. Similarly, Pástor et al. (2021) model ESG criteria and find that green assets have low expected returns in equilibrium. Nonetheless, investors enjoy holding such assets because they derive utility by hedging against climate risk. Moreover, the model reveals that green assets outperform when there is an exogenous shock in the market, which captures investors' tastes for green holdings. Additionally, Bolton and Kacperczyk (2021) state that historically, carbon risk has been omitted while exploring the factors that impact stock returns. They investigate the effects of carbon risk on US stock returns and find that carbon emission is a perceived risk by the investors, and investors demand compensation for their exposure to risk, which is reflected in stock returns.

A critical challenge in research in sustainable finance is the potential endogeneity issue, which is the difficulty in identifying the direction of causality between ESG scores and firm performance. Utilizing the exogenous shock findings by Pástor et al. (2021), Albuquerque et al. (2020) explore this endogeneity issue by investigating the high ES-rated (excluding the Governance score) firms around an exogenous shock, the COVID-19 pandemic. They investigate the relationship utilizing difference-in-differences and cross-sectional analysis. Moreover, they consider the pre-pandemic ES ratings of the companies to eliminate the endogeneity problem. This paper establishes that stocks with higher ES ratings have higher returns, lower return volatility, and higher operating profit margins during the first quarter of 2020. Then, they introduce two mechanisms to explain these results: customer and investor loyalty. They show that ES firms with higher advertising expenditures experience higher stock returns, supporting the customer loyalty mechanism. Stocks held by more ES-oriented investors experience less return volatility during the crash, which supports the investor loyalty mechanism.

Building on the findings of Albuquerque et al. (2020), the literature delves deeper into investor preferences and their response to ESG considerations, especially in times of uncertainty. In their study, Ferriani and Natoli (2021) focus on investment preferences and ESG risk during the COVID-19 pandemic. Their findings indicate

that investors significantly took ESG risk into account during the pandemic and demanded low-ESG risk funds while discarding the high-ESG risk stocks. Extending Ferriani and Natoli (2021), Engelhardt et al. (2021) concentrate on the performance of European stocks during the pandemic. Their results indicate that firms with high ESG scores experienced significantly higher cumulative abnormal returns and significantly lower idiosyncratic volatility at the beginning of 2020. Similarly, Díaz et al. (2021) investigate the impact of ESG ratings on S&P 500 industry returns during the pandemic by introducing an ESG factor. Their findings indicate that the ESG factor contributes significantly to explaining industry returns in addition to the Fama-French factors. Moreover, Environmental and Social scores are the main drivers of the explanatory power, which is consistent with Albuquerque et al. (2020).

Building on the factor approach, Hübel and Scholz (2020) construct three risk factors for each ESG pillar, in addition to the Fama-French 6 Factor model. They show that portfolios with high ESG risk exposures exhibit significantly higher risks. Consequently, firms with low environmental ratings outperformed those with high environmental ratings. Further, firms with high social scores outperform less social firms during crisis times. The authors emphasize that the inclusion of the ESG factors significantly increases the explanatory power of standard asset pricing models.

Although some studies present robust evidence linking ESG scores to stock returns, a substantial body of research offers contrary findings. For instance, Demers et al. (2021) state that ESG and CSR activities do not improve the resilience of the stocks during crisis periods. The results reveal that ESG scores do not provide a meaningful explanation for stock performance during the COVID-19 pandemic once they are controlled for market-based measures of risk. Similarly, Torre et al. (2020) investigate the European market and find no impact of ESG commitments on the performance of Eurostoxx50 companies. Furthermore, Limkriangkrai et al. (2017) present a weak relationship between ESG scores and Australian stock

returns, extending the focus from American and European markets. They demonstrate no significant difference in risk-adjusted returns for portfolios based on ESG ratings. Expanding the geographic scope, Naffa and Fain (2022) investigate the impact of separate E, S, and G factors on global equity investments. In contrast to the findings by Hübel and Scholz (2020), this study does not find sufficient evidence to conclude that ESG factors complement the Fama-French 5 Factor model. Moreover, Gianfrate et al. (2021) explore the behavior of ESG stocks across global markets in the first quarter of 2020. The paper's results indicate little evidence that companies with higher ESG ratings exhibited superior performance worldwide, except for the United States. The paper emphasizes that the superiority of ESG stock returns is still debatable and it is geography-dependent.

2.1. Hypothesis Development

Literature reveals that low sustainability performance is associated with higher exposure to risk. For instance, the Carbon Risk Premium Hypothesis proposed by Bolton and Kacperczyk (2021) emphasizes that firms with high carbon emissions face various risks, including technological risk or regulatory interventions. Specifically, a firm with high carbon emissions is highly likely to be dependent on fossil fuels and it has a low ESG score, which increases its susceptibility to being replaced by environmentally sustainable counterparts. Consequently, investors demand a premium to compensate for exposure to such risks. While this hypothesis primarily pertains to the Environmental Pillar of ESG, there is a similar mechanism for each pillar and ESG principles overall. Similarly, Lee and Faff (2009) argue that the weak CSP portfolio exhibits higher idiosyncratic risk, and Díaz et al. (2021) emphasize that disregarding social responsibilities expose firms to significant risks, whereas a high ESG score signals a better capability to mitigate stakeholder-related risks. Moreover, Ghoul et al. (2011) demonstrates that higher corporate social responsibility is associated with higher valuation, lower cost of capital, and lower risk.

Based on the literature, I expect the investors to perceive low ESG scores as a risk factor for Turkish stocks and demand higher returns for their exposure. Thus, I hypothesize that there is a negative relationship between ESG scores and stock returns.

CHAPTER 3

DATA AND METHODOLOGY

This section describes the data used in the analysis and the research methodology employed to examine the impact of ESG ratings on stock returns listed on Borsa Istanbul (BIST). The dataset includes ESG scores, firm characteristics and industry controls. There are several sources of ESG scores from various ratings agencies and they differ in their scope and methodology. This thesis employs ESG scores provided by Bloomberg and Thomson Reuters Refinitiv. The primary results include Bloomberg ESG scores, while the results of an analysis using Refinitiv[1] ESG scores are presented in the Appendix. The analysis employs multivariate regressions to investigate the impact of the ESG scores on stock returns.

3.1. Data

The sample consists of 61 publicly traded companies listed on the Borsa Istanbul (BIST) between 2007 and 2022. The analysis uses Bloomberg ESG scores to measure firms' ESG performance and expand the dataset by adding stock and

[1]For robustness, the analysis extends to Refinitiv's ESG ratings obtained from Thomson Reuters Eikon. However, there are several reasons for preferring Bloomberg ESG scores: (1) The Refinitiv database contains information for only 94 Turkish companies, with only 54 companies having consistent scores between 2008 and 2021, further limiting the sample size and period. (2) Unlike Bloomberg, Refinitiv ESG scores are self-reported by the companies (Gianfrate et al., 2021). Thus, the ESG ratings suffer from possible bias in reporting. The results of the analysis with Refinitv's ESG scores are in the Appendix.

accounting data obtained from Bloomberg Terminal. The starting point for this analysis is 2007, as this is when Bloomberg ESG scores first became available for Turkish companies. Notably, while the BIST hosts a total of 467 public companies in this period, only 61 consistently maintained ESG scores suitable for this analysis.

Bloomberg ESG scores serve as the fundamental component in assessing ESG performance in this analysis. The annually updated scores range from 0 to 100, where a lower score indicates poorer sustainability practices, whereas a higher score reflects a more substantial commitment to sustainability. Bloomberg presents the scores individually for each pillar, offering insights into the specific aspects of ESG performance, while an aggregate ESG score combines these components to provide a holistic overview of a company's ESG profile (Bloomberg, 2018). Bloomberg employs several channels to gather ESG data, including corporate sustainability and social responsibility reports, regulatory filings, corporate materials, and company websites (Bellamy et al., 2020). Further, the researchers conduct meetings, phone interviews, and surveys to gather first-hand ESG insights. Their Sustainability Survey, based on Global Reporting Initiative (GRI) standards, helps fill gaps in publicly available data. Moreover, their method assigns weights to data points based on the firm's primary industry sector to account for industry-specific variations in environmental indicators' materiality. For instance, indicators like Greenhouse gas (GHG) emissions and water usage are more emphasized for semiconductor firms than those manufacturing healthcare equipment, reflecting the nuanced materiality considerations.

The analysis focuses on the impact of ESG scores on stock riskiness, which is captured by two transformation variables: yearly difference in ESG scores and percentage changes in ESG scores. The yearly difference between the scores (denoted by ΔESG) reflects how ESG scores change from one year to the next, while the percentage change between years (denoted by %ESG) provides insights into the relative shifts in ESG scores over time. These transformations augment the

Table 3.1: Description of Variables. This table provides definitions of the variables. Financial data and ESG ratings retrieved from Bloomberg.

Variable	Definition
Dependent variables:	
$\text{Return}_{i,t}$	Yearly stock returns calculated from yearly closing prices.
$\text{Return}_{i,t+1}$	Stock return in the following year.
Independent variables:	
ESG	ESG score of a firm.
ΔESG	Yearly difference between a firm's ESG scores. (Computed as $\text{ESG}_{i,t} - \text{ESG}_{i,t-1}$)
% ESG	Yearly percentage change in a firm's ESG scores. (Computed as ΔESG divided by $\text{ESG}_{i,t-1}$)
Control variables:	
TQ	Tobin's Q. Total assets minus the book value of equity plus market capitalization, divided by a firm's total assets.
ROE	Return on equity. Net income divided by market capitalization.
ROA	Return on assets. Net income divided by a firm's total assets.
MB	Market-to-book ratio. Market capitalization divided by the book value of equity.
CASH	Cash/Assets ratio. Cash divided by total assets.
ST DEBT	Short-Term Debt/Assets ratio. Short-term debt divided by total assets.
LT DEBT	Long-Term Debt/Assets ratio. Long-term debt divided total assets.

analysis, offering a deeper understanding of the relationship between ESG scores and stock returns. In conjunction with the ESG score, other variables integrated into the study include Tobin's Q, return on equity, return on assets, and the market-to-book ratio, consistent with prior research (Akdeniz et al., 2000; Engelhardt et al., 2021; Zeytinoğlu et al., 2012). Table 3.1 provides detailed definitions of the variables used in this analysis. Additionally, the analysis controls for industry effects to factor in the sector-specific nuances. Upon gathering ESG scores and accounting data on 467 public companies between 2007 and 2022, the filtering process excludes companies that received less than three scores alongside the

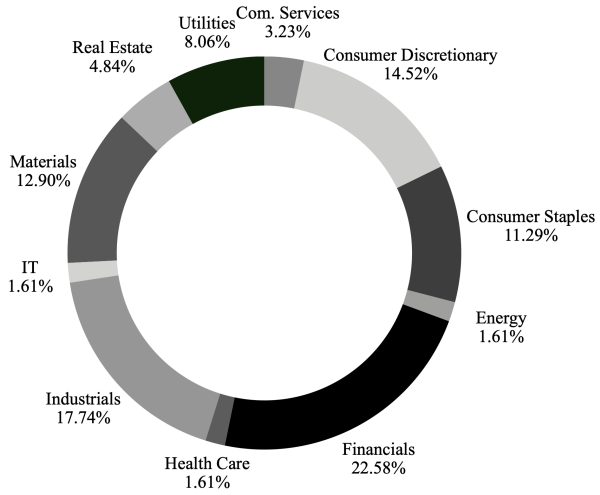

Figure 3.1: Firms per industry. This figure shows the weights of the 11 different industries classified by Bloomberg.

extreme data points. Ultimately, the dataset includes 61 companies, totaling approximately 1,000 data points over the course of 16 years. The sample is rather limited, but the sample size itself is a signal of the level of awareness and priorities of the companies listed on BIST. Nevertheless, this sample has representatives from all industries identified by Bloomberg (see Figure 3.1). Bloomberg classifies firms into 11 distinct industries. The distribution of companies with consistent ESG scores indicates that companies in the Financials, Industrials, and Consumer Discretionary sectors are the leaders in ESG reporting and rating considerations. In contrast, Energy, Health Care, and Information Technology sectors have the least amount of companies with ESG disclosures.

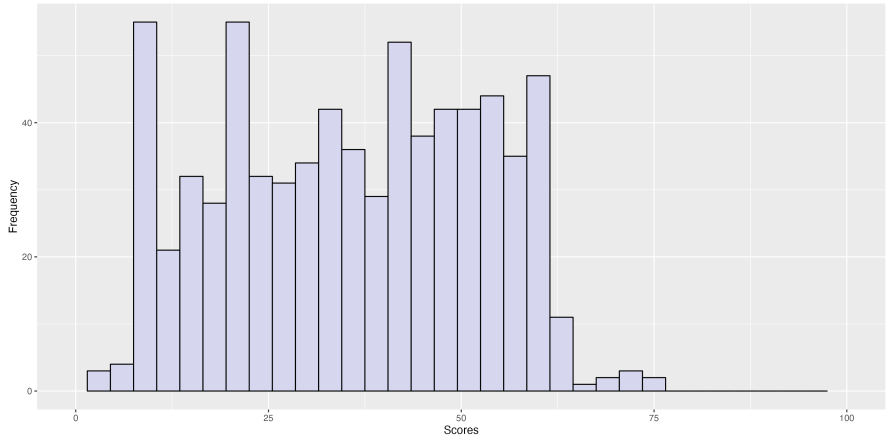

Figure 3.2: Histogram of Bloomberg ESG scores of companies listed on BIST.

Table 3.2: Descriptive Statistics. This table presents summary statistics for the variables used in this paper. The sample consists of 61 companies. The definitions of the variables are provided in Table 3.1.

Variable	Obs.	Minimum	Maximum	Mean	Median	Std.
Return (%)	895.00	-81.30	886.22	42.26	19.65	92.56
ESG	721.00	2.06	74.01	35.83	36.31	16.54
ΔESG	663.00	-15.25	43.80	2.54	0.79	5.20
%ESG	663.00	-0.88	4.82	0.11	0.02	0.30
TQ	904.00	0.24	6.66	1.36	1.12	0.78
ROE	933.00	-12.04	920.74	1.15	0.14	30.15
ROA	933.00	-0.27	0.52	0.06	0.04	0.08
MB	904.00	-467.32	231.59	1.59	1.32	19.41
CASH	933.00	0.00	0.73	0.13	0.10	0.11
ST DEBT	933.00	0.00	0.83	0.12	0.09	0.11
LT DEBT	932.00	0.00	0.86	0.16	0.11	0.16

Table 3.2 presents the summary statistics for the final dataset. Stock returns exhibit a wide range, with values ranging from -81.30% to 886.22%. The mean stock return over the 16 years is 42.26%. ESG scores range from a minimum of 2.06 to a maximum of 74.01, with a standard deviation of 16.54. The average ESG score is 35.83, slightly exceeding the global average of 23.83[2], but falling below the European average of 43.3[3] (Dorfleitner et al., 2015; D'Amato et al., 2021). The ESG score histogram[4] in Figure 3.2 illustrates that scores are predominantly concentrated below 50, with only a limited number of companies scoring above 60. Further, the range of the yearly difference in ESG scores (ΔESG) reveals that the highest downgrade in the ESG score in one year is 15.25 points, while the greatest increase is 43.8 points. On average, companies in this sample experienced 2.54 points yearly change in their ESG scores. The percentage change in scores (%ESG) shows that the maximum increase in the scores is as high as the quintuple of the previous year (481.82%), while a company was penalized as high as 88.09%

[2]The average Bloomberg ESG score of 8,561 companies worldwide between 2002-2012

[3]The average Bloomberg ESG score of companies included in the STOXX Europe 600 Index between 2014-2018

[4]Refer to Figure A1 in the Appendix for the histogram of Refinitiv ESG Scores for comparison.

Table 3.3: Correlation Matrix. This table displays the correlation coefficients for the variables used in this study.

	ESG	ΔESG	%ESG	TQ	ROE	ROA	MB	CASH	ST DEBT	LT DEBT	$\text{Return}_{i,t}$	$\text{Return}_{i,t+1}$
ESG	1.00	0.23	0.05	-0.03	-0.01	-0.12	0.02	-0.08	0.10	0.15	-0.01	0.12
ΔESG	0.23	1.00	0.84	-0.01	-0.02	-0.09	-0.01	-0.04	0.00	0.05	-0.05	-0.01
%ESG	0.05	0.84	1.00	-0.02	-0.03	-0.10	-0.01	-0.04	-0.01	0.06	-0.05	-0.06
TQ	-0.03	-0.01	-0.02	1.00	0.10	0.39	0.11	0.18	-0.07	-0.08	0.26	-0.08
ROE	-0.01	-0.02	-0.03	0.10	1.00	0.15	-0.83	0.01	-0.02	-0.03	0.03	-0.01
ROA	-0.12	-0.09	-0.10	0.39	0.15	1.00	0.05	0.35	-0.06	-0.39	0.11	0.00
MB	0.02	-0.01	-0.01	0.11	-0.83	0.05	1.00	0.05	0.00	0.01	0.06	-0.01
CASH	-0.08	-0.04	-0.04	0.18	0.01	0.35	0.05	1.00	-0.01	-0.19	0.03	0.03
ST DEBT	0.10	0.00	-0.01	-0.07	-0.02	-0.06	0.00	-0.01	1.00	-0.06	0.06	0.12
LT DEBT	0.15	0.05	0.06	-0.08	-0.03	-0.39	0.01	-0.19	-0.06	1.00	-0.05	0.02
$\text{Return}_{i,t}$	-0.01	-0.05	-0.05	0.26	0.03	0.11	0.06	0.03	0.06	-0.05	1.00	0.04
$\text{Return}_{i,t+1}$	0.12	-0.01	-0.06	-0.08	-0.01	0.00	-0.01	0.03	0.12	0.02	0.04	1.00

of its previous year's score. The firms in this sample gained a 10.88% increase in their ESG scores on average. Moreover, Tobin's Q exhibits a mean value of 1.36, while Return on Equity has a mean of 1.15. Return on Assets averages at 0.06. The Market-to-Book Ratio has a mean value of 1.59. The Cash/Assets ratio reports an average of 0.13, while the Short-Term Debt/Assets ratio and Long-Term Debt/Assets ratio have means of 0.12 and 0.16, respectively.

Next, the investigation includes a correlation analysis before exploring the relationship between returns and ESG scores through regression analysis. Table 3.3 presents the correlation coefficients among the variables included in this analysis. ESG scores exhibit a positive correlation with the market-to-book ratio, short-term debt-to-assets ratio, and long-term debt-to-assets. Conversely, ESG scores are negatively correlated with Tobin's Q, Return on Assets, and the Cash/Assets ratio. They show a modest but negative correlation with Returns and a stronger positive correlation with returns in the subsequent year. On the other hand, the yearly differences between ESG scores and the yearly percentage changes in ESG scores display negative relationships with returns and subsequent year returns. Moreover, Tobin's Q, ROA, and market-to-book ratio positively correlate with stock returns.

3.2. Methodology

Upon analyzing the descriptive statistics and conducting correlation analysis, the study employs OLS regressions to examine the relationship between ESG scores and stock returns further. First, the analysis explores the impact of the yearly difference in ESG scores on stock returns and estimate the following OLS regression:

$$\begin{aligned} \text{Stock Performance} = \beta_0 &+ \beta_1 \Delta\text{ESG}_{i,t} \\ &+ \sum \beta_m \text{Firm Controls} \\ &+ \sum \beta_n \text{Industry Fixed Effects} + \varepsilon_{i,t} \end{aligned} \tag{3.1}$$

where i denotes the firm and t denotes the year. Stock performance is measured by either stock returns for firm i in year t, or subsequent year returns, and $\Delta\text{ESG}_{i,t}$ denotes the yearly difference in ESG scores for firm i in year t. Additionally, the model incorporates firm-specific variables and industry fixed effects into the regression models as detailed in the previous section (see Table 3.1).

Next, the following regression investigates the effect of the yearly percentage change in ESG scores:

$$\begin{aligned} \text{Stock Performance} = \beta_0 &+ \beta_1 \%\text{ESG}_{i,t} \\ &+ \sum \beta_m \text{Firm Controls} \\ &+ \sum \beta_n \text{Industry Fixed Effects} + \varepsilon_{i,t} \end{aligned} \tag{3.2}$$

where stock performance can take the values of $\text{Return}_{i,t}$ or $\text{Return}_{i,t+1}$, and $\%\text{ESG}_{i,t}$ is the yearly percentage change in ESG scores. Similar to Equation 3.1, this analysis includes firm and industry controls.

Moreover, the following OLS regression analyzes the impact of ESG scores individually:

$$\begin{aligned} \text{Stock Performance} = \beta_0 + \beta_1 \text{ESG}_{i,t} \\ + \sum \beta_m \text{Firm Controls} \\ + \sum \beta_n \text{Industry Fixed Effects} + \varepsilon_{i,t} \end{aligned} \tag{3.3}$$

where $\text{ESG}_{i,t}$ denotes the ESG scores. This regression offers insight on the ESG score level impact in the corresponding and subsequent year.

After investigating the independent impact of these variables, the analysis combines them with the ESG score variable to capture more insight. However, an important aspect of this analysis is that including all the transformation variables in the same regression would expose the model to potential multicollinearity because of their high correlation. Thus, $\text{ESG}_{i,t}$ is introduced to the regressions encompassed by Equations 3.1 and 3.2 in Equation 3.4:

$$\begin{aligned} \text{Stock Performance} = \beta_0 + \beta_1 \text{ESG}_{i,t} + \beta_2 \text{ESG\_transform}_{i,t} \\ + \sum \beta_m \text{Firm Controls} \\ + \sum \beta_n \text{Industry Fixed Effects} + \varepsilon_{i,t} \end{aligned} \tag{3.4}$$

where $\text{ESG}_{i,t}$ denotes the ESG scores and $\text{ESG\_transform}_{i,t}$ represents the transformation variables. This regression analysis provides further insights on the impact of ESG scores and ESG score changes on stock returns.

CHAPTER 4

RESULTS

This chapter discusses the findings of the analysis and performs robustness tests. Table 4.1, which presents the main findings of this analysis, displays the results for Equations 3.1 and 3.2. The dependent variable in columns (1) and (2) is stock returns, and subsequent year stock returns in columns (3) and (4). Columns (1) and (3) explore the relationship between the yearly difference in a firm's ESG scores and stock returns in the corresponding and subsequent year, while columns (2) and (4) focus on the percentage change in a firm's ESG scores. All the regressions include firm characteristics and industry controls. Column (1) presents a highly statistically significant negative relationship between the yearly difference in ESG scores and stock returns. Moreover, Tobin's Q and ROA are statistically significant at the 1% level. However, the yearly difference in ESG scores loses its significance when regressed on Return_{t+1} in column (3). Similarly, the percentage change ESG scores has a statistically significant negative impact on stock returns, although the significance of the variable diminishes when regressed on subsequent year returns. However, the models in columns (3) and (4) have low explanatory power, as the adjusted R^2 values are close to zero. This regression analysis tests the hypothesis that ESG scores affect the riskiness of stocks, and the significant negative impact of change in ESG scores on stock returns supports this hypothesis. A decrease in ESG scores is associated with an increased perception of risk

by investors, leading to a heightened demand for risk premium.

Further, Table 4.2 investigates the impact of ESG score levels on stock riskiness. Columns (1) and (3) examine the relationship between ESG scores and stock returns without firm and industry controls, while columns (2) and (4) introduce firm characteristics, such as Tobin's Q and market-to-book ratio, and industry controls. All four regression results indicate a statistically significant positive relationship between ESG scores and the corresponding and subsequent year stock returns. The first column reveals that ESG is statistically significant at 5% level, and this significance increases as the model controls for firm and industry characteristics in column (2). In accordance with the literature, the coefficients of Tobin's Q and ROA are highly statistically significant and positive. Further, the impact of ESG scores is more pronounced on subsequent year returns than on returns in the corresponding year. Namely, the coefficient of the ESG score variable increases from 0.528 to 0.89 between columns (1) and (3) and from 0.63 to 1.002 between columns (2) and (4). Moreover, the ESG score variable coefficients in columns (3) and (4) are significant at 1% level. Additionally, the coefficients of Tobin's Q and ROA are insignificant in the fourth regression, whereas the short-term debt-to-assets ratio gains statistical significance. However, the explanatory power of these models is relatively low, with the adjusted R^2 figures close to zero. Column (2) exhibits the highest adjusted R^2, explaining 11.5% of the variation in stock returns.

The results of this analysis contradict the hypothesis and the findings presented in Table 4.1, as ESG score levels demonstrate a positive relationship with stock performance. The risk-return perspective anticipates a negative sign for ESG score levels, assuming they act as a risk mitigation measure. However, from a corporate finance standpoint, these results may be interpreted as higher ESG scores positively influence firm performance, consequently contributing to elevated stock performance (Heinkel et al., 2001; Ghoul et al., 2011).

Table 4.1: ESG score transformations and stock returns. This table presents the results from OLS regressions. In columns (1) and (2), the dependent variable is stock returns, while the dependent variable is subsequent year returns in columns (3) and (4). Independent variables in the regressions include yearly difference between a firm's ESG scores (ΔESG) and yearly percentage change in a firm's ESG scores (%ESG). The sample period is between 2007 and 2022. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	$\text{Return}_{i,t}$		$\text{Return}_{i,t+1}$	
	(1)	(2)	(3)	(4)
ΔESG	-1.873^{***}		-0.231	
	(0.005)		(0.753)	
%ESG		-25.06^{**}		-15.96
		(0.033)		(0.211)
TQ	33.638^{***}	33.562^{***}	-11.070	-10.697
	(0.000)	(0.000)	(0.131)	(0.144)
ROE	15.480^{*}	15.836^{*}	-2.297	-2.644
	(0.083)	(0.077)	(0.818)	(0.791)
ROA	193.449^{***}	193.612^{***}	63.570	57.563
	(0.003)	(0.003)	(0.449)	(0.493)
MB	0.969^{*}	0.988^{**}	-0.132	-0.149
	(0.054)	(0.050)	(0.813)	(0.790)
CASH	-41.143	-40.916	41.745	41.768
	(0.233)	(0.237)	(0.290)	(0.289)
ST DEBT	75.711^{*}	74.822^{*}	114.507^{**}	112.715^{**}
	(0.053)	(0.056)	(0.012)	(0.013)
LT DEBT	14.532	14.380	34.353	34.104
	(0.541)	(0.546)	(0.214)	(0.216)
Constant	-58.761^{***}	-60.371^{***}	2.363	3.303
	(0.008)	(0.007)	(0.927)	(0.897)
Observations	662	662	604	604
Adjusted R^2	0.130	0.125	0.006	0.008

Table 4.2: ESG scores and stock returns. This table presents the results from Ordinary Least Squares (OLS) regressions. In columns (1) and (2), the dependent variable is stock returns, while the dependent variable is subsequent year returns in columns (3) and (4). The sample period is between 2007 and 2022. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	$\text{Return}_{i,t}$		$\text{Return}_{i,t+1}$	
	(1)	(2)	(3)	(4)
ESG	0.528**	0.630***	0.890***	1.002***
	(0.013)	(0.004)	(0.0001)	(0.00004)
TQ		31.725***		−8.563
		(0.00000)		(0.186)
ROE		12.272		−3.519
		(0.152)		(0.699)
ROA		197.899***		48.519
		(0.002)		(0.532)
MB		0.792		−0.216
		(0.104)		(0.675)
CASH		−33.465		55.858
		(0.314)		(0.124)
ST DEBT		56.521		82.043**
		(0.111)		(0.036)
LT DEBT		8.703		29.054
		(0.709)		(0.260)
Constant	24.361***	−78.542***	13.145	−34.008
	(0.004)	(0.0005)	(0.124)	(0.171)
Industry FE	No	Yes	No	Yes
Observations	714	714	661	661
Adjusted R^2	0.007	0.115	0.022	0.031

Following Equation 3.4, the analysis incorporates ESG score levels and yearly differences in Table 4.3, and ESG and the percentage change in ESG in Table 4.4.[1] In Table 4.3, the dependent variable is stock returns in columns (1) and (2), while it is subsequent year returns in columns (3) and (4). Columns (1) and (3) focus on the main independent variables, excluding the firm and industry controls, while columns (2) and (4) include firm characteristics and industry controls. Consistent with the previous results, the yearly difference in ESG scores has a negative relationship with returns, while ESG scores exhibit a positive relationship. Both variables are highly statistically significant. Column (2) reveals that the impact of both variables remain significant when control variables are included. Similar to the previous results, firm characteristics follow the literature. When regressed on subsequent year returns, ESG scores remain positive and statistically significant. On the other hand, the yearly difference in ESG is not statistically significant, but there is still a negative relationship. Although the explanatory power of these regressions is lower than the results presented in Table 4.1 in general, the highest explanatory power of this investigation occurs in column (2).

Table 4.4 presents the rest of the results for Equation 3.4. The layout is similar to Table 4.3. While the ESG score variable maintains its highly statistically significant positive relationship with corresponding and subsequent year returns, the percentage change in ESG scores has an impact similar to the yearly difference in ESG scores in Table 4.2. This variable has a consistently negative impact on returns, while the significance levels differ between regressions. It is highly statistically significant in column one, but the significance level reduces to 5% when control variables are introduced. It is insignificant against the subsequent year returns.

[1]Variance inflation factor (VIF) analysis reveals no evidence of multicollinearity among the ESG score variable and its transformations.

Table 4.3: ESG scores and yearly difference between ESG scores against stock returns. This table presents the results from OLS regressions. In columns (1) and (2), the dependent variable is stock returns, while the dependent variable is subsequent year returns in columns (3) and (4). Independent variables in the regressions include ESG scores (ESG) and yearly difference between a firm's ESG scores (ΔESG). The sample period is between 2007 and 2022. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	$\text{Return}_{i,t}$		$\text{Return}_{i,t+1}$	
	(1)	(2)	(3)	(4)
ESG	0.762^{***}	0.860^{***}	0.754^{***}	0.844^{***}
	(0.001)	(0.0003)	(0.003)	(0.003)
ΔESG	-2.632^{***}	-2.245^{***}	-0.776	-0.686
	(0.0002)	(0.001)	(0.295)	(0.356)
TQ		34.884^{***}		-9.355
		(0.000)		(0.200)
ROE		14.125		-3.045
		(0.110)		(0.758)
ROA		181.392^{***}		58.746
		(0.004)		(0.481)
MB		0.878^{*}		-0.191
		(0.078)		(0.730)
CASH		-32.890		49.250
		(0.337)		(0.210)
ST DEBT		68.787^{*}		110.498^{**}
		(0.075)		(0.014)
LT DEBT		7.859		26.818
		(0.739)		(0.330)
Constant	22.319^{**}	-88.518^{***}	22.880^{**}	-27.583
	(0.013)	(0.0002)	(0.017)	(0.309)
Industry FE	No	Yes	No	Yes
Observations	662	662	604	604
Adjusted R^2	0.029	0.147	0.012	0.020

Table 4.4: ESG scores and yearly percentage change in ESG scores against stock returns. This table presents the results from OLS regressions. In columns (1) and (2), the dependent variable is stock returns, while the dependent variable is subsequent year returns in columns (3) and (4). Independent variables in the regressions include ESG scores (ESG) and yearly percentage change in a firm's ESG scores (%ESG). The sample period is between 2007 and 2022. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	$\text{Return}_{i,t}$		$\text{Return}_{i,t+1}$	
	(1)	(2)	(3)	(4)
ESG	0.623^{***}	0.742^{***}	0.708^{***}	0.799^{***}
	(0.005)	(0.002)	(0.004)	(0.003)
%ESG	-32.66^{***}	-25.05^{**}	-18.59	-16.48
	(0.008)	(0.032)	(0.140)	(0.194)
TQ		34.548^{***}		-9.226
		(0.000)		(0.206)
ROE		14.874^{*}		-3.136
		(0.094)		(0.751)
ROA		185.134^{***}		54.326
		(0.004)		(0.515)
MB		0.920^{*}		-0.194
		(0.066)		(0.726)
CASH		-33.891		49.033
		(0.325)		(0.212)
ST DEBT		69.160^{*}		109.112^{**}
		(0.075)		(0.016)
LT DEBT		8.564		26.871
		(0.718)		(0.328)
Constant	24.318^{***}	-86.699^{***}	24.577^{**}	-25.800
	(0.008)	(0.0003)	(0.011)	(0.341)
Industry FE	No	Yes	No	Yes
Observations	662	662	604	604
Adjusted R^2	0.019	0.138	0.014	0.022

4.1. Robustness Check: Market Risk-Adjusted Stock Returns

For further investigation, the analysis extends to incorporate market risk-adjusted returns. The returns analyzed in the previous analysis incorporate market risk within their composition. By utilizing market risk-adjusted returns, the analysis obtains components of stock returns that remain unaffected by market risk. Consequently, this approach enables an investigation into the relationship between ESG considerations and returns, focusing on the unexplained variance in returns independent of market dynamics.

The calculation of market risk-adjusted returns employs the Capital Asset Pricing Model (CAPM):

$$R_{i,t} = r_f + \beta_{i,t}(R_m - r_f) + \epsilon_{i,t} \tag{4.1}$$

where R_i is the stock return, r_f denotes the risk free rate and R_m is the market return. Upon estimating beta, the following model derives market risk-adjusted returns by computing the residuals, revealing the investment's performance after accounting for its market sensitivity.

$$\epsilon_{i,t} = R_{i,t} - r_f - \beta_{i,t}(R_m - r_f) \tag{4.2}$$

Table 4.5 demonstrates the main results of the robustness check. The dependent variable in the first two columns is corresponding year market risk-adjusted returns, and subsequent year market risk-adjusted returns in columns (3) and (4). The yearly difference in ESG scores and the percentage change ESG scores are central to this analysis. The findings reveal a highly significant negative impact of the yearly difference in ESG scores on market risk-adjusted returns. Consistent with the previous findings, this influence becomes statistically insignificant in the subsequent year. Furthermore, the percentage change ESG exhibits a negative relationship with market risk-adjusted returns, reaching statistical significance at 10%. Similar to the yearly differences, the percentage change ESG fails to demonstrate statistical significance with subsequent year returns.

Table 4.5: ESG score transformations and market risk-adjusted returns. This table presents the results from OLS regressions. In columns (1) and (2), the dependent variable is market risk-adjusted returns, while the dependent variable is subsequent year market risk-adjusted returns in columns (3) and (4). Independent variables in the regressions include yearly difference between a firm's ESG scores (ΔESG) and yearly percentage change in a firm's ESG scores (%ESG). The sample period is between 2007 and 2022. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	Market Risk-Adjusted Return$_{i,t}$		Market Risk-Adjusted Return$_{i,t+1}$	
	(1)	(2)	(3)	(4)
ΔESG	-1.724^{***}		-0.049	
	(0.010)		(0.946)	
%ESG		-21.76^{*}		-12.46
		(0.064)		(0.316)
TQ	34.095^{***}	34.002^{***}	-10.753^{*}	-10.466
	(0.000)	(0.000)	(0.097)	(0.106)
ROE	15.158^{*}	15.530^{*}	-2.544	-2.924
	(0.090)	(0.083)	(0.791)	(0.761)
ROA	190.347^{***}	191.076^{***}	51.286	46.118
	(0.003)	(0.003)	(0.462)	(0.508)
MB	0.941^{*}	0.960^{*}	-0.138	-0.157
	(0.061)	(0.057)	(0.798)	(0.771)
CASH	-43.890	-43.723	38.354	38.423
	(0.205)	(0.208)	(0.305)	(0.304)
ST DEBT	70.567^{*}	69.891^{*}	104.133^{**}	102.632^{**}
	(0.071)	(0.075)	(0.015)	(0.016)
LT DEBT	11.632	11.483	28.681	28.581
	(0.625)	(0.630)	(0.269)	(0.271)
Constant	-69.951^{***}	-71.548^{***}	-6.730	-5.737
	(0.002)	(0.002)	(0.777)	(0.809)
Observations	662	662	646	646
Adjusted R^2	0.128	0.123	0.006	0.007

Furthermore, Table 4.6 investigates the effect of ESG score levels on market risk-adjusted returns. Consistent with the preceding analysis, ESG scores exhibit a statistically significant positive relationship with corresponding and subsequent year market risk-adjusted returns.

Finally, the analysis integrates ESG score levels with the yearly difference in ESG scores and the percentage change in ESG scores in Table 4.7 and Table 4.8, respectively. Across both models, the primary independent variables retain their statistical significance and maintain the direction of the relationship when regressed on market risk-adjusted returns. This consistent pattern further emphasizes the robustness of the findings, affirming the negative impact of ESG score changes and the positive effect of ESG score levels on stock returns.

4.2. Robustness Check: ES Scores

The composition of ESG scores inherently incorporates governance measures. Using ESG scores as a measure of corporate sustainability in this analysis includes the impact of governance, a topic studied extensively in the literature. To obtain the isolated effects of the environmental and social pillars of ESG, this study adopts a methodological refinement similar to Albuquerque et al. (2020) and omits the governance score. Employing this approach enables the investigation to assess the impact of corporate social responsibility while eliminating other factors.

Building upon the methodology established by Albuquerque et al. (2020), this analysis constructs Environmental and Social (ES) scores by averaging firms' environmental and social scores spanning the period from 2007 to 2022. Table 4.9 demonstrates the results, where the dependent variable is stock returns, and the main independent variables include ES scores, yearly difference in ES scores (ΔES), and percentage change in ES scores (%ES). All three independent variables exhibit a similar pattern to the primary results when considered in isolation. ES scores have a significant positive impact on stock returns, while both yearly difference and percentage change maintain their negative impact. Further, the

Table 4.6: ESG scores and market risk-adjusted returns. This table presents the results from Ordinary Least Squares (OLS) regressions. In columns (1) and (2), the dependent variable is market risk-adjusted returns, while the dependent variable is subsequent year market risk-adjusted returns in columns (3) and (4). The sample period is between 2007 and 2022. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	Market Risk Adjusted Return$_{i,t}$		Market Risk Adjusted Return$_{i,t+1}$	
	(1)	(2)	(3)	(4)
ESG	0.426**	0.516**	0.693***	0.768***
	(0.044)	(0.018)	(0.001)	(0.001)
TQ		32.139***		−8.981
		(0.000)		(0.123)
ROE		12.122		−3.830
		(0.159)		(0.665)
ROA		195.063***		39.644
		(0.002)		(0.546)
MB		0.775		−0.221
		(0.113)		(0.660)
CASH		−36.583		49.724
		(0.273)		(0.152)
ST DEBT		51.869		72.479*
		(0.145)		(0.051)
LT DEBT		7.059		26.683
		(0.763)		(0.276)
Constant	15.300*	−85.796***	5.803	−34.587
	(0.068)	(0.0002)	(0.476)	(0.138)
Observations	714	714	703	703
Adjusted R^2	0.004	0.111	0.014	0.022

Table 4.7: ESG scores and yearly difference between ESG scores against market risk-adjusted returns. This table presents the results from OLS regressions. In columns (1) and (2), the dependent variable is market risk-adjusted returns, while the dependent variable is subsequent year market risk-adjusted returns in columns (3) and (4). Independent variables in the regressions include ESG scores (ESG) and yearly difference between a firm's ESG scores (ΔESG). The sample period is between 2007 and 2022. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	Market Risk Adjusted Return$_{i,t}$		Market Risk Adjusted Return$_{i,t+1}$	
	(1)	(2)	(3)	(4)
ESG	0.653***	0.740***	0.531**	0.581**
	(0.004)	(0.002)	(0.021)	(0.021)
ΔESG	−2.426***	−2.044***	−0.392	−0.309
	(0.001)	(0.003)	(0.583)	(0.666)
TQ		35.168***		−9.877
		(0.000)		(0.126)
ROE		13.992		−3.397
		(0.115)		(0.723)
ROA		179.975***		44.316
		(0.005)		(0.524)
MB		0.862*		−0.197
		(0.085)		(0.714)
CASH		−36.791		43.773
		(0.285)		(0.241)
ST DEBT		64.612*		98.954**
		(0.096)		(0.020)
LT DEBT		5.892		23.897
		(0.804)		(0.357)
Constant	12.964	−95.549***	15.224*	−26.809
	(0.148)	(0.00005)	(0.094)	(0.288)
Observations	662	662	646	646
Adjusted R^2	0.023	0.140	0.005	0.013

Table 4.8: ESG scores and yearly percentage change in ESG scores against market risk-adjusted returns. This table presents the results from OLS regressions. In columns (1) and (2), the dependent variable is market risk-adjusted returns, while the dependent variable is subsequent year market risk-adjusted returns in columns (3) and (4). Independent variables in the regressions include ESG scores (ESG) and yearly percentage change in a firm's ESG scores (%ESG). The sample period is between 2007 and 2022. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	Market Risk-Adjusted Return$_{i,t}$		Market Risk-Adjusted Return$_{i,t+1}$	
	(1)	(2)	(3)	(4)
ESG	0.524**	0.633***	0.512**	0.563**
	(0.019)	(0.007)	(0.023)	(0.023)
%ESG	−29.26**	−21.74*	−13.97	−12.29
	(0.018)	(0.063)	(0.256)	(0.321)
TQ		34.842***		−9.702
		(0.000)		(0.133)
ROE		14.711*		−3.584
		(0.099)		(0.708)
ROA		183.851***		40.783
		(0.004)		(0.558)
MB		0.902*		−0.206
		(0.072)		(0.702)
CASH		−37.736		43.656
		(0.275)		(0.242)
ST DEBT		65.065*		97.895**
		(0.096)		(0.021)
LT DEBT		6.527		23.893
		(0.784)		(0.357)
Constant	14.729	−93.986***	16.464*	−25.689
	(0.105)	(0.0001)	(0.072)	(0.309)
Observations	662	662	646	646
Adjusted R^2	0.014	0.132	0.007	0.014

percentage change is significant at the 10% level in the absence of governance considerations, as opposed to the 5% level observed in the main results. Incorporated with ES scores, the yearly difference in ES scores sustains its statistically significant negative relationship with a reduced magnitude compared to the yearly difference in ESG scores. Simultaneously, the percentage change in ES scores maintains its negative impact, reaching statistical significance at 10%. Notably, the influence of ES scores remains consistent across the entire regression analysis.

Overall, the results of this analysis are consistent with the main findings, which highlight the robustness of the observed impacts throughout the investigation. Moreover, this robustness check concludes that ES scores drive the relationship between ESG scores and stock returns, implying that investors in BIST prioritize pricing the environmental and social risks over corporate governance.

Table 4.9: ES scores and its transformations against stock returns. This table presents the results from OLS regressions. The dependent variable is stock returns, and the independent variables in the regressions include ES scores (ES), yearly difference in ES scores (ΔES) and yearly percentage change in ES scores (%ES). The sample period is between 2007 and 2022. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:				
	Return				
	(1)	(2)	(3)	(4)	(5)
ES	0.598***			0.807***	0.689***
	(0.003)			(0.0002)	(0.002)
ΔES		−1.599***		−1.963***	
		(0.005)		(0.001)	
%ES			−12.635*		−13.083**
			(0.057)		(0.047)
TQ	34.913***	36.678***	36.335***	38.673***	37.963***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROE	12.099	15.872*	16.144*	13.711	14.415
	(0.162)	(0.078)	(0.074)	(0.125)	(0.109)
ROA	145.151**	145.727**	151.000**	134.514**	142.883**
	(0.030)	(0.032)	(0.027)	(0.045)	(0.035)
MB	0.788	0.989*	1.005**	0.864*	0.905*
	(0.109)	(0.051)	(0.048)	(0.085)	(0.073)
CASH	−29.312	−37.376	−42.299	−30.022	−36.551
	(0.391)	(0.294)	(0.237)	(0.395)	(0.304)
ST DEBT	53.658	81.321**	78.837*	74.988*	73.235*
	(0.138)	(0.043)	(0.051)	(0.059)	(0.067)
LT DEBT	6.356	8.304	9.620	6.281	8.089
	(0.792)	(0.736)	(0.697)	(0.797)	(0.742)
Constant	−69.713***	−59.634***	−59.783***	−78.415***	−76.351***
	(0.002)	(0.008)	(0.008)	(0.001)	(0.001)
Observations	685	630	630	630	630
Adjusted R^2	0.112	0.128	0.122	0.146	0.135

CHAPTER 5

CONCLUSION

This thesis examines the effect of ESG scores on the returns of stocks listed on Borsa Istanbul. The growing interest in sustainable investment, driven by increased global awareness of sustainability issues, has led to the expansion of sustainable finance. Consequently, ESG criteria are increasingly recognized as financial performance indicators and risk mitigation tools. Although ESG considerations are gaining importance, sustainable finance research primarily focuses on developed countries. This study extends the literature by focusing on Turkey, an emerging market. Further, the analysis employs changes in ESG scores as an indicator of stock riskiness. The data contains Bloomberg ESG scores and firm characteristics for 61 Turkish companies between 2007 and 2022, with the analysis incorporating various multivariate regression models.

This thesis presents several findings regarding the impact of ESG scores on stock performance. The main findings reveal that changes in ESG scores have a negative impact on stock returns. This result asserts that changes in ESG scores indicate stock riskiness, where increases in ESG scores signal lower risk and decreases in ESG scores increase riskiness. As a consequence, investors demand higher risk premiums for holding weak ESG stocks. Furthermore, the results demonstrate that this negative relationship is more prominent in yearly differences in ESG scores compared to percentage changes. On the other hand, there is no sufficient

evidence that the negative impact persists in the subsequent year. Moreover, ESG score levels exhibit a significant and positive relationship with returns, which becomes more pronounced when analyzed together with yearly changes in scores. Similarly, the impact of yearly changes in ESG scores increases in magnitude when investigated with ESG score levels. Further, the findings remain consistent after robustness checks.

One limitation of this study is the small sample size. Investigating an emerging market that is newly introducing sustainability efforts limits the number of firms with ESG scores and the historical range of the ratings. A potential extension of this research entails broadening the sample beyond Turkey and focusing on several emerging markets. Another avenue for extension involves examining whether including ESG scores as a risk factor alongside Fama-French factor models provides further insights into the impact of sustainability efforts on firm returns.

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APPENDIX

For robustness, the analysis extends to include Refinitiv ESG scores, mirroring the approach taken with Bloomberg ESG scores. Similar to Bloomberg, Refinitiv ESG scores range from 0 to 100, and the index is updated annually. The rating agency assesses each ESG pillar independently. However, both rating agencies use different methodologies in assessing the scores. The main difference between the ratings is that Refinitiv relies heavily on ESG efforts self-reported by companies (Gianfrate et al., 2021).

94 Turkish companies are evaluated within the Refinitiv database; however, only 54 of them maintain sufficient score continuity to be incorporated into the analysis. All 54 companies also have representation in the Bloomberg database. The sample period is between 2008 and 2021.

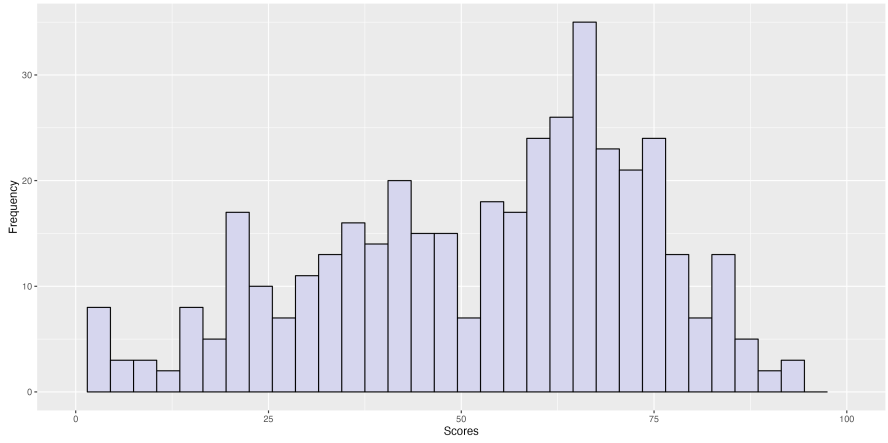

Figure A1: Histogram of Refinitiv ESG scores of companies listed on BIST.

Figure A1 presents the histogram illustrating the distribution of Refinitiv ESG scores. In contrast to Bloomberg ESG scores, Refinitiv scores exhibit a higher average and a clustering tendency around 65.

Table A2 provides descriptive statistics for the variables considered in this analysis, denoting Refinitiv ESG scores as RESG (see Table A1 for the definitions of the new variables). Over the sample period, Refinitiv ESG scores average at 53.58,

Table A1: Description of Variables Added in Robustness. This table provides definitions of the variables added in this analysis. The definitions of the control variables remain the same as presented in Table 3.1

Variable	Definition
Independent variables:	
RESG	ESG score of a firm obtained from Refinitiv.
ΔRESG	Yearly difference between a firm's Refinitiv ESG scores. (Computed as $\text{RESG}_{i,t} - \text{RESG}_{i,t-1}$)
%RESG	Yearly percentage change in a firm's Refinitiv ESG scores. (Computed as ΔRESG divided by $\text{RESG}_{i,t-1}$)

reaching a peak of 93.82. The maximum score decline is observed at 15.28 points, while the highest increase is 46.49.

Table A3 presents the correlation coefficients among the variables. Refinitiv ESG scores demonstrate a negative relationship with returns and a positive relationship with subsequent year returns, while the yearly difference and percentage change in scores exhibit a more positive association with both returns and subsequent year returns. This correlation is particularly noteworthy with returns.

To ensure methodological robustness, parallel regression analyses employ Refinitiv ESG scores. Table A4 presents the outcomes of the initial regression analysis. The yearly difference in ESG scores (ΔRESG) demonstrates a positive relationship with stock returns at a 10% significance level, while the percentage change in scores (%RESG) displays a more pronounced positive relationship with returns at 5%. Conversely, the statistical significance of the coefficients diminishes in the context of subsequent year returns, with the coefficients displaying a negative trend.

Table A2: Descriptive Statistics. This table presents summary statistics for the variables used in the analysis that contain the Refinitiv ESG Scores. The sample consists of 54 companies.

Variable	Obs.	Minimum	Maximum	Mean	Median	Std.
Return	697.00	-84.28	448.18	26.61	17.17	64.38
RESG	434.00	3.35	93.82	53.48	58.61	20.51
ΔRESG	380.00	-15.28	46.49	3.82	2.34	8.45
%RESG	380.00	-0.41	1.86	0.11	0.05	0.26
TQ	701.00	0.28	6.66	1.29	1.08	0.70
ROE	718.00	-12.04	920.74	1.43	0.14	34.36
ROA	718.00	-0.21	0.44	0.05	0.04	0.07
MB	701.00	-467.32	231.59	1.37	1.27	22.00
CASH	718.00	0.00	0.75	0.14	0.11	0.13
ST DEBT	718.00	0.00	0.83	0.12	0.10	0.11
LT DEBT	718.00	0.00	0.86	0.17	0.15	0.15

Furthermore, Table A5 investigates the impact of ESG score levels on stock riskiness. Despite ESG scores lacking statistical significance against stock returns, there is a positive association with subsequent year returns, significant at a 5% level. However, this significance diminishes when accounting for firm characteristics and industry-specific factors.

Further, the analysis examines the impact of Refinitiv ESG scores alongside the yearly differences and percentage change in ESG scores. Similar to the main study, these transformations cannot be included in the same regression due to high correlation. Table A6 outlines the analysis results, which include ESG scores and the yearly difference between ESG scores. When coupled with yearly differences, ESG scores exhibit a negative relationship with stock returns, while the transformation retains its positive impact. Although both variables demonstrate statistical significance in Column (1), these significance levels reduce when adjusting for firm and industry characteristics. Conversely, when regressed against subsequent year returns, ESG scores exhibit a highly statistically significant positive impact, while yearly differences are not statistically significant.

Table A7 presents the results of the analysis incorporating ESG scores and the

Table A3: Correlation Matrix

	RESG	ΔRESG	%RESG	TQ	ROE	ROA	MB	CASH	ST DEBT	LT DEBT	$\text{Return}_{i,t}$	$\text{Return}_{i,t+1}$
RESG	1.00	0.26	0.05	-0.19	-0.03	-0.26	0.01	-0.17	0.22	0.22	-0.09	0.14
ΔRESG	0.26	1.00	0.87	0.04	-0.02	-0.05	-0.02	-0.07	0.05	0.09	0.09	0.02
%RESG	0.05	0.87	1.00	0.08	-0.01	-0.02	-0.02	-0.04	0.04	0.07	0.14	0.03
TQ	-0.19	0.04	0.08	1.00	0.08	0.51	0.08	0.11	-0.09	-0.08	0.18	-0.05
ROE	-0.03	-0.02	-0.01	0.08	1.00	0.24	-0.69	-0.01	-0.12	0.00	0.04	-0.04
ROA	-0.26	-0.05	-0.02	0.51	0.24	1.00	0.05	0.44	-0.10	-0.28	0.19	0.04
MB	0.01	-0.02	-0.02	0.08	-0.69	0.05	1.00	0.05	0.02	0.01	0.08	-0.00
CASH	-0.17	-0.07	-0.04	0.11	-0.01	0.44	0.05	1.00	-0.14	-0.22	-0.01	-0.01
ST DEBT	0.22	0.05	0.04	-0.09	-0.12	-0.10	0.02	-0.14	1.00	0.13	0.12	0.20
LT DEBT	0.22	0.09	0.07	-0.08	0.00	-0.28	0.01	-0.22	0.13	1.00	-0.02	0.07
$\text{Return}_{i,t}$	-0.09	0.09	0.14	0.18	0.04	0.19	0.08	-0.01	0.12	-0.02	1.00	0.08
$\text{Return}_{i,t+1}$	0.14	0.02	0.03	-0.05	-0.04	0.04	-0.00	-0.01	0.20	0.07	0.08	1.00

percentage change in ESG scores. ESG scores exhibit a statistically insignificant negative relationship, while the percentage change in scores displays a statistically significant positive relationship with stock returns. In contrast, ESG scores exhibit a highly statistically significant positive relationship with subsequent year returns.

The findings of this analysis reveal notable differences compared to the primary study utilizing Bloomberg ESG scores. Both ESG scores exhibit a positive impact after controlling for firm characteristics and industry specifics; however, Bloomberg's impact is statistically significant, while Refinitiv's is not. Additionally, the yearly difference and percentage change in ESG scores impact stock returns but do not exhibit a statistically significant relationship with subsequent year returns. Specifically, the change in Bloomberg scores demonstrates a negative relationship with stock returns, while the change in Refinitiv ESG scores shows a positive relationship with returns. Moreover, when ESG scores are combined with the transformations, the model with Bloomberg scores exhibits greater explanatory power and maintains significance, while the model with Refinitiv scores loses significance. One potential explanation for these variations could be the methodological differences between the two indices. Unlike Bloomberg, Refinitiv scores are self-reported by companies, introducing the possibility of bias in reporting (Gianfrate et al., 2021).

Table A4: Refinitiv ESG score transformations and stock returns. This table presents the results from OLS regressions. In columns (1) and (2), the dependent variable is stock returns, while the dependent variable is subsequent year returns in columns (3) and (4). Independent variables in the regressions include the yearly difference between a firm's Refinitiv ESG scores (ΔRESG), and the yearly percentage change in a firm's Refinitiv ESG scores (%RESG). The sample period is between 2008 and 2021. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5%, and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	$\text{Return}_{i,t}$		$\text{Return}_{i,t+1}$	
	(1)	(2)	(3)	(4)
ΔRESG	0.519*		−0.243	
	(0.084)		(0.602)	
%RESG		21.520**		−4.891
		(0.027)		(0.746)
TQ	12.448**	12.053**	−5.225	−5.323
	(0.018)	(0.022)	(0.519)	(0.512)
ROE	12.154	11.597	39.675*	39.841*
	(0.382)	(0.403)	(0.067)	(0.066)
ROA	−9.652	−1.610	−85.997	−86.266
	(0.905)	(0.985)	(0.493)	(0.492)
MB	0.779	0.752	1.844*	1.854*
	(0.249)	(0.265)	(0.079)	(0.078)
CASH	−4.845	−3.391	20.701	20.056
	(0.859)	(0.901)	(0.623)	(0.634)
ST DEBT	15.331	15.862	130.065**	130.251**
	(0.701)	(0.691)	(0.037)	(0.037)
LT DEBT	9.992	11.871	43.637	42.402
	(0.634)	(0.569)	(0.181)	(0.192)
Constant	−18.523	−20.652	−10.617	−10.170
	(0.234)	(0.185)	(0.660)	(0.675)
Industry FE	Yes	Yes	Yes	Yes
Observations	377	377	377	377
Adjusted R^2	0.104	0.074	0.109	0.073

Table A5: Refinitiv ESG scores and stock returns. This table presents the results from Ordinary Least Squares (OLS) regressions. In columns (1) and (2), the dependent variable is stock returns, and the dependent variable is subsequent year returns in columns (3) and (4). The sample period is between 2008 and 2021. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	$\text{Return}_{i,t}$		$\text{Return}_{i,t+1}$	
	(1)	(2)	(3)	(4)
RESG	−0.011	0.133	0.380**	0.304
	(0.933)	(0.360)	(0.035)	(0.148)
TQ		16.686***		−7.333
		(0.002)		(0.332)
ROE		15.661		31.027
		(0.256)		(0.107)
ROA		−77.560		2.483
		(0.294)		(0.982)
MB		0.936		1.422
		(0.164)		(0.129)
CASH		23.033		6.820
		(0.384)		(0.859)
ST DEBT		−4.663		92.732*
		(0.900)		(0.084)
LT DEBT		3.044		36.151
		(0.880)		(0.214)
Constant	25.348***	−27.687*	23.967**	−15.318
	(0.0005)	(0.100)	(0.020)	(0.522)
Industry FE	No	Yes	No	Yes
Observations	429	425	434	430
Adjusted R^2	-0.002	0.076	0.008	0.056

Table A6: Refintiv ESG scores and yearly difference between ESG scores against stock returns. This table presents the results from OLS regressions. In columns (1) and (2), the dependent variable is stock returns, while the dependent variable is subsequent year returns in columns (3) and (4). Independent variables in the regressions include Refinitv ESG scores (RESG) and yearly difference between a firm's Refinitiv ESG scores (ΔRESG). The sample period is between 2008 and 2021. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	$\text{Return}_{i,t}$		$\text{Return}_{i,t+1}$	
	(1)	(2)	(3)	(4)
RESG	-0.220^{*}	-0.170	0.574^{***}	0.586^{**}
	(0.096)	(0.275)	(0.005)	(0.016)
ΔRESG	0.831^{***}	0.606^{*}	-0.149	-0.540
	(0.009)	(0.052)	(0.760)	(0.259)
TQ		11.346^{**}		-1.434
		(0.034)		(0.861)
ROE		13.401		35.385^{*}
		(0.337)		(0.100)
ROA		-13.287		-73.500
		(0.870)		(0.555)
MB		0.843		1.622
		(0.214)		(0.121)
CASH		-3.126		14.792
		(0.909)		(0.724)
ST DEBT		22.018		107.075^{*}
		(0.586)		(0.086)
LT DEBT		12.552		34.837
		(0.552)		(0.284)
Constant	36.619^{***}	-11.521	11.639	-34.692
	(0.00001)	(0.494)	(0.317)	(0.182)
Industry FE	No	Yes	No	Yes
Observations	380	377	380	377
Adjusted R^2	0.016	0.104	0.016	0.086

Table A7: Refintiv ESG scores and yearly percentage change in ESG scores. This table presents the results from OLS regressions. In columns (1) and (2), the dependent variable is stock returns, while the dependent variable is subsequent year returns in columns (3) and (4). Independent variables in the regressions include Refinitv ESG scores (RESG) and yearly percentage change in a firm's Refinitiv ESG scores (%RESG). The sample period is between 2008 and 2021. The regression coefficients are reported with significance levels where *, **, *** represent 10%, 5% and 1% significance levels, respectively. The p-values are reported in parentheses.

	Dependent variable:			
	$\text{Return}_{i,t}$		$\text{Return}_{i,t+1}$	
	(1)	(2)	(3)	(4)
RESG	−0.144	−0.112	0.558***	0.522**
	(0.259)	(0.459)	(0.005)	(0.026)
%RESG	27.718***	21.93**	1.972	−6.803
	(0.006)	(0.025)	(0.899)	(0.651)
TQ		11.393**		−2.240
		(0.032)		(0.784)
ROE		12.390		36.135*
		(0.373)		(0.094)
ROA		−4.429		−73.096
		(0.957)		(0.559)
MB		0.792		1.665
		(0.242)		(0.112)
CASH		−2.117		14.107
		(0.938)		(0.737)
ST DEBT		20.143		110.247*
		(0.617)		(0.078)
LT DEBT		13.890		32.970
		(0.509)		(0.311)
Constant	32.608***	−16.084	11.754	−31.511
	(0.00002)	(0.337)	(0.314)	(0.224)
Industry FE	No	Yes	No	Yes
Observations	380	377	380	377
Adjusted R^2	0.018	0.108	0.016	0.084