Spring 4-23-2020

An Examination of How Environmental, Social, Governance (ESG) Investing Influences a Company's Stock Return

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AN EXAMINATION OF HOW ENVIRONMENTAL, SOCIAL, GOVERNANCE (ESG) INVESTING INFLUENCES A COMPANY'S STOCK RETURN

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6 April 2020

Submitted in partial fulfillment of the requirements for
graduation with Honors

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Abstract

Using a random sample of 184 companies traded on the New York Stock Exchange in 2019, this paper investigates the impact of Environmental, Social, Governance (ESG) investing on a company's stock return. The results show that ESG investing has a positive and statistically significant impact on a company's stock return. An increase in one ESG rating leads to an increase between 0.4% and 3.6% in the return of a company's stock. Additionally, the results show that individual ESG factors are each statistically insignificant. This indicates that the three ESG factors need to be viewed together rather than individually. Lastly, the results show that a five-year average ESG rating has a statistically insignificant effect on stock returns, showing that ESG investing only has a positive and significant impact on stock returns in a one-year time period.

Acknowledgements

I sincerely thank Dr. Aristotelous for his advice and encouragement throughout this entire process. He has taught me that excellence cannot be achieved without hard work and perseverance; I am extremely grateful for that life lesson. I also thank Dr. Whalen for offering his time and expertise throughout this process.

I would also like to thank Mom, Dad, Will, and Uncle Paul for their support, encouragement, and helpful comments during the review process. I am blessed with such a loving family and I am forever thankful.

1. Introduction

What is the purpose of a company? Is it to serve its shareholders? Is it to serve their customers, employees, communities and the environment? Is a company responsible for all these groups? Conventional thinking suggests that the main purpose of a company is to maximize the wealth of its shareholders. However, there has been a shift in thinking when determining the main purpose of a company. The shift reflects the fact that a rapidly growing number of funds and individuals are now beginning to incorporate the interests of the environment, communities, employees, customers, and suppliers into their investment decisions. The interests of these groups, in addition to others, are what make up environmental, social, governance (ESG) investing. For example, "In 2006, when the Principles for Responsible Investment (PRI) was launched [a report published by the United Nations], 63 investment companies […] with $6.5 trillion in assets under management (AUM) signed a commitment to incorporate ESG issues into their investment decisions. By June 2019 the number of signatories had grown to 2,450 and represented $82 trillion in AUM" (Harvard Business Review, 2019). Furthermore, "ESG assets account for $12 trillion of the $46.6 trillion in total assets under professional management in the United States" (Penserra, 2020).

This research aims to investigate the impact of ESG investing on stock returns of companies that are publicly traded on the New York Stock Exchange in 2019. It is investigated through the utilization of regression analysis to isolate the relationship and significance of ESG investing on stock returns. This research provides a better understanding of how companies can manage the needs of not only shareholders, but also communities, governments, employees and the environment.

In this study, ESG investing will be measured using ESG ratings. A company can increase their ESG rating in a variety of ways. For example, if a company pledges to invest resources to reduce their carbon footprint, their ESG rating could increase. For example, the natural gas and oil company BP announced in February of 2020 that they have set a goal to eliminate their CO2 emissions entirely by 2050. Strategic business moves like this are how a company can increase their ESG rating. This study will seek to find out if higher ESG ratings result in higher stock returns.

There are multiple factors that are known to influence stock returns. This study uses the popular Fama-French Three Factor Model. This model states that there are three factors that influence stock returns: company size, company value and market risk. This study uses three variables to measure each of those factors. Market capitalization is used to capture the size of a company, the market-to-book ratio is used to capture the value of a company, and beta is used to capture the risk of a company. This study will also include an ESG Rating as a fourth variable to capture a company's ESG performance. The influence of ESG investing on a company's stock return will be examined using this model.

My research contributes to the literature surrounding ESG investing's influence on stock returns in multiple ways. This paper is one of the first to provide results on the short-term relationship between these two factors. There is agreement that the long-term relationship is positive (Flammer (2013), Whelan & Fink (2016), and Goldman Sachs (2018)), but the relationship in the short run is ambiguous. Additionally, this paper is also one of the first to analyze each ESG factor individually. My dataset allows me to isolate each ESG factor to test which/if any factor has the largest impact on stock returns. Lastly my research contributes to the

literature surrounding the long-term effect of ESG investing. This is done by testing the impact of a five year (2015-2019) average ESG score on a company's 2019 stock return.

The paper begins with a review of the literature to increase the understanding of the sustainability movement, stock returns, ESG factors, the relationship between stock returns and ESG factors, and how each are quantified. In section 3, I present and discuss the model I used to conduct my research, while at the same time discuss the data collection process I followed. The fourth section includes a discussion of my data, including summary statistics of the variables and the limitations of the dataset. In section 5 I justify the use of the Ordinary Least Squares (OLS) technique and address the common econometric problems associated with OLS that could affect hypothesis testing if not dealt with properly. I then give a summary of my results in section 6, discuss the effect ESG investing has in the long run in section 7, and then conclude with the primary takeaways and future suggestions of the analysis in section 8.

2. Literature Review

2.1 Why ESG is Important

ESG has grown in popularity because it is assumed that the ESG factors have financial relevance for multiple different groups of people. For investors, ESG data is increasingly important to identify companies who are well positioned for the future and to avoid those who are likely to underperform or fail. For individuals, ESG investing offers the opportunity to support companies that are aligned on the same values you hold. And for policy makers, it should be a welcomed, market-led development that ensures that the common good does not get lost in short-term profit making at any cost (Kell, 2018).

Flammer (2013) studied the effect on a firm's stock return when the sustainability news about a company was released. Her motivation for conducting this analysis came from an overwhelming increase in the importance of sustainable business practices (based off a survey conducted by the Accenture and United Nations Global Compact). The survey of 766 CEO's shows, "93 percent of the CEOs surveyed believe that sustainability will be critical to the future success of their businesses, and 91 percent report that their company will employ new technologies (e.g., renewable energy) to address sustainability issues over the next five years" (Flammer, 2013).

At a wider scope, this analysis will add to the overall discussion of how businesses need to be positioned according to important world issues like climate change, poverty, diversity, etc. The fact of the matter is that ESG investing has grown rapidly in the last ten years (Graph 1). "According to the US SIF Foundation's 2018 biennial report, "sustainable, responsible, and impact investing (SRI) [SRI measures essentially the same metrics as ESG] assets now account for $12 trillion of the $46.6 trillion in total assets under professional management in the United States" (Penserra, 2020). The growth of this movement can be attributed to major shifts in the profile of investors in the next five years. "The private wealth held by women grew from $34 trillion to $51 trillion from 2010-2015 and is expected to reach $72 trillion in 2020. Women and millennials are looking to align their values with investments and are more likely to invest in sustainable and impactful business models." Furthermore, BlackRock found in a survey that 67% of millennials and 76% of women wanted investments to reflect their social and environmental values. (North Capital 2019). It is clear that ESG factors are important to the next wave of investors and as a result, business leaders are beginning to respond.

In October 2019, Nasdaq hosted a panel discussion of ESG experts to give recommendations for how companies can better implement and adapt to the growing ESG movements. First, companies need to ensure that the data needed by ESG rating providers can be easily attained: “Put data into Excel tables, so the AI tools [of ESG rating companies] can pick them up” (MarketInsite, 2019). Secondly, companies need to specifically identify which ESG issues directly affect their business: “Think about what risks are more specific to you as a business; and get the whole company behind taking action on those that resonate most strongly – your employees are your most important advocates” (MarketInsite, 2019). Lastly, they addressed the need to understand your company’s physical climate risks: “We recommend corporates should think about disclosing physical climate risk and opportunities” (MarketInsite, 2019). Overall, companies need to embrace the changes ESG investing is asking of them. This involves transparency in reporting data relevant to ESG risks, working closely with ESG rating providers, and establishing a company culture that is committed to increasing the company’s ESG profile.

ESG investing is also beginning to affect areas outside of the business world. Specifically, a movement is taking place at the state legislative level. Illinois, New York, Oregon, New Jersey and California are introducing regulations to advance sustainable investments. Illinois, for example, signed into a law that “requires all public or government agencies involved in managing public funds to ‘develop, publish, and implement sustainable investment policies applicable to the management of all public funds under its control. (Zaidi, 2019). This shows an example that ESG investing is not the only way our society is attempting to combat the major issues our world is facing. Corporate Social Responsibility (CSR) and Socially Responsible Investing (SRI) are examples of other sustainability practices that have a strong following within our society.

2.2 The difference between ESG and other Sustainability Metrics

ESG is often discussed in close relation to corporate social responsibility (CSR). ESG is used in this paper because it is related to the actual measurement of a firm's performance in relation to the environment, society, and governance. Additionally, the concept of CSR is losing its relevance. It was first seen in business models in the mid-19th century and has always struggled to connect with a business's strategy and gain necessary resources within the company to make a real difference. ESG is fully integrated into a firm's strategic objectives because "ESG performance indicators are closely aligned with the mission of the firm, which in the long run should produce companies making responsible business decisions" (Thygesen, 2019). Therefore, investors and companies can use ESG metrics to help them decipher between responsible and irresponsible decisions.

Socially Responsible Investing (SRI) is another type of sustainability investing that is growing in popularity along with ESG investing. Cautero (2019) defines this as "a type of investing that keeps in mind the environmental and social effects of investments and strives to make positive impacts in both areas" (Cautero, 2019). The important difference between ESG and SRI is seen in ESG's focus in determining how its metrics impact a company's performance in the market: "investors in this discipline [ESG] consider how environmental, social and corporate governance impact how well an investment does in the market. More specifically, this type of investing considers how these three factors affect the performance of an investment and, therefore, an investor's returns" (Cautero, 2019). Another difference is that the two investment strategies have different objectives. "[ESG investing] focuses on how environmental, social, and governance factors affect the performance of a particular investment, while [SRI investing] refers to not taking advantage of an investment opportunity based on the impact a

company has on environmental and social factors" (Cautero, 2019). In this study, ESG investing is the focal point because of its ability to directly connect sustainability practices to the financial performance of a company.

2.3 How is ESG measured?

It is vital to understand how ESG investing is measured and what issues it addresses in order to properly use the ESG Ratings. Zhang (2018) and Flammer (2013) used three separate ESG ratings: environmental performance, corporate governance performance, and social performance. MSCI has been widely accepted as one of the top ESG rating providers. MSCI uses "a rules-based methodology to identify leaders and laggards. [They] rate companies on a 'AAA to CCC' scale according to their exposure to ESG risks and how well they manage those risks relative to peers" (MSCI.com, 2020). Companies with a rating of CCC or B are laggards of their industry, while companies with a rating of BB, BBB, or A are considered to be average among their industry competitors. Lastly, ESG leaders are given ratings of either AA or AAA.

As of October 2019, MSCI.com has rated 7,500 companies. Companies are rated based off thirty-seven key ESG issues (Table 1). These issues are divided into three pillars (environmental, social, governance) and then broken up further into ten themes. The four environmental themes are: climate change, natural resources, pollution and waste, and environmental opportunities. For example, issues that are included in the natural resources theme are water stress, biodiversity and land use, and raw material sourcing. The four social themes are: human capital, product liability, stakeholder opposition, and social opportunities. For example, the issues that are covered in the human capital theme are labor management, human capital development, and health and safety. The two governance themes are corporate governance and

corporate behavior. For example, the issues covered in the corporate behavior theme are business ethics, anti-competitive practices, corruption and instability, and financial system instability.

MSCI collects its data from a variety of data sources and then moves the data through a hierarchy of steps in order to arrive at the final score from AAA-CCC. This hierarchy can be viewed in Chart 1 of the Appendix. "To arrive at a final letter rating, the weighted averages of the Key Issue Scores are aggregated and companies' scores are normalized by their industries. After any overrides are factored in, each company's final industry-adjusted score corresponds to a rating between best (AAA) and worst (CCC). These assessments of company performance are not absolute but are explicitly intended to be relative to the standards and performance of a company's industry peers" (MSCI ESG Ratings Methodology, 2018). They collect their data from the following sources: academic/government/NGO datasets, company disclosures (i.e. 10-Ks, sustainability reports), and other government, media, and NGO sources regarding specific companies. Once the data is collected, companies are given multiple different opportunities to consult, review, and update their ratings report: "Companies are monitored on a systematic and ongoing basis, including daily monitoring of controversies and governance events. New information is reflected in reports on a weekly basis and significant score changes trigger analyst review and re-rating. Companies receive an in-depth review at least annually" (MSCI ESG Ratings Methodology, 2018). This process of data collection and reporting provides MSCI clients with some of the most in-depth ESG rating reports compared to other ESG rating providers.

However, ESG ratings scores are not the only way a business's sustainability practices are measured. Flammer (2013) also measured specifically the environmental factor of ESG through recording publications of news stories released about a firm and whether the event has a

positive or negative effect on the environment. Whetman (2018) measured sustainability through recording whether the firm released a sustainability report, which is defined as "a report published by a company or organization about the economic, environmental and social impacts caused by its everyday activities." This study was aimed to analyze if the transparency of a firm on their sustainability practices influenced their financial performance.

2.4 What influences stock returns?

In order to build an accurate regression model for testing the influence of ESG investing on the financial performance of a company, including the correct explanatory variables is critical. In this study, stock return was the variable chosen to capture the financial performance. However, the literature explains that there are many ways to measure a firm's performance. The possible metrics can be categorized into three types: (a) market approaches, such as share price or other values determined by external stakeholders; (b) internal accounting approaches, such as return on assets (ROA) and return on equity (ROE); and (c) perceptual approaches, which qualitatively assess a company's performance, using either internal or external sources such as management surveys or *Fortune* magazine rankings (Peloza, 2009). The market-based metrics are the most popular metric used in the literature because of how easy it allows firms to measure their performance overtime and compare their performance with other firms. Stock return is an example of a market-based metric and I have chosen to use it to measure firm performance for those reasons.

There are many factors that influence the return of a stock, including both market and accounting-based metrics. A researcher must decide which of these variables are the most important to include in their model. "Including all factors can result in excessively complex models, and most analysts therefore limit the number of independent variables to anywhere from

three to five" (Ozyasar, 2011). The Fama-French 3 Factor model is widely used by investors and financial managers today to estimate future returns and is based off an econometric regression of historical stock prices (Anastasia, 2019). The model specifies the three factors as market risk, company size, and market-to-book ratio (Armstrong, 2013).

As a result of the Fama-French Model, the literature surrounding stock return regression includes variables that, generally, reflect the risk, size, and value of a firm. As Ozyasar discussed, modeling the future stock return of a firm is complex and the risk, size, and value of firms can be captured by many different measurements. Zhang (2017) for example, included the natural log of book-to-market ratio, the natural log of size of firm (market capitalization), and the profitability (return-on-equity) in his model to predict CSR on stock returns for firms in the S&P 500 from 2000-2014. Flammer (2013) specified her model to predict an increase/decrease of stock returns using size of the firm, age, profitability, market-to-book ratio, and the number of analysts following a company in her model. Peiris and Evans (2010) used the monthly return of the market, size, and percent change in sales growth to analyze the relationship between ESG factors and stock valuation and operating performance.

Even with the inconsistency of the models in the literature, there does seem to be a general agreement of what factors are most important. Among them include variables that measure the size of the firm and valuation of the firm in the market. The inconsistency among literary sources also suggests that there is some flexibility when deciding to include other variables because of the complexity associated with modeling stock returns. The model for this study includes variables to capture the size of the firm, valuation of the firm in the market, and the risk of the firm.

2.5 The relationship between ESG and Financial Performance

One of the main contributions of this research is the analysis of the short-term effect of ESG investing on stock returns. Still, it is important to understand the relationship between ESG investing and stock returns in the long-term. Currently, most investors only consider ESG factors for long-term investments. Mark Orsagh of the CFA Institute writes, "several reasons are often given when investors state that ESG factors are long-term factors and not short-term factors. One point often made is that conventional financial factors (financial metrics, quarterly results, economic indicators, etc.) have an overriding influence on prices, especially in the short term" (Orsagh, 2019). Theory states that the relationship between ESG investing and financial performance is positive because of the time needed for ESG-backed business decisions to make an impact.

The positive relationship between financial performance and ESG investing is rooted in the incorporation of ESG strategies into the long-term strategy of a company. For example, "When companies pursue a stakeholder-centric approach to value creation by incorporating ESG into their long-term investment strategy, they're able to attract the best talent, build loyal customer bases, prosper through strong corporate governance oversight, mitigate risk, and drive profitable growth by investing in sustainable innovations that positively impact the world (Rotonti and Lomax, 2019). Establishing a strong ESG strategy within a company requires a leadership team that is committed to developing ESG strategies in every area of the company: "A company cannot become an ESG powerhouse overnight. It takes time to develop a deeply rooted ESG culture and leadership team who dedicated to investing (through research and development, and capital expenditures) in long-term initiatives to drive shared-value creation" (Rotonti and Lomax, 2019). To go further, there is evidence that even if the relationship is not positive, ESG

factors do not have a negative impact on performance: “out of 2,200 studies on ESG, 90% show either a positive relationship to corporate financial performance (CFP) or at least non-negative relationship. So, if ESG is likely positive and in the very least is not hurting corporate performance, then why would investors not want to invest in companies that are trying to make the world a better place” (Eccles & Serafeim, 2019)?

The literature surrounding this relationship coincides with this theory as well. Clark, Feiner, and Viehs (2015) conducted a study that investigated 200 academic studies and sources on sustainability to assess the evidence on both sides of investing: the business case for sustainability and the integration of sustainability into investment decisions. They measured the effect of each ESG metric using alpha to measure financial performance (alpha is used in finance to measure the performance of a firm by comparing the excess return of an investment to the return of a benchmark, such as the S&P 500). Each ESG factor was analyzed individually and the results were in line with what the theory suggests. The environmental factor was analyzed through measuring the effect of environmental news released about a firm on the alpha of the company from 1980-2009: “After reporting environmentally positive events stocks show an average alpha of 0.84%. Conversely, after negative events, stocks underperform by -0.65%” (Flammer, 2013). “The social factor also showed a positive relationship: A portfolio comprised of the ‘100 Best Companies to Work for in America’ yielded an alpha of 2.3% above industry benchmarks over the period 1984-2011” (Edmans, 2012). The governmental factor within ESG was analyzed and the “a portfolio that goes long in well governed firms and short in poorly governed firms creates an alpha of 10% to 15% annually over the time period 1990 to 2001.” (Cremers and Nair, 2005). The report also discusses aggregated scores of ESG investing in addition to the individual metrics where they found, “Stocks of sustainable companies tend to

outperform their less sustainable counterparts by 4.8% annually" (Clark, Feiner, and Viehs, 2015).

There are, however, examples in the literature that suggest that the relationship is negative between ESG investing and stock performance. Zhang (2017) for example found a negative relationship. The author examined the impact of corporate social responsibility (CSR) on stock returns among companies in the S&P 1500 Index from 2000-2014. The results show a significant negative correlation between the overall CSR metric and stock return of the company, with only corporate governance being statistically significant. "The one-year lagged value of the corporate governance score is the only indicator that has a significant effect on the stock returns, as indicated by the relatively large t-stat of -2.29 in Model 2. If one company engaged in corporate governance activities last year, for each increment in the performance score of its corporate governance activity, the company will expect a 0.000526 decrease in its stock returns, holding all else equal" (Zhang, 2017). Zhang used a cross-sectional, one-year lagged regression analysis that is similar to the regression tool that is used in this study. Although his main finding showed a very small effect on stock returns, it is still a valuable finding considering how it disagrees with other literary works.

As discussed earlier, one of the main contributions of this paper is the effect of ESG investing on stock returns in a short (one-year) time period. Whetman (2018) conducted a similar study where he found the relationship between sustainability reporting and profitability to be positive and significant for firms with low institutional ownership from 2014-2015. Sustainable reporting is "a report published by a company or organization about the economic, environmental and social impacts caused by its everyday activities" (Whetman, 2018). These reports allow companies to provide information regarding the non-financial aspects of its

operations, ultimately allowing companies to actively engage in a solution towards improving firms accountability, transparency, and corporate image" (Whetman, 2018). Whetman measured sustainability reporting in his regression model using a dummy variable as an independent variable along with firm size and capital structure. He used those variables to test their effect on profitability, which was measured through three separate dependent variables: return on equity, return on assets, and profit margin.

The results showed evidence that firms who publish sustainability reports are likely to see an increase in profitability. For return on equity, "the regression indicates that sustainability reporting […] has a positive and significant impact on firm equity. Holding other variables constant, the model predicts that when a firm decides to switch to [sustainable] reporting, return on equity would increase by 22%" (Whetman, 2018). For return on assets, "the regression indicates sustainability reporting has a positive and significant impact on a firm's return on assets. The coefficient is +3.324, […] which suggests that a firm would experience a 3.324% increase in return on assets by engaging in sustainability reporting" (Whetman, 2018). For profit margin, "the results suggest that sustainability reporting enhances a firm's profit margin by 10.71%." (Whetman, 2018).

Flammer's (2013) study that analyzed the relationship between environmental news and stock returns showed a positive relationship between positive/negative environmental news and stock returns. Specifically, this study looked at short, two day 'event windows' for the analysis. Flammer sought to analyze how shareholders react the two days after the release of environmental news. Flammer concluded that companies who release positive environmental news experience a significant stock increase and firms that release a negative environmental see a corresponding decrease in their stock: "I find that shareholders react positively to the

announcement of eco-friendly initiatives, and negatively to the announcement of eco-harmful behavior" (Flammer, 2013). She argues that the increasing pressures on firms to take care of the environment have made shareholders react more and punish the behaviors that harm the environment.

3. Methodology

This study uses two regression models to estimate the effect of ESG investing on stock return. The equations are based off the Fama-French 3 Factor model, which focuses its attention to three main factors: market risk, company size, and value factors (Armstrong, 2013). The first equation expresses the stock return of a given stock in 2019 as a function of the following independent variables: market capitalization, book-to-market ratio, beta, and ESG rating.

$$STOCK\_RETURN_i = \beta_0 + \beta_1 \log(MARKET\_CAP_i) + \beta_2 MB\_RATIO_i + \beta_3 BETA_i + \beta_4 ESG_i + \varepsilon_i$$

This equation expresses that return of a stock as function of four independent variables. The dependent variable, STOCK_RETURN, is a year-to-date (YTD) return from January 2019 to December 2019. The size of the firm is captured in the MARKET_CAP variable by measuring the market capitalization of each company. MB_RATIO is the variable that captures the company's market to book ratios. BETA represents the beta value of the company, which measures the company's risk by capturing the company's return in comparison to the market's return (Keown, Martin, Petty, 2018). The ESG variable provides the 2019 ESG ratings of given a company from *MSCI.com*.

The expected signs from a theoretical perspective for the independent variables are as follows: The expected coefficient sign for MARKET_CAP is ambiguous. Based off a review of literature surrounding this relationship, there are differing views. "Large-cap companies tend to

have slower growth rates, but they overall produce a larger return each investment period. In contrast, small-cap stocks have the potential to grow very quickly, but often yield fewer returns than large-cap stocks" (Lumio, 2019). The disagreement on the expected sign of this variable seems to be centered around how the growth potential of a stock influences the returns. Lumio (2019) argues that besides the high growth potential of small-cap stocks, the stability of the large-caps will produce higher returns. However, Chang (2019) argues against this: "investors can take advantage of this growth by investing in small caps, creating prospects to participate in higher returns."

The MB_RATIO coefficient is expected to be ambiguous because there are differing views about how value stocks (stocks with lower ratios) and growth stocks (stocks with higher ratios) are related to stock returns. Value stocks are bought at relatively low prices and growth stocks are bought at relatively high prices, but there is not a consensus on if stocks with low or high ratios result in higher returns. Fama & French (1992) found that that value stocks enjoy higher returns than growth stocks, suggesting that the relationship between market-to-book ratios and returns is negative: "Firms that have […] high ratios of book-to-market [or low ratios of market-to-book] equity have higher expected stock returns" (Fama & French, pg. 428). However, this argument has opposing views, which suggest that growth stocks (with high market-to-book ratios) produce higher returns. The relationship largely depends on the time period being used because some years growth stocks outperform value stocks and in other years the opposite is true. Since the data set used in this study is only a one-year time period, I have determined the expected sign of the MB_RATIO coefficient to be ambiguous.

BETA is expected to have a positive sign. The literature that argues for this sign to be positive states "beta is the measure of the volatility, or systematic risk, of a security in

comparison to the market as a whole. High-beta securities have more risk than the market and low-beta securities less. Thus, high-beta stocks should have higher returns to compensate investors for their higher risk" (Swedroe, 2012).

The expected sign for the ESG ratings in 2019 is ambiguous. As discussed in the earlier section, there are differing views on how ESG investing influences stock returns. Zhang (2017) concluded that there is negative relationship between ESG and corporate governance, but that was in a study that ranged from 2000-2014. The research around the short-term effect of ESG shows a positive relationship, however the studies do not specifically use ESG ratings to measure sustainability or stock returns to measure financial performance (Flammer (2013), Whetman (2018)).

The second model expresses stock return of a given stock in 2019 as a function of the following independent variables: market capitalization, book-to-market ratio, beta, environmental ESG, social ESG, and governance ESG:

$$STOCK\_RETURN_i = \beta_0 + \beta_1 \log(MARKET\_CAP_i) + \beta_2 MB\_RATIO_i + \beta_3 BETA_i$$

$$+ \beta_4 ENVIRONMENT_i + \beta_5 SOCIAL_i + \beta_6 GOVERNANCE_i + \varepsilon_i$$

The expected signs of market capitalization, book-to-market, and beta are all the same. Theory states that in the short run, investors react positively when a company decides to invest resources into practices related to ESG. As a result, all three coefficients of the ESG factors are expected to have a positive sign. The expected positive signs for these coefficients align with the work of Flammer (2013), Edmans (2012), and Cremers and Nair (2005).

Based off these expected signs and the literature review, I hypothesize that the effect of ESG investing on a one-year stock return of a company will be positive. In order to test the

relationship between ESG investing in the short run and the stock return of a firm, I ran a t-test using the output from the Ordinary Least Squares (OLS) regression estimation technique. OLS is the best estimator possible under a set of specific assumptions, which can be viewed in Table 2. (Studenmund, 2017).

4. Data

My data is a cross-sectional random sample of 184 companies that were traded on the New York Stock Exchange as of December 2019. This time period allows me to analyze the most recent stock market and ESG data, thus reducing any influence external factors may have on the financial metrics of a given firm. I collected my data from *Yahoo! Finance, Vanguard,* and *MSCI.*

The overall ESG ratings were collected from *MSCI* because of the renowned reputation their ESG rating reports have among investors. The ratings have been recognized by multiple independent entities for their excellence in research. In January of 2020, they released ESG ratings of 2,800 companies for free on their website. Each report rates a company on a "AAA – CCC" scale according to their exposure to ESG risk and how well they manage those risks relative to peers. I simply searched by ticker symbol and recorded the rating for each firm in my dataset. Firm's with a CCC or B rating are considered laggards among their competitors. Firm's with a BB, BBB, or A rating are average among their competitors, and those with a rating of either AA or AAA are the ESG leaders in their industry. Each report also highlights what areas of their business contributed to the rating they received. For a firm with an average rating (BB-A), there is usually an area where the firm is lagging behind their peers and also an area where the firm is a leader. For example, Amazon is an ESG leader in corporate governance, average in their privacy/data security, average in their carbon footprint emissions, and an ESG laggard in

their labor management. For those reasons, they received a BB rating. For simplicity, I rated companies in my dataset on a 1-7 scale, 1 = CCC and 7 = AAA.

The individual ESG scores were collected on *yahoo.finance.com.* Yahoo! Finance attains these scores from *Sustainanalytics*, which is another leading independent global provider of ESG research and ratings. Unlike *MSCI,* these ratings include three individual ratings (environmental, social, governance) on a scale from 1^{st}-100^{th} percentile of a firm's performance compared to other firms within the same industry. I searched by ticker symbol for this data as well, and then recorded the percentiles for each factor into my dataset.

I also collected the remaining independent variables on *Yahoo! Finance:* market capitalization, market-to-book, and beta. Market capitalization is the observed value for the asset in the marketplace and is calculated by multiplying the number of shares outstanding and the price of each share. The beta is calculated by dividing the covariance of the firm's return and the market's return by the variance of the market returns (CFI, 2019). Market-to-book is calculated by dividing the firm's market capitalization by the firm's book value. Lastly, I collected the data for stock returns, the dependent variable, on *vanguard.com*. This website allowed free and easy access to one-year stock returns for all of the companies in my dataset.

The mean one-year stock return of the dataset was +19%, with a minimum of -50.41% and a maximum of +82.65%. The data included firms with a market cap mean of $40.41 billion, ranging from $4.53 billion to $316 billion. Market to book ratios had a mean of 1.92 and ranged from – 117.37 to +64.53. The beta mean is at .99 and ranged from .00 to 2.57. The MSCI 2019 scores have a mean rating of 4, with a range from 1 to 7. The environmental ESG scores have a mean of 55, with a maximum score of 98 and minimum score of 0. The social ESG scores have a mean 54, a maximum score of 100 and minimum score of 0. The governance ESG scores have a

mean score of 58, maximum score of 100 and minimum score of 4. A full summary of these statistics can be seen in Table 3 in the appendix and the full dataset can be seen in Table 4.

5. Estimation Procedure

The regression estimation technique called Ordinary Least Squares (OLS) was used in the study. OLS calculates the coefficient estimates by following an objective statistical criterion in order to minimize the squared residuals. OLS is an estimator, which means that it is a mathematical technique that is applied to a sample of data to produce real-world numerical estimates of the true population regression coefficients. OLS is relatively easy to use and is the best linear unbiased estimator when all the "classical assumptions" hold true. "They are classical because they are necessary for ordinary least squares to be the best linear estimation method for a given regression model" (Halcoussis, pg. 26). When one of the assumptions do not hold true, the analyst must take the necessary steps in order fix the problem in the model so all seven assumptions are true.

The classical assumptions are as follows:

1. The dependent variable is linearly related to the coefficients, and the regression model is correctly specified and has and additive error term. A correctly specified model is one that includes all important variables and is of the correct functional form.

2. The expected value of the error term is equal to zero.

3. All independent variables are uncorrelated with the error term.

4. Observations of the error term are uncorrelated with each other.

5. The error term has a constant variance.

6. No independent variable is a perfect linear function of any other independent variables.

7. The error term is normally distributed.

Assumption number 7 is not required to make OLS the best estimator, but it is important for statistical tests on regression results.

Before interpreting the results of the study, I needed to check my data for a few econometric problems that could result in incorrect hypothesis testing. First, I checked for multicollinearity, which occurs when two independent variables are either highly correlated (meaning they are basically the same variable) or that they have relatively the same movements as one another.

Lastly, a test was run to check the data for heteroskedasticity. Heteroskedasticity is the most common econometric problem when dealing with cross sectional data, so checking for the symptoms of this problem is important. Heteroskedasticity occurs when assumptions five is violated, meaning the variance of the error term is not constant. the error terms do not have a constant variance (violation of assumption five). If the error term is not constant this most likely means that the error term is related to a variable that may or may not be included in the model. This is a problem because the error term should be completely random.

Serial correlation is another econometric problem that needs to be checked for. It occurs when an observed error term is influenced by the error term from the preceding time period (violation of assumption four). However, this econometric problem is only commonly seen in time series data and because of that I am not concerned about having to correct for the consequences of this problem.

6. Findings

My test for multicollinearity found there to be no multicollinearity, which means that all independent variables in my equation are not highly correlated to one another. I used a correlation matrix to test the strength and direction of the relationships between the independent variables and found that all were under 80% correlated. The results for this test can be seen in Table 5 of the appendix. The White Test was used to check for heteroskedasticity. The results show that there was heteroskedasticity in my data (Table 6). I am confident that the heteroskedasticity in my model is pure because the theory and literature suggest that my equation is specified correctly. In order to correct for pure heteroskedasticity, I used the natural log of the MARKET_CAP variable. Due to the wide variety in the sizes of the firms within my dataset, the natural log will decrease the variance in the model, thus making the error term constant.

For the 2019 ESG Model, the adjusted r-squared is 0.11 which indicates that after adjusting for the degrees of freedom, 11% of the variation in stock returns can be explained by the market cap, market-to-book ratio, beta, and 2019 ESG score (Table 7). The sign of the 2019 MSCI ESG rating coefficient is positive as expected. Due to the results of the t-test in Table 8, I am 95% confident that when the market capitalization of a company increases, so will the stock return. This means companies that had a higher ESG also had a higher stock return in 2019. I also calculated a confidence interval in order to find the true value of the coefficient using a specified probability. The results of that calculation show that I am 95% confident that as the MSCI ESG Rating of a company increases by one letter rating, the stock return of the company will increase between 0.4% and 3.6%.

The sign of the MARKET_CAP coefficient is positive, which suggests that growth stock outperformed value stocks in 2019. This agrees with the theory that larger companies will

produce larger returns for their shareholders. It is also in agreement with the analysis completed by Lumio (2019). The t-test performed in Table 8 shows that the coefficient is significant at a 1% level. The confidence interval in Table 9 shows that I am 99.5% confident that if the market capitalization of a company increases by $1 million, the stock return of the company will increase between 1.4% and 11%.

The sign MB_RATIO is positive, which suggests that growth stocks see higher returns because they have higher market-to-book ratios. However, the t-test performed in Table 8 shows the coefficient is insignificant at a 5% level. The positive sign of the coefficient aligns with theory as well, which states that as the ratio increases, so will the return of the stock. However, I believe the significance of this coefficient would be increased with a larger and more diverse sample size.

The sign for BETA is negative, which is not excepted. Based on financial theory, it is expected that as the beta of the stock increases (higher risk) there will be a higher return on the stock. The coefficient is significant at a 5% level (Table 8), suggesting that as the beta increases, the stock return decreases. While the result of the sign is unexpected, there have been studies conducted that agree with this finding. Frazzini and Pedersen (2013) argue, "relative to high-beta stocks, low-beta stocks […] have higher returns over the prior 12 months" (Frazzini and Pedersen, 2013). This argument is based off the concept of the momentum factor, which is defined as "the tendency of winning stocks to continue performing well in the near term" (MSCI.com, 2020). Therefore, this argument suggests that in the short term, the relationship between beta and stock returns could be negative. Additionally, this result may have revealed a constraint within my dataset. The beta estimation period and stock return period for the data I collected overlapped, while theory suggests that I calculated a confidence interval and with 95%

confidence that as the beta of a company increases by .01, the stock return of a company will decrease between .6% and 10.2%.

The Individual ESG Regression (Table 10) has an r-squared of .10, which means that 10% of the variation in stock returns can be explained by the market capitalization, market-to-book ratio, beta, environmental ESG, social ESG score, and governmental ESG score. Market capitalization is positive and significant at the .01% level. Market-to-book and beta have the same signs as the 2019 ESG regression, but neither of the coefficients are significant at the 10% level. The environmental and social ESG coefficients are negative and insignificant, while the governance coefficient is positive and insignificant (Table 11). The insignificance of these coefficients means that these factors do not have a large enough impact on the stock returns to influence them. Furthermore, when compared to the results of the 2019 ESG model, these results indicate that a company's ESG practices need to be viewed in their entirety instead of individually in order to make a positive impact on their stock return in a one-year time period.

7. Long Run Effect of ESG Investing

I ran an additional regression analysis to add to the literature surrounding the long-term effect of ESG investing on stock returns. This equation includes an average ESG score from 2015-2019. This model expresses stock return of a given stock in 2019 as a function of the following independent variables: market capitalization, book-to-market ratio, beta, and the average ESG:

$$STOCK\_RETURN_i = \beta_0 + \beta_1 \log(MARKET\_CAP_i) + \beta_2\ MB\_RATIO_i + \beta_3\, BETA_i + \beta_4\, AVG\_ESG + \varepsilon_i$$

In this model, the expected signs for market capitalization, book-to-market, and beta are all the same. AVG_ESG is also expected to be positive because theory suggests that as companies are able to implement ESG practices into their business model over the course of many years, those practices will have a positive impact on the financial performance of the company. The study published Rotonti and Lomax (2019) agrees with this relationship as well.

The results of this regression analysis can be seen in Table 12 in the appendix. The r-squared is .11 (Table 11), which means that 11% of the variation in the stock return of a company in 2019 can be explained by the market capitalization, market-to-book, beta, and average ESG score from 2014-2019. The sign for market capitalization is positive and significant at the .05% level. The sign for market-to-book is positive but is insignificant at the 10% level, like the two other regression results discussed in the paper. The beta coefficient is negative, which is still unexpected according to theory, but does agree with the other regression models in this paper and with Frazzini and Pedersen (2013). In this regression, beta was insignificant at a 10% level (Table 13).

The average ESG coefficient showed a positive sign but was insignificant at a 10% level. This means that the average ESG score from 2014-2019 did not have a significant impact on the 2019 stock return of a company. This insignificance can be attributed to the time frame used in this study. Most studies about the long-term effect of the ESG investing used timelines of 10-30 years (Flammer, 2013 & Eccles & Serafeim, 2019), while limitations in my dataset only allowed be to use a 5-year average. This finding is important when compared to the results of the short-run analysis conducted in this paper. The effect of ESG investing on stock returns in one year is significant, not significant in a five-year average, but significant again in a time period of 30 years (Flammer, 2013). This suggests that the impact of ESG investing on stock returns is

significant when the company first announces ESG practices but then takes many years for those practices to make a lasting impact on the company's stock return

8. Conclusion

The purpose of this paper was to examine the effect of ESG investing on stock return from companies in the NYSE in 2019. This was completed by using a regression on a random sample of companies and accounting for the following variables: stock return, market capitalization, market-to-book ratio, beta, and overall ESG score.

The major findings of the paper are: (a) I am 95% confident that if a company's ESG rating increases by one level, the stock return of that company will increase between 0.4% and 3.6%. (b) The average ESG rating is insignificant at a 10% level, indicating that ESG investing only has a positive and significant impact on stock return in a one-year time period. (c) All three individual ESG factors are insignificant at a 10% level, indicating that the three ESG factors must be viewed together for ESG investing to have a positive and significant effect on stock returns.

This research could be improved in a couple of ways to provide more insights into the effect of ESG investing on stock returns. First, the sample size can be increased. Due to the complexity and volatility of the stock market, a larger dataset will result in a more representative sample that will, as a result, provide more accurate and reliable analysis. Secondly, collecting data from a fewer number of sources will reduce the chance of discrepancies between sources once collected into a single dataset. There are data sources available for purchase that provide the data needed for this analysis, but because of financial limitations I was not able to use those sources.

One way this research could be expanded in order to provide more insight on the relationship between ESG investing and stock returns would be to study the relationship among companies from one industry. This will make the data collection process simpler because many online platforms already breakdown firms by industry and provide financial and sustainability information related to the industry. For example, focusing on the energy industry could provide interesting insights because of that industry's close relationship with the environment.

The answer to the question, "what is the main goal of a company?" may have been an easy question for many people to answer a few decades ago. However, this paper shows that the answer to this question may no longer be that clear because of the rise in ESG investing. This study has shown that ESG investing can make a direct influence on the stock return of a firm in a one-year time period. As these initiatives continue to rise and more research is completed on this topic, the relationship between ESG investing and the financial performance a company will become clearer. Hopefully, the clearer this relationship becomes, the better everyone's lives will be.

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Appendix

Graph 1: The Rapid Growth of ESG Investing

Chart 1: Hierarchy of MSCI ESG Scores

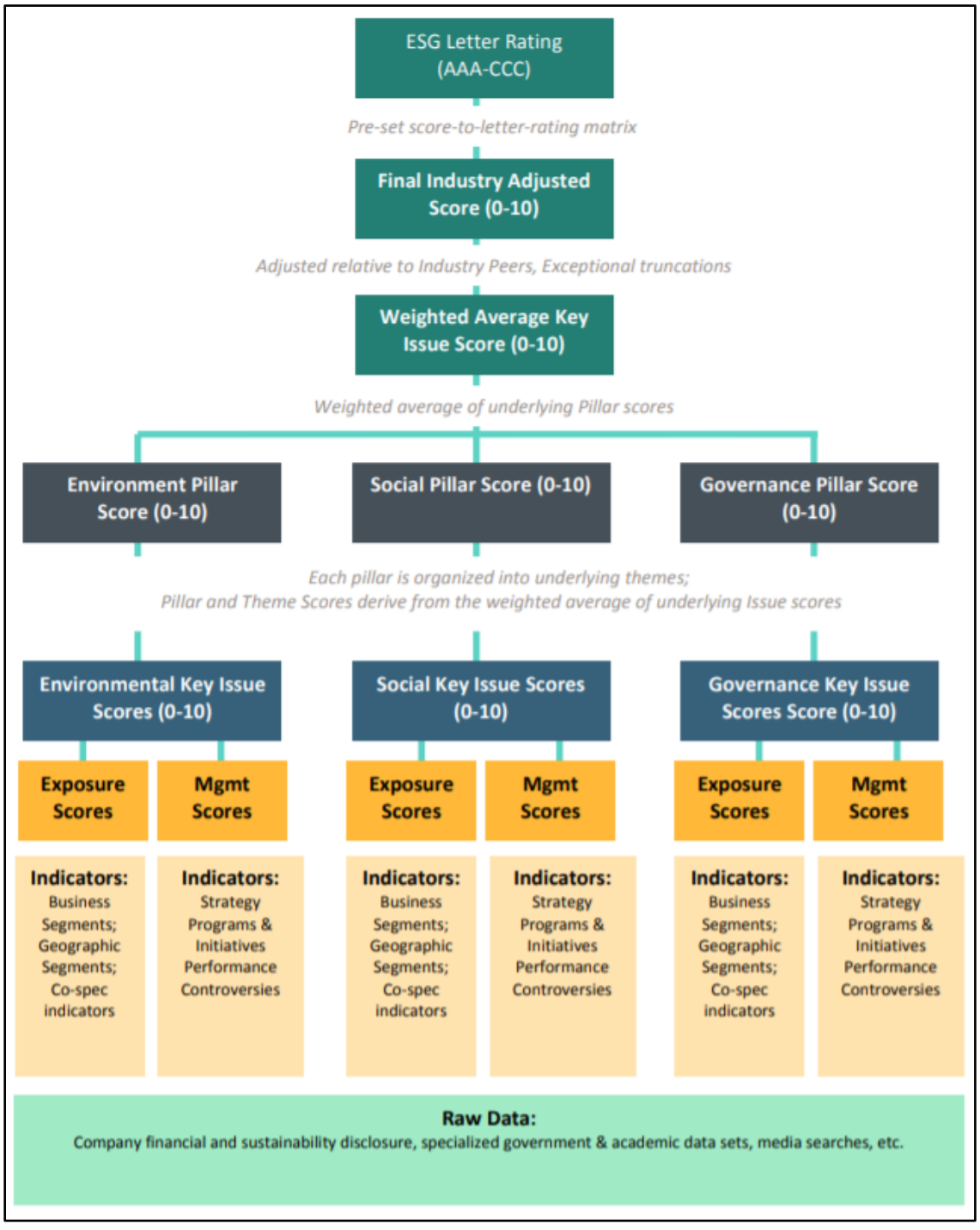

Table 1: MSCI ESG 37 Key Issues

3 Pillars	10 Themes	37 ESG Key Issues
Environmental	**Climate Change**	carbon emissions, product carbon footprint, financing environmental impact, climate change vulnerability
	Natural Resources	water stress, biodiversity and land use, raw material sourcing
	Pollution & Waste	toxic emissions and waste, packing material & waste, electronic waste
	Environmental Opportunities	clean tech, green building, renewable energy
Social	**Human Capital**	labor management, human capital development, health and safety
	Product Liability	product safety and quality, chemical safety, financial product safety, privacy and data security, responsible investment, health and demographic risk
	Stakeholder Opposition	controversial sourcing
	Social Opportunities	access to communications, access to finance, access to health care, opportunities to health and nutrition
Governance	**Corporate Governance**	board diversity, executive pay, ownership and control, accounting
	Corporate Behavior	business ethics, anti-competitive practices, tac transparency, corruption and instability, financial system instability

Table 2: Classical Assumptions

1	The dependent variable is linearly related to the coefficients, and the regression model is correctly specified and has and additive error term. A correctly specified model is one that includes all important variables and is of the correct functional form.
2	The expected value of the error term is equal to zero.
3	All independent variables are uncorrelated with the error term.
4	Observations of the error term are uncorrelated with each other.
5	The error term has a constant variance.
6	No independent variable is a perfect linear function of any other independent variables.
7	The error term is normally distributed.

Table 3: Descriptive Statistics

	RETURN	MARKET_CAP	MB_RATIO	BETA	MSCI_2019
Mean	0.19	40.71	1.95	0.99	4.14
Median	0.22	22.71	0.76	1.01	4.0
Maximum	0.83	316.23	64.54	2.57	7.0
Minimum	-0.50	4.76	-117.37	0.0	1.0
Standard Deviation	0.23	50.95	12.50	0.51	1.25
Observations	184	184	184	184	184

Table 4: Portion of Dataset

Ticker	Company	Return	Martket Cap	M/B Ratio	Beta	Envrio	Social	Gov	MSCI 2015	MSCI 2016	MSCI 2017	MSCI 2018	MSCI 2019	Average MSCI
A	Agilent Technologies	25.31%	27.1	1.76	1.43	96	91	74	7	7	7	7	7	7
AAP	Advance Auto Parts Inc	-9.73%	10.1	0.20	0.83	63	93	64	3	3	3	3	4	3.2
ABBV	Abbvie Inc	0.98%	129.3	-23.25	0.95	94	93	53	3	4	4	4	5	4
ABC	Amerisourcebergen Corp	14.53%	18.1	1.30	0.96	74	27	37	6	5	4	4	4	4.6
ABT	Abbott Laboratories	23.57%	149.9	8.33	1.11	73	79	66	2	3	2	3	4	2.8
ACN	Accenture Plc	41.25%	133.4	5.58	1.04	95	95	92	7	7	7	7	7	7
ADM	Archer Daniels Midland	1.34%	24.6	0.73	1.1	67	40	56	6	5	5	5	4	5
ADS	Alliance Data Systems	-32.98%	5.2	0.16	1.66	78	17	94	3	3	3	3	3	3
AEE	Ameren Corp	17.02%	19.0	0.58	0.2	32	52	49	4	4	4	4	4	4
AEM	Agnico-Eagle Mines Ltd	49.60%	13.9	0.69	0.52	89	80	83	6	6	6	6	6	6
AEP	American Electric Power Company	26.26%	46.7	1.17	0.08	52	75	82	4	5	5	5	5	4.8
AER	Aercap Holdings N.V.	36.30%	8.0	0.12	1.78	15	2	26	4	4	4	3	3	3.6
AES	The Aes Corp	31.55%	13.5	2.84	1.08	41	78	48	4	5	5	5	6	5
AFG	American Financial Group	17.30%	9.9	0.14	0.83	16	23	27	3	3	3	3	3	3
AFL	Aflac Incorporated	13.76%	38.4	0.96	0.7	41	56	25	4	3	3	2	3	3
AGN	Allergan Plc	31.12%	62.8	0.35	1.64	97	84	92	1	2	2	2	2	1.8
AIG	American International Group	25.62%	45.9	0.61	1.17	57	50	13	3	3	3	3	3	3
AIZ	Assurant Inc	43.18%	8.0	0.09	0.48	58	3	49	3	3	3	3	3	3
AJG	Arthur J. Gallagher & Company	29.52%	17.8	0.68	0.8	28	36	32	3	3	4	4	4	3.6
ALB	Albemarle Corp	-6.69%	8.1	0.22	1.68	21	61	60	3	3	3	3	3	3
ALL	Allstate Corp	35.80%	36.9	0.52	0.81	70	56	57	4	4	4	4	4	4
ALLE	Allegion Plc	50.16%	11.5	1.57	1.18	20	43	60	5	6	6	6	6	5.8
ALLY	Ally Financial	23.40%	11.5	0.30	1.25	17	37	42	4	4	4	4	5	4.2
ALV	Autoliv Inc	2.51%	7.0	0.31	1.39	53	72	83	4	4	4	3	3	3.6
AMP	Ameriprise Financial Services	49.12%	21.5	0.46	1.84	84	14	61	4	4	4	4	4	4
AMT	American Tower Corp	42.59%	104.4	8.83	0.42	42	38	61	5	5	6	5	5	5.2
ANET	Arista Networks Inc	-4.82%	16.2	0.47	1.48	46	35	15	5	5	4	4	4	4.4
ANTM	Anthem Inc	21.99%	75.3	0.61	0.77	89	50	87	3	3	3	2	3	2.8
AON	AON Plc	40.93%	48.4	3.25	0.84	53	13	59	3	3	3	3	3	3
AOS	Smith [A.O.] Corp	2.30%	7.8	0.77	1.46	13	0	20	4	4	3	3	4	3.6
APA	Apache Corp	4.59%	12.3	0.73	1.95	53	87	39	3	4	4	4	4	3.8
APD	Air Products and Chemicals	47.58%	51.9	1.04	0.88	68	85	88	4	5	4	4	4	4.2
APH	Amphenol Corp	32.39%	32.3	2.30	1.03	40	72	35	4	4	4	4	4	4
APTV	Aptiv Plc	27.45%	22.8	1.63	2.01	84	86	50	3	3	3	4	5	3.6
ARE	Alexandria Real Estate Equities	32.62%	20.7	0.30	0.71	68	9	81	4	4	4	4	5	4.2
ARMK	Aramark Holdings Corp	45.17%	11.3	0.84	0.86	68	51	26	4	4	4	4	4	4
ARW	Arrow Electronics	16.46%	6.9	0.12	1.36	38	47	70	3	3	3	3	4	3.2
ATO	Atmos Energy Corp	20.53%	13.7	0.29	0.15	5	24	35	3	3	3	3	3	3
AVB	Avalonbay Communities	17.11%	29.1	0.38	0.46	78	74	88	3	3	3	3	4	3.2
AVY	Avery Dennison Corp	37.27%	10.9	0.87	1.31	52	85	37	4	4	4	4	3	3.8
AWK	American Water Works	35.04%	22.4	0.65	0.06	47	72	74	4	4	4	4	4	4
AXP	American Express Company	29.53%	105.9	3.78	1.05	74	72	58	5	5	6	6	6	5.6
AXTA	Axalta Coating Systems Ltd	23.06%	7.3	1.33	1.45	88	72	82	5	5	6	6	6	5.6
AYI	Acuity Brands Inc	-0.66%	4.8	0.09	1.54	18	18	34	4	5	5	5	5	4.8
AZO	Autozone	36.85%	26.3	-0.35	0.62	30	44	67	2	2	2	2	2	2
D	Dominion Resources	14.14%	67.7	2.01	0.22	26	41	55	4	4	4	4	5	4.2
DD	Du Pont De.Nemours Inc	-4.37%	44.4	0.80	1.03	37	67	91	3	3	4	5	5	4
DE	Deere & Company	8.99%	54.7	1.50	1.14	74	49	30	6	5	5	5	5	5.2
DFS	Discover Financial Services	32.31%	26.1	0.74	1.61	56	86	71	2	3	3	3	3	2.8

Table 5: Correlation Matrix Test for Multicollinearity

	RETURN	**MARKET_CAP**	**MB_RATIO**	**BETA**	**MSCI_2019**
RETURN	1.0	0.21	0.11	-0.18	0.14
MARKET_CAP	0.21	1.0	0.40	-0.19	0.12
MB_RATIO	0.11	0.40	1.0	-0.007	0.01
BETA	-0.18	-0.19	-0.007	1.0	0.07
MSCI_2019	0.14	0.12	0.01	0.07	1.0

Table 6: White Test for Heteroskedasticity

Heteroskedasticity Test: White
Null hypothesis: Homoskedasticity

F-statistic	0.608627	Prob. F(14,169)	0.8555
Obs*R-squared	8.831775	Prob. Chi-Square(14)	0.8417
Scaled explained SS	7.226865	Prob. Chi-Square(14)	0.9256

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/27/20 Time: 12:54
Sample: 1 184
Included observations: 184

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.044074	0.108272	0.407070	0.6845
LOG(MARTKET_CAP)^2	-0.002177	0.005847	-0.372303	0.7101
LOG(MARTKET_CAP)*M_B_RATIO	-0.000931	0.000886	-1.049773	0.2953
LOG(MARTKET_CAP)*BETA	-0.013311	0.015633	-0.851478	0.3957
LOG(MARTKET_CAP)*MSCI_2019	0.003293	0.004629	0.711404	0.4778
LOG(MARTKET_CAP)	0.009065	0.048679	0.186218	0.8525
M_B_RATIO^2	1.14E-05	1.13E-05	1.005988	0.3159
M_B_RATIO*BETA	-0.001687	0.002152	-0.783906	0.4342
M_B_RATIO*MSCI_2019	-8.41E-05	0.000761	-0.110407	0.9122
M_B_RATIO	0.006597	0.006908	0.954946	0.3410
BETA^2	-0.000904	0.015536	-0.058216	0.9536
BETA*MSCI_2019	-0.002311	0.008559	-0.270043	0.7875
BETA	0.066448	0.067401	0.985856	0.3256
MSCI_2019^2	0.001345	0.002410	0.558324	0.5774
MSCI_2019	-0.021555	0.024168	-0.891874	0.3737

R-squared	0.047999	Mean dependent var	0.045592
Adjusted R-squared	-0.030865	S.D. dependent var	0.060118
S.E. of regression	0.061038	Akaike info criterion	-2.676623
Sum squared resid	0.629640	Schwarz criterion	-2.414536
Log likelihood	261.2493	Hannan-Quinn criter.	-2.570396
F-statistic	0.608627	Durbin-Watson stat	1.835801
Prob(F-statistic)	0.855515		

Table 7: 2019 ESG Regression

Dependent Variable: RETURN
Method: Least Squares
Date: 02/27/20 Time: 12:49
Sample: 1 184
Included observations: 184

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.050463	0.085412	-0.590825	0.5554
LOG(MARTKET_CAP)	0.066281	0.018699	3.544601	0.0005
M_B_RATIO	0.000746	0.001334	0.559270	0.5767
BETA	-0.053716	0.033130	-1.621350	0.1067
MSCI_2019	0.021336	0.013003	1.640836	0.1026

R-squared	0.133827	Mean dependent var	0.199307
Adjusted R-squared	0.114471	S.D. dependent var	0.230051
S.E. of regression	0.216484	Akaike info criterion	-0.195801
Sum squared resid	8.388907	Schwarz criterion	-0.108438
Log likelihood	23.01365	Hannan-Quinn criter.	-0.160392
F-statistic	6.914035	Durbin-Watson stat	1.988154
Prob(F-statistic)	0.000034		

Table 8: 2019 ESG Rating Results

Test Performed	Formula $\left\|\frac{\beta x - Ho}{SE}\right\| = T\ Statistic$	Decision Rule/Result $T_{Stat} > T_{Critical}$ = **Significant**
T-test on β_1 **log(MARKET_CAP)**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|3.54\|$ $T_{Critical}$ (0.5%, 184) = 2.6	$T_{Stat} < T_{Critical}$ = **Significant** I am 99.5% confident that when the market cap of a stock increases the stock return increases
T-test on β_2 **MB_RATIO**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|0.55\|$ $T_{Critical}$ (5%, 184) = 1.6	$T_{Stat} < T_{Critical}$ = **Insignificant** MB_RATIO is statistically insignificant on Stock Return at the 5% level
T-test on β_3 **BETA**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|-1.6\|$ $T_{Critical}$ (5%, 184) = 1.6	$T_{Stat} > T_{Critical}$ = **Significant** I am 95% confident that when the beta of a stock increases the stock return decreases
T-test on β_4 **2019 MSCI**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|-1.6\|$ $T_{Critical}$ (5%, 184) = 1.6	$T_{Stat} < T_{Critical}$ = **Significant** I am 95% confident that when the 2019 MSCI score increases the stock return increases

Table 9: Confidence Intervals for 2019 ESG Rating

Test Performed	Formula	Result
Confidence interval on $\boldsymbol{\beta 1}$ **log(MARKET_CAP)** coefficient	$CI\beta_1$ = .066 +/- Tcr(0.5%, 184)x SE(β1-hat) $CI\beta_1$ = .066 +/- (2.6 x .02)	99.5% confident if MARKET_CAP increases by $1 million, stock return will increase between 1.4% and 11%
Confidence interval on $\boldsymbol{\beta 3}$ **BETA** coefficient	$CI\beta_3$ = -0.054 +/- Tcr(5%, 184)x SE(β3-hat) $CI\beta_3$ = -0.054 +/- (1.6 x 0.03)	95% confident if BETA increases by .01, stock return will decrease between 10.2% and 49.2%
Confidence interval on $\beta 4$ **MSCI 2019** coefficient	$CI\beta_5$ = 0.02 +/- Tcr(5%, 184) x SE(β5-hat) $CI\beta_5$ = 0.02 +/- (1.6 x 0.01)	95% confident if MSCI 2019 increases by 1 letter rating, stock return will increase between 0.4% and 3.6%

- *Market-to-book not included in confidence interval tests because of its insignificance*

Table 10: Individual ESG Regression

Dependent Variable: RETURN
Method: Least Squares
Date: 02/27/20 Time: 12:51
Sample: 1 184
Included observations: 184

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.021685	0.083311	0.260285	0.7949
LOG(MARTKET_CAP)	0.085554	0.020504	4.172526	0.0000
M_B_RATIO	0.000648	0.001341	0.483086	0.6296
BETA	-0.036130	0.034091	-1.059830	0.2907
ENVRIO	-0.000386	0.000824	-0.468864	0.6397
SOCIAL	-0.000940	0.000749	-1.255476	0.2110
GOV	0.000163	0.000778	0.210076	0.8339

R-squared	0.135917	Mean dependent var	0.199307
Adjusted R-squared	0.106626	S.D. dependent var	0.230051
S.E. of regression	0.217441	Akaike info criterion	-0.176477
Sum squared resid	8.368666	Schwarz criterion	-0.054170
Log likelihood	23.23590	Hannan-Quinn criter.	-0.126904
F-statistic	4.640229	Durbin-Watson stat	2.006803
Prob(F-statistic)	0.000209		

Table 11: Individual ESG Regression Results

Test Performed	Formula $\left\|\frac{\beta x - Ho}{SE}\right\| = T\ Statistic$	Decision Rule/Result $T_{Stat} > T_{Critical}$ = **Significant**
T-test on β_1 log(**MARKET_CAP)**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|4.17\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} < T_{Critical}$ = **Significant** I am 99% confident that when the market cap of a stock increases the stock return increases
T-test on β_2 **MB_RATIO**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|0.48\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} < T_{Critical}$ = **Insignificant** MB_RATIO is statistically insignificant on Stock Return at the 5% level
T-test on β_3 **BETA**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|-1.05\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} > T_{Critical}$ = **Significant** I am 95% confident that when the beta of a stock increases the stock return decreases
T-test on β_4 **ENVIRO**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|-0.46\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} < T_{Critical}$ = **Insignificant** OVERALL is statistically insignificant on Stock Return at the 5% level
T-test on β_5 **SOCIAL**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|-1.25\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} < T_{Critical}$ = **Insignificant** OVERALL is statistically insignificant on Stock Return at the 5% level
T-test on β_6 **GOVERNMENT**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|0.21\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} < T_{Critical}$ = **Insignificant** OVERALL is statistically insignificant on Stock Return at the 5% level

Table 12: 2019 ESG Average Rating Results

Dependent Variable: RETURN
Method: Least Squares
Date: 02/27/20 Time: 12:50
Sample: 1 184
Included observations: 184

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.025929	0.083865	-0.309177	0.7575
LOG(MARTKET_CAP)	0.067791	0.018806	3.604718	0.0004
M_B_RATIO	0.000735	0.001340	0.548285	0.5842
BETA	-0.053253	0.033467	-1.591216	0.1133
AVERAGE_MSCI	0.014960	0.013216	1.131979	0.2592

R-squared	0.127048	Mean dependent var	0.199307
Adjusted R-squared	0.107540	S.D. dependent var	0.230051
S.E. of regression	0.217330	Akaike info criterion	-0.188005
Sum squared resid	8.454563	Schwarz criterion	-0.100642
Log likelihood	22.29642	Hannan-Quinn criter.	-0.152596
F-statistic	6.512827	Durbin-Watson stat	1.978443
Prob(F-statistic)	0.000065		

Table 13: Average ESG Rating Results

Test Performed	Formula $\left\|\frac{\beta x - Ho}{SE}\right\| = T\ Statistic$	Decision Rule/Result $T_{Stat} > T_{Critical}$ = **Significant**
T-test on β_1 log(**MARKET_CAP)**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|3.60\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} < T_{Critical}$ = **Significant** I am 99% confident that when the market cap of a stock increases the stock return increases
T-test on β_2 **MB_RATIO**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|0.54\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} < T_{Critical}$ = **Insignificant** MB_RATIO is statistically insignificant on Stock Return at the 5% level
T-test on β_3 **BETA**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|-1.59\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} > T_{Critical}$ = **Significant** I am 95% confident that when the beta of a stock increases the stock return decreases
T-test on β_4 **AVERAGE MSCI**	Ho: $\beta_1 \leq 0$ Ha: $\beta_1 > 0$ $T_{Stat} = \|1.13\|$ $T_{Critical}$ (5%, 184) = 1.64	$T_{Stat} < T_{Critical}$ = **Insignificant** OVERALL is statistically insignificant on Stock Return at the 5% level