

MASTER THESIS
APPLIED ECONOMICS AND FINANCE

**ENVIRONMENT, SOCIAL AND GOVERNANCE IMPACT
ON U.S. LISTED FIRMS:
AN EMPIRICAL ANALYSIS FROM 2011-2019**

Author:
Geethu Mariam Rajeev

Supervisor:
Thomas Einfeldt

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**Copenhagen
Business School**
HANDELSHØJSKOLEN

ABSTRACT

This study is motivated by the growing interest in Environmental, Social and Governance (ESG) indicators and quantitatively examines their impact on firm performance for U.S. listed firm from 2011-2019. Both market-based (Annual Stock Returns) and accounting-based (Net Income & Return on Assets) measures have been employed in the study. Most of the previous research study the aggregate ESG score. In addition to the aggregate score, the study looks at the individual pillars as well as the change in scores for potential signalling effect on ESG performance. To control for the impact of ESG on firm performance, relevant control variables were introduced. Twelve regression models were set up to test the impact of ESG scores on firm performance. The results postulate that ESG factors have a negative link with stock market returns in the U.S. It was found that the environment component was the driving factor in the aggregate ESG score for stock returns. Interestingly, it was found that the environment factor positively influences profitability (when measured as Net Income). It was also noted that while a higher environment score is associated with higher earnings, an improvement in the score showed a negative link. It was inferred that enhanced environmental practices led to corporate value creation, but investors did not seem to see this value in the study. Looking at the impact of ESG factors on Return on Assets, no statistical significances were observed. It was found that ESG scores do not lead to enhanced market performance in U.S. listed firms in the sample. However, the study showed that ESG can have an impact on firm profitability and could be an important tool for value creation, especially the environment pillar. This study adds to the existing literature on the topic and is of relevance to investors, managers and strategists looking at the impact of ESG on firm performance

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Chapter 1: Introduction

1.1 Introducing the scene

The world today is wrestling with numerous challenges from rising temperatures, racial inequality, and boardroom diversity. Pressures to address ESG issues arise from multiple stakeholders including customers, employees, local communities, and NGOs. A global survey of more than 33,000 respondents conducted by Edelman revealed that only 52 % of the total respondents trusted businesses to do *“what is right”* and public confidence is low (Harrington, 2017). Companies are increasingly being challenged to make more than just profits and be part of the solution by integrating Environmental, Social and Governance (ESG) considerations in their business. From Mark Carney, the former Governor of the Bank of England pronouncing climate change as a *“systematic financial risk”* (Carney, 2015) to Larry Fink, the CEO of Blackrock calling on the business world to increase ESG disclosures, it is no surprise why ESG is gaining widespread momentum. In 2020, sustainable funds reached a record high in the U.S. with net inflows of USD 51.1 billion (Hale, 2021). The COVID-19 pandemic proved the resilience of ESG. Asset managers saw this as an opportunity and between a span of three months, 105 new ESG funds were launched in the U.S. (Ricketts, 2020). Asset management leaders like Blackrock have put on an activist hat in recent years. In their annual stewardship report, they flagged 191 companies for not accounting for material climate risks in their operations (Blackrock, 2020). The companies have been warned of being voting against in future shareholder meetings in the case of not taking adequate action (ibid).

Businesses are run for profit and in the light of these ESG developments, an important question that arises is whether such developments create value and influence firm performance. The concept of *“doing well by doing good”* is supported by the stakeholder theory. The premise is that businesses have a responsibility to multiple stakeholders (Freeman, 1984). In a stark contrast, the shareholder theory states that the main purpose of corporations is to maximize shareholder wealth as they owe them a fiduciary duty (Friedman, 1970). The proponents of ESG argue that incorporating ESG into business can reduce costs, access capital at low costs and enjoy high reputation in the market (Henisz et al., 2019). The opponents argue that there is a trade-off between ESG and firm performance because of the cost involved in pursuing ESG-related activities and the disconnect in the term horizon. Investors are characterised by their short-termism and ESG has a long-term horizon (Ashford, 2019). The growing focus on the environment component in ESG has also seen a rise in companies indulging

in “*greenwashing*”, whereby they claim to be more sustainable than they are in reality (de Freitas Netto et al., 2020). When Volkswagen launched its low emissions diesel car, it was hailed as a success story, only to be later found circumventing the emissions tests (Hotten, 2015). Greenwashing poses an important consideration to the authenticity of the ESG claims made by companies.

The over-arching purpose of this study to assess the impact of ESG on firm performance as a measure of both market and accounting measures. Much of previous literature has focused on the aggregate ESG score. This study will investigate the individual ESG pillars and assess if these pillars have an impact on firm performance. Taking the analysis even a step further, the study will also assess the impact of change in scores on firm performance and if it signals any important ESG information to investors.

1.2 Objective of the study

The study is motivated by widespread momentum ESG and responsible investing is gaining in recent times. The main objectives of the paper are two-fold:

- i. Assess whether ESG adds any significant value to investors beyond what is known to influence stock performance.
- ii. Assess whether ESG enhancing practices create value for firms.

The study is of interest to executives, managers, practitioners, and investors and the findings can have important implications regarding:

- i. Whether ESG is an important consideration in investment decisions
- ii. Integration of ESG criteria in the firm strategy
- iii. Potential development of ESG linked incentive schemes for management

The paper will add to the existing body of literature in finance, particularly ESG, firm performance as well as sustainability.

1.3 Research question

Using statistical analysis, this paper aims to answer the following research question:

Does Environmental, Social and Governance performance lead to higher corporate financial performance for U.S. listed companies during 2011-2019?

To better answer this, the main research question will be answered through two guiding questions, which will provide the basis for hypothesis development and analysis.

Sub-question 1: Does Environmental, Social and Governance performance lead to higher market returns?

The rationale behind this sub-question is to analyse whether ESG performance impacts the investment decisions of investors, and whether such decisions translate into higher stock market returns. Looking at the factors of Fama and French's three-factor model (1992) designed to explain stock market returns, this sub-question delves into whether ESG scores can explain stock returns, more than what is already found to affect stock price movements (Martin and Dahlström, 2020). Taking this analysis, a step further, this sub-question also seeks to understand if changes in ESG scores (increase/decrease) have an impact on stock market returns, and potentially uncover the signalling effect pertaining to this change in scores.

Sub-question 2: Does Environmental, Social and Governance performance contribute to improved profitability?

The rationale behind this sub-question is to analyse whether ESG performance impacts firm profitability. This sub-question is important in answering the main research question for two reasons. Firstly, studying the impact of ESG scores on firm profitability ties closely with stock market returns, which we seek to answer in *sub-question 1*. Generally, stock prices are said to be positively correlated with firm profitability (Ball & Brown, 1968). So, when studying the impact of ESG on stock performance, it becomes essential to uncover if good ESG performance translating into higher stock prices are because of value creation or investor sentiment (Martin and Dahlström, 2020). Secondly, studying the impact of ESG scores on firm profitability can be important to uncover if integrating ESG into the broader company strategy is of value.

Furthermore, to better answer the research question, this paper will investigate the combined ESG score as well as the disaggregated Environmental, Social and Governance pillars. Much of previous literature has been focused on the influence of the combined ESG score. In contrast, this paper will study whether any of the individual pillar scores are of particular significance to investors, both from market returns and profitability angles. Such an analysis is deemed to provide more comprehensive evidence in answering the research question.

1.4 Delimitations

Delimitation parameters limit the scope of the study and outlines the boundaries within which the study is undertaken. The geographical location of this study has been limited to U.S. listed firms registered at the two large U.S. stock exchanges- New York Stock Exchange (NYSE) and NASDAQ. The data sample only includes established public companies with a market capitalisation value of above USD 2 billion. This was mainly based on the availability of continuous ESG data for the sample period.

The paper will analyse the firm performance for the period between 2011-2019, mainly for two reasons. Firstly, ESG disclosures are still largely voluntary in the U.S. and while the volume and quality of the disclosures have improved over time, it is still an evolving area. Choosing a period prior to the chosen time frame would affect both the quality and availability of data. Secondly, the study seeks to limit the influence of any major crisis's (e.g., Global Financial Crisis 2008, COVID-19 pandemic 2020) so this time-period is deemed appropriate.

When examining stock performance to study the market performance, it is assumed that the investment is held for a horizon of one year. For the sake of simplicity and for comparison with the annual ESG rating scores, this delimitation has been applied. Finally, it is assumed that the investors exhibit irrationality, thereby necessitating the need to delve into studying the market as well as the financial performance of the firm (Schiller, 2000).

1.5 Research design

Research approach or research design outlines the general plan to tackle the research question (Thornhill et al., 2009). The research question in this paper will be answered through a deductive approach. In this approach, the study will investigate the existing literature and theoretical considerations in relation to ESG and firm performance and then deduce hypotheses that will be subject to empirical scrutiny through a regression analysis (Bryman & Bell, 2011). The research

question in this study does not seek to develop a new theory based on the results, but rather seeks to add to the existing body of literature. The hypotheses will be tested using an econometric approach. This approach involves:

- Availability of sufficient data observations to make well rounded statistical inferences
- Looking for relationships between the variables
- Setting controls to test the validity of the hypotheses and whether the chosen variables are the best ones for the hypothesis

The methodological approach employed for this study is *mono method*, whereby a single technique, namely *quantitative* is used for data collection and analysis (Thornhill et al., 2009). The data for the study was extracted based on the access to relevant databases. While financial data was extracted from the Bloomberg database, the ESG scores were extracted from Refinitiv. Both these databases are considered highly reliable in the research field. The study will conduct a multivariate analysis which will be elaborated in detail in Chapter 4: Methodology.

1.6 Structure

The thesis consists of nine descriptive chapters. The *first chapter*, as read, sets the tone for the study by giving an outline of the research. This includes the objective for the study, outset research question that will be answered, delimitations to define the scope of the study and the research design to aid in the analysis. The *second chapter* will review relevant theories and developments in the field of ESG and firm performance. This chapter is divided into two sections-a financial deep dive and a sustainability deep dive. The financial deep dive will focus on relevant economic theories on market performance, profitability as well as investor behavior. The sustainability deep dive will focus on the evolution of responsible investing, relevant theories and present the business case and challenges associated with ESG. The section will also touch upon the ESG ratings industry as well as the regulatory implications. The *third chapter* will outline and discuss some of the relevant previous studies in this field. Since ESG is a relatively new concept, the discussion starts with reviewing previous studies on *Corporate Social Responsibility (CSR)* and firm performance and then delve into ESG and firm performance. The *fourth chapter* will discuss the methodology including the statistical analysis, overview of the sample variables as well as the final regression models. The *fifth chapter* will present the empirical results as well as comment on the general statistical implications of the results. The *sixth chapter* will present a thorough discussion of the results supported with the theories and

previous research presented in the second and third chapters respectively. The *seventh chapter* will discuss some of the limitations posed by the study and the *eighth chapter* will outline some avenues for future research work. The *final chapter* will use the inferences from the findings to answer the outset research question.

Chapter 2: Literature Review

2.1 Financial deep dive

2.1.1 Modern portfolio theory and Market outperformance

In his paper *Portfolio Selection* (1952), Harry Markowitz pioneered the Modern Portfolio Theory (MPT) regarding maximizing the expected returns investors could get on their investments based on a given level of market risk. The MPT is rooted in Markowitz's (1952) mean-variance which follows that expected return on a portfolio is the weighted-average of the expected returns of the assets in the portfolio. In addition, it also follows that the variance of a portfolio's return consists of two important components: the *weighted average* of the variance for the individual assets and the *weighted covariance* between pairs of individual assets (Markowitz, 1952). The MPT is anchored in some important assumptions which state that (ibid): i) Investors attempt to maximize returns, ii) investors are risk averse, iii) All investors have access to the same information and that the markets are efficient, and iv) the market is frictionless.

The first and the second assumption postulates that investors want to maximize returns while bearing a certain level of risk, or conversely, minimize the variance for a given level of expected returns. Following this, if two investment opportunities yield the same level of returns, investors always opt for the one with the lower risk, indicating their risk aversiveness. In other words, if the risk is constant, investors prefer higher returns to lower returns and conversely, if the returns are constant, investors prefer lower risk to higher risk. The third and the fourth assumption implies that the markets are always available and that investors can buy and sell securities without any restrictions. Additionally, it also assumes no taxes or transaction costs. The third and fourth assumptions seems more unrealistic than the first two. Thus, an investor selects an investment based on the risk-return profile.

According to Markowitz (1952), the total risk of a security can be divided into two components: systematic risk (also known as market risk or common risk), and unsystematic risk (also known as diversifiable risk). Systematic risk is a macro-level form of risk that affects many assets to one degree or another (Berk & DeMarzo, 2017). Accordingly, systemic risk cannot be eliminated. On the other hand, unsystematic risk is a micro-level form of risk that affects a single asset or narrow group of

assets (Berk & DeMarzo, 2017). Accordingly, unsystematic risk can be significantly reduced through diversification of securities within a portfolio (ibid).

Subsequently, Markowitz won the Nobel Prize in Economics for his seminal work on MPT and its contributions to the fields of economics and corporate finance. Markowitz's contribution also laid the groundwork for several other works in the field of economics and finance, most notably the Capital Asset Pricing Model (CAPM). Independently developed by William Sharpe, John Lintner, and Jan Mossin, CAPM is one of the most widely used models in modern finance today (Berk & DeMarzo, 2017).

The ability to beat the market has been long debated and discussed in finance. In their paper, Treynor & Mazay (1966) devised a statistical study to test the performance record of 57 open-end mutual funds and found no outperformance. In a similar line of research conducted by Sharpe (1966) concluded that only eleven funds out of the 34 mutual funds did better than the Dow-Jones portfolio, while the other twenty-three did worse. Sharpe (1966) highlighted the concept of *random walks* which states that the past performance of a security's price does not predict its future price due to the unpredictable nature of the market. The theory of random walks became popular through the seminal work of economist Malkiel (1973) who argued that stock prices take a random path, and that the probability of a share price increasing at any given time, is the same as the probability that it will decrease.

Random walk theory has been likened to the efficient market hypothesis (EMH), as both these theories agree it is not possible to outperform the market. The EMH argues that this is because the share prices reflect all information (Fama, 1970). EMH can take three forms-*weak, semi-strong and strong* (ibid). The weak form asserts that prices of securities reflect all the publicly available information and assumes that past information does not influence future prices (ibid). The semi-strong form is an extension of the weak form and adds that prices adjust quickly to any new information that is publicly available and dismisses the predictive power of technical and fundamental analysis (ibid). The strong form asserts that prices of securities factors in all forms of information-private, public, historical, and new (ibid).

One of the arguments against the EMH is that since no investor should be able to beat the market, the best investment strategy would be to place all the funds in an investment fund. However, there are

investors who have consistently outperformed the market year after year. Warren Buffet is perhaps the most iconic example who attributes the outperformance to value investing. Through a fundamental security analysis, he examined the intrinsic value of stocks and asserted that undervalued stocks tend to outperform over time.

2.1.2 Behavioral finance

Behavioral finance is a branch of psychology that attempts to explain the irrational investment behavior of investors (Bloomfield, 2011). While the EMH supports the claim that investors are rational and that prices in the market are informationally efficient, behavioral finance supports the claim that investors tend to have biases (psychological and emotional) which leads them to make irrational choices (Yildirim, 2017). These biases can be an important source of information in explaining market anomalies in the stock market (Bloomfield, 2011). The following section will delve into two concepts that are deemed important in the study-*Mental accounting* and *Signalling theory*.

2.1.2.1 Mental accounting

Mental accounting is a theory based on the seminal work of Richard Thaler. According to the theory, individuals place different value on the same amount of money depending on factors such as the money's "*origin*" and "*intended use*" even though the concept of money is "*fungible*" (Thaler, 1999). An important sub-theory within mental accounting is the concept of *sub-accounting* whereby the value of the money depends on the source of income. The assumption of fungibility of money rests on the premise that it has the same value regardless of its origin, but the theory suggests this assumption is violated and people make irrational choices (ibid). This theory could potentially be an important determinant in this study to analyse ESG performance and investor behavior based on where (origin of income) the stocks are picked.

2.1.2.2 Signalling theory

Signalling theory was introduced by Michael Spence and is based on the premise where one party conveys some credible information to influence the perception of the other party (Spence, 1973). Spence's seminal work focussed on job markets to assert how an applicant might engage in behaviors to reduce information asymmetries by illustrating how higher education signals employers to distinguish between high-quality and low-quality applicants (ibid). Since then, the concept has been applied to a range of disciplines including finance, especially in relation to dividends and IPOs. The

signalling theory asserts that dividend announcements signal pertinent information about a firm's future profitability and prospects (Vieira & Raposo, 2011). Leland & Pyle (1977) applied the concept of signalling within the IPO process and asserts that companies with a good future prospective should always send clear signals to the market and this signal must be costly for the sub-par firms to emulate. The authors argue that if no signals are sent to the market, then the information asymmetry will cause adverse selection (ibid). This concept will have important implications in this study in relation to studying the change in ESG scores.

2.1.2.3 Irrational exuberance

Robert Shiller is another critic of the EMH and challenged Fama's idea that financial markets are efficient. He asserted that popular opinion and psychology influence investors to make "faddish" choices and that investors need to conduct extensive research before considering an investment (Shiller, 1981). In his book *Irrational Exuberance*, Shiller popularised the concept of *speculative bubbles* whereby he defines it as "...a situation in which news of price increases spurs investor enthusiasm which spreads by psychological contagion from person to person, in the process amplifying stories that might justify the price increase and bringing in a larger and larger class of investors, who, despite doubts about the real value of the investment, are drawn to it partly through envy of others' successes and partly through a gambler's excitement" (Shiller, 2013). Shiller introduced the Cyclically Adjusted Price Earnings Ratio to account for the market cycles to give a better representation of the PE ratio (Schiller, Robert, 2000).

2.1.3 Profitability, stock prices and accounting measurement

The impact of profitability on stock prices is of great value to investors and this warrants a discussion. Most of the previous research studying this link focussed on accounting based measures like net profit margin, earnings per share, return on assets, debt to equity ratio return on equity and dividend yield (Mirgen et al., 2017; Alaagam, 2019; Susilowati, 2015; Srinivasan, 2012). In their study based on sample firms in Latin America, Berggrun et al. (2020) found that profitable firms outperform unprofitable firms indicating a positive effect of firm profitability on stock returns. Kormendi & Lipe (1987) studied the effect of unexpected earnings on stocks and concluded that higher unexpected earnings are positively correlated with higher returns. Craig Nichols & Wahlen (2004) built on the work of Kormendi & Lipe (1987) and concluded a positive relationship as well.

The ground-breaking work of Ball & Brown (1968) strengthened the notion of financial statements providing valuable information. Prior to their work, investors assumed that financial statements did not provide much value and for the most part was subject to the preferences of the preparer (Kothari, 2001; Ball & Brown, 1968). This notion has been challenged since and to test this, the authors studied how share prices reacted to financial statement information (Ball & Brown, 1968). They found strong evidence of earnings announcements altering the stock prices and concluded that there is valuable information content in earnings announcements (ibid). In 2019, the authors replicated their 1968 study and expanded the scope to include sixteen other geographies and found the results to still hold. The value of information content was still significant, and most information is already factored into the prices before earnings are announced (ibid). Validating the study of Ball & Brown (1968), Chen & Huang (2014) found that there is a significant relationship between annual earnings changes and stock returns. An interesting finding was that in comparison to the U.S. market, the Chinese counterparts responded more strongly to good news than bad news (ibid).

2.1.4 Capital Asset Pricing Model (CAPM)

Markowitz's seminal work laid the groundwork for several other contributions in the field of modern finance and the Capital Asset Pricing Model (CAPM) is notably one of them. Developed by William Sharpe, John Lintner, and Jan Mossin, CAPM is one of the most widely used models in finance today. CAPM is a single-factor model that postulates the relationship between systematic risk (beta) and the expected returns (Sharpe, 1964). There are three important underlying CAPM assumptions (Berk & DeMarzo, 2017):

1. Investors can buy and sell securities without incurring any taxes or transaction costs and can borrow and lend at the risk-free interest rate.
2. Investors hold portfolios that maximize their expected returns based on a given level of volatility.
3. Investors have homogeneous expectations regarding the volatilities, correlations, and expected returns of securities.

The risk premium on any risky asset (the expected rate of return above the risk-free rate) equals the product of the market beta of the asset and the market risk premium (ibid). The market risk premium is the additional return that an investor receives for holding riskier assets. Mathematically, it can be expressed as (Sharpe, 1964):

$$E(R)_i = R_f + \beta(E(R_m - R_f)) \quad (1)$$

The beta or the measure of systematic risk can be expressed as (ibid):

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)} \quad (2)$$

whereby, $\text{Cov}(R_i, R_m)$ is a measure of the covariance between asset i 's return and the market and $\text{Var}(R_m)$ is the variance of market returns.

According to the CAPM:

1. All investors should choose a portfolio on the capital market line, by holding some combination of the risk-free security and the market portfolio.
2. The market portfolio is efficient, so all stocks and portfolios should lie on the security market line.

2.1.5 Fama-French three-factor model

Fama & French (1992) proposed a three-factor model, expanding the original CAPM model to include more variables to describe stock returns. By adding two additional factors, one accounting for size and the other for *value*, the authors expressed that the model could explain a higher variability in the returns (Fama & French, 1992). The *Small Minus Big (SMB)* factors the size effect and empirical studies assert that small cap stocks outperform the large cap stocks (ibid). The *High Minus Low* factors the value effect and asserts that value stocks (high book-to-market ratio) outperform growth stocks (low book-to-market ratio) (ibid). Mathematically, the model can be expressed as (ibid):

$$E(r_i) = r_f + \beta_1(r_m - r_f) + \beta_2(SMB) + \beta_3(HML) \quad (3)$$

Since the introduction of the three-factor model, the arguments for considering additional factors have been heavily discussed (Renneboog et al., 2008). One of the arguments against the model is that it has been poor in explaining returns in emerging markets (ibid). Considering that this study is based on U.S. listed firms, this argument is not deemed material.

Over time, there have been extensions to the three-factor model to factor variation in returns that is related to profitability and investment (Fama & French, 2015). While the five-factor did improve the predicting power of the model, critics argued that the cross interactions between factors also increased (Blitz, 2018). Furthermore, the five-factor model ignores *momentum*, a factor which critics argue is important given its relevance and acceptance in recent research (ibid). Given these pitfalls, the three-factor model is still widely used and so, the factors of this model will be used in this study.

2.2 Sustainability deep-dive

The main independent variable of analysis in this study are the Environment, Social and Governance scores, so a good understanding of these sustainability pillars is crucial to make well-informed inferences from the study. Firstly, the section will delve into the history of responsible investing and the inception of ESG in the mainstream investment landscape. Secondly, the influence of ESG scores on stock market prices will be elaborated upon. Thirdly, the impact of ESG in influencing the profitability of the company will be touched upon. Finally, ESG is gaining widespread momentum recently and this warrants a discussion on the ESG rating industry that produces these scores as well as the regulatory environment. Given that there are no standard requirements for reporting ESG information, the scores produced by these ESG ratings are prone to shortcomings and this has important implications in interpreting the results of this study (MacMahon, 2020).

2.2.1 History of Responsible Investing and the inception of ESG

Traditional investing	Socially responsible investing (SRI)	Responsible investing	Impact investing		Philanthropy
			Thematic investing	Impact-first investing	
Maximize returns without ESG considerations	Negative and positive screening of companies to align portfolio to specific values	Consider material ESG risks and opportunities in investments	Addressing ESG issue(s) by investing in specific solutions for market-rate returns	Addressing ESG issue(s) by investing in specific solutions which may generate market-rate returns	Address societal challenge(s) with no financial returns
Competitive returns			ESG risk management		
			High impact solutions		

Figure 1: Responsible Investing spectrum. Source: Own contribution based on information cited in text.

Many of the early ideas about the moral responsibilities of commercial enterprises in the U.S. came from the Methodist church in the eighteenth century in the form of participation against slave trade and other sectors deemed immoral, such as alcohol and tobacco (Finkelman & Huntington, 2017). In 1928, with the launch of the *Pioneer Fund*, the first mutual fund to exclude certain investments based on religious criteria, such moral responsibilities made its foray into mainstream finance (ibid). The growing impact the enterprises were having on the social and environmental dimension led to the launch of the first *Socially Responsible Investment* fund which avoided investments in alcohol, tobacco, and manufacturing of weapon (Finkelman & Huntington, 2017).

Until the late 1990s and early 2000s, most investors typically viewed philanthropy and investing as in isolation-one for social good and the other for creating financial returns. It was believed that to the extent personal values, environment and social considerations were taken into account, it typically led to “*binary outcomes*” (Finkelman & Huntington, 2017). However, with the changing investment landscape, the idea that these two concepts could be integrated- generating financial returns while doing good slowly started gaining momentum among investors. Investors can now employ strategies that make use of social and environmental data to steer investment decisions (ibid).

As with any emerging field, practitioners continue to debate the appropriate use of the different terminologies in the field of responsible investing. While *responsible investing* is often used as a catch-all term, it constitutes only a part of the spectrum, albeit an important part. Until the mid-20th century, the two ends of the spectrum were *traditional* and *philanthropic* investing. Under traditional investing, the investor seeks to maximize financial returns without considering any social or environmental impact. On the other end, philanthropic investments are aimed at maximizing social impact regardless of the financial outcome (Trelstad, 2016). Between 1960s and 1970s, the investment spectrum began to expand to include socially responsible investing (SRI) and Impact investing-thematic investing and impact-first investing (ibid).

Socially responsible investing (SRI) is an investing strategy that aims to generate positive social change as well as financial returns for an investor by screening out companies making a negative impact (Finkelman & Huntington, 2017). Typical screens include avoiding investing in companies involved in alcohol, tobacco, weapons, and fossil fuels. Investments that do not meet the screening criteria are excluded, following a “*do no harm approach*”(Fulton et al., 2013; Trelstad, 2016). In recent

times, investors employ an investment strategy combining “*negative (values-driven)*” and “*positive (risk-return driven)*” screening to maximize financial returns (Fulton et al, 2012).

The beginning of the 21st century saw the emergence of ESG/Responsible investing, thereby locating itself in the middle of the spectrum (Fulton et al, 2012). Under ESG investing, market participants go a step further than under SRI to consider material environmental, social, and governance (ESG) risks and opportunities in their investments (ibid). For the longest time, the focus was on the E and S pillars of ESG, but under ESG investing, the G pillar also took importance, especially in the light of the enactment of the Sarbanes Oxley Act in 2002 (ibid). Investors who employ this approach can invest sustainably by considering the ESG factors while also maintaining financial returns (ibid). An ESG-minded investment strategy accounting for climate-risks and other environmental challenges, pressing social issues and good governance is said to substantially improve company performance, generating returns on par or even better than purely risk-weighted portfolios (ibid).

Incorporating ESG elements into the investment process can be mainly done in two ways: i) Exclusionary screening and ii) Best-in-class approach. In the broadest sense, exclusionary screening involves removing companies from an investment portfolio performing poorly on the ESG front (Asmus, 2020). The best-in-class approach allows investors to capitalize on their exposure to companies with leading ESG practices. By doing so, they mitigate the risks associated with poor ESG

Environment	Social	Governance
<ul style="list-style-type: none"> • Climate change and carbon emissions • Biodiversity • Air and water pollution • Deforestation • Energy efficiency • Waste management • Water scarcity 	<ul style="list-style-type: none"> • Labour standards • Human rights • Community relations • Customer satisfaction • Data protection and privacy • Employee engagement • Gender and diversity 	<ul style="list-style-type: none"> • Board composition • Audit committee structure • Bribery and corruption • Lobbying • Political contributions • Whistle-blower schemes

Figure 2: ESG pillar constituents. Source: CFA Institute (2021)

performers, while positioning themselves for the benefits associated with leading ESG performers (Northern Trust Asset Management, 2017).

The discussion around ESG also warrants a discussion of Corporate Social Responsibility (CSR). CSR has expanded its focus from just philanthropy to being a powerful tool for risk mitigation as well as improving firm returns (Fulton et al., 2013). This is done through enhanced corporate citizenship and transparent reporting, thereby leading to a stronger reputation and brand image (ibid). Often linked closely with CSR is Creating Shared Value (CSV), a concept devised by Porter and Kramer (2011). The concept of CSV rests on the premise that enhancing the competitiveness of a company and the social health of the communities in which it operates are mutually inclusive (Porter & Kramer, 2011). A good example is Nestlé's ambitions to create shared value by having a positive and measurable impact on the communities and environment where they operate (Nestlé, 2021).

2.2.2 Shareholder theory v/s stakeholder theory

There has been a growing momentum around the concepts of corporate social responsibility, impact investing, and ESG among corporations and investors. Whether the incorporation of these practices translate into improved financial performance is a longstanding debate among investors and practitioners. In line with this, it is important to look at two opposing theories that form the basis of this discussion-*shareholder theory* and *stakeholder theory*.

Introduced by Milton Friedman in the 1970s, the shareholder theory advocates that a corporation's primary responsibility is towards its shareholders and that the ultimate goal of all corporate decision making is to raise the share prices (Friedman, 1970). The theory is based on the premise that a corporation's board and management owe its "*fiduciary duties*" exclusively to shareholders as they are hired as the "*agent*" of the shareholders to run the company for their benefit (ibid). Given this relationship, they are legally and morally obligated to serve in the best interest of the shareholders. According to this theory, engaging in socially responsible activities translates into higher costs for the corporation, thereby negatively impacting the bottom line (ibid). On the other hand, the stakeholder theory rests on the premise that a corporation's primary responsibility is not only to its shareholders but to a wide-ranging group of stakeholders (Freeman, 1984). Freeman (1984) defines stakeholders as "... *any group or individual who can affect or is affected by the achievement of the organization's objectives*" (p. 46). In addition to shareholders, the wide-ranging group of stakeholders can include employees, suppliers, customers, creditors, and the local community in which the company operates (ibid).

In line with the stakeholder theory, John Elkington outlined the concept of the *triple bottom line (TBL)*. In finance, bottom line usually refers to a company's profits. Taking this a step further, the TBL is an accounting framework that focuses on the company's social (people), environmental (planet) and economic impact (profits) (Elkington, 1997). One of the key challenges Elkington (1997) highlighted with the TBL framework is the difficulty in measuring social and environmental aspects because of its qualitative nature.

2.2.3 Business case for ESG

Bloomberg (2021) reports that the global ESG assets under management (AUM) is projected to exceed by USD 53 trillion, indicating an increase of more than a third of the expected USD 140.5 trillion AUM by 2025. It is also predicted that inflows into ESG exchange-traded funds' (ETFs) should exceed USD 135 billion before 2021 and more than USD 1 trillion inflows are expected into such ETFs globally over the next five years (ibid). Looking at the geographic distributions, more than half of the global ESG assets are managed in Europe followed by the U.S (ibid). The U.S. is predicted to establish its dominance starting in 2022 (ibid). A recent report by Morningstar revealed that in 2020, nearly 400 open-end and exchange-traded sustainable funds were available to U.S. investors that captured USD 51.1 billion (2019: USD 21 billion) of ESG-related investments (Hale, 2021). The report also highlighted that ESG funds could potentially gain even further momentum if the Biden administration seeks to ease ESG funds being included in 401(k) plans. In his annual letter to CEOs, Larry Fink, the CEO and Chairman of the world's largest asset manager pronounced climate risk as an *"investment risk"*. In line with the stakeholder theory, Fink (2020) advocates that *"a company cannot achieve long-term profits without embracing purpose and considering the needs of a broad range of stakeholders"*. It is argued that firms that adapt their company operations to account for ESG factors are in a better position to identify key strategic opportunities and gain competitive advantage (Atkins, 2018). In their paper, Clark et al. (2015) highlight three avenues how the integration of ESG factors can provide competitive advantage to a firm-Risk, Performance and Reputation.

Risk

The authors argue that integration of ESG factors can lower the overall risk for the firm. For example, BP's Deepwater Horizon 2010 oil spill in the Gulf of Mexico is a good example of how environmental risks can have substantial financial and litigation consequences for a business. The catastrophe

resulted in fines of USD 4.5 billion and saw BP's share price plummet 50% between April 2010-June 2010 (Clark et al., 2015). The paper also highlights that good ESG practices are associated with lower cost of equity. Previous studies have shown that firms which have good environmental management practices in place are shown to enjoy lower cost of equity and reduced beta and with voluntary disclosure of environmental performance, the cost of equity is expected to lower even further (Dhaliwal et al., 2011; Albuquerque et al., 2019; El Ghouli et al., 2018). Another risk for companies is the potential costs associated with externalities such as physical climate risks which can have tangible internal impact on a firm's supply chain and production process as well as price fluctuations (Clark et al., 2015). Superior ESG practices are also shown to lower the volatility of a firm's cash flows (Minor & Morgan, 2011; Ashwin Kumar et al., 2016). In addition, studies have pointed out that enhanced ESG activities is associated with better capital allocation, thereby improving investment returns (Witold et al., 2019). Such capital allocation reduces the risk of stranded investments especially in fossil fuel industries which are under increased regulatory scrutiny in recent times (ibid).

Performance

Clark et al. (2015) advocates that integration of ESG factors can significantly improve performance. Porter & Van Der Linde (1995) argue that good environmental practices can lead to innovation, which in turn can help reduce costs as the firms can now employ their resources more efficiently. The authors claim that pollution signals *inefficiency*. They argue that “...when scrap, harmful substances, or energy forms are discharged into the environment as pollution, it is a sign that resources have been used incompletely, inefficiently, or ineffectively” (Porter & Van Der Linde, 1995). Several studies have shown that having more gender diversity on the Board is associated with improved firm efficiency as well as profitability (Kılıç & Kuzey, 2016; Post & Byron, 2015; Brahma et al., 2020). Eccles & Serafeim (2013) pointed out that while the number of firms engaging in ESG related activities are on the rise in recent times with the hopes of being rewarded financially for doing good, only a small proportion of these firms *strategically* focus on *material* issues. The authors argue that there is indeed a trade-off between ESG and firm performance and that the market is not going to reward firms for simply doing good if it doesn't create any substantive value.

Reputation

It is argued that good corporate reputation has a substantive value creating impact in gaining competitive advantage (Clark et al., 2015). High reputation, associated especially with the 'S' pillar in ESG points to enhanced financial performance and competitive advantage (Edmans, 2012). On studying the relationship between employee satisfaction and financial performance, Edmans (2012) points to a positive relationship between the two indicators citing that a good workplace can bolster employee motivation, thereby leading to lower employee turnover. The author pointed out that companies that made to the coveted Fortune's "100 Best Companies to Work For" list generated 2.3 % - 3.8 % higher stock returns than their counterparts over a 25-year horizon (ibid). Furthermore, good firm reputation does not only positively impact employees but also good relations with suppliers, investors, and the wider local community, thereby reducing the costs associated with reputational and litigation risks (Clark et al., 2015).

2.2.4 ESG scepticism

While the proponents of ESG spin a win-win narrative of *doing well by doing good*, opponents express their fair share of concerns. Armstrong (2020) expresses that the win-win narrative is a "fallacy" and bases it on two main arguments. Firstly, an average investor is characterized by short-termism and ESG enhancing activities have a long-term horizon (Armstrong, 2020). This mismatch in time horizon makes the win-win narrative difficult to achieve. While it is possible that at some point in the distant future, doing good and financial performance might converge, it is beyond the scope of a firm's planning horizon (ibid). Secondly, Armstrong (2020) argues that "a wicked or 'anti-ESG' portfolio perfectly well might offer the best available return". In theory, investments outperform either if they generate higher than expected average returns (growth), or if they're bought cheap (value). ESG investing rests on the premise of moving away from these "wicked or 'anti-ESG' portfolio" making the prices cheap and setting up these non-ESG portfolios to outperform their ESG counterparts over time (Armstrong, 2020).

Despite the good performance of ESG funds in recent years, there are some questions raised around performance attribution (ibid). In 2018, Vanguard's U.S. ESG ETF generated returns of 28 % compared to 17 % by the general market. However, on having a closer look at the holdings of the ESG fund, the top seven holdings accounted for approximately a quarter of the fund's value and was led

by major technology companies. It was these tech companies that led the outperformance and poses the question if it had anything to do with ESG (ibid). Armstrong (2020) goes on to add that at best, good ESG performance is simply a “*factor*” like company size and investors should not think of it as a profit maximizing strategy.

Opponents of ESG investing argue that there is inconclusive evidence that ESG funds outperform their traditional counterparts. Renneboog et al. (2008) noted that the risk-adjusted returns of ESG funds are not statistically different from their traditional counterparts. Nofsinger & Varma (2014) noted that while ESG funds underperform during normal periods, they show outperformance during crises. An IMF (2019) study found that the performance of sustainable funds are in line with that of conventional funds. While this is a good justification to invest in ESG funds, an important caveat is that the fees associated with managing ESG funds are often higher than that of their traditional counterparts. This poses an important consideration when it comes to its widespread adoption (ibid). Furthermore, it is argued that restricting the investment universe can limit investment opportunities by reducing diversification, leading to more volatile portfolios (ibid).

While Blackrock, the world’s largest asset management company is continuing to take a more activist stance when it comes to climate change and the impact of ESG, its former, and first Chief Investment Officer for Sustainable Investing Tariq Fancy has his doubts. His take on ESG is strongly influenced by the shareholder theory and says that investment managers owe a fiduciary duty to their clients to maximize returns and if investing in non-ESG activities translates into higher returns, no rhetoric surrounding the need for ESG investing can trump that (Fancy, 2021). Continuing with the argument posed by Armstrong (2020), Fancy (2021) argues as well that for highly liquid investments with a short holding period, the narrative of ESG investing is irrelevant. Danone, a French/Spanish multinational food corporation ousted its CEO who is a longstanding advocate of stakeholder capitalism and sustainability over falling share prices (Economist, 2021). Critics pointed out that the company focused too much on its sustainability efforts at the cost of financial performance, thereby indicating some form of a trade-off between ESG and firm performance (ibid). Fancy (2021) also argues that in many cases, it is cheaper for firms to engage in “*green washing*” rather than engaging in hard work of really improving firm sustainability.

Lack of standardized ESG reporting standards, high costs of ESG reporting and the inconclusiveness of ESG performance pose a challenge for investors when it comes to ESG integration in the firm. Third party ESG providers aim to provide ESG scores based on their standardized assessments but this is also not without issues, especially lack of transparent methodology and issues with measuring the E, S and G components.

2.2.5 ESG rating industry and Regulatory environment

The independent variables in this study are the ESG scores. This includes the individual E, S and G scores, combined ESG score as well as the change in scores. The importance of these scores in the study warrants a discussion on the ESG rating industry that is responsible for providing these scores. With the surge in ESG investing and the increase in investor demand for ESG data, the ESG rating industry has seen an increase in rating agencies over time. Some of the most popular rating agencies include MSCI, Sustainalytics, ISS ESG and Refinitiv (formerly Thomson Reuters). These ratings evaluate companies based on their ESG policies, processes and systems and usually base their scores on publicly available sources (Deloitte, 2021). The rating scores are aimed at aiding investors in identifying material ESG risks (ibid). Despite its usefulness in identifying material ESG risks, the rating industry is fraught with some pertinent challenges. One of the criticisms faced by ESG rating agencies is lack of standardized and transparent methodology (Escrig-Olmedo et al., 2019). Each rating evaluates a firm's ESG performance based on their own methodology, resulting in rating divergence (Berg et al., 2019; Escrig-Olmedo et al., 2019). According to Berg et al. (2019), this can result in three types of divergence-*scope, measurement and weights*.

Scope divergence occurs when different ratings are based on a different set of material criteria (ibid). For example, one rating might include lobbying as a material indicator while the other may not resulting in scope divergence. *Measurement divergence* occurs when ratings measure the same criteria using different indicators (ibid). For example, the strength of the labour practices in a firm could be assessed based on the policies such as the code of conduct or based on outcomes such as the frequency of labour-related cases in a year. While both the indicators measure the same attribute of labour practices in a firm, it can lead to diverging results. *Weights divergence* occurs when ratings place different weights on material attributes (ibid). For example, one rating might place more weights on greenhouse gas reduction than water pollution. These divergences make it difficult to make reasonable inferences from the scores. As a result, the rating scores should be interpreted with

caution and should be used to inform investors about a firm's material ESG issues rather than forming the basis of investment decision-making (Michaelsen & Gilbert, 2021).

It is safe to say that the demand for ESG disclosure is expected to increase in the coming years. To have a grounded understanding of what economic activities qualify as sustainable and to prevent the potential of green washing, the European Union set out the EU taxonomy Regulation (European Commission, 2021). The Taxonomy is the first *credible* and *accepted* standard that lays down the criteria for economic parties to transition to a low carbon economy (ibid). In 2020, New Zealand became the first country in the world to announce mandatory climate disclosure reporting in line with the Task Force on Climate-related Financial Disclosures (TCFD) and could take effect from 2023 (CDSB, 2020). Following suit, the UK government announced that climate risk reporting will become mandatory for large companies and financial institutions (HM Treasury, 2020). Even though in the U.S. there is currently no mandatory requirements for ESG disclosure, the Biden administration has prioritized to set up a comprehensive framework for mandatory ESG disclosures (EY, 2021).

Chapter 3: Previous Research

The below section will delve into previous strands of research within the area of sustainability and firm performance. Reviewing previous studies is in alignment with the deductive approach employed in this study and will also help in the formulation of the hypotheses. In addition, reviewing previous literature will also provide the inspiration for the choice of methodology to be applied in this study. The section will first begin with previous research conducted in the field of CSR and firm performance since ESG is a relatively recent field. Subsequently, the previous literature on ESG and firm performance will also be presented.

3.1 Corporate Social Responsibility (CSR) and firm performance

The relationship between CSR and firm performance has been subject to mixed views in previous literature. Moskowitz (1972) conducted one of the first studies focusing on CSR and firm performance. In his empirical analysis, Moskowitz selected 14 firms which he thought were socially responsible, and then calculated their rate of returns for the first six months of 1972. He noted that the 14 stocks had appreciated an average of 7.28 % and outperformed the general market index (Moskowitz, 1972). Based on his empirical study, Moskowitz observed a positive relationship between CSR and firm performance. Studies focusing on the relationship between CSR and accounting based performance measures have generally yielded a positive relationship. In their empirical work, Bragdon & Marlin (1972) and Bowman & Haire (1975) selected the return on equity (ROE) metric, Parket & Eilbirt (1975) selected net income, profit margin, return on equity (ROE) and earnings per share (EPS) and Sturdivant & Ginter (1977) selected the 10-year EPS growth. All the authors found a positive and significant relationship between CSR and the aforementioned metrics. Delving a bit deeper into different geographies, Basuony et al. (2014) investigated the impact of CSR on firm performance in the Middle East and North Africa (MENA) region and found a positive and significant relationship. In their empirical study based on sample data from Taiwan, Wang (2011) pointed out that CSR has a significantly positive impact on firm performance. On examining the relationship between CSR and firm performance on Chinese listed companies, Sial et al. (2018) found that a positive and significant relationship as well. The aforementioned studies validate that CSR seems to positively influence firm performance across geographies.

Opponents of the aforementioned studies point out to a negative relationship between CSR and firm performance. Picking up where Moskowitz (1972) concluded, Vance (1975) challenged Moskowitz's findings and took the analysis a step further. He examined the market performance of firms deemed as having high and low levels of CSR and found that the latter outperformed the former and established a negative relationship between CSR and firm performance. Analysing firms operating in the operating automobile industry, Marcus (1989) concluded a negative relationship between CSR and firm performance. Both these studies focused on analysing accounting performance measures such as ROA. Some authors argue that high investments in CSR activities result in additional costs to the firm, thereby negatively impacting the bottom line (McGuire et al., 1988; Marcus, 1989; Roman et al., 1999).

There is a third strand of literature that points to no significant relationship between CSR and firm performance. On analysing ASX300 companies in Australia, Brine et al. (2007) validated this claim in their empirical analysis. Alexander & Buchholz (1978) concluded that no significant relationship was found while studying stock market performance and CSR for U.S. listed firms between 1970-1974. Consistent with the findings of Fama (1970), the authors conclude that stock markets are efficient and that any new information relevant to the earning outlook is reflected in the stock prices.

McWilliams & Siegel (2000) pointed out that the inconclusiveness surrounding the relationship between CSR and firm performance is due to a *"flawed empirical analysis"*. The authors argue that previous research showing a positive relationship between CSR and firm performance does not account for relevant control variables like Research and Development (R&D) expenditure which is shown to be a significant determinant in influencing firm performance. When they took R&D expenditure in their regression model, the authors saw a change from positive relationship to no relationship between CSR and firm performance. To an extent, such inconsistencies and limitations in measuring CSR performance paved the way for the development of ESG scores, forming the basis of the rest of the study.

3.2 ESG and firm performance

Moving beyond the CSR frontiers, an increasing number of studies have focused on examining the relationship between ESG performance (using ESG scores) and firm performance. Moreover, since ESG is a relatively newer concept, there has been a growing interest among academicians, practitioners, and investors. In their meta-analysis, Friede et al. (2015) combined the findings of over 2000 studies in this field and concluded with empirical evidence that the business case for ESG is strong. Their work is also by far the most exhaustive study in this area. They found that more than 90 percent of the studies show a positive relationship between ESG and firm performance. Moreover, the study also highlighted that the positive relationship between ESG and firm performance remains consistent over time. A study conducted by Spellman (2020) showed that there appears to be a positive link between ESG performance and corporate financial performance. He argued that this relationship is perhaps because the higher the profitability of the firm, the more resources they must invest in ESG enhancing activities. He also highlights that the higher profitability could also be attributed to these firms managing their material ESG risks well. Spellman (2020) argues that the relationship could be attributed to a little bit of both the aforementioned arguments. This indicates that ESG enhancing activities could improve financial performance, which in turn provides firms with the monetary resources to invest in even better ESG enhancing activities, driving up the firm's financial performance.

In their study of 351 firms from FTSE350 for the period of 2002-2018, Ahmad et al. (2021) found an overall positive and significant relationship between high ESG performance and high firm profitability compared to firms with lower profitability. However, while looking at the individual ESG pillars, the findings showed varying results. The authors noted in their findings that it is the firm size that largely influences the relationship between ESG and financial performance. Evaluating the performance of public listed companies in Europe using machine learning and logistic regression models, De Lucia et al. (2020) found a positive relationship between ESG performance and financial indicators. Furthermore, the author's findings reveal that when companies in particular look into matters relating to innovation in environmental practices, measures in improving employee productivity as well as diversity and inclusion, this relationship appears more pronounced. Studying the relationship between ESG performance and financial performance in the energy sector revealed that good financial performance can in fact lead to improved financial performance confirmed by the

financial indicator-Return on capital employed, indicating that the findings have important implications for investors, management, and regulators (Zhao et al., 2018). Deutsche Bank Group (2012) analysed over 100 academic studies studying this relationship and found that 89% companies with higher ESG ratings showed market-based outperformance while 85% companies in the studies showed accounting-based outperformance (Fulton et al., 2013). Khan et al. (2016) conducted a study whereby rather than taking the ESG ratings as given by the ratings provider, they took inspiration from the methodology devised by the Sustainable Accounting Standards Board (SASB) to identify the most material ESG risk factors on an industry basis. The authors also controlled for other important variables like size and ownership to paint as clear a relationship as possible and found that companies performing well on the material ESG risk factors showed outperformance, generating up to a 6% annualized alpha.

Opponents of the studies point to a negative relationship between ESG and firm performance. In their study, Auer and Schuhmacher (2016) looked at firms in Asia-Pacific, the United States and Europe and concluded that regardless of the geographic location, stocks with higher ESG performance showed no risk-adjusted outperformance compared to passive investments. In Europe, investors were willing to pay a premium for being socially responsible, leaving them with a lower risk-adjusted performance compared to the passive investments. In their paper, authors Sahut and Pasquini-Descomps (2015) investigated how ESG scores affected the monthly stock market return for firms in the U.S., U.K., and Switzerland during 2007-2011. The authors observed a negative relationship between the stock's monthly returns and their ESG scores in the UK while found no significant relationship in the U.S. and Switzerland markets. A research study conducted by Morningstar (2020) revealed that in the U.S. and Canada, there is evidence showing that there is a premium associated for choosing companies scoring high in the ESG dimension (Sargis & Wang, 2020). The study revealed that the *"Worse ESG portfolio"* earned a 212% return over the sample period of January 2009 through May 2019, while the *"Medium"* and *"Better"* portfolios earned only 198% and 157% returns, respectively. The report highlighted that if investors held only U.S. and Canadian securities, they would have underperformed for holding better ESG securities. By employing both accounting-based measures (Return on Assets and Return on Capital) and market-based measures (Excess stock returns), Nollet et. al. (2015) studied the relationship between these measures and ESG scores for S&P500 from 2007–2011 and considering both linear and non-linear relationships. The authors found a significant negative relationship between ESG and Return on Capital and no significant

relationship was reported between ESG scores and Return on Assets and excess stock returns. However, the non-linear model showed the presence of a U-shaped relationship between ESG and the accounting-based measures indicating ESG pays off only after a certain level of investments have been made into Corporate Social Performance. The authors argue that before this threshold of investment is reached, any additional ESG expenditure will translate into lower financial performance.

The third strand of literature of this topic presents no significant relationship between higher ESG scores and firm performance. Balatbat (2012) analysed the performance of companies listed on the Australian Stock Exchange from 2008-2010 and found no significant relationship between ESG scores and the various firm performance metrics. Both the 1-year and 2-year lag analysis could not substantiate a strong correlation between financial performance and ESG, and furthermore, many negative correlations were also observed between ESG and the different metrics. The author explains that one possible reason for such weak correlations could be attributed to the fact that ESG scores do not paint a full picture of the *“true sustainability practices that provide a flow-on effect to firm performance”*. Atan et al. (2018) performed an analysis studying the impacts of ESG on firm performance in Malaysia using three indicators-profitability, firm value, and cost of capital. The empirical results from their study point to no significant relationship between the individual and aggregate ESG components and profitability (measured through Return on Equity) as well as firm value (measured through Tobin’s Q). Mănescu (2011) conducted a study on U.S listed firms from July 1992-June 2008 and found no significant relationship between ESG and stock returns. The author found that only community relations (falling under the ‘S’ pillar) had a positive effect on stock returns. In their study, Almeyda and Darmansya (2019) looked at the G7 countries over a sample period of 2014-2018 and found no significant relationship between ESG and stock price. Their study also highlighted that there is no significant relationship between social and governance pillars and firm’s financial performance. However, they did note a statistically significant and positive relationship between ESG and Return on Assets as well as Return on Capital.

Chapter 4: Methodology

The following chapter will delve into the methodology employed in this study. An overview of the data samples (dependent, independent and control variables) that will be used in the statistical analysis will be presented, followed by a brief comment on the sample period. This will be followed by a deep dive into the statistical method employed and the justification for the same as well as an overview of the regression models.

4.1 Hypothesis Development

The goal of the study is to assess whether Environmental, Social and Governance scores positively influence firm performance, specifically looking at a firm's annual stock returns and profitability. In line with the research question and supported by previous literature within the field of ESG and firm performance, hypotheses have been developed, which will be tested for significance using a multiple regression model. For this, the combined ESG score as well as the individual ESG pillars will be studied. The rationale behind such an approach is to gain a more comprehensive insight into how the scores influence firm performance. This is also in line with previous studies in this area. In addition, to uncover the influence of ESG score changes on firm performance, the effect of a score change (increase or a decrease) will be studied as well. This will be measured as a percentage change of the scores (applied to both combined as well as disaggregated scores). Although, the analysis of a score change has only been observed in a limited amount of previous study, it is deemed beneficial to study.

Hypotheses: Stock market performance

H1a: Environment, Social and Governance score is positively linked to stock returns

H1b: Combined ESG score is positively linked to stock returns

Hypotheses: Firm profitability

H2a: Environment, Social and Governance score is positively linked to Net income

H2b: Combined ESG score is positively linked to Net income

H3a: Environment, Social and Governance score is positively linked to Return on Assets

H3b: Combined ESG score is positively linked to Return on Assets

4.2 Statistical Analysis

Since an empirical approach forms the basis of the study, a statistical analysis, more specifically a multiple regression model is used to study the relationship between ESG scores and firm performance. Since the data sample contains 373 observations for 9 years, the first choice was to use a panel regression accounting for both the entity and time fixed effects. However, upon observing the results, no satisfactory inferences could be made and so, it was decided to employ an Ordinary Least Squares (OLS) method instead. The below section will first explain the theoretical background and delve into how previous studies have utilised this statistical method.

4.2.1 Theoretical background

Regression modelling is a set of statistical processes that tests for the relationship between a dependent variable and a set of independent variable(s) (Stock & Watson, 2015). Although the modelling can take many forms, the most common form is the linear regression model, and this study will employ the Ordinary Least Squares (OLS) method. A linear regression follows a linear approach to modelling the relationship between the dependent variable Y and the independent variable(s) X and predicts Y based on the independent variable(s). The formula for a simple linear relationship is as follows (Stock and Watson, 2015):

$$Y = \beta_0 + \beta_1 X + \varepsilon \quad (4)$$

This simple model can be extended to include multiple independent variables to form a multiple linear regression model as follows (ibid):

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \varepsilon \quad (5)$$

whereby (ibid):

1. intercept β_0 is the expected value of Y when all the X 's equal zero.
2. β_1 is the slope coefficient on X_1 and is interpreted as the expected change in Y_i resulting from a one unit change in X_{1i} , holding constant X_{2i}, \dots, X_{ki} . Note that the coefficients on the other X 's can be interpreted in a similar manner.
3. ε is the error term and accounts for how much the observed data differs from actual population data.

4.2.2 OLS estimator in a multiple regression

The OLS estimator chooses the regression coefficients such that the regression line is as close to the observed values. The rationale is that these coefficients can be estimated by minimising the sum of the squared prediction mistakes (Stock and Watson, 2015). Consider b_0, b_1, \dots, b_k be the estimates of $\beta_0, \beta_1, \dots, \beta_k$, then the predicted value of Y_i is $b_0 + b_1X_{1i} + \dots + b_kX_{ki}$, and the mistake in predicting Y_i is $Y_i - b_0 - b_1X_{1i} - \dots - b_kX_{ki}$. The sum of the squared prediction mistakes over n observations is expressed as (ibid):

$$\sum_{i=1}^n (Y_i - b_0 - b_1X_{1i} - \dots - b_kX_{ki})^2 \quad (6)$$

The estimators of the coefficient $\beta_0, \beta_1, \dots, \beta_k$ that minimise the sum of the squared mistakes in equation X are the least ordinary least squares (OLS) estimators and are given by $\hat{\beta}_0, \hat{\beta}_1, \dots, \hat{\beta}_k$ (Stock and Watson, 2015). The OLS regression line is the line that is constructed using the OLS estimators $\hat{\beta}_0 + \hat{\beta}_1X_1 + \dots + \hat{\beta}_kX_k$ (ibid). Based on the OLS regression line, the predicted value of y_i is given by $\hat{y}_i = \hat{\beta}_0 + \hat{\beta}_1X_1 + \dots + \hat{\beta}_kX_k$. The OLS residual is expressed as $\varepsilon = y_i - \hat{y}_i$ (ibid).

4.2.3 Testing for significance

The OLS method allows to test the variables in the model for significance, individually and/or jointly. The hypothesis to test the individual significance of the regression coefficient is expressed as follows (Stock and Watson, 2015):

$$H_0: \beta = 0$$

$$H_1: \beta \neq 0$$

Simply put, the null hypothesis states that there is no relationship between the variables that are measured and that the slope equals zero (Stock and Watson, 2015). To determine if the null hypothesis can be accepted or rejected, the null hypothesis can be tested using the *t-statistic*. In general, the t-statistic takes the format $t = \frac{\text{estimator} - \text{hypothesized value}}{\text{standard error of the estimator}}$ (Stock & Watson, 2015). This can be mathematically expressed as (ibid):

$$t_1 = \frac{\hat{\beta}_1 - \beta_0}{S.E.(\hat{\beta}_1)} \quad (7)$$

The result is then compared to a critical value to determine if the null hypothesis can be rejected. However, there is the potential occurrence of type 1 errors whereby the null hypothesis is rejected

when it is in fact true (ibid). The hypothesis can be then be tested against a significance level (e.g., 5%) and if the t-statistic is greater than the critical value then the null hypothesis can be rejected with a 95% probability (ibid). The *p-value* is the probability of obtaining t-statistic by random sampling variation and is the smallest significance level at which the null hypothesis can be rejected (Stock & Watson, 2015).

To test the joint hypothesis of the regression coefficients, an F-test can be used in combination with the p value. The null and the alternative hypothesis can be expressed as (Stock & Watson, 2015):

$$H_0: \beta_j = \beta_{j,0}, \beta_m = \beta_{m,0}, \dots \text{ for a total of } q \text{ restrictions}$$

$$H_1: \text{one or more of the } q \text{ restrictions under } H_0 \text{ does not hold}$$

The F-test can be mathematically defined as (Stock & Watson, 2015):

$$F = \frac{\frac{ESS}{k}}{\frac{RSS}{(n-k-1)}} = \frac{\frac{R^2}{k}}{\frac{(1-R^2)}{(n-k-1)}} \quad (8)$$

From the above expression, it can be inferred that as the value of R^2 increases, the F score increases as well indicating stronger joint significance and evidence against the null hypothesis. R^2 is a goodness of fit measure and is used to explain the percentage of variance between the dependent and independent variables (Stock & Watson, 2015). In a multiple regression, the R^2 increases whenever an independent variable is added to the model. However, this poses an issue since more variables can be added just to increase the R^2 does not necessarily improve the fit of the model (ibid). To mitigate this, the adjusted R^2 can be considered which adjusts for the number of variables and does not necessarily increase when a new regressor is added (ibid). Thereby, for this study, the adjusted R^2 will be considered to observe how well the term(s) fits the model.

Despite its simplicity and usefulness, the OLS methodology is not free of certain limitations. The OLS methodology is modelled to study linear relationships. However, not all relationships are linear, and this restricts the possibility of studying some important relationships. Secondly, while an OLS regression examines the relationship between the mean of the dependent and independent variables, it is the case that sometimes it is the extreme value of the dependent variable that needs to be investigated (Stock & Watson, 2015). The OLS regression rests on some important assumptions and the failure to follow these could lead to ill-informed inferences (Stock & Watson, 2015).

Despite these limitations posed by the OLS methodology, given the nature of the study sample and its applicability and usefulness, an OLS regression is deemed appropriate. This is further validated by the fact that previous research studying the influence of ESG on firm performance have made use of this methodology and have made meaningful inferences from the same (Balatbat et al, 2012; Martin and Dahlström,2020; Buallay, 2019; Velte, 2017; Manescu, 2011). In their study, Nollet et al. (2015) use both linear and non-linear models to study this relationship.

4.3 Overview of variables

4.3.1 Dependent variables

The below section will outline the choice of the dependent variables employed in studying firm performance. To make well-rounded inferences, both market-based (annual returns) and accounting-based (Net Income and Return on Assets) have been used as proxies for firm performance. The variables were carefully chosen based on previous literature and their applicability in the study.

4.3.1.1 Stock market returns

The stock market return indicates the change (increase or decrease) in the price of a stock over time (annual in this study) and may be represented by a price change or percentage change. The underlying rationale behind employing annual stock returns in this study is to analyse whether ESG scores create any value towards firm performance and thereby increase the stock price of the firm during the observed period (Hvidkjær, 2017). Furthermore, employing stock market returns as a proxy for market performance is in line with numerous previous studies in this area and further strengthened the reasoning to use this metric (Balatbat et al., 2013;Stotz, 2021; Sahut & Descomps, 2015; Ramadhani, 2019). It should be noted that past studies have also used Tobin's Q as a proxy for market performance but in this study stock market returns were decided upon.

Another important consideration is dividends. Dividend payments have an impact on stock market prices and on the ex-dividend date, the stock price decreases by the dividend amount to reduce "*dividend capture*" (Berk & DeMarzo, 2017). As a result, the stock prices in this study have been adjusted for dividends as a dividend-adjusted return considers both the appreciation of a stock's price as well as the dividends. This presents a better idea of the overall valuation of the stock's return (ibid). For similar reasons, the prices have also been adjusted for stock splits.

To calculate the annual stock market returns, the monthly adjusted closing prices were retrieved from Bloomberg (2021). It was assumed that the investor would purchase the stock at time $t-12$ and sell the stock at time t and calculated as:

$$\text{Annual Stock Market Returns} = \frac{\text{Closing Price}_t}{\text{Closing Price}_{t-12}} - 1 \quad (9)$$

4.3.1.2 Net Income

In this study, absolute Net income is used as one of the proxies for firm profitability. It is one of the most important line items on an income statement and a good net income is an indication of a financially sound business (Berk & DeMarzo, 2017). Net Income is calculated after subtracting the revenue from all the expenses and the final figure is a good indicator of firm profitability (ibid). The rationale behind taking Net Income as a dependent variable is two-fold. Firstly, Net Income is a sound indicator to study the impact of ESG on a firm's bottom line. Secondly, previous literature hasn't focused on Net Income and so it will be interesting to analyse its influence in this study. However, a word of caution regarding Net Income is that it can be prone to earnings manipulation whereby the current period earnings on the income statement can be altered by either inflating the revenue or deflating the expenses for that period (Berk & DeMarzo, 2017). One of the main reasons for such manipulation is that Executive Compensation is directly tied to the company's financial performance and as a result, there is a huge incentive to present a positive outlook to boost personal compensation (ibid). The end of year Net Income for the sample firms were retrieved from Bloomberg (2021).

4.3.1.3 Return on Assets

The second proxy used for firm profitability is Return on Assets (ROA). ROA is a sound indicator of how profitable a company is relative to its total assets and a higher ROA indicates more asset efficiency (Berk & DeMarzo, 2017). The rationale behind using this variable is two-fold. Firstly, ROA will help analyse the impact of ESG on a firm's ability to utilize its assets efficiently to generate profits (ibid). Secondly, previous studies have included ROA as a proxy for firm profitability (Yawika & Handayani, 2019; Balatbat et al., 2012; Buallay, 2019; Velte, 2017). However, a word of caution regarding ROA is that it is best used when comparing similar firms as asset sizes can vary across sectors (Berk & DeMarzo, 2017). To control for this effect, a sector dummy has been included in the

analysis. To calculate ROA, the end of year figures for Net Income and Total Assets were retrieved from Bloomberg (2021) and is calculated as (Berk & DeMarzo, 2017):

$$\text{Return on Assets} = \frac{\text{Net Income}_t}{\text{Total Assets}_t} \quad (10)$$

4.3.2 Independent variables

With ESG gaining widespread momentum in the recent past, a plethora of rating providers have sprung. Some of the most used providers include MSCI, Sustainalytics, Refinitiv (formerly Thomson Reuters) and ISS ESG. These rating providers rate the companies based on their ESG policies, procedures, and management (KPMG, 2020). Since there is no single, accepted framework or methodology behind how the ESG scores are calculated by these different providers, there were two main determinants in choosing a rating provider for this study. Firstly, the accessibility of ESG rating scores for U.S. listed firms for the sample period and secondly, how widely the rating provider is used in ESG research. The choice of ESG rating provider in this study is *Refinitiv* given that it fulfills both the criteria.

The Refinitiv database covers approximately 70% of the global market cap since 2002 (Refinitiv, 2020). Refinitiv's ESG scores measure the performance of firms across ten metrics based on the three ESG. The scores are based on only publicly available information and undergoes a thorough quantitative analysis to be as objective and comparable across companies and sectors (ibid). The scores for each of the ESG pillar is calculated using a percentile-rank scoring approach by aggregating the estimates of each of the 10 categories and their weights, with the scores ranging from 0 to 100 (ibid). The weights for the E and S pillars vary depending on the industries and are updated regularly while the G pillar is fixed. This is because for different industries, different categories are deemed appropriate proxies for the E and S performance (ibid). The E and the S pillars are benchmarked against industry peers while the G performance is benchmarked against companies with the same country of incorporation (ibid). Furthermore, the final pillar scores are industry-adjusted.

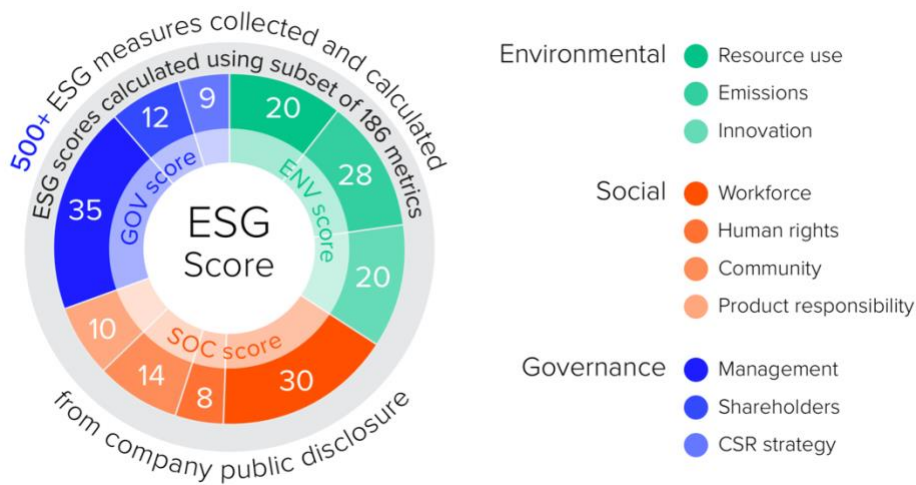


Figure 3: Refinitiv classification of ESG pillars and indicators per category. Source: Refinitiv (2020)

Much of previous literature has focused on the aggregate ESG score. This study will employ the use of both the individual ESG pillar scores as well as the aggregate ESG score. The rationale behind studying the disaggregate score is to assess which of the three ESG pillars have key impact on firm performance.

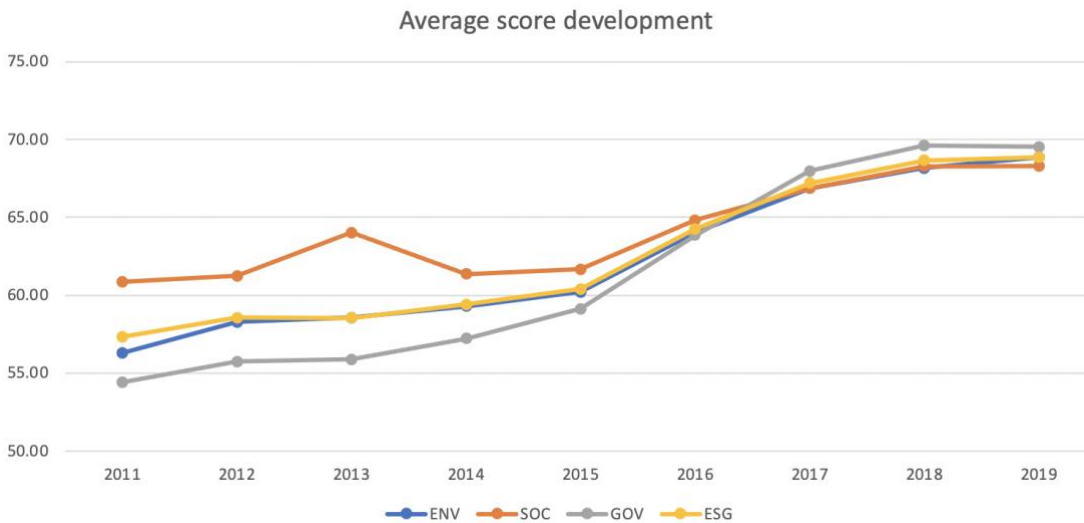


Figure 4: Average scores in the data sample. Source: Own contribution based on data from Refinitiv (2021)

The above graph shows the average of the yearly scores across the Environment (ENV), Social (SOC), Governance (GOV) and the combined ESG indicator in the study sample. All the four indicators in the

graph point to a positive trend. Looking at the combined score in the sample, Intel Corp had the highest ESG score with 97.66 while TransDigm Group Inc had the lowest ESG score with 12.89.

In addition to the individual and combined ESG score, the study will also investigate the change in scores to test for influence on firm profits and for potential signalling effect associated with ESG score improvement. All the firms in the sample showed an increase or decrease in their score, further validating the rationale for considering the change in scores. The score change is calculated as follows:

$$\text{Score change}_T = \frac{\text{Score}_t}{\text{Score}_{t-12}} - 1 \quad (11)$$

4.3.3 Control variables

A control variable can be defined as a variable included in the study to hold constant factors that if not considered could lead to wrong inferences. To separate the effect of ESG on firm performance, a set of control variables have been introduced in the study. These variables have been chosen based on previous literature and is shown to impact firm performance. The below section will explain the rationale for each controlled variable in detail.

4.3.3.1 CAPM

Fama and French's three factor model (1992) is one of the most important models for understanding how well some factors adequately explain the stock returns. To assess the influence of ESG scores on a firm's stock returns, the factors originating from model (1992) is applied as a basis for the control variables in the regressions. CAPM is calculated as $E(R)_i = R_f + \beta(E(R_m - R_f))$ (Munk, 2018). The one-year U.S. treasury bond yield was used as the risk-free rate. There were two reasons why the one-year U.S. treasury bond yield was chosen. Firstly, the sample consists of U.S. listed firms and secondly, one-year rate matches with the Annual returns time horizon. The monthly bond yields were retrieved from Bloomberg (2021).

The second component of the CAPM formula is beta, the measure of systematic risk and a historical measure of a stock's volatility. In this study, for the CAPM calculation at time t , the lagged beta two years prior to time is considered. The beta for the study has been retrieved from Bloomberg (2021).

The final component in the calculation of CAPM is market returns. The Russell 1000 index has been used as the proxy for market returns. This index has been considered for three reasons. Firstly, the index matches the characteristics of the study sample. As of 2020, the index's lowest bound had a market capitalization of USD 1.8 billion which captures the lower bound of the sample's market capitalization of USD 2 billion (FTSERussell, 2020). Secondly, the Russell 1000 is one of the most widely followed stock market index in the U.S. along with the S&P 500. Lastly, previous studies with similar sample observations have employed the Russell 1000 as a proxy for market returns (Buallay, 2019; Martin & Dahlström, 2020). To compute the market returns, monthly index prices from end of 2010 to the end of 2019 were retrieved from Bloomberg (2021) and was calculated as follows:

$$\text{Index returns}_T = \frac{\text{Index Price}_t}{\text{Index Price}_{t-12}} - 1 \quad (12)$$

5.3.3.2 Market capitalisation

The second factor in the Fama and French's three factor model (1992) is the small minus big (SMB) component. The SMB accounts for the spread in returns between small and large cap stocks whereby the authors found that small cap stocks tend to outperform large cap stocks (Munk, 2018). To control for the size effect, market capitalisation was included as a proxy for the SMB component. This is also in line with previous research (Manescu, 2011; Martin and Dahlström, 2020). The market capitalisation data for the firms over the sample period were retrieved from Bloomberg (2021). In the study, the variable is transformed by taking the natural logarithm to account for any large variations and to reduce the influence of outliers in the sample (Stock & Watson, 2015).

5.3.3.3 Price to Book Ratio

The third factor in the Fama and French's three factor model (1992) is the high minus low (HML) component and accounts for the outperformance of companies with a high book-to-market ratio (value stocks) over low book-to-market ratio (growth stocks). Based on the availability of data from the Bloomberg (2021) portal, the Price to Book Ratio will be used to control for the potential effect of a value stock versus a growth stock. Given that the price to book ratio is the inverse of the book to market ratio, the observed relationship will be opposite to what was inferred by Fama and French (1992). Including the HML factor as a control variable is also in line with previous research (Manescu,

2011; Martin and Dahlström,2020). For similar reasons as mentioned in the case of market capitalisation, the variable is transformed by taking the natural logarithm as well (Stock & Watson, 2015).

4.3.3.4 Number of employees

Like market capitalisation, the number of employees is another common proxy for size. For studying the impact of ESG on firm profitability, the number of employees were deemed as a more appropriate variable to control for the size effect as it is not impacted directly by market factors like market capitalisation (Martin and Dahlström,2020; Ball & Brown, 1968). Furthermore, if a relationship exists between earnings and stock prices, the market capitalisation variable could be potentially influenced by the impact of ESG on earnings, making it an inappropriate control variable in the profitability regression models (Martin and Dahlström, 2020). So, it was decided to include the number of employees as an appropriate control variable in the profitability regression model. Including number of employees as a control variable is also in line with previous research (Dang & Li, 2015; Martin and Dahlström,2020). For similar reasons as mentioned in the case of market capitalisation, the variable is transformed by taking the natural logarithm as well (Stock & Watson, 2015).

4.3.3.5 Leverage

Several studies have been conducted analysing the impact of leverage on financial performance (Ilyukhin, 2015; Kalantonis et al., 2021; Ibhagui & Olokoyo, 2018). For example, Ilyukhin(2015) found that leverage as a disciplining tool can have positive impact on firms but high indebtedness may pose a limitation to the firm and affect it negatively. Extending this to the analysis of ESG and firm performance, Nollet et. al (2015) included leverage ratio as a proxy for risk in their study. Other previous studies have also included leverage as an appropriate control variable in the analysis (Velte, 2017; Balatbat et al., 2012; Landi & Sciarelli, 2019). For the study, the end of year annual debt to equity ratios were retrieved from Bloomberg (2021).

4.3.3.6 Sector

The firms in the study sample belong to one of the six industries-Consumer Staples, Consumer Discretionary, Health Care, Industrials, Technology and Utilities. Since the firms in the sample belong to a wide range of industries, it is deemed important to include a sector dummy to control for sector effects. This is also in line with previous research in this area (Manescu, 2011; Velte, 2017; Balatbat et al., 2012). Manescu (2011) noted in her study that including a sector variable was important to avoid any false association between ESG and firm performance. To avoid the dummy variable trap, the Consumer Staples sector is taken as the reference variable (Stock & Watson, 2015).

4.3.3.7 Year

To account for the time effect, it is deemed relevant to include year as an appropriate control variable. As mentioned earlier, the first statistical choice for this study was a panel data regression. However, since no satisfactory inferences could be made from the results, it was decided to use the Ordinary Least Squares (OLS) method and include year as a control variable to control for some time effect.

4.4 OLS Regression Assumptions

OLS regression has some assumptions that must be checked for before conducting the analysis to strengthen the validity of the findings.

4.4.1 Linearity

The assumption of linearity is based on the premise that the statistical model is linear in parameters (Stock & Watson, 2015). In other words, for the linearity assumption to hold, the independent and the dependent variables should exhibit a linear relationship. Violation of this assumption will lead to incorrect inferences and so the data should be checked for linearity. A common way to check for linearity is to plot a scatterplot for each of the independent and dependent variable and to visually observe the presence of a linear relationship (ibid). In this study, a scatter-plot matrix was constructed to observe for linearity, and based on the resulting plots, linearity was deemed satisfactory for the study.

4.4.2 Multicollinearity

Perfect multicollinearity is said to exhibit in a regression model when the independent variables are correlated (Stock & Watson, 2015). In other words, if one of the independent variables is a perfect linear function of the other independent variables, then perfect multicollinearity is said to exist (ibid). The assumption is based on the premise that the independent variables should not be multicollinear. The underlying problem associated with multicollinearity is that the statistical significance of an independent variable is compromised. It should be noted that multicollinearity is a “*matter of degree*” as it is possible that two random variables will be correlated at some level in the sample even if they have no explanatory relationship (Siegel, 2016).

A common method to test for the presence of multicollinearity is to conduct a Variance Inflation Factor (VIF) test. The VIF tests helps to identify the extend of the severity of multicollinear issues by measuring how much the variance of an independent variable is “*inflated*” by its correlation with other independent variables (Siegel, 2016). A VIF test was conducted for all the regression models. The general rule of thumb is that VIF’s exceeding 5 calls for further analysis while VIF’s exceeding 10 indicates signs of severe multicollinearity (Siegel, 2016). Upon conducting a VIF-test for the regression models, none of the VIF-scores were found to be above 5 and the assumption of no perfect multicollinearity is satisfied. A Pearson’s Correlation test (Appendix B) was also conducted. The combined ESG score is shown to be highly correlated with the individual E, S and G pillars. However, since the combined ESG score and the individual scores are not analysed in the same regression, the high correlation is not deemed as a potential issue.

4.4.3 Homoscedasticity

One of the assumptions made about residuals for all observations in an OLS regression is related to its dispersion. Homoscedasticity is observed when regardless of the independent variable, the variance of the residuals is constant (Stock & Watson, 2015). Conversely, when it is observed that there is an “unequal scatter of the residuals”, heteroskedasticity is said to be present. Despite the presence of heteroskedastic tendencies, the least squares estimator is still a linear and unbiased estimator though it is no longer the best (ibid). With the presence of heteroskedasticity, the standard errors computed are incorrect, which can affect the confidence intervals and hypothesis testing and lead to misleading inferences.

An informal way of detecting heteroskedasticity is to examine graphically by constructing residuals versus fitted plots. If a cone shape is observed in the plots, then heteroskedasticity is said to be present (ibid). A more formal way of detecting heteroskedasticity is to perform a *Breusch-Pagan* test (ibid). The test uses the following hypothesis:

H_0 : *Homoscedasticity (residuals are distributed with equal variance)*

H_1 : *Heteroscedasticity (residuals are not distributed with equal variance)*

The Breusch-Pagan test was performed for all the regression models which led to the rejection of the null hypothesis and heteroskedasticity was detected to be present in the data. To correct for the issue of heteroskedasticity, two methods were considered. The first one entails using a Weighted Least Squares method that rectifies for the non-constant variance by weighing each observation by the inverse of its estimated variance (Rasheed et al., 2014). The second method is to use *standard errors* that are robust to the presence of heteroskedasticity in a model's unexplained variation (White, 1980). Given that the standard errors of the model can be corrected for heteroskedasticity without altering the statistical process, the method of using robust standard errors (Huber-White standard error) is chosen for this study.

One of the arguments against the application of robust standard errors to smaller samples is that the t-statistic obtained using this method might have distributions that are not close to the t distribution (Imbens & Kolesár, 2016). However, given that the sample size in this study is reasonably large, it is reasonable to forgo this argument and apply the Huber-White standard error to correct for heteroskedasticity

4.4.4 Normality

The assumption of normality is based on the premise that the errors follow a normal distribution with a mean of zero (Stock & Watson, 2015). There are two views when it comes to the normality assumption. It is argued that if the assumption of normality is violated, then the F-test cannot be used to test if the regression coefficients are jointly significant. Furthermore, the t-values of the coefficients become inaccurate and affects the calculation of the p-values for significance testing (ibid). An appropriate method to test for normality is to construct a quantile-quantile (q-q) plot which visually plots the distribution of the data against the expected normal distribution. A q-q plot was constructed for the three dependent variables. Both Annual Returns and Return on Assets showed features

leading to assume normality, but the same could not be said with entire confidence regarding Net Income. The Net Income showed the presence of heavy tails as confirmed by the q-q plot (Refer Appendix A). Delving into literature showed that the consequences posed by violating the normality assumption should be accounted for when the sample size is small. It is further argued that the central limit theory ensures that the regression coefficients will approximate normality in large samples (Lumley et al., 2002) The sample in this study consists of 3,357 observations and so, it is assumed to be of reasonably large dataset. Based on this, it is argued that normality will not pose a substantive threat in interpreting the results of this study.

4.4.5 Endogeneity

The issue of endogeneity arises when the independent variable(s) is correlated with the error term (Stock & Watson, 2015). There are two main ways of solving for endogeneity-creating a natural experiment or to make use of a valid instrumental variable Z . A natural experiment involves taking an exogenous event which affects the independent variable(s) but only affects the dependent variable through the effect it has on the independent variable(s) (Wooldridge, 2012; Gippel et al., 2015). Put simply, since the change in the independent variable(s) is caused by an exogenous event and not the dependent variable, thereby the observed effect on the dependent variable is more likely to be causal (ibid). However, natural experiments are rare in the field of ESG given its voluntary nature. Furthermore, none of the previous studies in the field have employed this technique. Given this, the natural experiment approach was not used. A valid instrumental variable must satisfy the conditions of instrument relevance ($(Z_i, X_i) \neq 0$) and instrument exogeneity ($(Z_i, X_i) = 0$) (Stock & Watson, 2015). If the instrument Z fulfills these two conditions, then the coefficient can be estimated using the *two stage least squares estimator*. Due to the relationship between ESG and firm performance, it was found extremely difficult to find an appropriate instrument for ESG variables. So, the instrumental variable approach was not employed either.

For example, firms with a high ESG score might have higher firm performance but the higher performance might also induce the firms to invest more in ESG. However, the causality issue is not well addressed in the ESG literature. This leaves the issue of endogeneity unresolved but given the context of the study, the measures outlined to remedy for potential endogeneity are deemed difficult. This is an important consideration when interpreting the results of this study and for future work.

4.5 Note on outliers

It is important to check the data sample for potential outliers because extreme values can greatly impact the coefficient of the estimates in the OLS regression and lead to misleading results (Stock & Watson, 2015). In an OLS regression, the regression line minimizes the sum of squared residuals. The issue with outliers is that if a certain data point has an abnormally large value compared to the remaining points, its squared residuals will receive a larger weight in fitting the regression line (ibid). A common way to detect the presence of outliers is to construct a boxplot. In the sample, the main outliers were observed for the *Net Income* variable. Upon examining, it was observed that the data exhibits feature of a heavy tail. Furthermore, the likelihood of observing extreme values is common when dealing with larger datasets (Cousineau & Chartier, 2010; Kwak & Kim, 2017). It can be argued that the extreme values observed could be a feature of natural variability in the data rather than a weakness (Kwak & Kim, 2017). Based on the this, it was decided not to exclude the outliers in the sample.

4.6 Final regression models

4.6.1 Final sample

The initial sample consisted of 984 firms. Firms with non-continuous ESG scores for nine years were removed and this reduced the sample size to 558 firms. There were some missing data points for the dependent and control variables. Missing data is a common issue when dealing with large samples. If not dealt with correctly, it can impact the reliability of the estimated model. This reduced the sample size to 373 firms with 3,357 observations. Having a reasonably good size sample reduces the possibility of making type II errors whereby a hypothesis is accepted when it should be rejected (Stock and Watson, 2015). Commenting on the sample size, the population consisted of over 6100 firms listed on both NYSE and NASDAQ (Bloomberg, 2021). The sample in the study thus covers approximately 6.1% of the true population. While this seems to cover only a small portion of the population, some studies have taken much smaller samples (Almeyda and Darmansya, 2019; Kim et al., 2013). It can be concluded that the sample size is satisfactory and should not have much adverse impact when inferring the results.

4.6.2 Final models

4.6.2.1 Market based performance

For simplicity, the generalized regression models can be written out as:

1. Models 1-4 (Annual returns):

$$MODEL (AR) = \alpha + \beta_1 SCORE + \beta_2 CAPM + \beta_3 LOG(MKTCAP) + \beta_4 LOG(P/B) + \beta_5 LEV + \beta_6 YEAR + \beta_7 SECTOR + \varepsilon$$

2. Models 5-8 (Net Income):

$$MODEL (NI) = \alpha + \beta_1 SCORE + \beta_2 LOG(EMPL) + \beta_3 LEV + \beta_4 YEAR + \beta_5 SECTOR + \varepsilon$$

3. Models 9-12 (Return on Assets):

$$MODEL (ROA) = \alpha + \beta_1 SCORE + \beta_2 LOG(EMPL) + \beta_3 LEV + \beta_4 YEAR + \beta_5 SECTOR + \varepsilon$$

The full overview of the twelve regression models can be found below:

Table 1: Overview of regression models

Regression model #	Dependent variable	Independent variable	Control variables
1.	Annual stock returns	Combined ESG	CAPM, LOG(MKTCAP), LOG(P/B), LEV, YEAR, SECTORS
2.	Annual stock returns	Δ Combined ESG	CAPM, LOG(MKTCAP), LOG(P/B), LEV, YEAR, SECTORS
3.	Annual stock returns	ENV, SOC, GOV	CAPM, LOG(MKTCAP), LOG(P/B), LEV, YEAR, SECTORS
4.	Annual stock returns	Δ ENV, Δ SOC, Δ GOV	CAPM, LOG(MKTCAP), LOG(P/B), LEV, YEAR, SECTORS
5.	Net income	Combined ESG	LOG(EMPL), LEV, YEAR, SECTORS
6.	Net income	Δ Combined ESG	LOG(EMPL), LEV, YEAR, SECTORS
7.	Net income	ENV, SOC, GOV	LOG(EMPL), LEV, YEAR, SECTORS
8.	Net income	Δ ENV, Δ SOC, Δ GOV	LOG(EMPL), LEV, YEAR, SECTORS
9.	Return on assets	Combined ESG	LOG(EMPL), LEV, YEAR, SECTORS
10.	Return on assets	Δ Combined ESG	LOG(EMPL), LEV, YEAR, SECTORS
11.	Return on assets	ENV, SOC, GOV	LOG(EMPL), LEV, YEAR, SECTORS
12.	Return on assets	Δ ENV, Δ SOC, Δ GOV	LOG(EMPL), LEV, YEAR, SECTOR

Chapter 5: Empirical results

To assess the impact of ESG on firm performance, an OLS regression was conducted on the twelve models presented earlier. This section will present the findings of the regression and comment on the general statistical implications. The findings presented in this section will form the basis for discussion in Chapter 6.

Lag performance

It is important to comment that the lag effects of ESG (including the change in score) in year T on the firm performance in year $T+1$ was considered in the study. Since the results didn't point to something different than what is outlined in the results below, it was concluded that the lag effect could not be found on firm performance.

	Variables	Mean	Median	Minimum	Maximum
Dependent variable	Annual stock returns	0.225	0.198	-0.605	2.975
	Net Income	2432	968	-3300	59531
	ROA	6.28	4.78	-36.67	45.98
Independent variables	ENV	62.13	66.17	7.99	99.09
	SOC	64.12	66.03	10.47	98.85
	GOV	55.91	64.18	5.91	98.78
	Δ ESG	0.053	0.008	-0.725	4.569
	Δ SOC	0.043	0.009	-0.709	2.344
	Δ GOV	0.069	0.018	-0.740	5.060
	ESG	62.51	65.11	12.89	97.66
Control variables	Δ ESG	0.035	0.013	-0.468	1.837
	CAPM	0.119	0.107	-0.146	0.728
	LOG(MKTCAP)	9.57	8.98	7.03	13.67
	LOG(P/B)	1.168	1.094	-1.284	6.632
	LOG(EMPL)	9.891	9.815	4.419	14.648

Table 2: Summary of Descriptive Statistics

Model 1: Environment, Social and Governance Score and Annual Returns

Dependent variable-Annual Returns

Independent Variables	Estimate	Std. Error	T-value
Intercept	-0.043	0.059	-0.728
ENV	-0.003	0.000	-3.582 ***
SOC	0.000	0.001	-0.213
GOV	0.000	0.001	-0.586
CAPM	1.109	0.033	33.606 ***
Log (MKT CAP)	0.018	0.004	4.250 ***
Log(P/B)	0.072	0.007	10.592 ***
Leverage	-0.001	0.000	-3.323 ***
Year	-0.007	0.002	-4.598 ***
Consumer Discretionary	0.007	0.025	0.382
Health Care	0.037	0.024	1.516
Industrials	-0.007	0.023	-0.304
Technology	-0.024	0.024	-1.021
Utilities	0.036	0.025	1.462

R-squared	0.307
Adjusted R-squared	0.302
F-statistic	91.82 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**' 0.1 '*'

Model 2: Δ Environment, Δ Social and Δ Governance Score and Annual Returns

Dependent Variable- Annual returns

Independent Variables	Estimate	Std. Error	T-value
Intercept	-0.070	0.039	-1.794
Δ ENV	-0.084	0.036	-2.333 **
Δ SOC	-0.033	0.042	-0.785
Δ GOV	-0.121	0.058	-2.086 **
CAPM	1.086	0.034	31.941 ***
LOG(MKTCAP)	0.009	0.003	2.572 **
LOG(P/B)	-0.073	0.007	10.528 ***
Leverage	-0.010	0.000	-3.722 ***
Year	-0.012	0.002	-6.547 ***
Consumer Discretionary	0.010	0.024	0.416
Health Care	0.026	0.024	1.083
Industrials	-0.013	0.023	-0.565
Technology	-0.036	0.024	-1.500
Utilities	0.028	0.023	1.217

R-squared	0.301
Adjusted R-squared	0.298
F-statistic	90.5 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**' 0.1 '*'

Model 3: Aggregate ESG and Annual Returns

Dependent Variable- Annual returns

Independent Variables	Estimate	Std. Error	T-value
Intercept	-0.011	0.043	-0.2558
ESG	-0.002	0.001	-4.602 ***
CAPM	1.112	0.034	32.705 ***
LOG(MKTCAP)	0.014	0.004	3.582 ***
LOG(P/B)	0.073	0.007	10.428 ***
Leverage	-0.001	0.000	-3.473 ***
Year	-0.007	0.002	-5.045 ***
Consumer Discretionary	0.015	0.024	0.625
Health Care	0.032	0.023	1.391
Industrials	0.003	0.023	0.130
Technology	-0.022	0.024	-0.9166
Utilities	0.051	0.023	2.217 **

R-squared	0.305
Adjusted R-squared	0.293
F-statistic	103 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**' 0.1 '*'

Model 4: Δ ESG and Annual Returns*Dependent Variable- Annual returns*

Independent Variables	Estimate	Std. Error	T-value
Intercept	-0.012	0.043	-0.279
Δ ESG	-0.167	0.068	-2.455
CAPM	1.092	0.034	32.177 ***
LOG(MKTCAP)	0.009	0.003	2.489 **
LOG(P/B)	0.073	0.007	10.717 ***
Leverage	-0.001	0.000	-3.735 ***
Year	-0.010	0.002	-6.134 ***
Consumer Discretionary	0.010	0.024	0.416
Health Care	0.025	0.024	1.041
Industrials	-0.013	0.023	-0.565
Technology	-0.035	0.024	-1.458
Utilities	0.028	0.023	1.217

R-squared	0.300
Adjusted R-squared	0.298
F-statistic	101.4 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**' 0.1 '*'

Regression models 1 & 2

Looking at the three individual pillars (Model 1), the environment score is statistically significant and shown to have a negative influence on annual stock returns at the 0.01 level. This indicates that in the sample, a one-point increase in the environment score is associated with a 0.3 % points reduction in stock returns, holding everything else constant. While looking at the change in the individual ENV, SOC and GOV scores (Model 2), it was found that improvements in the ENV and GOV score are linked to having a negative impact on stock performance at the 0.05 level while improvement in the SOC score is shown to have no statistical significance in the sample. Looking at the control variables for both the models, CAPM, Market capitalisation and the Price-to-Book ratio are shown to positively influence stock returns. The model shows that indebtedness (leverage) and time (year) negatively influence the sample stock returns. None of the sectors seem to show any significance on stock returns. Both the models have an adjusted R-squared of around 30 % which is deemed satisfactory when compared to similar studies. Furthermore, both the models have a significant F score at the 0.01 level asserting that the presented models have well fitted variables. Based on the findings, the outset hypothesis of environment, social and governance score positively affecting stock returns is rejected.

Regression models 3 & 4

The aggregate ESG score is shown to have a negative influence on annual stock returns at the 0.01 level. It can be inferred that the ENV score is the key driver in the overall ESG score (Refer to below models). Looking at the control variables for both the models, CAPM, Market capitalisation and the Price-to-book ratio are shown to positively influence stock returns while indebtedness (leverage) and time (year) negatively influence the sample stock returns. None of the sectors except for Utilities (Model 3) seem to show any significance on stock returns. Both the models have an adjusted R-squared of around 30 % which is deemed satisfactory when compared to similar studies. Furthermore, both the models have a significant F score at the 0.01 level asserting that the presented models have well fitted variables. Based on the findings, the outset hypothesis of combined ESG score being positively related to stock returns is rejected.

Model 5: Environment, Social and Governance Score and Net Income

Dependent Variable- Net Income

Independent Variables	Estimate	Std. Error	T-value
Intercept	-6857.278	633.876	-10.818 ***
Environment	49.234	5.328	9.240 ***
Social	-13.567	4.977	-2.725 ***
Governance	-24.322	6.245	-3.894 ***
LOG(EMPL)	983.714	53.291	18.459 ***
Leverage	-3.637	2.675	-1.359
Year	-41.486	14.587	-2.845 ***
Consumer Discretionary	-2213.351	311.593	-7.103 ***
Health Care	-1148.841	339.657	-3.382 ***
Industrials	-1859.325	312.456	-5.953 ***
Technology	-1267.456	323.567	-3.917 ***
Utilities	-890.546	309.528	-2.877 ***

R-squared	0.333
Adjusted R-squared	0.230
F-statistic	118.3 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**' 0.1 '*'

Model 6: Δ Environment, Δ Social and Δ Governance Score and Net Income

Dependent Variable- Net Income

Independent Variables	Estimate	Std. Error	T-value
Intercept	-8273.577	551.253	-15.008 ***
Δ Environment	-812.758	353.869	-2.296 **
Δ Social	-74.568	411.572	-0.181
Δ Governance	374.293	714.549	0.523
LOG(EMPL)	1134.589	54.428	20.845 ***
Leverage	-2.324	2.756	-0.843
Year	-8.907	15.739	-0.565
Consumer Discretionary	-2454.460	327.774	-7.489 ***
Health Care	-739.154	340.908	-2.169 **
Industrials	-1916.342	329.457	-5.817 ***
Technology	-1126.347	334.721	-3.365 ***
Utilities	-1226.324	318.156	-3.854 ***

R-squared	0.308
Adjusted R-squared	0.298
F-statistic	105.8***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**' 0.1 '*'

Model 7: ESG Score and Net Income

Dependent Variable- Net Income

Independent Variables	Estimate	Std. Error	T-value
Intercept	-9134.562	567.458	-16.098 ***
ESG	31.348	5.578	5.619***
LOG(EMPL)	1059.764	57.539	18.418 ***
Leverage	-2.778	2.716	-1.022
Year	-20.573	15.346	-1.341
Consumer Discretionary	2567.524	325.768	-7.881 ***
Health Care	-850.786	345.629	-2.461 **
Industrials	-1987.579	324.359	-6.122 ***
Technology	-1276.526	377.859	-3.378 ***
Utilities	-1528.224	320.756	-4.764 ***

R-squared	0.315
Adjusted R-squared	0.311
F-statistic	124 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**' 0.1 '*'

Model 8: Δ ESG Score and Net Income*Dependent Variable- Net Income*

Independent Variables	Estimate	Std. Error	T-value
Intercept	-8269.578	546.789	-15.124
Δ ESG	-1005.785	656.429	-1.532
LOG(EMPL)	1135.694	55.579	20.434 ***
Leverage	-2.468	2.765	-0.892
Year	-10.794	15.362	-0.702
Consumer Discretionary	-2467.356	324.578	-7.601 ***
Health Care	-745.469	342.473	-2.176**
Industrials	-1917.583	323.592	-5.926 ***
Technology	-1137.471	340.383	-3.342 ***
Utilities	-1223.592	318.479	-3.841***

R-squared	0.305
Adjusted R-squared	0.302
F-statistic	120.7 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**'0.1 '*'

Regression model 5 & 6

Looking at the individual pillars (Model 5), all the pillars are statistically significant at the 0.01 level. Environment score is shown to positively influence Net Income while the social and governance scores show a negative link with Net Income. It is interesting to note that while a higher environment score (Model 5) is shown to have a positive influence on earnings, an improvement in the environment score (Model 6) is shown to have a negative influence. Looking at the control variables, the size effect (number of employees) is shown to positively influence earnings in both the models. However, time (year) had a negative influence on earnings in Model 5, but such influence could not be found when looking at the change in scores (Model 6). All sectors are shown to have an impact on Net Income in both the models. The model has an adjusted R-squared of around 30 % which is deemed satisfactory when compared to similar studies. Furthermore, the models have a significant F-score at the 0.01 level asserting that the presented models have well fitted variables.

Regression model 7 & 8

While the aggregate ESG score is shown to positively impact net income in the sample (Model 7), an improvement in the score (Model 8) shows no statistical significance. Looking at the control variables for both the models, only the size effect (number of employees) shows statistical significance and positively influence earnings. All sectors are shown to have an impact on Net Income. The models have an adjusted R-squared of around 30 % which is deemed satisfactory when compared to similar studies. Furthermore, the models have a significant F-score at the 0.01 level asserting that the presented models have well fitted variables. Based on the findings of these two models, the outset hypothesis of combined ESG score positively influencing Net Income is accepted.

None of the previous research studying the influence of ESG on firm profitability took Net Income as a profitability indicator so it was deemed interesting to study the impact of ESG on the true bottom line. Upon running the regressions, the coefficients in the models were observed to have large and small values. However, it can be argued that the models have a satisfactory R-squared, so it is not deemed problematic in this case. Since no previous research has been done on this metric, an alternative for future research would be to use a Net Income ratio like Net Income to Revenue.

Model 9: Environment, Social and Governance Score and Return on Assets

Dependent Variable-Return on Assets (%)

Independent Variables	Estimate	Std. Error	T-value
Intercept	10.367	1.407	7.368 ***
Environment	0.037	0.012	3.084 ***
Social	-0.019	0.015	-1.267
Governance	-0.007	0.018	-0.389
LOG(EMPL)	-0.376	0.093	-4.043 ***
Leverage	-0.105	0.007	-15.143 ***
Year	0.026	0.039	0.667
Consumer Discretionary	4.003	0.445	8.995 ***
Health Care	2.367	0.509	4.650***
Industrials	3.567	0.388	9.193 ***
Technology	2.348	0.479	4.901 ***
Utilities	-1.115	0.478	-2.332 **

R-squared	0.192
Adjusted R-squared	0.190
F-statistic	56.63 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**'0.1 '*'

Model 10: Δ Environment, Δ Social and Δ Governance Score and Return on Assets

Dependent Variable-Return on Assets (%)

Independent Variables	Estimate	Std. Error	T-value
Intercept	9.982	0.925	10.791 ***
Δ Environment	0.965	0.918	1.051
Δ Social	0.096	1.048	0.091
Δ Governance	0.036	1.479	0.024
LOG(EMPL)	-0.267	0.079	-3.379 ***
Leverage	-0.105	0.006	-14.464 ***
Year	0.057	0.039	1.461
Consumer Discretionary	3.786	0.428	8.845 ***
Health Care	2.503	0.506	4.947 ***
Industrials	3.452	0.397	8.695***
Technology	2.307	0.472	4.887 ***
Utilities	-1.398	0.376	-3.718 ***

R-squared	0.190
Adjusted R-squared	0.188
F-statistic	55.87 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**'0.1

Model 11: ESG Score and Return on Assets

Dependent Variable- Return on Assets (%)

Independent Variables	Estimate	Std. Error	T-value
Intercept	9.187	1.019	9.015 ***
ESG	0.023	0.015	1.534
LOG(EMPL)	-0.314	0.079	-3.974 ***
Leverage	-0.107	0.007	-15.285 ***
Year	0.034	0.035	0.971
Consumer Discretionary	3.793	0.431	8.813***
Health Care	2.458	0.509	4.829 ***
Industrials	3.405	0.397	8.578 ***
Technology	2.246	0.463	4.851 ***
Utilities	-1.607	0.391	-4.109 ***

R-squared	0.192
Adjusted R-squared	0.189
F-statistic	64.05 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**' 0.1 '*'

Model 12: Δ ESG Score and Return on Assets

Dependent Variable- Return on Assets (%)

Independent Variables	Estimate	Std. Error	T-value
Intercept	9.759	0.915	10.665 ***
Δ ESG	1.375	1.574	0.873
LOG(EMPL)	-0.267	0.087	-3.068 ***
Leverage	-0.105	0.007	-15.253 ***
Year	0.052	0.036	1.445
Consumer Discretionary	3.796	0.431	8.807 ***
Health Care	2.563	0.513	4.997 ***
Industrials	3.467	0.395	8.806 ***
Technology	2.356	0.467	5.045 ***
Utilities	-1.392	0.381	-3.653 ***

R-squared	0.191
Adjusted R-squared	0.189
F-statistic	63.89 ***
Number of observations	3,357

Level of significance: 0.01 '***' 0.05 '**' 0.1 '*'

Regression model 9 & 10

Looking at the three individual pillars, the environment pillar is shown to positively influence ROA statistically significant at the 0.01 level. This indicates that a 1 % increase in the environment score is associated with a 3.5 % in Return on Assets. The other two pillars show no statistical significance. Looking at the change in the individual ENV, SOC and GOV scores, none of the pillars are shown to have statistical significance. Looking at the control variables for both the models, the size effect (number of employees) and indebtedness (leverage) are shown to negatively influence ROA. All sectors are shown to have an impact on the dependent variable. The models have an adjusted R-squared of around 20 % which is which is lower than the previous models presented. Furthermore, the models have a significant F-score at the 0.01 level asserting that the presented models have well fitted variables. Based on the findings, the outset hypothesis of the individual pillars positively influencing ROA is accepted.

Regression model 11 & 12

Both the aggregate ESG score and the change in aggregate ESG score show no statistical significance on ROA. Looking at the control variables for both the models, the size effect (number of employees) and indebtedness (leverage) are shown to negatively influence Return on Assets. Looking at the control variables, the size effect (number of employees) and indebtedness (leverage) is shown to negatively influence Return on Assets. All sectors except for utilities are shown to positively influence the dependent variable. Both the models have an adjusted R-squared of around 19 % which is the lower than the other the models presented. Furthermore, the models have a significant F-score at the 0.01 level asserting that the presented models have well fitted variables. Based on the findings, the outset hypothesis of the aggregate ESG score positively influencing ROA is rejected.

Chapter 6: Discussion and Inferences

To answer the overarching research question of this study, the following section will delve deeper into the empirical this study. This will be done through a deep-dive discussion tying the findings of the study to previous literature and economic theories addressed earlier in the paper and strengthening the implications of the empirical results.

6. 1 The ESG and annual stock market returns puzzle

Most of the previous literature studying ESG scores and stock market returns point to a positive relationship. However, this study postulates a negative link between the two metrics, rejecting hypothesis 1a stating a positive relationship between ESG scores and stock market returns. Having said that, there are also previous literature that supports the results of this study postulating a negative relationship between the two metrics. In their study, Auer and Schuhmacher (2016) looked at firms in Asia-Pacific, the United States and Europe and concluded that stocks with higher ESG performance showed no risk-adjusted outperformance compared to passive investments. Sahut and Descomps (2015) in their empirical analysis found that the overall ESG score was significant and negative for the sample period, supporting the findings of this study. Martin & Dahlström (2020) also conducted a study for U.S. listed firms from 2010-2018 and found a negative relationship between the two indicators, supporting the results of this study. In line with this, Farooq (2015) concluded that ESG disclosure is negatively associated with stock returns. Based on previous literature and the results of this study, it can be argued that there is an added cost involved in ESG enhancing activities, thereby reducing shareholder's wealth. This argument is rooted in Friedman's shareholder theory (1970).

It could also be argued that the geographic location of the market could influence the direction of the relationship. This study is based on firms listed firms in the U.S. Morningstar conducted a recent study on ESG performance and stock returns and found that if investors restricted their universe to just North American holdings, then they would have underperformed (Sargis & Wang, 2020). Tying the geographic location argument to the argument regarding ESG adding cost to the firm, the authors concur the same. However, it should be noted that this underperformance was not observed when looking at a global level. It could be argued that the U.S. investors play a small premium for holding companies faring well in the ESG criteria while this effect might be mitigated at a global level.

Looking at the individual environmental, social and governance scores, the study pointed out that it is the environment score that seems to negatively influence the overall ESG score in the sample. It was found that the impact of social and governance scores on stock returns is not statistically significant. This result is supported by the empirical findings of Almeyda & Darmansya (2019) who also found no significant relationship between the social and governance components and stock market returns. Similarly, the results of this study are partially aligned with the findings of Landi & Sciarelli (2019) who found no significant relationship between the aggregate ESG scores and stock market returns as well as the individual components and stock market returns. It could be argued that the social and governance components might in fact be of relevant value to the firm but is not efficiently incorporated into the stock prices.

Lastly, looking at the change in ESG scores, there was only one other study found analyzing this effect. In line with the findings of this study, Sahut & Pasquini- Descomps (2015) pointed to a significant and slightly negative relationship between the change in ESG scores and the stock returns over the observed sample period in the UK. However, this relationship did not hold any statistical significance in the U.S. and Switzerland validating the argument about geographic locations discussed above.

6.2 ESG and Profitability relationship

In this study, Net income and Return on Assets were used as proxies for firm profitability. The empirical results point to a positive link between aggregate ESG scores and firm profitability when Net income is used as a measure of profitability. This is partially in line with the outset hypothesis of this study, postulating a positive relationship between ESG scores and firm profitability. It was found that majority of the previous studies undertaken postulates a positive relationship between ESG scores and profitability (Velte, 2017; Buallay, 2019; Ahmad et. al., 2021). One caveat that should be considered is that none of the previous studies have used Net Income as a proxy for firm profitability. In this regard, the findings of this study using Net Income cannot be directly compared to the results found in existing literature.

Looking at the impact of ESG scores on ROA, this study presents no statistical significance, which is in line with some of the previous literature. Balatbat et al. (2012) analysed the performance of companies listed on the Australian Stock Exchange from 2008-2010 and found no significant relationship between ESG scores and the various firm performance metrics including ROA. Similarly,

Nollet et. al. (2015) studied the relationship between different firm performance indicators and ESG scores for S&P 500 from 2007–2011 and reported no significant relationship between ESG scores and ROA and a negative relationship between ESG and ROC.

Looking at the individual environmental, social and governance pillars, the study presents statistical significance for the environment component on both the firm profitability proxies (i.e. Net income and ROA). The findings suggest that firms that fare well on the environmental front see higher profitability. Since no prior literature could be found on Net income as a profitability metric when looking at the environmental component, looking at other accounting-based measures instead indicated similar findings. In their study Lee et. al. (2016) found a positive correlation between the environment component and ROA, in line with the findings of this study. Similarly, Buallay (2019) found that environmental disclosures positively affect ROA. In the same study it was found that governance disclosure is shown to negatively affect ROA. In this study, the governance score is shown to negatively affect ROA, but it is not statistically significant.

Another interesting finding from the analysis showed that while the individual environment score showed a positive and significant relationship with Net Income, looking at the change in the environment score pointed to a negative relationship. In other words, the results shows that while a higher environmental score is associated with higher earnings, an improvement in the score is associated with lower earnings. In their study, Nollet et.al.(2015) postulated no significant relationship between ESG and firm profitability but showed evidence of a U-shaped relationship between the two variables. Applying this reasoning to the study, it can be argued that ESG translates into improved firm profitability only after a certain investment threshold is reached and that until this threshold is reached, any additional ESG expenditure will translate into lower financial performance (Nollet et.al.,2015). It was also found that the individual social and governance scores were negatively influencing Net Income. Buallay (2019) argued that the Executive Management and Board of Directors often engage in social dealings for their own benefit. The associated costs with these are borne by the firm and other stakeholders, thereby reducing the total market value, the equity and efficiency of assets (ROA) (ibid). This could be argued the reason for the negative relationship between ESG and the social and governance pillars in this study.

Finally, the empirical results indicate no statistical significance when studying the relationship between the remaining ESG indicators and ROA. This could be attributed to two main reasons. ROA is typically used when comparing different companies of similar size operating in the same industry.

While Balatbat et.al. (2012) reported statistical significance when analysing individual industries and ROA, upon performing a portfolio analysis, the authors could not observe any statistical significance, despite accounting for the sector dummy. In this study sample, there are companies of different sizes (mainly medium-large size firms) across sectors. While this study included a sector dummy to account for sector effects, the empirical results could potentially be subject to sector differences, like in the case of Balatbat et.al. (2012) study. Secondly, some of the previous studies have employed total assets to control for size (Balatbat et.al., 2012; Moraleja & Whittaker; 2019), while this study uses the number of employees. This could be an important consideration for future research in this area.

6.3 Firm profitability and strategy link

Freeman (1984) and Porter & Van Der Linde (1995) presented the case for stakeholder management by arguing that firms have a responsibility to the broader communities in which they operate and not just the shareholders. In their study, Porter & Van Der Linde (1995) identified that lack of good environmental practices can affect the bottom line since these inefficiencies can add to the compliance costs for the firms. Applying this reasoning to the results of this study, it can be explained that firms with a higher score in the environment component perform better when measured as both Net income and ROA. Porter & Van Der Linde (1995) go on to say that proper environmental management can trigger innovation leading to cost efficiencies, which in turn can be a source of competitive advantage for the firm. This is in line with the findings of this study.

The main opponents of the stakeholder theory argue that there is indeed a fixed trade-off between ESG and firm profitability, indicating that the added costs associated with ESG improving activities will then be borne by the shareholders (Friedman, 1970; Eccles & Sarafeim, 2013). Although Eccles & Sarafeim (2013) argue that there is additional cost involved with ESG enhancing activities, they also point out to firm value creation but only in the long run. In this study, it was found that while a higher environmental score is associated with higher earnings, improvements in the environment score translates into lower earnings for the firm, indicating that there is some cost involved. It should be noted that this study does not delve deep into the associated ESG costs, but it is an area to consider for future research work. The diverging results observed for the environment pillar could be explained by the fact that since firm profitability and the change in ESG scores are calculated for the same period, the immediate costs involved when improving the environmental management are borne by the firm, thereby lowering the overall firm profitability (Martin and Dahlström, 2020).

Applying the argument posed by Eccles & Sarafeim (2013), there could be some value creation in the long run.

Another interesting inference from the study shows that while good environmental management could trigger innovation leading to cost efficiencies, which in turn can be a source of competitive advantage for the firm (Porter & Van Der Linde, 1995; Eccles & Sarafeim, 2013), the same could not be extended to the social and governance pillars. In other words, the findings indicate no fixed trade-off between environment and firm profitability, but there exists some trade-off between the remaining two pillars and firm profitability. It could be argued that this because of misalignment between the firm strategy and the social and governance objectives of the firm. As argued earlier, Executive Management and Board of Directors often engage in social aspects for their own benefit (Buallay, 2019). If this benefit is not in alignment with the firm strategy, then it is not going to create any competitive advantage for the firm or translate into improved bottom-line performance (Martin and Dahlström, 2020). This presents two important implications for managers. Firstly, managers should strategically focus and prioritize their efforts on the most “*material*” ESG indicators that create bottom-line impact. Secondly, managers should ensure that the different ESG indicators are well aligned with the firm strategy to reap any competitive advantage.

6.4 Behavioural Finance

In their seminal paper, Ball and Brown (1968) found a positive relationship between earnings and stock prices, signalling future cash flows to the investor. If ESG disclosures have a positive impact on a firm’s profitability measures, this should also send signal of positive future earnings in the market, thereby translating into higher stock prices. In this study, it was found that the aggregate ESG score positively influence Net Income and that the environment component of ESG positively influences both the earnings and ROA. Interestingly, the same indicators were shown to be negatively associated with stock returns, contradicting the findings of Ball and Brown (1968). The below two sub-sections will look into the signalling theory and mental accounting to understand this association better

6.4.1 Signalling theory

Much of the previous research has been directed towards studying the aggregate ESG impact on firm performance, fewer studies on the individual ESG pillars and even fewer studies on the change in the scores. The rationale behind studying the changes in ESG scores were to identify if it signalled any

valuable information to the investors (Martin and Dahlström,2020). The empirical findings from the study show that for the environment and governance scores, there exists some signalling effect. Research points out that good governance mechanisms create value for shareholders and stakeholders in the long run (Naimah & Hamidah, 2017). Despite this value creation, it should be noted that a high level of governance comes with increased operating costs as well as resource attrition for the firm (Durden & Pech, 2006). This could potentially be the reasoning for the negative link between Governance and Net Income as well as the signalling effect on the annual stock market returns.

As previously mentioned, the negative correlation between the environment score and annual stock returns could potentially reflect the signalling effect pertaining to the change in environment score and Net Income. Investors are often fixated on short termism (Chesebrough & Sullivan, 2013) and ESG enhancing activities create value in the long-term (Ernst & Young, 2019). Given this, investors may not be fully aware of the long term ESG value creation benefits as outlined by Eccles & Sarafeim (2013). This divergence could potentially be the reason why the environment component is negatively associated with stock market returns which is however, positively associated with Net Income in this study. The aforementioned argument on the divergence between investor myopia and the long-term horizon of ESG warrants a deep dive. As mentioned, investors are often characterized for their myopic outlook given the short-term expectation of stock markets. Buffett & Dimon (2018) argues that investor myopia “...often leads to an unhealthy focus on short-term profits rather at the expense of long-term strategy, growth and sustainability”. In their study, Graham et. al. (2006) conducted a survey of 400 Chief Financial Officers and found that short-termism is on the rise and can translate into making poor decisions. Majority of the respondents said that they would cut spending on a good long-term project to hit their quarterly target, further validating the negative ESG association in the study (ibid). This implies that an investor with a myopic outlook prefers to invest in firms that focus less on ESG improving activities. In this study, the extent of investor myopia could explain why an increase in the Environmental and Governance scores signals a negative outlook to the investor, thereby translating into negative stock returns. This implies that an average investor values short-term profits over long-term ESG improving activities.

6.4.2 Mental accounting

According to the theory of mental accounting, individuals place different value on the same amount of money, depending on factors such as the money's "origin" and "intended use", even though the concept of money is "fungible" (Thaler, 1999). Applying the theory of mental accounting to the empirical findings of this study could explain some of the investor behaviour of placing value on the "origin of their income". Auer and Schuhmacher (2016) looked at firms in three different geographic locations: Asia-Pacific, U.S., and Europe, and concluded a negative link between ESG performance and stock market returns in the Asia-Pacific and U.S. markets. As mentioned earlier in the section, European investors were willing to pay a premium for being socially responsible, leaving them with a lower risk-adjusted performance compared to the passive investments. A research study conducted by Morningstar highlighted that if investors held only U.S. and Canadian securities, they would have underperformed for holding better ESG securities (Sargis Wang, 2020). The sample in this study is composed of U.S. listed firms and these geographical differences could potentially explain the negative relationship between ESG and stock market returns in this study. It could be inferred that investors in the U.S. place less importance on where their income "originates", in line with the theory of mental accounting. Looking at the U.S. and European markets, the observed sentiment is that U.S. still lags behind their European counterparts when it comes to ESG disclosures and incorporation in business (Marsh, 2020). It was reported that U.S. managers "...aren't sure how much they'll have to sacrifice if they take ESG into account" (ibid).

6.5 Trade-off between risk and return

The empirical results in the study point that the market is not entirely efficient. According to the Efficient Market Hypothesis (EMH), any new information is already factored into the stock prices and hence, it should not be possible to "beat the market consistently" by using the information that is already publicly known in the market (Fama, 1970). Applying the EMH to the context of this study, if any new ESG related information relevant for stock pricing is provided, the public availability of this information will determine whether it is already incorporated into the stock price (Manescu, 2011). If this is the case, the risk-adjusted returns of firms with high ESG-scores should be no different from those with low ESG-scores (ibid). However, the empirical results in this study show that investors could outperform by investing in low ESG firms. Firms with low ESG scores have a tendency of generating higher expected returns due to the presence of non-sustainability risk premium (Manescu,

2011). Put simply, low-ranked ESG firms are being compensated with higher expected returns for taking on non-sustainability risk.

The negative relationship between ESG and stock market returns could be explained by the risk and return trade-off. As expounded in the literature review, Markowitz's Modern Portfolio Theory (MPT) explains how investors can maximize their expected returns on their investments based on a given level of risk (Markowitz, 1952). A common way to quantify this risk is to take into account the beta of the stock, which is a measure of systematic risk of a security relative to the market as a whole (Da et al., 2009). Previous research points that higher ESG performance is associated with lower risk (Sassen et al., 2016; Ashwin Kumar et al., 2016; Boffo & Patalano, 2020; (Plagge & Grim, 2020). By applying Markowitz's (1952) theory of risk and return, the negative association between ESG performance and stock market returns could be attributed to the reduced risk or beta. This is because investors now require a lower compensation for the risk they undertake. As mentioned above, firms with low ESG scores have a tendency of generating higher expected returns due to the presence of non-sustainability risk premium (Manescu, 2011). Furthermore, this argument holds for the study when looking at the negative correlation between CAPM, where the beta is captured and the ESG score in the study (Appendix B). Going back to the EMH, if the markets are considered efficient, the lower risk because of ESG enhancing activities should be reflected in the CAPM (systematic risk being captured by the beta). In this study, the beta is lagged two years prior to the ESG rating. This could result in two important implications. Firstly, if a current firm improves its ESG activities, then the risk associated with the ESG is not captured in the beta (since the beta is lagged two years prior to the ESG rating). The implication is that negative effect in this study could reflect the risk that the beta hasn't captured yet. This reasoning is also in line with the observations of Martin and Dahlström (2020). Secondly, if the firms have had a constant ESG score over a two-year period, then the CAPM should have already accounted for the risk. In this case, the negative influence could be explained by other factors like investor behaviour and associated ESG costs as discussed previously.

6.6 Other implications

The discussion and inferences from the empirical results presented need to be viewed in tandem with some of the inherent and pertinent issues related to the ESG ratings industry.

1. **Rating heterogeneity:** The correlation between ESG ratings across different providers on an average is around 0.54 (Berg et.al., 2019). In contrast, with credit ratings, the correlation between

S&P and Moody's is around 0.99, thus giving rise to the main pitfall of ESG ratings (ibid). Since there is no standardized framework, each rating employs different methodologies, leading rating agencies to have differing opinions on the same evaluated companies and the agreement across rating providers is also substantially low. This heterogeneity across the ratings highlights one of the main pitfalls of ESG ratings and could have important implications on the results of this study. It should be noted that given this heterogeneity, the relationship between ESG and firm performance in this study is subject to the specific rating provider (in this case Refinitiv). Considering these differences, investors cannot be expected to have a consensus regarding the relationship between ESG and firm performance, thereby impacting the potential signalling effect of ESG scores (Martin and Dahlström, 2020).

2. **Measurement issues:** Berg et.al., 2019 notes that the ESG rating industry is fraught with inconsistencies when it comes to how the individual Environmental, Social and Governance pillars are measured. Similar to the concept of earnings management, investors may tap into this rating short-fall and engage in ESG enhancing activities for their own benefit. A rating agency that is more concerned with Greenhouse gas (GHG) emissions reduction than Electromagnetic Fields will assign different weights to each than a rating agency that cares equally about both issues (Berg et.al., 2019). For example, a firm may turn to investing in a combined heat and power plant (CHP) to reduce its GHG emissions, but this may also inadvertently increase the radiation level. But since this is not accounted for in the same level as GHG reduction, firms may become more incentivised to engage in activities that boost their scores and not care much about the negative externalities associated with such action.

Chapter 7: Limitations of the study

This section will delve into the limitations posed by the study. Having an overview of the limitations of the study is important for future work and for interpreting the results of the study.

Firstly, this study is limited to only medium and large cap listed U.S. companies. This includes firms with a market capitalization of USD 2 billion and above. This decision was heavily based on the availability of data. Furthermore, only those firms with continuous ESG scores for the sample period of nine years have been included for data completeness. The effect of this might be that there is an overrepresentation of a subset of firms focusing on ESG disclosures. Since the choice of the sample was based on data availability, the sample may be prone to selection bias, making the sample not entirely representative of the population intended to be analysed (Stock & Watson, 2015).

Secondly, the choice of the statistical analysis employed should be accounted for in future work. Initially, the study employed a panel data regression accounting for both the entity and time fixed effects. However, upon analysing the results of the regression, satisfactory inferences could not be drawn. The decision was made to employ an Ordinary Least Squares (OLS) method instead and this statistical analysis method have been used in previous studies studying the relationship between ESG and firm performance (Martin and Dahlström, 2020). To control for year effect, a year variable was included in the model.

Thirdly, in addition to the variables employed in the study, there were other variables considered at the start of the study but were subsequently omitted due to the lack of availability of data for all the firms in the sample period. The EBITDA margin was initially considered to study the impact of ESG on firm performance since it a good indicator of the operational efficiency of the firm. Furthermore, this variable has been used in similar previous research (Zhao et. al, 2018, Yawika & Handayani, 2019; Balatbat et al. 2012). However, the data was available for only a small subset of firms which would drastically reduce the sample size. The alternative was to look at a different database but given the circumstances, it was decided not to include this variable in the analysis. It was also initially decided to include Research and Development (R&D) expenditure as a control variable. Past studies have confirmed that firms with higher R&D expenditure show improved firm performance and so to control for this effect in the analysis, it made sense to include this as a relevant control variable (Coad & Rao, 2010; T. chun Chen et al., 2019). Furthermore, including the R&D expenditure was also in line

with previous research (McWilliams & Siegel, 2000; Xu et al., 2020; Lee et al., 2016). Regarding omitted variable bias, R&D expenditure might be correlated with some ESG variables that could have a positive influence on firm performance. Like the case of EBITDA margin, the R&D expenditure was only available for a small subset of firms and so it was decided not to include in the study.

Lastly, it is important to point out that while our study points to a positive relationship between ESG and firm profitability, this correlation does not imply causation. Since the study does not consider the causality effect as well as the direction of the effect, inferences related to causality cannot be made. However, this is an important consideration for future work.

Chapter 8: Future Work

Despite ESG having gained widespread momentum and interest in the recent past, it is still a novice area in finance. The findings presented in this study offer some interesting insights into the relationship between ESG and firm performance and has also uncovered potential new avenues for further research.

Firstly, to gain a more rounded understanding of the different institutional environments and how different geographic markets react to ESG information, it will be interesting to do a comparative study across geographic locations (developed and emerging markets). Such an analysis could provide valuable insights while considering how different regulations can impact investor behaviour regarding ESG information. Secondly, it will be interesting to delve deeper into ESG and firm performance by looking at specific sectors. While this study controlled for sector differences, a more sector-centric study could provide insights that make the findings more practically applicable to firms in a given sector.

Thirdly, as mentioned throughout the paper, the ESG rating industry is fraught with issues pertaining to rating heterogeneity and measurement across providers. The results presented in this study are based on the scores provided by one rating provider (Refinitiv). Given these rating issues, it will be worthwhile to study the impact of ESG on firm performance based on multiple rating providers and see how this impact is affected. Lastly, this study is conducted over a sample period from 2011-2019 and does not consider the impact of the COVID-19 pandemic. Preliminary research affirms the notion that there was a significant positive tilt towards ESG during the pandemic (JP Morgan, 2020). It will be interesting to study the impact of ESG on firm performance during times of crises. There already exists a wealth of literature providing good insights into the impact of ESG on firm performance. However, directing more work towards this area will provide a well-rounded understanding of this relationship and make the findings more relevant for firms. Note that the aforementioned is not an exhaustive list but rather interesting avenues that opened while conducting research for this paper that could prove beneficial in this area of study.

Chapter 9: Conclusion

The world today is facing unprecedented challenges from climate change to racial inequality and businesses are increasingly challenged to be a part of the solution. Challenging Friedman's shareholder theory, businesses are urged by their stakeholders to look beyond enhancing shareholder value and contribute positively to the wider community. As a result, the concept of doing well by doing good has never been higher on the business and investor agenda. However, businesses are also profit-making institutions and so it is essential to understand the impact of ESG undertaking on firm performance. On the one hand, research has shown that firms faring well in the ESG agenda enjoy lower costs of capital, lower risk, more risk-adjusted returns, enhanced profitability, and higher reputation. Businesses and investors are beginning to see ESG as a means of competitive advantage to increase firm value. Furthermore, the COVID-19 crisis tested the resilience of ESG investments and saw a record flow of investments into ESG funds. Furthermore, few ESG funds even outperformed their traditional counterparts in the crisis. The ESG momentum has paved way for an increasing number of rating providers that assess firms on their environmental, social and governance performance. Despite their supposed usefulness in providing pertinent ESG data, these ratings are fraught with issues from rating heterogeneity to ambiguous methodologies.

The central question in this study was to assess the impact of ESG scores on firm performance. Looking into previous literature did not provide a conclusive evidence of the relationship, thus necessitating the need for further research. The study looked into U.S. listed firms from 2011-2019. Firm performance in this study includes both market-based measures (Annual Stock Returns) and accounting-based measures (Net Income and Return on Assets). Much of the previous literature focused on the combined ESG effect. This study looks into the individual ESG component as well the changes in ESG score to study for potential signalling effect. Appropriate control variables deemed to influence firm performance were chosen and twelve regression models were set up to study the influence of ESG scores on firm performance. A statistical analysis, more specifically an OLS regression was conducted for these twelve models. All the twelve models showed a highly significant F-statistic implying that the model is well-fitted and also had a satisfactory adjusted R-squared.

Upon analysing the models, some interesting inferences become apparent. In the study sample, a higher ESG score is not associated with better firm performance when measured as stock market returns. Upon looking at the individual ESG components, it became apparent that the environment score is the key driver in the negative relationship. When examining the change in scores for potential signalling effect, a negative influence was found for both the environment and governance indicators. The negative influence on stock markets also revealed investor myopia by focusing on the short-term. It was also observed that the time horizon mismatch between an average investor (short-term) and ESG (long-term) could explain the negative relationship. This led to the rejection of the outset hypothesis of observing a positive relationship between ESG and stock market returns. Looking at the influence of ESG scores on profitability, it was found that there is a positive influence on Net Income and the combined ESG. It was also observed that firms that fared well on the environment criteria enjoyed higher levels of profit when measured by both the profitability metric. As discussed, the environment score is observed to be the key driver in the overall ESG scores in this sample. An interesting observation was that while a higher environment scores positively influenced profitability, it had the opposite influence on stock market returns. It was observed that enhanced environmental practices led to corporate value creation, but investors did not seem to see this value in the study. It was also interesting to note that while ESG is shown to positively influence Net Income, an improvement in the score is associated with a negative relationship. It was argued that that ESG translates into improved firm profitability only after a certain investment threshold is reached and that until this threshold is reached, any additional ESG expenditure will translate into lower profitability.

Based on the inferences from the study, it can be concluded that higher ESG scores do not lead to enhanced market performance in U.S. listed firms. However, the study showed that ESG can partially improve firm profitability and when aligned with the firm strategy could be an important tool for value creation, especially relating to environment. The results of this study add to the existing literature on ESG and firm performance. The divergence of the results only validates the need for more research to be directed in this field.

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11 Appendices

Appendix 1

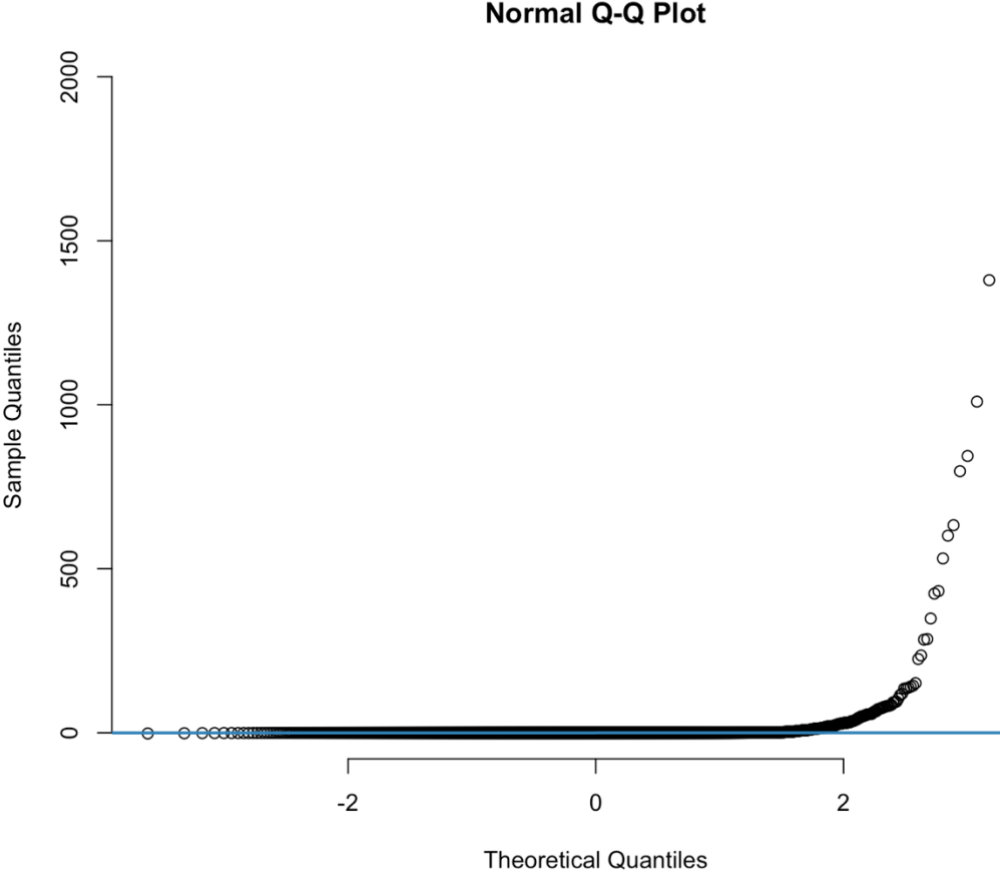


Figure 5: Q-Q plot for Net Income

Appendix B-Pearsons Correlation matrix

	ANNUAL RETURNS	NET INCOME	ROA	ESG	ENV	SOC	GOV	Δ ESG	Δ ENV	Δ SOC	Δ GOV	CAPM	LOG(MKTCAP)	LOG(P/B)	LEV	LOG(EMPL)	YEAR
ANNUAL RETURNS	1																
NET INCOME		1															
ROA			1														
ESG				1													
ENV					1												
SOC						1											
GOV							1										
Δ ESG								1									
Δ ENV									1								
Δ SOC										1							
Δ GOV											1						
CAPM												1					
LOG(MKTCAP)													1				
LOG(P/B)														1			
LEV															1		
LOG(EMPL)																1	
YEAR																	1

Appendix C

The screenshot displays the Refinitiv ESG portal interface. At the top, there are navigation tabs for Overview, News & Research, Price & Charts, Estimates, Financials, ESG, Events, Ownership, Debt & Credit, Peers & Valuation, Derivatives, Filings, and 360 Menu. The main heading is "ENVIRONMENTAL, SOCIAL, GOVERNANCE". Below this, there are filters for "ESG STATEMENT" (set to Environmental), "Social", "Governance", and "Controversies". A "NEW!" button is visible in the top right. The table below shows data for years 2017 through 2008. The columns represent the years, and the rows represent various ESG metrics. The "ESG Score" row shows a general downward trend from B+ in 2017 to B in 2008. The "Environment Pillar Score" is consistently high, ranging from A- to A. The "Social Pillar Score" fluctuates between C+ and B+. The "ESG Controversies Score" shows a significant decline from B- in 2017 to D in 2008. The "Resource Use" row is expanded to show specific metrics like "Resource Reduction Policy" (TRUE) and "Policy Water Efficiency" (FALSE).

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Period End Date	31-12-2017	31-12-2016	31-12-2015	31-12-2014	31-12-2013	31-12-2012	31-12-2011	31-12-2010	31-12-2009	31-12-2008
Reporting Currency	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
Period Status	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete
ESG Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
ESG Reporting Scope	100	100	100	100	100	100	100	100	--	--
ESG Report Auditor Name	--	--	--	--	--	--	--	--	--	--
ESG Period Last Update Date	29-09-2018	29-09-2018	29-09-2018	29-09-2018	29-09-2018	29-09-2018	29-09-2018	29-09-2018	23-02-2018	23-02-2018
ESG Combined Score	B+	C	B	B+	C	C	C-	C-	B-	C
ESG Score	B+	B	B	B+	B	B	B-	C+	B-	C
Environment Pillar Score	A-	A-	A-	A-	B+	B	C+	C+	C+	C
Governance Pillar Score	C+	C+	C	B	B-	B+	B-	C	C+	C-
Social Pillar Score	A-	B+	B+	B+	B	B	B	B	B	C+
ESG Controversies Score	B-	D	B-	B-	D	D	D-	D-	B	B
▼ Resource Use	B	B+	A-	A-	A-	B+	B	B	B	D
Resource Reduction Policy	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE
Policy Water Efficiency	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE
Policy Energy Efficiency	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE
Policy Sustainable Packaging	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE
Policy Environmental Supply Chain	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Resource Reduction Targets	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Targets Water Efficiency	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE

Figure 6: Refinitiv ESG portal