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Master's thesis

Financial Economics

The Relative Valuation of ESG Leaders

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Abstract

This study focuses on how valuations of responsible companies develop over time. The rise of socially responsible investing is one of the biggest trends within investing of the last years. Using Thomson Reuters ESG scores and multiple valuation metrics, the impact of a high responsible investment rating on the valuation of a company is investigated. The sample consists of American companies over the time period 2005-2019. The results show that responsible investments have higher valuations on average when compared to other investments. This is likely due to a lower implied cost of equity rather than superior growth prospects. The valuations of these highly valued responsible investments also seem to mean revert to a lower degree. Finally, relative valuations of responsible investments have increased and their implied cost of equity has decreased over the investigated time period. This increase and decrease in the relative valuations and cost of equity of responsible investments might have contributed to their stock performance over the last years. As relative valuations and the cost of equity reach an equilibrium, future stock returns of ESG leaders could decrease.

Contents

1 Introduction

Over the past few years, the rise of socially responsible investing (SRI) has been one of the biggest trends in the investment management industry. SRI has become increasingly important, not only for institutional investors but also for individual investors. Whereas investment in a company has historically mostly been a financial decision, more and more individuals also invest based on non-financial reasons, such as contributing to society or environment.

These non-financial arguments have implications for stock prices. Some investors might want to invest in responsible stocks, even when the expected return is lower than the market return. Research shows that investors are often willing to reduce their returns somewhat in order to invest responsibly (Lewis & Mackenzie, 2000; NNIP, 2019). However, research on stock returns for responsible investment shows that these returns are neither higher nor lower compared to other investments (Revelli & Viviani, 2015). Even though stock returns have not been notably different for responsible companies, valuations are. Valuations of responsible investments are higher compared to other investments (Gregory & Whittaker, 2013; Gregory et al., 2014; Koh et al., 2015).

This study compares the valuations of responsible investments to those of other companies. As described above, responsible investments have achieved similar stock returns while having richer valuations. Highly valued stocks generally perform worse (Fama & French, 1993) compared to other stocks, largely the result of a mean reversion in valuation levels (Fama & French, 2007). This creates a gap in the current literature, it is not clear why responsible investments show similar returns while being valued higher.

Investors might behave different in response to highly valued responsible investments compared to non-responsible stocks with high valuations. If the high valuation of responsible investments is the result of a structural higher demand for these stocks rather than highly optimistic growth expectations, the mean-reversion of valuations might not take place in the same way. Responsible companies might have a more durable business model, leading to a long-term growth rate which stays high for an extensive period of time. Thus, to explain the performance of responsible investments, it is interesting to observe the development of valuations and how investors respond to responsible investments compared to conventional investments. The research

question is thus as follows:

Research question: How do valuations of socially responsible companies develop over time compared to valuations of conventional stock investments?

The results in this paper are important for investors. As the trend towards responsible investing is taking place, these responsible investors want to be aware of the expected returns in the future. To more accurately predict future returns for responsible companies, it is important to paint a clear picture on how and why the performance of responsible investments has been on par with other investments. By investigating the development of the valuations, this driver of stock returns becomes more clear.

The sample of this paper consists of American companies over the period 2005-2019. For this time period, environmental, social and governance (ESG) scores from Thomson Reuters are collected. Companies with a rating of A- or higher are classified as a responsible investment in this thesis. Using four valuation measures and a valuation composite, the impact of being a responsible investment on valuations is investigated. Other factors that impact valuations are controlled for. Furthermore, the implied cost of equity is calculated based on methods of Gebhardt et al. (2001). This implied cost of equity and the long-term growth rate are used to investigate how responsible investments and conventional investments differ in these two aspects which also impact valuations.

The paper is structured as follows. Section 2 gives an overview of the related literature on socially responsible investing and presents the hypotheses. The data and methodology used in the paper is described in section 3. Section 4 describes the results. Before concluding in section 6, the implications and limitations of the results are discussed in section 5.

2 Related Literature

This section portrays the current state of the literature on responsible investments and links this to their valuations. The section begins with an overview of responsible investing. Then, the investors' behavior towards responsible investments will be analyzed. This will be linked towards the performance and valuations of responsible investments. Finally, based on previous research and gaps in the current literature, hypotheses will be developed.

2.1 Overview responsible investing

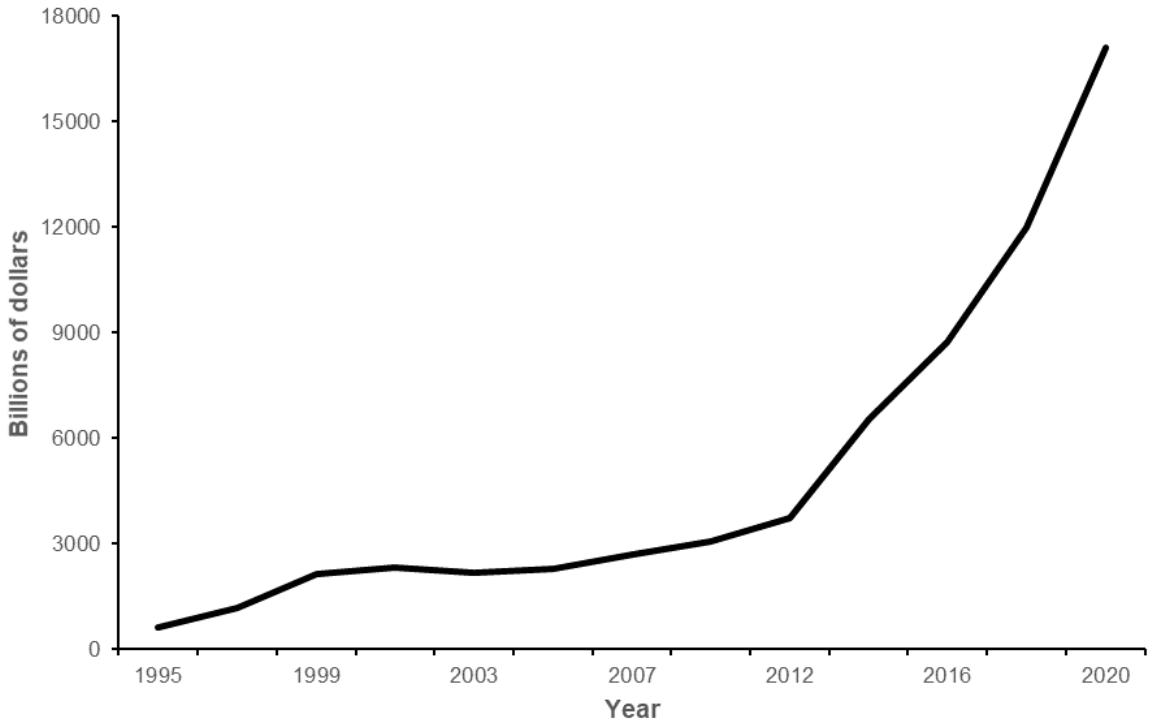
Socially responsible investing (SRI) is investing while not only considering financial returns, but also the impact on society. As individuals' perception of a good impact is different, SRI is at least somewhat subjective. However, in a survey of over 5000 individual investors, topics associated with responsible investing included environmental concerns, business policy and company products (Berry & Junkus, 2013). Positive screening entails investing in those companies making a positive contribution to society whereas negative screening punishes companies hurting society by excluding them from the investment universe. Positive screening of investments has been found to be more in line with individual investors' preferences than negative screening (Berry & Junkus, 2013).

Responsible investing has historically been the playground of religious investors (Schueth, 2003). The term 'sin stocks' presents certain industries in which some responsible investors do not invest such as alcohol, tobacco or gambling. However, the modern version of responsible investing began with political movements during the 1960s. Later, American investors pressured the South African government to abandon the apartheid. Corporate incidents such as the Exxon oil spill in the 1980s increased awareness of environmental problems. Since then, global warming and human right issues have been important focus points of responsible investing (Schueth, 2003).

As a result of this increasing trend to consider ESG issues while making investment decisions, the responsible investment market has grown sharply. A survey among investors in the last four years has shown a continuously increasing interest in responsible investing with alignment to values as a top reason (Nuveen, 2018). In this survey, 80% of respondents wanted their investments to have a positive impact on society in 2018 compared to 75% in 2015.

This trend has increased the amount of capital dedicated to responsible investing. The amount of money that is being managed using sustainable investment strategies has grown from $639 billion in 1995 to $17.1 trillion at the start of 2020 (USSIF, 2020). Over this time period, the total value of the US stock market has increased from $6.95 trillion in 1995 to $30.44 trillion in 2018 (World Bank, 2021). Thus, the percentage being managed using responsible investment strategies has grown from 9% in 1995 to 39% in 2018. These investors consider the risks associated with ESG factors. As more investors consider responsibility an important part of investing, its relevance in academic literature is growing. Figure 1 shows the increase of sustainable investing strategies over the years.

Figure 1. The total US-domiciled assets under management using sustainable investing strategies



Note: Data from The Forum for Sustainable and Responsible Investment (USSIF, 2020) is used.

2.2 Investors' behavior

The behavior of investors towards responsible investing is essential in understanding the dynamics at play in the performance and valuation of responsible companies. Do investors consider non-financial elements such as altruism in their investment decisions and if so, how does this affect their holdings?

The term altruism was first introduced by the French philosopher Auguste Comte. Altruism refers to being concerned about the well-being of others, without having any selfish intentions. The economics literature often sees people as individuals who are trying to maximize their own utility. However, evidence shows how altruism plays a role within economic decision making, and also within investing.

Sullivan & Miller (1996) surveyed informal investors in the United states. They found how informal investors have motives for investing that are not economic. One of those other motives was altruism. This includes the willingness to help family or friends, support a new business or support a product that is beneficial for society. Even though informal investments have different characteristics than stocks, investors can be willing to act altruistic with their money.

More recently, Brodback et al. (2019) investigated altruism in investment decisions by surveying German citizens. They found evidence linking altruistic behavior to responsible investing. Altruistic individuals were also less willing to invest responsibly if the returns of responsible investments were higher. Apparently, individuals have an intrinsic motivation to invest more in line with their values and do not always need extrinsic rewards such as high returns.

It is interesting to find out how investment professionals deal with responsible investing. Van Duuren et al. (2016) distributed a survey to international fund managers to investigate ESG integration in their investment process. Among the 126 respondents, 46% had reduced a position due to ESG problems in the last year while 57% had increased a position due to positive ESG performance. Furthermore, on average, the expected impact of ESG integration on long-term performance was positive. Thus, ESG integration in these funds might be the result of performance maximization rather than altruistic behavior. Van Duuren et al. (2016) note a problem of a survey: managers might want to give answers that they expect to be 'socially desirable'. Another problem of the survey is the response rate of 50%. This could potentially

lead to a selection bias where those managers who were already implementing ESG principles filled in the survey.

If investors are willing to incorporate altruistic behavior into their investment decisions, this can impact their expected economic return. Lewis & Mackenzie (2000) surveyed more than 1000 ethical investors in the UK. Among those, only 5.2% would shift their money away if the returns of the ethical investments were 2% lower compared to ordinary investments. More recently, a survey among 290 professional investors in Europe found that 52% of these professional investors believed that responsible investing would reduce their returns (NNIP, 2019). However, these investors were willing to reduce their returns by 2.4% in order to make responsible investments.

However, actions speak louder than words. Benson & Humphrey (2008) looked at mutual fund flows. They distinguished between responsible funds and conventional funds. While investment flows were positively related to returns for conventional funds, this was less true for responsible funds. This is another indication of the non-financial arguments in the decisions of investors.

2.3 Performance

If investors are willing to accept a somewhat lower return to invest responsibly, it is interesting to find out what the performance of these responsible investments is compared to conventional investments.

Many people have argued that responsible corporate behavior can hurt the performance of companies while other have argued it might benefit them. Within a theoretical framework, Husted & de Jesus Salazar (2006) looked at the optimal behavior of firms regarding social performance. Social output is assumed to lead to benefits (increased sales, higher prices or cheaper production) but also costs money. The marginal benefits decline as the social output increases. This leads to the constraint where it is not possible to maximize profits and social performance at the same time. Theoretically, not incorporating strategic benefits can lead to underinvestment in corporate social responsibility (CSR). At the same time, if a company starts acting according to corporate altruism rather than strategic, it will eventually hurt profits.

A lot of research has been done on the actual performance of responsible investments. The empirical evidence on this topic is mixed. First, over the period 1995-2003, more eco-efficient

firms generated higher stock returns than less eco-efficient firms (Derwall et al., 2005). This could not be explained by differences in other characteristics. On the other hand, Auer & Schuhmacher (2016) investigated the performance of responsible investments worldwide and found lower Sharpe ratios of portfolios consisting of responsible investments in Europe, while not improving it elsewhere.

Humphrey et al. (2012) investigated the performance and risk of UK firms that scored high and low on corporate social performance. There was no difference in performance between the two groups. Furthermore, the idiosyncratic risk was equal. Aggregated into socially responsible indices, the results found by Śliwiński & Łobza (2017) are similar. The performance of these responsible indices was not better than their counterparts, however, insufficient evidence was found to conclude that the performance is worse.

These different methods used over different time periods provide interesting results. However, these studies need to be taken together to form a meaningful conclusion. Revelli & Viviani (2015) performed a meta-analysis of studies on the performance of responsible investments versus other investments. This included studies on US and international markets. Out of 190 empirical studies, 87 reported a positive effect of SRI on performance and 103 reported a negative effect. However, the average effect size of the sample was positive. Thus, the effect size of a study with a positive contribution to performance was larger on average. To conclude, insufficient evidence exists to support either outperformance or underperformance of responsible investments. The divergence among findings is mostly the result of different methodologies and dimensions of responsible investments used in studies.

2.4 Valuations

The general theory behind the impact of responsible investing is that when a company is not acting responsible, investors can express their opinions by selling their shares. As the stock price declines, the required rate of return for these companies increases, making it more expensive to operate. Using the same logic, when a company is acting more responsible than the average company, investors can reward this behavior by allocating more capital towards this company. This increases the share price and decreases the cost of equity for this firm.

As mentioned before, no evidence for either outperformance or underperformance of respon-

sible investments has been found. Then, it seems as if investors are indifferent on the dimensions of responsible investments. However, Gregory & Whittaker (2013) argued that recent stock performance is a weak metric when investigating investors' behavior. Performance comparisons assume an efficient market and infrequently changed behavior of corporate social performance. Since the biggest market response to corporate social responsibility is expected to be related to changes in policy, it is hard to find the underlying effect of valuations on the stock returns of companies. Thus, it is more appropriate to look at valuations directly rather than through stock returns. Gregory & Whittaker (2013) found a higher Tobin's Q for responsible companies in the US compared to their counterparts (Gregory & Whittaker, 2013). Thus, based on these results, the market did seem to reward corporate social responsibility.

Gregory et al. (2014) extended this analysis and found that CSR strength had a positive effect on valuation while concerns had a negative effect on valuation. They also found this to be the result of higher expected long-term growth rates. Furthermore, a small negative effect of CSR on the cost of equity was presented. Koh et al. (2015) also investigated the impact of corporate social responsibility on the valuation of firms. They investigated the performance of both saints (members of the MSCI KLD 400 index) and sinners (sin-stocks) between 1990 and 2008. Saint stocks traded at a valuation premium of 19.2% compared to other stocks while sinners got a discount of 32.1%.

Marsat & Williams (2011) find different results. Their research was based on the period 2005-2009 and consisted of almost 3000 firms from 50 different countries. Here, a negative effect is found between CSR performance and the valuation of a firm. This was mostly the result of a negative valuation effect of environmental performance. "Shareholders therefore seem to consider that CSR costs, and more precisely environmental costs, exceed benefits from the firm's standpoint." (Marsat & Williams, 2011)

Historically, companies with higher valuations have underperformed companies with low valuations, demonstrated by the value factor (Fama & French, 1993). Fama & French (2007) found that a large part of this underperformance can be explained by a mean-reversion of price-to-book ratios: "Growth companies are hit with higher costs of equity capital (expected stock returns) as they move out of the highly profitable growth category, whereas value companies are rewarded with lower costs of equity capital as they restructure and become more profitable". Companies

with the 30% highest valuations were defined as growth companies whereas companies with the 30% lowest valuations were value companies.

Magnuson (2011) investigated the expectations of investors for glamour and value stocks. Their findings on the reaction of the stock market to earnings misses for these stocks were in line with Fama & French (2007). When glamour stocks miss earnings, their share price decreased in the period afterwards, as expected. However, when value stocks missed earnings, their share price increased regardless. In the period after reporting earnings, P/E ratios of value stocks increased while those of glamour stocks decreased. This asymmetrical response to new information is another indication of a mean-reversion in the valuations of stocks.

2.5 Hypothesis development

As some investors are willing to lower their required rate of return for responsible investments (Lewis & Mackenzie, 2000; NNIP, 2019), this could lead to an elevated demand for responsible investments. This elevated demand could increase the valuation of these companies.

Critics could argue that a higher relative valuation of responsible investments leads to arbitrage opportunities, where buying conventional companies and short-selling responsible companies becomes attractive. Therefore, this difference in pricing could be arbitraged away. However, for this to be a viable strategy, the divergence between valuations of responsible and irresponsible companies should not grow over time. Furthermore, shorting costs often amount to a large proportion of trading anomalies (Kim & Lee (2019)) while transaction costs and the relatively small expected profits of this strategy further decrease its attractiveness.

Conventional fund managers could also exclude responsible investments. This way, they will not buy these 'overpriced' type of stocks. However, this again exposes fund managers towards the risk of an increasing divergence of the valuations for responsible and conventional investments. If responsible investment become increasingly popular, this could lead to the underperformance of an aggregate benchmark. Besides, this could raise questions from investors as to why responsible investments are so underrepresented in the fund.

Besides the elevated demand for responsible investments, responsible companies might be better able to withstand changes in future legislation or shifts in consumer behavior. If so, their expected long-term growth rate is higher than those of conventional investments (Gregory et al.,

2014). Then, this should lead to a positive effect on their valuation as well.

Most of the empirical research has found valuations of responsible companies to be higher (Gregory & Whittaker, 2013; Gregory et al., 2014; Koh et al., 2015) although this was not consistent over all time periods (Marsat & Williams (2011)). I will investigate whether these high valuations of responsible investments hold for the latest time period, where a trend towards more responsible investing is taking place. Furthermore, a potential reason for the higher valuation is investigated through the implied cost of equity and growth rate of responsible investments. This leads to hypothesis 1 to 3.

Hypothesis 1: Stocks of responsible companies are valued higher compared to other stocks.

Hypothesis 2: Stocks of responsible companies have a lower cost of equity compared to other stocks.

Hypothesis 3: Stocks of responsible companies have a higher growth rate compared to other stocks.

Highly valued stocks generally underperform the stock market (Fama & French, 1993). However, at the same time the performance of responsible investments has been on par with those of conventional investments (Revelli & Viviani, 2015). If responsible investments are indeed valued higher than conventional investments, this creates a puzzle. Why are responsible investments not underperforming the broad stock market if their valuations are higher? We have to look at the reason for the general underperformance of highly valued stocks. This has been found to be mostly the result of a mean reversion of the valuation (Fama & French, 2007; Magnuson, 2011). A potential explanation is that responsible investments might not experience the same degree of mean reversion of conventional investments. If the valuations of responsible investments do indeed stay high for longer, this could explain the historical performance of responsible investments. Whether the persistence of high valuations in responsible investments is indeed stronger has not been researched yet. This leads to hypothesis 4.

Hypothesis 4: Stocks of responsible companies with high valuations continue to be valued

high for longer than other stocks with high valuations.

If there is a persistence in the highly valued responsible investments, it is interesting to find out why. As noted before, two possible explanations for higher valuations of responsible investments are a reduced cost of equity and superior long-term growth prospects (Gregory et al., 2014). Could a lower cost of equity or a higher growth rate for responsible investments persist for a prolonged period of time compared to conventional investments? Hypothesis 5 will test whether this might explain the persistence of high valuations for responsible investments.

Hypothesis 5a: The cost of equity of stocks with high valuations tends to increase (revert to the mean) at a lower rate for responsible companies.

Hypothesis 5b: The growth rate of stocks with high valuations tends to decrease (revert to the mean) at a lower rate for responsible companies.

As the impact of responsible investing has increased over the past years (USSIF, 2020; Nuveen, 2018), it is interesting to see whether this has had an impact on valuations. Hypothesis 6 investigates whether this impact of being a responsible company on valuations has increased over time and whether this has resulted in a decreasing return on equity or an increasing growth rate.

Hypothesis 6a: The relative valuation of stocks of responsible companies compared to other stocks has increased over time.

Hypothesis 6b: The relative cost of equity of responsible companies has decreased over time.

Hypothesis 6c: The relative growth rate of responsible companies has increased over time.

Hypothesis 6d: The persistence in high valuations of stocks of responsible companies has increased over time.

3 Data and Methods

This section includes information on the data collection and methods used to arrive at the results of this paper. First, the data used in this study is presented. Then, the alterations to this dataset will be described. Finally, the methods used to convert the dataset into results are discussed.

3.1 Data

The sample in this study consists of American companies over the time period 2005-2019 for which Thomson Reuters has published ESG scores. These ESG scores are available from Datastream. Compustat Capital IQ is used for fundamental values of companies while the Center for Research in Security Prices (CRSP) is used for data on daily stock returns and volume. Analyst forecasts on individual companies are retracted from the Institutional Brokers' Estimate System (IBES). The final sample is determined based on data availability for the required variables. The total firm-year observations are displayed in Table 1. The lack of analyst coverage for some firms has the biggest impact on reducing the firm-year observations. Missing stock price and volume data is mostly the result of an insufficient lookback period to calculate the illiquidity measure, as some companies only recently went public and historical data is needed.

Table 1

Summary of sample selection

Step in data collection process	Firm-year observations	Unique firms
Available from Thomson Reuters ESG	19132	3220
Cost of equity/earnings forecasts available	14795	2752
Stock price and volume data available	13383	2529
Fundamental variables available	11157	2131
Final observations	11157	2131

3.2 ESG Scores

To measure the corporate social responsibility of individual companies, ESG scores from Thomson Reuters are used. Thomson Reuters ESG scores are an enhancement and replacement of the ASSET4 ratings (Thomson Reuters Eikon, 2017). The environmental, social and governance pillars are divided into categories. These are displayed in Table 2.

Table 2

Thomson Reuters ESG categories

Pillar	Category
Environmental	Resource Use, Emissions, Innovation
Social	Workforce, Human Rights, Community, Product Responsibility
Governance	Management, Shareholders, CRS Strategy

Based on these categories, the 178 most relevant data points to measure ESG are selected. The category score of a company is based on the number of companies with a worse, equal or better category score within an industry group for Environmental and Social factors and within a country for Governance factors. Thus, scores are relative. The category weight for calculating the ESG score is based on the number of relevant data points within that category. Based on the category scores and the category weights, a final ESG score is calculated. These ESG scores are translated to ratings, ranging from D- to A+. For this research, a company is deemed to be an ESG leader or responsible investment when the ESG ratings is an A- or higher. This translates into an ESG score higher than 75.

At the formation moment at the end of June, the ESG score of the previous year is used to determine which companies are responsible investments, as this is the most recent data available to investors at that moment. Around 10% of the sample has an ESG score higher than 75. Other research often focuses on constituents of the MSCI KLD 400 Social Index (see Koh et al., 2015). This is an index of the 400 most responsible companies out of a universe of over 3000 stocks. However, the data for constituents of this index is not available anymore. The methods used in this paper create a similar proportion of responsible investments against conventional

investments. Thus, this research looks at the very best performers on ESG related issues.

3.3 Valuation measures

After collecting the relevant data, portfolios are constructed by sorting on value characteristics. Historically, the book-to-market ratio has been used to demonstrate value characteristics of a company (Fama & French, 1993). However, in the last years companies have accumulated more intangible assets which are not captured in their book values. Thus, it is not considerate to only use the book-to-market ratio as a measure of value. Therefore, Chan & Lakonishok (2004) is followed and a composite of the book-to-market ratio, cash-flow-to-price ratio, earnings-to-price ratio and sales-to-price ratio sorts the stocks in ten deciles ranging from glamour (high valuation) to value stocks (low valuation). To create this composite, the sum of the relative ranks of the four value measures for a company in a given year are compared to other companies. A company with a higher rank has a higher valuation for that measure. For each year, companies are assigned to a composite decile based on their relative valuation. If the sum of the valuation ranks for a company is among the 10% highest in a certain year, the company is considered a glamour/growth stock and placed in decile 10. Sorting stocks is done annually based on the latest trailing twelve month accounting data. The formation moment is end of June each year, in line with Fama & French (2007) as information has been made public at this moment.

Tobin's Q is used as an alternative measure of valuations. Tobin's Q gives a ratio for the market value of assets to the replacement value of those assets. The simplified formula of Marsat & Williams (2011) will be used:

$$Q = \frac{Market\ Value\ Stock\ + (Book\ Value\ Assets\ - Book\ Value\ Stock)}{Book\ Value\ Assets} \tag{1}$$

3.4 Implied cost of equity

To calculate the ex-ante cost of equity for companies, methods based on Gebhardt et al. (2001) are used. Gebhardt et al. (2001) forecast the future financials based on analyst predictions, the industry median return on equity, the dividend payout ratio and the book value of equity. Then, based on the current stock price, an implied discount rate is calculated. This is the discount rate that sets the implied price (based on forecasted financials) equal to the current stock price of a company.

Gebhardt et al. (2001) shows that with clean surplus accounting the price of a company is equal to the book value plus the economic profits of a company:

$$P_t = B_t + \sum_{i=1}^{\infty} \frac{E_t[(ROE_{t+i} - r_e)B_{t+i-1}]}{(1+r_e)^i} \tag{2}$$

B_t gives the reported book value in year t and ROE_t and r_e show the return on equity and the cost of equity in year t.

This translates into a price that is based on the current book value, an explicit forecast period and a terminal value beyond this forecast period. The terminal value is based on figures for the third year.

$$P_t = B_t + \frac{FROE_{t+1} - r_e}{(1+r_e)} B_t + \frac{FROE_{t+2} - r_e}{(1+r_e)^2} B_{t+1} + TV \tag{3}$$

For a horizon T, the terminal value is equal to the formula below. Earnings are forecasted for the first twelve years as in Gebhardt et al. (2001) and account for a mean reversion towards sector profitability.

$$TV = \sum_{i=3}^{T-1} \frac{FROE_{t+i} - r_e}{(1+r_e)^i} B_{t+i-1} + \frac{FROE_{t+T} - r_e}{r_e(1+r_e)^{T-1}} B_{t+T-1} \tag{4}$$

Gebhardt et al. (2001) is also followed for the inputs in this model. The dividend payout ratio is kept in the range of 0 to 1. Companies paying out more than 100% of their earnings are expected to reach a payout ratio of 1 in the future. For companies with negative earnings, the payout ratio is calculated by dividing the dividend by 6% of the total assets. The industry median return on equity will be calculated based on the industries of the Global Industry Classification Standard (GICS). Industry medians are based on data of the past 5 years and use firms with a positive return on equity, as these firms better reflect the long-term profitability within an industry. Also, more than 5 firm-year observations must be available. However, this can still lead to unrealistic outcomes. When the industry return on equity is based on a couple of extremely (un)profitable companies, it may give extreme results not reflecting the real long-term expectations for an industry. This is resolved by winsorizing the industry return on equity on the 2% and 98% level.

Gebhardt et al. (2001) uses analyst predictions for the first 2 years and forecasts the earnings of the third year with the long-term growth rate. As data availability for earnings forecasts 3 years from now has improved, those predictions are used directly. For the companies where those forecasts are missing, full year 3 earnings are predicted with the long-term growth rate. When both the third year forecasts and the long-term growth rate is missing, the growth rate between the second and first year is extrapolated as in Gebhardt et al. (2001).

Finally, some companies may experience a negative book value. As Luo et al. (2019) show, this is an increasingly common situation for companies. The book value of a company should never realistically be lower than zero, as shareholders have a limited liability. However, due to unrecorded intangible assets, a financially healthy company might have a negative book value Luo et al. (2019)). A negative or extremely low book value will produce unrealistic results in the model of Gebhardt et al. (2001). This is the result of an implied P/B ratio multiplied by the current book value of a company (see table 3 for an example). To resolve this problem, the

minimum book value of a company at the start of year 1 will be set to 10% of the current market value. Due to the limited liability and unrecorded intangible assets of those negative book value companies, the real book value is assumed to be better reflected by this figure. Finally, as the model can still produce some results that do not make economic sense, the implied cost of equity is winsorized at the 2% and 98% level.

An example for Microsoft is attached in Table 3 based on the example and calculations of Gebhardt et al. (2001). Starting in full year 4, the return on equity of Microsoft linearly mean reverses to the industry median of 17.6%. The abnormal earnings continue to grow until full year 11 as the book value increases each year since profits are only partly paid out as dividends. The implied cost of equity is calculated using the Nelder-Mead optimizer to find the discount rate that minimizes the difference between the implied stock price for the model and the actual stock price. The output of this optimizer was manually checked for 8 randomly selected companies. Using a solver function, the difference with the optimization results was at most 0.0024%.

Table 3

Microsoft

MSFT	Parameters	FY1	FY2	FY3									
as of	EPS Forecasts	2.68	3.09	3.38									
Jun 30, 2012	Book value shr.	8.17											
	Discount Rate	11.10%											
	Dividend Payout	0.259											
	Target ROE	0.176											
	Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	Forecasted EPS	2.68	3.09	3.38									
	Beg. year BV	8.17	10.16	12.45									
	Implied ROE		0.304	0.272									
ROE	Beg. ROE	0.328	0.304	0.272	0.261	0.250	0.240	0.229	0.218	0.208	0.197	0.186	0.176
Abnormal ROE	(ROE-r)	0.216	0.192	0.159	0.149	0.138	0.128	0.117	0.106	0.096	0.085	0.074	0.064
Growth rate B	(1-k)*(ROEt-1)	0.000	0.243	0.225	0.201	0.193	0.185	0.178	0.170	0.162	0.154	0.146	0.138
Comp. growth		1	1.243	1.523	1.829	2.183	2.588	3.047	3.564	4.140	4.778	5.475	6.231
Growth*AROE		0.216	0.239	0.243	0.272	0.302	0.330	0.356	0.379	0.396	0.406	0.407	0.397
Discount rate		1.112	1.237	1.375	1.529	1.700	1.891	2.103	2.338	2.600	2.892	3.216	3.576
Add to P/B	PV (gr.*AROE)	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.16	0.15	0.14	0.13	0.11
Cum P/B		1.19	1.39	1.56	1.74	1.92	2.09	2.26	2.43	2.58	2.72	2.84	2.96
Add perpetuity		1.73	1.72	1.58	1.59	1.58	1.56	1.51	1.45	1.36	1.25	1.13	0.99
Total P/B	P/B if stop est.	2.93	3.11	3.14	3.33	3.50	3.65	3.78	3.87	3.94	3.97	3.97	3.95
Implied price													32.26

Note. This table provides an example of the implicit discount rate calculation for Microsoft (MSFT) as of June 30th, 2012. Key parameters of the model are the analysts' mean EPS forecasts for the next three years ($2.68, $3.09 and $3.38), the dividend payout ratio (25.9%), and the target ROE for the industry (17.6%). To compute the implied discount rate, this parameter is adjusted until the implied price equals the current market price ($32.26). This process yields a current cost of equity for MSFT of 11.10%. For this cost of equity, the current book value multiplied by the implied P/B ratio in 2023 is equal to the current stock price.

3.5 Variables

This paper will control for variables shown to affect firm valuations: industry (Cockburn & Griliches, 1987), size, profitability and R&D costs (C. Chen & Steiner, 2000), liquidity (Fang et al., 2009), S&P 500 membership (H. Chen et al., 2004) and the year of the valuation.

Industry effects are controlled for by using the eleven sectors of the Global Industry Classification Standard (GICS). The GICS is used both in academic papers and in the investment industry. To control for the effect of size on valuation, the log of the book value of total assets will be used. This is in line with C. Chen & Steiner (2000). No control variable is included which is based on the market value of a company. Marsat & Williams (2011) do include the log market value of a company as a control variable for valuation. However, this ultimately leads to the problem of simultaneity. The market value of a company can have an impact on the valuation. However, the valuation level also has a direct impact on the market value of a company. This endogeneity problem can lead to biased coefficients.

Profitability and R&D costs are controlled for by dividing the profit and R&D costs by the total assets of a firm as in C. Chen & Steiner (2000). The resulting return on assets as a profitability measure is winsorized at the 2 and 98% level to minimize the impact of outliers due to low asset values. Finally, the illiquidity measure is calculated using the measure of Amihud (2002):

$$Illiquidity_{iy} = 1/D_{iy} \sum_{t=1}^{Diy} |R_{iyd}|/VOLD_{iyd} \tag{5}$$

R_{iyd} stands for the absolute return on stock i on day d of year y. $VOLD_{iyd}$ is the trading volume in dollars of stock i on day d of year y. This equation thus looks at the absolute percentage price change per dollar of trading volume. An average of this daily price change is used based on the past twelve months.

Table 4 shows the descriptive statistics for the sample. First, the ESG score is 48.88 on average, close to 50 as scores are relative. 9.1% of companies are a responsible investment, according to the definition of this research in Section 3.2, with an ESG rating of A- or higher.

The (winsorized) implied cost of equity ranges from just 2% to more than 23%, a wide range of ex-ante returns for investors. The long-term growth rate prediction of companies also varies widely, 38.1% of the sample is an S&P 500 constituent and R&D expenses make up an average of 3.4% of assets. For some firm-year observations, the long-term growth rates are missing as these forecasts are not issued. Since the long-term growth rate is only used for some results, these observations are kept in the sample.

Table 4

Descriptive statistics

Variable	N	Mean	Median	Min	Max	St dev.
ESG Score	11157	48.884	45.86	7.320	97.660	17.266
Responsible investment	11157	0.091	0.000	0.000	1.000	0.287
Book to market ratio	11157	0.463	0.355	-25.726	45.576	0.708
Earnings to price ratio	11157	0.025	0.044	-11.192	29.469	0.366
Sales to price ratio	11157	1.048	0.585	-3.645	89.321	2.079
Cash flow to price ratio	11157	0.076	0.071	-6.991	29.818	0.362
Tobin's Q	11157	2.313	1.726	0.308	35.501	1.885
Implied cost of Equity	11157	0.094	0.089	0.020	0.234	0.041
Long term growth rate	8882	0.136	0.12	-1.823	3.071	0.144
Return on Assets	11157	0.041	0.048	-0.343	0.218	0.096
S&P 500 membership	11157	0.381	0.000	0.000	1.000	0.486
Size	11157	8.385	8.291	3.627	14.488	1.553
R&D expenses	11157	0.034	0.000	0.000	1.689	0.077
Illiquidity measure	11157	1.55e-09	3.30e-10	2.89e-12	5.10e-07	7.35e-09

Note. Table 4 reports the descriptive statistics of the main variables. The sample period is 2005 to 2019. Responsible investments are companies with an ESG score of at least 75 in the previous year. The implied cost of equity and return on assets are winsorized at the 2 and 98% level. The long-term growth rates are based on analyst predictions. S&P 500 membership is a dummy variable indicating membership in a firm-year. Size is calculated using the logarithm of the value of a company's assets. R&D expenses are R&D costs divided by the total assets of a firm. Illiquidity is calculated using the measure of Amihud (2002).

Table 5 shows the firm observations per year and industry. As can be seen in the table, ESG coverage has increased over the years, resulting in a constantly growing amount of observations over the years. Data availability and analyst coverage is also better in recent years.

For industries, the largest representation in the sample is in the Industrials, Consumer Discretionary and Information Technology industries. Those three sectors make up almost 50% of the sample.

Table 5

Observations per year and industry

Year	Firm observations	Percent	Industry	Firm-years	Percent
2005	172	1.54	Energy	851	7.63
2006	260	2.33	Materials	718	6.44
2007	274	2.46	Industrials	1828	16.38
2008	315	2.82	Consumer Discretionary	1795	16.09
2009	452	4.05	Consumer Staples	628	5.63
2010	539	4.83	Health Care	1505	13.49
2011	642	5.75	Financials	938	8.41
2012	654	5.86	Information Technology	1848	16.56
2013	658	5.90	Communication Services	476	4.27
2014	659	5.91	Utilities	385	3.45
2015	662	5.93	Real Estate	185	1.66
2016	1100	9.86			
2017	1534	13.75			
2018	1654	14.82			
2019	1582	14.18			
Total	**11157**	**100.00**	**Total**	**11157**	**100.00**

Note. Table 5 shows the observations per year and industry. Year observations show the year at the formation moment (end of June). However, data is collected over the previous year as data over a full year is not available in June.

3.6 Regressions

The regressions necessary to test the hypotheses are described below. RI is a dummy variable that stands for Responsible Investments (as described before).

To test hypothesis 1, the following model will be estimated:

$$Valuation = \alpha + \beta_1 * RI + \beta_2 * control\ variables \tag{6}$$

The expected β_1 is positive, responsible investments are expected to be valued higher than other investments.

To test hypothesis 2, the following model will be estimated:

$$Cost\ of\ Equity = \alpha + \beta_1 * RI + \beta_2 * control\ variables \tag{7}$$

The expected β_1 is negative, investors are expected to demand a lower rate of return for the most responsible investments.

To test hypothesis 3, the following model will be estimated:

$$Growth\ rate = \alpha + \beta_1 * RI + \beta_2 * control\ variables \tag{8}$$

The expected β_1 is positive, responsible investments are expected to have better growth prospects.

To test hypothesis 4, the following model will be estimated:

$$\begin{aligned} \Delta\ Valuation\ highly\ valued\ stocks = \alpha + \beta_1 * RI + \beta_2 * beginning\ valuation \\ + \beta_3 * control\ variables \end{aligned} \tag{9}$$

The dependent variable illustrates the change up or down in the valuation measures and the deciles of relative valuation. This change in valuation is measured compared to the previous year. This regression only includes stocks in the 3 highest valuation deciles in the previous year,

to measure the effect on highly valued stocks. These highly valued stocks are generally expected to mean revert and get a lower valuation. However, the expected β_1 is positive, responsible investments are expected to mean revert to a lower degree.

To test hypothesis 5a and 5b, the following models will be estimated:

$$\begin{aligned} \Delta\ Cost\ of\ Equity\ = \alpha\ +\ \beta_1\ *\ RI\ +\ \beta_2\ *\ beginning\ cost\ of\ equity \\ +\ \beta_3\ *\ control\ variables \end{aligned} \tag{10}$$

$$\begin{aligned} \Delta\ Long\ term\ growth\ rate\ = \alpha\ +\ \beta_1\ *\ RI\ +\ \beta_2\ *\ beginning\ growth \\ rate\ + \beta_3\ *\ control\ variables \end{aligned} \tag{11}$$

This regression again only includes stocks in the 3 highest valuation deciles in the previous year to measure the change in cost of equity and long-term growth rates of stocks with a high valuation.

First, the expected α is positive for the change in the cost of equity, growth stocks are expected to get a higher cost of equity over time (Fama & French, 2007). However, β_1 is expected to be negative. The lower cost of equity for responsible companies is expected to be partly the result of a lower return being demanded due to the elevated demand for this stock by investors. This effect on the cost of equity is expected to be more stable over time. Thus, the increase in the cost of equity is expected to be lower for highly valued responsible companies.

Second, the expected α is negative for the change in the long-term growth rate, growth stocks are expected to eventually move out of their fast growth stage (Fama & French, 2007). However, β_1 is expected to be positive. The long-term growth prospects of responsible companies are expected to be more durable than the long-term growth prospects of other companies. Therefore, the change in the long-term growth rate is expected to be less negative for responsible companies.

To test hypothesis 6a, 6b, 6c and 6d, the year effect is introduced with an interaction effect to the previous regressions:

$$\begin{aligned} Valuation\ highly\ valued\ stocks\ &= \alpha\ +\ \beta_1\ *\ RI\ +\ \beta_2\ *\ RI\ *\ year \\ &+\ \beta_3\ *\ year\ +\ \beta_4\ *\ control\ variables \end{aligned} \tag{12}$$

$$\begin{aligned} Cost\ of\ Equity\ &= \alpha\ +\ \beta_1\ *\ RI\ +\ \beta_2\ *\ RI\ *\ year \\ &+\ \beta_3\ *\ year\ +\ \beta_4\ *\ control\ variables \end{aligned} \tag{13}$$

$$\begin{aligned} Long\ term\ growth\ rate\ &= \alpha\ +\ \beta_1\ *\ RI\ +\ \beta_2\ *\ RI\ *\ year \\ &+\ \beta_3\ *\ year\ +\ \beta_4\ *\ control\ variables \end{aligned} \tag{14}$$

$$\begin{aligned} \Delta\ Valuation\ highly\ valued\ stocks\ &= \alpha\ +\ \beta_1\ *\ RI\ +\ \beta_2\ *\ RI\ *\ year\ +\ \beta_3\ * \\ &year\ +\ \beta_4\ *\ beginning\ valuation\ + \\ &\beta_5\ *\ control\ variables \end{aligned} \tag{15}$$

In these regressions, β_2 is expected to be positive for hypothesis 6a and 6d: the effect of responsible investments on the valuation and change in valuation are expected to have become larger in the last years. The β_2 is also expected to be positive for hypothesis 6c: being a responsible investment has become increasingly important for a company's growth rate. However, the β_2 is expected to be negative for hypothesis 6b: over time, responsible investments are expected to have increasingly seen their relative cost of equity decline.

For all mentioned regressions, a pooled OLS estimation is used with clustered standard errors by firms and years as in Gregory & Whittaker (2013). This is done by following the code for the cmgreg regression in Stata by Cameron (2020). Clustering the standard errors by firms and years accounts for potential correlation within firms and years.

4 Results

4.1 Valuation levels

Hypothesis 1 states that stocks of the most responsible companies are expected to be valued higher compared to other stocks. To investigate this, multiple value measures are used, as described before. The following four measures are used and aggregated into a composite: the earnings/price ratio, cash flow/price ratio, sales/price ratio and book/market ratio. A lower value for these measures is an indication of a higher valuation as each dollar invested yields a lower earnings/cash-flow/sales yield or book value. Also, Tobin's Q is used as an additional value measure.

Table 6 presents the results for the four main value measures and a composite of these measures. The coefficient for the dummy variable of a responsible investment is negative and statistically significant for 3 out of 4 value measures. The coefficient for the sales/price measure is negative but statistically insignificant. A responsible investment has earnings, cash flow and sales yields which are on average respectively 2.6, 3.9 and 9.2 percentage points lower compared to a non-responsible investment, ceteris paribus. Also, a responsible investment has a lower book value compared to a non-responsible investment, the book value is on average 12.5 percentage points of the market value lower compared to non-responsible investments, ceteris paribus. A difference of a couple percentage points in earnings or cash flow yield is considered substantial in the financial markets. Thus, these results are not only statistically, but also economically significant.

The four measures are aggregated into a valuation composite, which places each company in a valuation decile for a given year. This is based on the sum of the relative ranks of these four measures in a certain year. A company in a higher decile is valued higher in that year. As can be seen in model 5, responsible investments are on average placed in a higher valuation decile. Compared to non-responsible investments, the difference is half a decile.

The valuation composite shows that companies with a higher return on assets are on average valued lower. However, this can be explained as companies with a positive (negative) return on assets automatically have positive (negative) earnings and cash flow. Including a control variable for companies with negative earnings does change the coefficient for the return on assets, but

not the coefficient or significance of the responsible investment dummy variable. Further, larger companies are valued lower although companies within the S&P 500 are valued higher. R&D costs are recognized by the market and lead to a higher valuation, on average. Finally, stocks with lower liquidity (or higher illiquidity) are valued lower by the market. The results for these control variables are in line with earlier literature on valuations.

Also, as an additional measure of valuation, Tobin's Q is used. Responsible investments have a higher Tobin's Q ratio which is another indication that responsible investments are on average valued higher than non-responsible investments. The high valuation of responsible investments is robust over multiple measures. Thus, the results in Table 6 support hypothesis 1. For the value measures and ESG scores used, the most responsible investments get a higher valuation compared to the rest of the market. This is in line with earlier research (Gregory & Whittaker, 2013; Gregory et al., 2014; Koh et al., 2015).

Table 6

Impact of corporate social responsibility on valuation measures

	(1) Earnings/P	(2) Cash Flow/P	(3) Sales/P	(4) Book/Market	(5) Composite	(6) Tobin's Q
Responsible Investment	-0.026***	-0.039***	-0.092	-0.125***	0.498***	0.449***
	(0.010)	(0.010)	(0.091)	(0.029)	(0.191)	(0.093)
Return on Assets	1.218***	1.014***	-3.403***	-1.106***	-4.222***	3.979***
	(0.194)	(0.204)	(0.569)	(0.194)	(0.893)	(0.428)
S&P 500 member	-0.034	-0.076***	-0.729***	-0.255***	1.587***	0.825***
	(0.077)	(0.017)	(0.130)	(0.039)	(0.193)	(0.157)
Size	0.018**	0.035***	0.268***	0.111***	-0.853***	-0.543***
	(0.009)	(0.010)	(0.039)	(0.012)	(0.073)	(0.059)
R&D costs	0.456***	0.286***	-4.262***	-0.951***	5.183***	9.495***
	(0.109)	(0.097)	(0.798)	(0.185)	(1.183)	(0.792)
Illiquidity	3.22e+06	4.76e+06	1.61e+07***	5.36e+06**	-2.86e+07**	-1.86e+07***
	(4.33e+06)	(4.46e+06)	(5.47e+06)	(2.67e+06)	(1.24e+07)	(6.38e+06)
Industry control	Yes	Yes	Yes	Yes	Yes	Yes
Year control	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.195**	-0.207**	-0.863***	-0.165	12.11***	5.966***
	(0.088)	(0.085)	(0.285)	(0.119)	(0.768)	(0.321)
Observations	11,157	11,157	11,157	11,157	11,157	11,157
R-squared	0.082	0.076	0.097	0.109	0.304	0.373

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year.

4.2 Cost of equity and growth

Hypothesis 2 states that responsible companies have a lower cost of equity compared to other companies. Table 7 shows the implied cost of equity for responsible companies. As can be seen in the table, investors in responsible companies demand a lower rate of return, on average. The difference is 0.72%, which is economically and statistically significant. This supports hypothesis 2: responsible companies have a lower cost of equity. These results are in line with those of Gregory et al. (2014) and expected as investors are willing to lower their returns to invest responsibly (Lewis & Mackenzie, 2000; NNIP, 2019).

The other potential explanation for higher valuations is better growth prospects. Hypothesis 3 states that responsible companies have better growth prospects. However, as shown in Table 7, the long-term growth rate of responsible investments is not higher compared to other companies, the long-term growth rates of responsible investments is even lower by 1.00% and this is statistically significant. Thus, the evidence does not support hypothesis 3. This contradicts the results of Gregory et al. (2014) who find that responsible companies have higher long-term growth rates.

The evidence for hypothesis 2 and 3 is based on analyst estimates. An alternative explanation for the results in Table 7 is that analysts do not value the characteristics of responsible companies sufficiently, leading to earnings and growth forecasts which are consistently too low. To rule out this alternative explanation, it is important to investigate whether forecast biases present themselves. Using optimism measures, biases in earnings estimates are calculated. The higher the bias, the larger the overoptimism of analysts. A negative bias shows underestimated earnings. The optimism measure is based on Dreman & Berry (1995):

$$Optimism\ measure\ 1 = \frac{Forecast\ EPS - Actual\ EPS}{|Actual\ EPS|} \tag{16}$$

As research has shown that both analyst following and company size are inversely related to optimism bias (Lim, 2001), these are included as control variables. Size is the logarithm of

Table 7

Impact of corporate social responsibility on the implied cost of equity and long-term growth rates

	(1)	(2)
	Implied cost of equity	Long-term growth rate
Responsible Investment	-0.718***	-1.003**
	(0.215)	(0.454)
Return on Assets	1.038	-8.515**
	(1.487)	(4.266)
S&P 500 member	-1.937***	-0.459
	(0.261)	(0.617)
Size	0.860***	-0.902***
	(0.082)	(0.202)
R&D costs	3.543**	20.99***
	(1.780)	(6.855)
Illiquidity	3.79e+07***	-4.82e+07
	(6.32e+06)	(3.36e+07)
Constant	3.433***	27.680***
	(0.815)	(3.114)
Industry control	Yes	Yes
Year control	Yes	Yes
Observations	11,157	8,882
R-squared	0.188	0.062

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year. The implied cost of equity and long-term growth rate are scaled to be expressed in percentage points.

the value of a company's assets whereas analyst following is the number of analysts that made an earnings forecast for a forecast period. If analysts would be less optimistic for responsible investments, the responsible investment variable should be negative among the three forecast periods.

Table 8 shows the results for optimism measure 1. As can be seen, the impact of being a responsible investment on the optimism bias is not significant and changes signs over the different forecast periods. Using two different optimism measures, similar insignificant results are found (see Appendix A). Optimism measures are not winsorized. However, winsorizing the optimism measures at the 1% level does not change the results either. Thus, analysts are not overly pessimistic for responsible investments. The alternative explanation of biased estimates cannot be supported by the data.

Table 8

Impact of corporate social responsibility on optimism measure 1

	(1)	(2)	(3)
	Full Year 1	Full Year 2	Full Year 3
Responsible Investment	0.031	-0.207	0.063
	(0.081)	(0.225)	(0.077)
Size	0.039	-0.014	-0.140
	(0.025)	(0.047)	(0.107)
Analyst following	-0.018***	-0.011	-0.004
	(0.005)	(0.014)	(0.020)
Constant	0.069	3.033***	1.453*
	(0.250)	(0.792)	(0.797)
Industry control	Yes	Yes	Yes
Year control	Yes	Yes	Yes
Observations	10,877	9,032	6,792
R-squared	0.008	0.021	0.005

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year.

4.3 Changes in valuation

Hypothesis 4 states that stocks of the most responsible companies with high valuations continue to be valued high for longer than other stocks with high valuations. Thus, the annual changes in the valuation measures for companies are analyzed. The change is the valuation for a measure next year minus the valuation in the current year. This is done for companies with the highest valuation, which is determined based on the valuation decile of a company in that year. A stock with a high valuation is a company in the top 3 deciles (top 30%) for the composite measure. Whether a company is a responsible investment is determined based on the ESG score for the previous year.

Table 9 shows the results for the change in the value measures for the top 3 deciles of the valuation composite. As can be seen, results are mixed for the four valuation measures. The coefficient for sales/price is negative and significant. However, no significant change is seen in the valuation composite. The change in Tobin's Q is both statistically and economically significant. Being a responsible company increases the annual change of the Tobin's Q ratio of a stock by 0.407 compared to non-responsible companies.

Furthermore, larger firms become less expensive on average in the next year. However, being a S&P 500 member increases the valuation in the next year. This might be the result of an increased allocation towards passive funds during the investigated time period. Passive funds often track popular indices such as the S&P 500. Also, companies that spend more on Research & Development become more expensive in the next year.

To conclude, table 9 shows that for the sales/price ratio and Tobin's Q, the valuations of highly valued responsible investments mean revert to a lower degree compared to the valuations of highly valued non-responsible investments, ceteris paribus. However, other measures do not show similar statistical strength.

Table 9

Impact of corporate social responsibility on annual valuation change of highly valued stocks

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔE/P	ΔCF/P	ΔS/P	ΔB/M	ΔComposite	ΔTobin's Q
Responsible Inv.	0.010	0.005	-0.070***	-0.007	-0.124	0.407***
	(0.007)	(0.005)	(0.019)	(0.011)	(0.115)	(0.150)
Return on Assets	0.195**	0.171**	0.062	0.016	1.774**	1.237**
	(0.093)	(0.073)	(0.213)	(0.057)	(0.770)	(0.504)
S&P 500 member	0.001	-0.010	-0.008	-0.009	0.226***	0.176**
	(0.019)	(0.011)	(0.287)	(0.012)	(0.077)	(0.074)
Size	-0.001	0.005	0.020	-0.004	-0.111***	-0.176***
	(0.027)	(0.007)	(0.036)	(0.016)	(0.042)	(0.053)
R&D costs	-0.024	-0.066*	0.018	-0.020	1.589***	0.904***
	(0.069)	(0.035)	(0.137)	(0.034)	(0.549)	(0.247)
Illiquidity	-6.07e+06	-4.47e+06	1.40e+07	-1.74e+06	1.22e+07	-7.88e+06
	(4.29e+06)	(3.13e+06)	(1.64e+07)	(2.40e+06)	(9.29e+06)	(1.43e+07)
Start Valuation	-0.886***	-0.954***	0.349***	-0.100	-0.025	-0.382*
	(0.149)	(0.094)	(0.120)	(0.068)	(0.058)	(0.201)
Industry control	Yes	Yes	Yes	Yes	Yes	Yes
Year control	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.054	0.059*	-0.234	0.124***	-0.708	2.175***
	(0.033)	(0.030)	(0.143)	(0.043)	(0.769)	(0.495)
Observations	2,688	2,688	2,688	2,688	2,688	2,688
R-squared	0.575	0.588	0.233	0.094	0.120	0.234

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year. Only stocks in the top three valuation deciles are included.

4.4 Changes in growth rate and cost of equity

Hypothesis 5a and 5b test whether the relative persistence of high valuations for responsible companies is the result of a cost of equity that increases at a lower rate or a growth rate that decreases at a lower rate.

Table 10 shows the results for the change in the cost of equity and the long-term growth rate. Again, this is measured for the stocks with the highest valuations (top 3 deciles). Investors lower their required cost of equity for responsible investments in the next year, as the coefficient is negative and statistically significant (one-sided p-value is less than 5%). This amounts to a cost of equity that decreases by 0.32%. On the other hand, the hypothesis of more durable long-term growth seems to be debunked. The coefficient for the annual change in the long-term growth rate of responsible investments is negative. Being a responsible company does not increase the durability of growth prospects. The year after formation, the long-term growth rate of responsible companies decreases with 1.74% more compared to other investments. This coefficient is economically and statistically significant. To conclude, the potential change in valuations for responsible investments is more likely the result of a declining cost of equity than a more sustainable growth rate for responsible investments. The relatively fast declining growth rate of responsible investments might even have a negative effect on valuations, which is then cancelled out by the declining cost of equity.

Table 10

Impact of corporate social responsibility on the annual change in the cost of equity and long-term growth rate of highly valued stocks

	(1)	(2)
	Δ Cost of Equity	Δ Long-term growth
Responsible Investment	-0.316*	-1.740**
	(0.171)	(0.717)
Return on Assets	0.705	-10.85**
	(0.555)	(4.988)
S&P 500 member	-0.099	0.279
	(0.134)	(0.793)
Size	0.125**	-0.321
	(0.055)	(0.254)
R&D costs	3.706***	7.302***
	(1.133)	(2.370)
Illiquidity	-5.22e+07	1.80e+08
	(3.90e+07)	(2.31e+08)
Cost of Equity	-0.244***	
	(0.008)	
Long-term growth		-0.594
		(2.020)
Constant	1.654***	19.25***
	(0.496)	(3.356)
Industry control	Yes	Yes
Year control	Yes	Yes
Observations	2,688	2,057
R-squared	0.198	0.322

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year. Only stocks in the top three valuation deciles are included.

4.5 Impact over time

Hypothesis 6 states that the impact of being a responsible company on valuations has increased over time. To investigate this, an interaction term between the year in the sample (value for 2005 is 1, value for 2006 is 2 etc.) and being a responsible investment is created.

Table 11 shows the impact on valuations over time. After introducing the interaction term, the direct effect of being a responsible investment on valuations declines. However, as displayed by the interaction term for the four valuation measures, the impact has increased over time as all measures show a negative coefficient. Also, the impact of being a responsible investment on the valuation composite is positive and statistically significant. Every year further into the sample, responsible investments are placed 0.09 deciles higher compared to conventional investments. Finally, the interaction term is also positive for Tobin's Q.

The results in Table 12 show how the relative implied cost of equity has steadily declined over time for responsible investments. The coefficient for the interaction term of -0.097 is statistically significant and indicates that each year further into the sample, the demanded rate of return for responsible investments decreases by 0.097% compared to other companies. Even though the long-term growth rate for responsible companies is lower, this effect has decreased over time. This effect is not statistically significant.

Table 9 showed how the valuations of responsible investments have increased for some measures. The results in table 13 show whether the increase in valuations for responsible investments has also accelerated over time. The results show no clear relation. Therefore, insufficient evidence is presented to conclude that the pace of change in valuations has accelerated over time.

To conclude, the impact of being a responsible investment on valuation levels has significantly increased over time for the valuation composite. Each year, responsible companies have become more expensive. Although this change has not seen an acceleration, the constant change since the start of the time period in this sample has led to relative valuations of responsible companies being significantly higher towards the end of the sample. The relatively low cost of equity for responsible investments has become more pronounced over time. For the growth rate, no significant evidence of changes over time is found. Thus, the evidence supports hypothesis 6a and 6b.

Table 11

Impact of corporate social responsibility on valuation measures over time

	(1) E/P	(2) CF/P	(3) S/P	(4) B/M	(5) Composite	(6) Q
Responsible Investment	-0.011	-0.016	0.062	-0.052	-0.458	0.173
	(0.028)	(0.033)	(0.196)	(0.045)	(0.454)	(0.186)
Resp. inv * Year	-0.001	-0.002	-0.016	-0.007	0.092**	0.027
	(0.003)	(0.003)	(0.015)	(0.007)	(0.041)	(0.017)
Return on Assets	1.218***	1.014***	-3.404***	-1.107***	-4.215***	3.981***
	(0.203)	(0.195)	(0.571)	(0.202)	(0.802)	(0.449)
S&P 500 member	-0.034	-0.075*	-0.726***	-0.254***	1.575***	0.821***
	(0.050)	(0.046)	(0.121)	(0.053)	(0.285)	(0.172)
Size	0.018	0.035	0.268***	0.111***	-0.855***	-0.544***
	(0.041)	(0.063)	(0.048)	(0.015)	(0.095)	(0.067)
R&D costs	0.455***	0.285***	-4.267***	-0.954***	5.218***	9.505***
	(0.120)	(0.105)	(0.801)	(0.187)	(1.185)	(0.796)
Illiquidity	3.22e+06	4.75e+06	1.60e+07***	5.33e+06**	-2.83e+07**	-1.85e+07***
	(4.33e+06)	(4.46e+06)	(5.48e+06)	(2.67e+06)	(1.23e+07)	(6.37e+06)
Constant	-0.196**	-0.209**	-0.875***	-0.171	12.190***	5.987***
	(0.086)	(0.085)	(0.280)	(0.119)	(0.779)	(0.325)
Industry control	Yes	Yes	Yes	Yes	Yes	Yes
Year control	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,157	11,157	11,157	11,157	11,157	11,157
R-squared	0.082	0.076	0.097	0.109	0.305	0.373

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year.

Table 12

Impact of corporate social responsibility on the implied cost of equity and growth rates over time

	(1)	(2)
	Implied cost of equity	Long-term growth rate
Responsible Investment	0.292	-2.214
	(0.475)	(1.387)
Resp. inv * Year	-0.097**	0.118
	(0.040)	(0.131)
Return on Assets	1.030	-8.488**
	(1.502)	(4.312)
S&P 500 member	-1.924***	-0.479
	(0.259)	(0.461)
Size	0.862***	-0.902***
	(0.074)	(0.211)
R&D costs	3.506**	21.050***
	(1.778)	(6.835)
Illiquidity	3.75e+07***	-4.70e+07
	(6.33e+06)	(3.35e+07)
Constant	3.353***	27.760***
	(0.815)	(3.155)
Industry control	Yes	Yes
Year control	Yes	Yes
Observations	11,157	8,882
R-squared	0.189	0.062

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year.

Table 13

Impact of corporate social responsibility on annual changes in valuation measures of highly valued stocks over time

	(1) ΔE/P	(2) ΔCF/P	(3) ΔS/P	(4) ΔB/M	(5) ΔComposite	(6) ΔTobin's Q
Responsible Inv.	0.017	0.016	-0.082**	0.018	-0.298	-0.012
	(0.070)	(0.010)	(0.034)	(0.063)	(0.461)	(0.308)
Resp. inv * Year	-0.001	-0.001	0.001	-0.003	0.018	0.043*
	(0.001)	(0.001)	(0.004)	(0.002)	(0.042)	(0.023)
Return on Assets	0.195**	0.171**	0.062	0.016	1.770**	1.230**
	(0.095)	(0.072)	(0.167)	(0.053)	(0.766)	(0.499)
S&P 500 member	0.001	-0.010	-0.008	-0.009	0.225***	0.173**
	(0.087)	(0.018)	(0.026)	(0.011)	(0.076)	(0.077)
Size	-0.001	0.005	0.020	-0.004	-0.111***	-0.179**
	(0.009)	(0.029)	(0.019)	(0.006)	(0.042)	(0.080)
R&D costs	-0.024	-0.066***	0.018	-0.020	1.590***	0.906***
	(0.037)	(0.017)	(0.071)	(0.030)	(0.552)	(0.247)
Illiquidity	-6.07e+06	-4.47e+06	1.40e+07	-1.75e+06	1.22e+07	-7.82e+06
	(4.30e+06)	(3.13e+06)	(1.64e+07)	(2.40e+06)	(9.30e+06)	(1.43e+07)
Start Valuation	-0.886***	-0.954***	0.349	-0.100	-0.026	-0.383***
	(0.150)	(0.114)	(0.222)	(0.062)	(0.066)	(0.118)
Industry control	Yes	Yes	Yes	Yes	Yes	Yes
Year control	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.053	0.058	-0.233*	0.121***	-0.682	2.218***
	(0.039)	(0.036)	(0.139)	(0.043)	(0.780)	(0.503)
Observations	2,688	2,688	2,688	2,688	2,688	2,688
R-squared	0.575	0.588	0.233	0.094	0.120	0.235

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year. Only stocks in the top three valuation deciles are included.

4.6 Robustness tests

To test the robustness of the results above, some extra tests are performed. First, as within firm variation is quite low, a pooled OLS is used to calculate the effect of being a responsible investment on valuations. However, when using a fixed effects model and looking at within firm variation, results are similar. Appendix B shows these results. Not only are the signs of the coefficients for the variables as expected, the valuation composite and Tobin's Q show statistical strength.

Besides, including a dummy variable to control for companies with negative earnings does not alter results for valuations. Furthermore, even though the research focuses on responsible companies with high valuations for hypothesis 4, 5, and 6d, results are similar if all deciles of valuations are considered. Finally, the sample is divided into two periods: one including observations before 2012 and one from 2012 onwards. The results for hypothesis 6 do not change when replacing the year variable for this dummy variable, although statistical significance is somewhat lower due to less variation in the explanatory variable.

To conclude, results in this paper are robust to changes in assumptions. However, no robustness tests could be performed to test the hypotheses with scores from other ESG providers due to limited data availability.

5 Discussion

The most important findings are that responsible investments are valued higher compared to other investments and the results suggest this is due to a lower cost of equity. Furthermore, some measures show that the valuations of highly valued responsible investments mean revert to a lower degree. Other results suggest this is because the cost of equity mean reverts to a lower degree for responsible investments. Durability of growth prospects seems to be lower for responsible companies. Likewise, the relative valuations of responsible investments have increased over the last years. These results support and add to earlier literature. The puzzle in the literature where responsible investments have both higher stock valuations and equal stock returns can be explained by the somewhat lower degree of mean reversion for these stocks. As responsible investments have become more expensive over time, this has had a positive impact on the stock returns of these companies, countering the negative impact of high valuations.

The results in this paper move the field forward by providing a first step in disentangling the stock returns of responsible investments. Currently, a transition towards responsible investing is taking place. This has resulted in a change of the relative valuations for responsible companies. This process might continue for some time as the trend continues. An acceleration of this valuation divergence might even lead to attractive return opportunities for responsible investments. However, eventually an equilibrium will be reached where the valuation divergence between responsible and non-responsible companies remains constant. At this point, these changes in relative valuations cannot be expected anymore. The results in this paper show the impact of changes on relative valuations and implicitly on stock returns. The results also explain some of the historical performance of responsible investments, which is equal to other investments even though investors are willing to accept a lower cost of equity and valuations are higher.

A limitation of this research is that the results are based on the ESG scores of one data provider (Thomson Reuters) as this was the only data provider to which Erasmus University students have access. Furthermore, ESG scores are based on subjective measures and correlation among different providers is low, therefore results must be interpreted carefully.

Based on the results described in this paper, some future directions could be investigated. Firstly, the results can be replicated using ESG scores from other data providers to measure the

robustness of these results. Additionally, more research can be done on the anatomy of stock returns for responsible investments. Focus points could be which part of the stock returns of responsible investments is due to good underlying performance and which part can be attributed to a relative multiple expansion and declining cost of equity for responsible investments. Separating returns into those components can give useful insight to investors.

6 Conclusion

This study focuses on how valuations of responsible companies develop over time. The results suggest that responsible investments are valued higher compared to other investments due to a lower cost of equity. Furthermore, for some measures, this higher valuation mean reverts to a lower degree compared to other investments. Finally, responsible investments have become more expensive over time.

Literature on responsible investing finds that responsible investments are valued higher than conventional investments but achieve similar stock returns. As highly valued stocks generally underperform, this creates a puzzle. Using four valuation measures, the impact of being a responsible investment on the valuation of a company is investigated. The sample constitutes American companies over the period 2005-2019. Responsible investments are more expensive. This is the result of a lower implied cost of equity rather than better growth prospects. The annual valuation change of highly valued stocks is investigated. For some of the measures, responsible investments mean revert to a lower degree in the following year compared to other investments. Finally, responsible investments have become relatively more expensive over the investigated time period.

The results in this paper have implications for investors. Investors should consider the impact of relative valuation changes on the performance of responsible investments. This can be either a positive or negative effect. Investors expecting the responsible investing trend to accelerate going forward might want to increase their exposure to profit from an increasing divergence in stock valuations. However, as an equilibrium in the market is eventually reached, stock valuations should stop diverging further. Responsible investors must be aware that the recent performance has been helped by an expansion of relative valuations due to a declining cost of equity. Eventually, the underlying performance of companies will be the main determinant of stock returns.

This study contributes to the current literature by investigating an explanation for why the stock performance of responsible companies has been equal to other stock investments, even though valuations have been higher. The findings in this paper indicate that valuations and the cost of equity of expensive responsible companies have mean reverted to a lower degree over the

investigated time period. This has a positive impact on the returns of these companies. These findings are in line with the growing trend of responsible investing. As the world transitions to a climate where investing responsibly is considered more important, the relative valuations of these companies shift. These findings indicate that a transition has at least partly been taking place during the period 2005-2019. Finally, investors should consider an equilibrium where a further divergence in valuations and cost of equity cannot contribute to stock returns anymore.

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Appendix A

Optimism measure 2 is based on Dreman & Berry (1995) and measures the optimism in earnings forecasts. The results are shown in Table 15.

$$Optimism\ measure\ 2 = \frac{Forecast\ EPS - Actual\ EPS}{|Forecast\ EPS|} \tag{17}$$

Table 14

Impact of corporate social responsibility on optimism measure 2

	(1)	(2)	(3)
	Full year 1	Full year 2	Full year 3
Responsible Investment	-0.048	0.041	0.319
	(0.090)	(0.053)	(0.329)
Size	0.063**	-0.005	-0.227**
	(0.030)	(0.047)	(0.114)
Analyst following	-0.016***	-0.021***	0.004
	(0.004)	(0.008)	(0.038)
Constant	-0.016	0.418	5.347***
	(0.284)	(0.412)	(1.777)
Industry control	Yes	Yes	Yes
Year control	Yes	Yes	Yes
Observations	10,881	9,032	6,789
R-squared	0.005	0.008	0.021

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year.

Optimism measure 3 is based on Hong & Kubik (2003) and measures the optimism in earnings forecasts. The results are shown in Table 16.

$$Optimism\ measure\ 3 = \frac{Forecast\ EPS - Actual\ EPS}{Stock\ Price} \tag{18}$$

Table 15

Impact of corporate social responsibility on optimism measure 3

	(1)	(2)	(3)
	Full year 1	Full year 2	Full year 3
Responsible Investment	-0.0064	-0.0002	0.0025
	(0.0060)	(0.0033)	(0.0043)
Size	0.0050	0.0012	-0.0013
	(0.0042)	(0.0015)	(0.0020)
Analyst following	-0.0010	-0.0007***	-0.0005
	(0.0006)	(0.0002)	(0.0003)
Constant	-0.0248	0.0029	0.0459**
	(0.0275)	(0.0108)	(0.0182)
Industry control	Yes	Yes	Yes
Year control	Yes	Yes	Yes
Observations	10,886	9,040	6,793
R-squared	0.004	0.012	0.013

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively. Two-way clustering of standard errors is used, clustering by firm and year.

Appendix B

Appendix B shows the results for hypothesis 1 using a fixed effects model.

Table 16

Impact of corporate social responsibility on value measures (Fixed Effects)

	(1) E/P	(2) CF/P	(3) S/P	(4) B/M	(5) Composite	(6) Tobin's Q
Responsible Inv.	-0.002	-0.002	0.038	-0.032	0.284***	0.133***
	(0.010)	(0.009)	(0.073)	(0.029)	(0.080)	(0.045)
Return on Assets	1.778***	1.590***	-2.664***	-0.686***	-12.56***	2.829***
	(0.037)	(0.034)	(0.269)	(0.107)	(0.294)	(0.167)
S&P 500 member	-0.005	-0.039***	-0.484***	-0.147***	0.442***	0.463***
	(0.011)	(0.010)	(0.080)	(0.032)	(0.087)	(0.050)
Size	0.029***	0.054***	0.154***	0.238***	-1.311***	-0.963***
	(0.008)	(0.007)	(0.058)	(0.023)	(0.063)	(0.036)
R&D costs	0.498***	0.510***	-0.238	0.101	-5.320***	5.322***
	(0.082)	(0.074)	(0.595)	(0.237)	(0.651)	(0.370)
Illiquidity	-1.55e+06***	890,095**	2.49e+07***	2.38e+06*	1.15e+07***	5.43e+06**
	(484,704)	(438,042)	(3.51e+06)	(1.40e+06)	(3.84e+06)	(2.19e+06)
Year control	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.286***	-0.425***	-0.048	-1.418***	16.810***	9.607***
	(0.064)	(0.058)	(0.463)	(0.185)	(0.507)	(0.288)
Observations	11,157	11,157	11,157	11,157	11,157	11,157
R-squared	0.215	0.208	0.044	0.030	0.207	0.170
Nr. of companies	2,131	2,131	2,131	2,131	2,131	2,131

Note. ***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively.