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# ESG and the cost of capital

## Does disclosure of ESG performance affect the cost of equity and cost of debt?

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# Abstract

This thesis investigates how the disclosure of ESG performance affect the cost of capital, segregated into the cost of equity and cost of debt to find the appreciation of two distinct providers of the capital – the shareholders and debt holders. Using a large global panel dataset from 70 countries, this study intends to provide a better understanding on how the increasing discussion of sustainability have affected globally the cost of capital for the firms. We retrieve an unbalanced dataset of 53,831 firm-year observations from 3,511 firms during the period of 2005-2020 collected from the Thomson Reuters database Eikon. Our results indicate that equity providers generally penalize the firms disclosing higher ESG performance by demanding a higher cost of equity. Our results are inconsistent with previous research, but in line with the shareholder theory. From a debt holder perspective, we find that disclosing higher ESG performance is rewarded by a lower cost of debt offered to the firms. This is consistent with previous research and the stakeholder theory. Furthermore, our results indicate that size of the board is irrelevant for both cost of equity and cost of debt. In addition, we find a difference in appreciation of board gender diversity as debt holders reward firms with a higher percentage of females on the board, while equity providers seemingly find it irrelevant. In line with the agency theory, we find CEO duality to have a moderating effect of ESG disclosure on the cost of debt. Inconsistent with the agency theory we do not find a significant result on the cost of equity, indicating that equity providers do not penalize firms with an entrenched CEO. We aim to contribute with new and relevant information on sustainable investments for managers, investors, debt holders, stakeholders, and governments. Our results indicate some policy implications.



*Keywords: ESG, Cost of equity, Cost of debt, Board size, Board gender diversity, CEO duality, Shareholder theory, Stakeholder theory.*

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This master thesis has been completed as part of the required education for a master's degree in business and administration at Oslo Metropolitan University. This master thesis amounts to 30 credits and marks the end of our degree.

The purpose of writing this master thesis has been to create a better understanding of how disclosure of ESG performance can have an impact on the cost of capital. We also look more closely at how the governance aspect of ESG might affect the cost of capital. We have enjoyed working on such a critical issue as climate change, sustainability, and human rights as they are becoming important factors in the financial systems.

We want to show our appreciation to our supervisor, Muhammad Azeem Qureshi. His insights, ideas and discussions has improved our thesis. We would like to thank him for being enthusiastic and interested in our work.

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# 1. Introduction

"Given current corporate practices, not one wildlife reserve, wilderness or indigenous culture will survive the global market economy. We know that every natural system on the planet is disintegrating. The land, water, air, and sea have been functionally transformed into repositories for waste. There is no polite way to say that business is destroying the world "(Hawken, 1993). It does not seem like businesses or governments understood what was happening. Since then, global $CO_2$ emissions have increased year over year, forests have been reduced, and our rivers and oceans have been polluted. Every warning lamp is flashing bright red. Are we late to understand what Hawken saw in 93? Are we reacting before the tipping point? The thesis seeks to find some understanding of how the financial markets are reacting to this change.

Sustainable development is defined by UN (1987) especially as, "development that meets the needs of the present without compromising the ability of the future generation to meet their own needs."

Climate change is a reason sustainable finance and ESG (Environmental, Social and Governance) performance is important to understand, not only for institutional and retail investors but also more importantly for companies and governments. We are all facing a massive challenge of fighting climate change (WEF, 2022). Countries, companies, and individuals will all be impacted. There are many different proposals, plans, and petitions to change how investment and finance is done. The UN Principles for Responsible Investment (UNPRI), EU taxonomy, EU green deal, UN sustainable development goals (UN SDG), President Bidens plan for climate change (The White House, 2021), and a spread of investors using more ESG data in their analysis (UNPRI, 2021). The latest IPCC report from 2021 says that "its unequivocal that human influence has warmed the atmosphere, ocean and land" (IPCC, 2021). There are widespread changes happening in every ecosystem that has an impact on the global climate. This thesis hopes to make it clear for companies, capital providers, lawmakers, regulators, and banks that social responsible investment (SRI) and ESG investments is a pathway for financial markets to achieve their net-zero goals.

In this thesis we hope to show that implementing a ESG investing strategy will be profitable both for companies implementing and improving on ESG scores and for capital providers. Our focus is the cost of capital, looking specifically at cost of equity and cost of debt. By

using international data, our insights bring a new dimension to previous research. Previous research has been limited to a single country or the EU, our data looks at all continents that might show different results when analyzing rich international data. Our focus will be on how the disclosure of ESG performance affects the cost of capital. This leads us to our research question:

*Does disclosure of ESG performance affect the cost of equity and cost of debt?*

We start by presenting theory for ESG that is supplemented by responsible investment and climate change theory, then we continue with more financial theory that gives us a good background for discussing our results. In our theoretical framework section, we review the relevant literature to integrate ESG and financial theory to develop our hypotheses for the thesis. From there is a technical part where we describe how we collected data and prepared it. Then we get into our methodology and regressions. After our regressions we start showing our results and discussing what our findings mean for capital providers. Finally, we present our conclusion, policy implications, limitations, and further research.

# 2. Theoretical framework

In this section we present the framework leading to our hypotheses. We start by introducing the concept of ESG and different financial theories and prior studies related to the cost of capital. Lastly, we present the design of our hypotheses.

## 2.1 ESG

ESG came about as a term in 2004 from a report that 20 financial institutions made. The report was a response to the UN general secretary Kofi Annan's call to responsible investment (Secretary-General, 2006; UN, 2004). ESG has a broader approach than CSR (corporate social responsibility), which expands to include environment. Further it is also more specific and demands more clear reporting for both social and governance. In CSR governance is only included indirectly (Gillan et al., 2021). ESG is an expansion of CSR and evolves CSR into a modern measuring metric better suited for today's financial analysis.

Millennials have high demands for who they want to be employed by and where they invest their money (Barzuza et al., 2019). As problems from ESG issues are becoming more prominent, these issues become what people take an increased interest in (BCG, 2022; Kachaner et al., 2020). Human rights and equality are also becoming important, firms need to

pay their workers a fair wage, and everyone deserves an equal opportunity, whether it be an entry level job or a C-suite position (UN, 2022a). Gender, race, nationality or disability should not get in the way of getting good and representative people in the workplace(UN, 2015b). ESG disclosure will meet some of the demands of the next generation.

There are several different providers of data on ESG, the most common ones are from Thomson Reuters, Bloomberg, and KLD (Berg et al., 2019). Each of them has a different methodology and focuses when calculating their scores. Bloomberg has a focus on firm level of disclosure (Baldini et al., 2016; Fatemi et al., 2018; Ioannou & Serafeim, 2012). While Thomson Reuters measure the relative ESG performance of the firm across 10 different themes, which also are divided into the three main pillars of ESG, environmental, social, and governance (see table 3). In this paper the data used for our analysis are from the Thomson Reuters database, which has 9000+ (Refinitiv, 2021) companies reporting ESG scores.

### 2.1.1 The ESG pillars

The environmental pillar measures the contribution the company makes on greenhouse gas emissions, waste management and energy efficiency in accords with the climate change. The companies must do an effort in combating global warming. In hopes of reaching the Paris agreement, decarbonization and cutting emissions is vital (Robeco, 2022).

As scientist show how the continued exploitation of the world's resources are now showing the negative effects (IPCC, 2021). Global warming and challenges with climate change is real and already starting to make a big impact (IPCC, 2022). This pillar in ESG should therefore be of a high priority the environmental pillar is both the source and the solution to much of the climate crisis. Yet each industry weights the pillars differently (Refinitiv, 2021). The focus should really be on emissions, waste management, water pollution, not how companies compare in the sector or industry.

The social pillar gives score on human rights and labor standards in the supply chain. Issues with health and safety or exposure to illegal labor, such as child labor. The score gets penalized for not following human rights. The social score can also be raised if the company is integrated in the community (Robeco, 2022).

As human rights movement have picked up, we see that companies now also needs to advocate for social good. This means taking care of employee's health and safety, have diversity and have a position on social issues (Serafeim, 2020).

The governance pillar scores how a company is run from the top, quality of management and board, shareholder rights, anti-corruption and transparency (Robeco, 2022). There is a good amount of data that is used to estimate governance score is also used in CSR. This means that companies have to think long term not only for their shareholders but also their stakeholders. (Robeco, 2022; Smith, 2003)

It is important to understand that ESG is a strategy and not an asset class. And there are different ways to implement the strategy and how it is prioritized. From traditional investing where the focus is profits through SRI and impact investing to philanthropy. In these strategies it is possible to implement ESG strategy. Some of the strategies will put a great or all the weight of the decision on ESG or a pillar of ESG, some might just use it for extra information in the analysis of the asset. (Stevens, 2021)

Researchers find that there are big differences in ESG score between different industries (Garcia et al., 2017). To the extent that many use relative industry scores rather than raw data. This is the way Thomson routers also reports their ESG scores, all ESG scores are relative to their respective industry. This means that many large corporations, which also report on non-financials might have high ESG scores. Even if they are in a high CO2 emitting industry or high resource use (Borghesi et al., 2014; Gillan et al., 2021; Refinitiv, 2021). This industry balancing makes it harder to truly find the best ESG performing companies. The companies that are answering the call from Kofi Annan to invest responsible for future generations (UN, 2004)

### 2.1.2 From CSR to ESG

Most of the previous research that compares non-financial firm data with cost of capital have used CSR data or have been small samples using ESG data as stated in section 2.3. In section 2.3 we summaries relevant previous research to strengthen our hypothesis and how we build on previous research. It might be hard to differentiate between CSR and ESG. As Gillan et al. (2021) uses them interchangeably in their study on the terms in corporate finance. As mentioned above ESG is a further extension or CSR. ESG is reported as a score which makes it easier to compare companies on their non-financial performance.

We realize that the use of ESG is new, and many firms reporting ESG scores have different methods of estimating their scores. In the past 10 years there have also been a great increase in companies that need to report on ESG. As the public has put pressure on companies to create a greener more sustainable corporate landscape (Friedlander, 2020). The IPCC (2021)

are publishing reports that make it clear that human activity is a key driver for the climate change we are seeing today. These IPCC reports together with the climate activist movement are making ESG issues such as climate change a very public issue. These issues have made it impossible for investors to ignore ESG any further (Fleming, 2019). One organization that has a major influence in the responsible investments are the UNPRI (United Nations Principles for Responsible Investing), which has over 4600 signatories that wants to implement ESG strategies and be an active owner. The signatories manage 121 trillion dollars (UNPRI, 2021). Some investors have been using ESG strategies for their long holds, but just have not used the buzzword "ESG" to promote their strategy. A manager says, "you would be foolish not to analyze these ESG factors and engage accordingly." (Jean-François Gagnon, 2021). Understanding how capital providers value ESG will show if the UN call for responsible investment had an impact on the financial world.

### 2.1.3 Sustainable finance

The EU taxonomy is a classification system, creating a list of environmentally sustainable economic activities. The system will define if an activity is considered sustainable to any interested parties. This would help to make companies and investors more climate-friendly, and would also limit greenwashing (EU, 2022a).

Sustainable finance is taking ESG considerations into account when investing which should lead to more long-term investments. Considerations other than profit, making sure people and the planet also can sustain the business. This was key in developing the EU green deal, which aim to cut at least 55% greenhouse gasses (GHG) by 2030 and have the EU climate neutral by 2050 (EU, 2020), and economic growth that is not connected to resource use (EU, 2019). The European Union is really setting a standard for governments on how to face the challenges of the future. And are implementing regulation and incentives for a greener EU across all industries including finance (EU, 2022a). This aligns with the UN SDG (UN Sustainable Development Goals) (2015b) and Paris agreement limiting global warming to 1.5°C (UN, 2015a), a pathway towards a resilient low-carbon development (EU, 2022b).

### 2.1.4 Responsible investment

The UN principles for responsible investing defines responsible investment as: "a strategy and practice to incorporate environmental, social, and governance (ESG) factors in investment decisions and active ownership" (UNPRI, 2022). The reason for implementing responsible investments is divided into three parts: materiality, client demand and regulation. Materiality is better risk management and recognition that ESG impacts financials. Recent events as the

Volkswagen diesel gate and Facebook's problem with Cambridge Analytica, both were ESG factors that wiped billions in market value. 27 billion dollars in fines for Volkswagen (UNPRI, 2022). Clients wants transparency in where their assets are invested, and they are aware that ESG factors will influence the results, and they are chasing the best financial results. Lastly the regulation is seen by the financial markets as a good instrument to combat global challenges such as climate change, tax avoidance and slavery. (UNPRI, 2022)

NBIM "Oljefondet" the world's largest sovereign wealth fund (SWFI, 2022) uses steps to invest responsible; establish principles, exercise ownership, and invest sustainable (Norges Bank, 2022). NBIM are establishing standards for what they expect companies to comply and want to implement across all markets. As an active owner NBIM also uses its voting rights, this to set the agenda for long-term value creating, that does not impact the future negatively. NBIM also uses ESG in their valuation process and helps identify risks. They have expectations on what companies in their portfolio should be addressing. Children rights, climate change, water management, human rights, tax, transparency, anti-corruption, ocean sustainability, biodiversity and ecosystems making sure their investments are sustainable (Norges Bank, 2022). The signatories of UNPRI and other institutional investors are moving in the direction of combating global issues. Wanting to place their money to do good and reduce their risk exposure to global warming. NBIM as a sovereign wealth fund is by their actions leading by example for all other funds.

### 2.1.5 Impact investing

Impact investing is an investing strategy that does not only seek returns but also make a positive impact on the environment, or other parts of society where the situation can become better (Pandit & Tamhane, 2018). The goal is for the impact to have measurable effect on one or more of the UN sustainable development goals (Ferd, 2022). When choosing impact investing as a strategy, the social standing of the companies you invest in becomes important, to find companies that serve communities in line with the impact investing strategy. When wanting to make an impact, the view on the bottom line change to double or triple bottom line (Ferd, 2022). Now the bottom line includes people, planet, and profit. Some see this impact investing as an extended arm of philanthropy, but most expect the same return as in the regular market (Rockefeller, 2022). A Survey by (Pandit & Tamhane, 2018) shows that the median rate of return to be about 10% in India from impact investing. Both the implementation of SRI and ESG are ways that the assets managers can implement impact investing. Impact investors can be a powerful ally when the financial world is changing to a

more sustainable future, doing good and doing well is possible as an investor (Villiers & Levine, 2021).

### 2.1.6 Disaster risk

Disaster risk is financial loss caused by a natural disaster, extreme weather events, wildfires, landslides or earthquake, tsunamis, and volcanic eruptions. Some of these events are hard to predict and reduce risk of. For first events mentioned we now know that human actions influence the chance of a natural disaster. It is predicted that such events will happen more regularly. “Extreme weather is the new norm”, and it is a worrying trend (World Meteorological Organization, 2021). This will then have an impact on many financial situations across the world. The cost of the California fires in 2018 are estimated to 148 billion USD (Wang et al., 2021). Another US weather issue is the drought in the western states. Lake Mead at the Hoover dam reached the lowest it has been since it started to fill in 1937 this summer (NASA, 2021). Lake Mead also supplies the Colorado rivers, which supplies water for 40 million people (USBR, 2012). We can only imagine the cost if the water reserves do not fill up. In Kenya a drought from 2008-2011 caused a financial loss of 9.1 billion USD (Financial protection Forum, 2015) and Kenya is a developing country that on average per capita in cities use 40 liters of water each day (Sumlia Gulyani, 2000) compared to the US each person uses 310 liters a day (EPA, 2022), a dry Colorado river would cause large financial losses. Extreme weather comes in all form’s, floods can also become a massive natural disaster, when there are extreme rains or with sea levels rising (IPCC, 2019). Thailand had a flood in 2011 which ended up costing 46,5 billion USD, the equivalent 13% of national GDP (Financial protection Forum, 2015). The extreme weather and global warming are going to increase risk and the cost for nations and cities in the future.

Governments, companies, and capital providers needs to find a way to account for the risk that natural disasters can cause in their decision making. Capital providers might want to shy away from risky companies or areas which are more exposed to natural risk. Governments need to invest in infrastructure and solutions that would minimize the cost when disasters happen, not just react but be proactive. The science is clear it is not going to get better for the next couple of decades (IPCC, 2022).

### 2.1.7 Climate change

IPCC (2021) reports that it is unequivocal that human emissions are responsible for the global warming, which is then changing many ecosystems and will change the world as we know it. We also see that there are large institutions pushing to make a drastic change in how we

operate. This includes the US (The White House, 2021), EU (EU, 2019), UN (COP26, 2022) also, we see China being the biggest builder of renewable energy (IEA, 2021; Zinglersen, 2019). The gulf states are realizing they can't survive on their oil reserves forever. They are investing in becoming a tourist destination, but also a destination for academia, finance, and tech with their 2030 vision plans (Arabia, 2021; UAE, 2021). All these countries and institutions see the risk and opportunities of climate change. Investors and business owners are trying to position themselves in such a way that the impacts of climate change are at a minimum. Apple has a goal of reaching carbon-neutral for its supply-chain and products by 2030, Amazon by 2040 and Equinor an oil company by 2050 (Amazon, 2022; Apple, 2020; Equinor, 2022). This 2050 goal is the net zero that the UN is aiming for (UN, 2022c), it is also the goal for net zero Bill Gates suggest in his book on "How to avoid climate crisis" (Gates, 2021). There is a generation that even in a pandemic focuses on climate change (Ignatius, 2021). Everyone is trying to become sustainable. ESG scores should do a good job of showing which companies will be creating returns, and the market should provide incentives for companies that are positioning themselves for the future by estimating climate risk today (Hennick, 2022). As the newest report from IPCC (2022) states, every tenth of a degree matters, and so should every dollar. Eccles and Klimenko (2019) finds that executives of the largest investment funds in the world all have ESG on the top of their mind. Choi (2018) find that the next generation of capital providers are more social and environmentally conscious. The signals are strong, taking climate change seriously is important. The financial business world needs to start adapting and preparing for a substantial change by implementing ESG strategies to stop global warming and limit climate change.

## 2.2 Financial theory

This subsection presents relevant theory from corporate finance which will form the foundation we will build our hypotheses on. The theory will also create an understanding of the interaction between the financial and non-financial information and their possible mutual influence on the cost of capital.

### 2.2.1 Shareholder vs. Stakeholder

Long-term profits for shareholder vs triple bottom line, people, planet and profit where every stakeholder in the value chain should be considered (Bakken, 2021).

Shareholder theory has a focus on maximizing shareholder value, this means that the managers primary task is to create value for the shareholders. While stakeholder theory gives

the managers other interest to focus on as well as the profit of the shareholder, this includes taking care of employees, customers, and the local community. Anyone who has an interest in the company or is affected by the actions of the company is a stakeholder. Creating value for the stakeholders is important even if some actions reduce shareholder monetary profits (Smith, 2003).

A summary of Friedman (1962) views on shareholder theory, the only social responsibility for a business is to use its resources in activities that increase profits, without deception or fraud in an open market. And some argue that the shareholder is positioned for short-term profit maximization. It is important to understand that the shareholder theory does not say that you should cut cost everywhere possible, but when investments are made, they are placed at the best available opportunity (Smith, 2003). Critics of the shareholder theory would argue that this thinking will prohibit investment in employees or allowing charitable donations (Smith, 2003). This thinking might also be a limiting factor for ESG investments, as those investments do not create the best shareholder value in the short term.

In stakeholder theory the stakeholders demand that their beliefs and interest should matter to the company. The theory says that managers have a duty not only to shareholder but to parties that are involved in wealth creating either voluntary or involuntary. Here the managers have a challenging time knowing how to weigh different parties' opinions, who all want different things. As an executive of an oil company, it would be hard to find a good balance between shareholders and environmentalist. A manager cannot lessen the focus on profitability to please other stakeholders but needs to find a balance between all stakeholders including shareholders (Smith, 2003).

Sharing information with different stakeholders will make them more accepting, rather than to not include them in the decisions making. The act of information sharing might just be what the stakeholder needs to feel valuated enough to accept terms of the companies ways to generate value (Parmar et al., 2010). If a firm includes stakeholders in decision making, then stakeholders will feel validated. The decisions will then likely also create value on the 3P’s, people, planet, and profit. Including stakeholders makes is such that the firm is not only taking care of stakeholders but also making an impact on UN’s development goals.

### 2.2.2 Pecking order theory

The pecking order theory is relevant in order to understand how firms’ capital structure is decided. According to Brealey et al. (2019, p. 495) the capital structure decisions are

connected to the concept of asymmetric information, meaning difference in knowledge between managers and investors. According to the theory managers of firms will first opt into internal funds from retained earnings, then issue of new debt. Issue of new equity is used only as a last resort when the firm has no more debt capacity, meaning that the risk of financial distress turns to high (Brealey et al., 2019, p. 495).

Frank and Goyal (2003) found evidence that internal financing not necessarily is enough to cover investments, leading to the use of external financing such as debt and equity. They also found evidence that debt was not significantly dominant over equity, in contrast to earlier research and the pecking order theory. Further on, the study showed evidence that large firms tend to act according to the pecking order theory, while young and relatively small firm tend to use more equity financing (Frank & Goyal, 2003).

### 2.2.3 Agency theory

Adam Smith was a strong participant in founding what we today call agency theory. His initial work on the agency problem started out by stating that if a firm is managed by one or more persons not being the owners of the firm, there might be a chance those persons do not work towards the owners' best interest (Smith, 2000). This was the starting point for a popular topic for several researchers in the years to come.

Agency relationship is a contract under which one or more persons (the principals) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent (Jensen & Meckling, 1976, p. 308). For instance, when investor delegate the investment decisions to management in a firm. In such relationships agency conflicts might easily occur as firms' management might decide to invest shareholders money on ESG activities that might not generate any profits for the firm. Investors might disagree with ESG investments, either because of information asymmetry or different views on the investment spending. The long-term affect for such conflicts in a firm could be increased agency costs in the way of higher cost of equity as investors have lost trust to the management. Also, the agency cost can be related to investors now using resources to control and monitor management. Controlling the behavior of the management can be done by budget restrictions, compensation policies and operating rules, all costly measurements for the principals (Jensen & Meckling, 1976).

On the other hand, low investments in ESG and security measurements might lead to higher risk as for instance a firm producing oil can have an oil spill such as BP in the Gulf of Mexico

(Oikonomou et al., 2014). The study of Oikonomou et al. (2014) found a relationship between corporate social performance and the cost of debt financing and debt quality.

Investors are looking for value maximizing investments. As discussed, management might take decisions based on information not known to the investors. Management can also make bad decisions because of incompetence or decide by their self-interest and building on their own reputation (Jensen & Meckling, 1976). Especially decisions regarding investments in ESG activities have been troublesome for many as the value maximizing of these decisions are not always easy to measure or comprehend for investors. Cultural differences between countries also affect how positive or negative investors would be to such investments conducted by the firm management as found in the study of Matthiesen and Salzmann (2015).

### 2.2.4 Trade-off theory

Optimal capital structure in terms of the trade-off theory is the trade-off between interest tax shield generated from having debt and the cost of financial distress by taking on debt (Brealey et al., 2019, p. 493). According to the trade-off theory the optimal capital structure varies from firm to firm as their amount of intangible and tangible assets may vary as well as the riskiness of the assets. We have seen evidence supporting this theory as often high-tech firms operate with little debt as their assets are mostly intangible and quite risky (Kedzior et al., 2020). On the other hand, Wald (1999) found that the most profitable companies borrow the least, which goes against the trade-off theory. In addition, Bertrand and Schoar (2003) found that financial decisions such as the debt ratio of a firm is not only decided by the nature or assets of the firm, but by the personality of the managers in the firm. Older CEO`s tended to decrease the leverage and younger CEO`s with an MBA acted more aggressively by taking on more debt (Bertrand & Schoar, 2003).

### 2.2.5 Capital structure

Brealey et al. (2019, p. 495) defines Capital structure as the mix between equity and capital that a company employs to finance its assets. Previous studies have shown a negative association between cost of debt and size of the firm in addition to a negative association between leverage and return on assets (ROA) (Francis et al., 2005; Gray et al., 2009). Previous research has also found that firms with a high market-to-book (MTB) asset ratio often operate with low leverage (Rajan & Zingales, 1995). Firms with high profits operate with low leverage. Furthermore, research have found evidence that firms in industries where the median leverage is high also tend to have high leverage (Rajan & Zingales, 1995). If there is expected to be increased inflation firms tend to operate with high leverage. Firms facing

higher effective tax rates will issue longer-term debt as long-term debt also creates a higher tax shield when the yield curve is positively sloped (Mauer & Lewellen, 1987). In addition, firms with larger levels of asymmetric information are more likely to issue short-term debt. Firms with lower levels of asymmetric information are more likely to issue long-term debt (Flannery, 1986).

### 2.2.6 CEO duality and board size

CEO duality means that the CEO is also the chair on the board of directors (Rechner & Dalton, 1991). There is a scarce amount of previous research on the link between CEO duality and the possible effect on cost of capital of firms. In this thesis we seek to identify a possible connection on whether equity investors and debtholders will find CEO duality as a moderating effect on the ESG score on the cost of capital by punishing firms by demanding a higher return on their investment. Previous research has found that this could reduce the information asymmetry and lead to higher access to external debt (Abor, 2007). Corporate governance has been identified in previous studies (Berger et al., 1997; Wen et al., 2002) to be impactful in the decision on capital structure of firms. A study from Ali et al. (2019) finds an insignificant linkage between the cost of equity and CEO duality in their study of the cement sector in Pakistan from 2012 to 2017.

The linkage between board size and the cost of capital have previously been investigated, but often only on small or narrow samples. A small study conducted by (Arslan & Abidin, 2019) found a negative relationship between the size of the board and the cost of capital by looking at 120 PSX listed firms in Pakistan. The study from PSX listed firms indicates that firms with large board size have a reduced cost of capital in comparison of firms with a small board size in the case of Pakistan. Another study by Anderson et al. (2004) finds that independent boards have lower cost of debt, they also find that larger boards generally have a lower cost of debt too. Due to the narrow and limited amount of previous studies on the relationship between the segregated cost of capital and CEO duality or board size, our interest where piqued to investigate empirical results from a broader and more extensive scale study to fill this gap.

### 2.3.7 Board gender diversity

Findings from Tingbani et al. (2020) for firms on the London exchange show that there is a positive correlation between voluntary greenhouse gas disclosure and board gender diversity. Their findings also state that having an environment committee does not affect the disclosure of GHG. Tingbani et al. (2020) concludes that having a diverse, mixed gender approach to governance can better meet the demands of stakeholders. Nguyen (2020) finds that greater

board gender diversity is associated with lower cost of equity in a very narrow study of French firms from 2006 to 2017. Kamil and Appiah (2021) find that greater board gender diversity has a positive relationship with cost of debt, again an extremely narrow study of only 17 Ghanaian non-listed firms from 2007-2017. In this thesis we investigate the possible connection between cost of capital and the percentage of females on the board of directors on a much broader and larger scale than previous research. We seek to investigate the linkage on board gender diversity and cost of capital. This is conducted by looking at empirical evidence in our study, that companies focusing on governance and gender equality is either awarded or penalized by investors on cost of equity or by debt issuers on cost of debt.

## 2.3 Literature review

In this sub-chapter we will review and present relevant literature for our research question and hypothesis. The selected literature contains prior research on ESG related aspects as well as governance specific aspects in connection with the cost of capital and segregated results from cost of equity and cost of debt.

Pellegrini et al. (2019) empirically investigate the effect of ESG scores on the cost of equity as well as on the profitability of companies. The authors look at 182 companies all within the oil and gas industry. They use the variables return on assets as a proxy to find out how profitability is affected by ESG scores. Instead of using the CAPM or Fama-French model they implement the Easton Model (Easton, 2004) to find the implied cost of equity of the firms. After they run a fixed effect regression model, they show that firms with higher ESG scores are rewarded with cheaper equity financing. The authors find that for a 10% increase in overall ESG score the companies obtain a 134 bps lower cost of equity. Other findings in this study also show that a 10% increase in overall ESG score declines the return on assets by 0.45%.

Sharfman and Fernando (2008), study how improved environmental risk management is associated with a lower cost of capital. The authors look at 267 US firms from the S&P 500 index. The main findings in this study show that firms benefit from improved environmental risk management on several levels. Among these are reduction in their cost of equity and shift from equity to debt financing, as well as higher tax benefits from the increased debt. They conduct a hierarchical regression to obtain their results. Their results suggest a significant negative relation between the cost of debt and improved environmental risk management.

Suto and Takehara (2017) examine the link between corporate social performance and the cost of capital by looking at Japanese firms from 2008-2013 and use the variables cost of equity, cost of debt and weighted average cost of capital. The authors run a regression model where they control for bank relationship, the ownership structure of the firm and other firm specific attributes. Findings in this study show that institutional owners reduce the cost of equity while it does not significantly affect the cost of debt.

Dhaliwal et al. (2014) investigates benefits associated with corporate social responsibility disclosure. The study looks at 1,093 companies from 31 countries from 1995-2007. Using pooled regression of 5,135 firm-years with standalone CSR reports they find a negative relation between CSR disclosure and cost of equity. The authors also find that financial and CSR disclosure act as substitutes for each other in reducing the cost of equity.

Nazir et al. (2021) explores the nexus between ESG performance and the cost of capital for top global technology enterprises. The authors use data from 64 firms from 2010-2017 for a total of 512 firm-year observations. The study collects ESG data from Thomson Reuters and uses a two-step system GMM regression and find that ESG score is positively associated with the cost of capital of global tech leaders. Regarding the cost of debt, the study does not find a significant relationship between ESG performance and the cost of debt for top global tech leaders. The authors indicate that the effect of ESG is different from sector to sector.

Gjergji et al. (2021) looks at the effects of ESG disclosure on the cost of capital in SME on the Alternative Investment Market (AIM) in Italy. The study is quite narrow as they only look at the year 2018 and use data from 87 companies. By conducting regression, the authors find that for SME`s the benefits of higher ESG disclosure does not outweigh the cost and this led to a higher cost of capital.

Ould Daoud Ellili (2020) examine ESG disclosure, ownership structure and cost of capital on the Abu Dhabi Stock Exchange and Dubai financial market from 2010-2019. The author has gathered information on ESG rating from Bloomberg on 30 UAE listed companies. The ESG data show an overall low score both separate on E, S, G and combined ESG with an average lower than 50 for all scores. The study shows an increase in ESG disclosure over the time-period. The empirical results show that increased transparency and reduced information asymmetry through increased ESG disclosure reduces cost of capital as well as the cost of

equity and cost of debt, separately. The authors findings suggest that stockholders and creditors value such non-financial information.

Atan et al. (2018) looks at the impact of ESG in terms of cost of capital, profitability, and firm value on publicly listed companies in Malaysia. They used the Bloomberg database and select 54 companies in the period from 2010-2013, which gives 162 firm-year observations. Authors are aware of the short timeframe. The analysis method used is panel data regression with fixed and random effect. They look at the effects of each of the pillars in ESG and the full ESG score to assess the impacts on the firms. They do not find any statistically significant results from the pillars. They do however find a positive correlation between ESG and WACC.

Research from Wong et al. (2021) looks at the impacts of ESG on a firm's value by analyzing Tobin's Q and capital cost in emerging markets, in this instance Malaysia. The authors use data from the Bloomberg database to find ESG and firm specific data. The sample period is from 2005-2018. Where in 2005 only 2 firms reported ESG which then steadily increased to 80 firms in 2015, from then it was steady around 80 firms with ESG data. Sample ranges from 640-670 firm-year observations. For their analysis the authors use panel regression, with a multivariate framework. Their results show that on average implementing ESG rating reduces cost of capital by 1.2%.

El Ghoul et al. (2011) examines if corporate social responsibility affects the cost of capital for US. firms, by building on the theoretical framework of Merton (1987). The study looks at 12,915 firm-year observations and a total of 2,809 unique firms between 1992 and 2007. The study finds that firms with higher CSR score have a lower cost of equity. More specific they find that investments in employee relations, environmental policies and product strategies lower firms cost of equity while community relations, diversity and human rights does not lower the cost of equity.

Johnson (2020) investigates the link between ESG disclosure and the cost of capital using a panel regression analysis. Johnson (2020) investigates 68 firms from the Johannesburg Stock Exchange over a 8-year period from 2011-2018. The study is looking at six different sectors in South Africa and excludes the two sectors' financials and basic material. The study finds a significant negative relation between ESG disclosure score and the weighted average cost of capital for the consumer goods and consumer service sector. In addition, Johnson (2020) finds

a positive relation between ESG disclosure score for the industrial sector. The author state that equity capital providers seem to see increased ESG disclosure as an increased risk and thereby require an increase in return on capital. Local firms that improved their ESG disclosure seemed to benefit from lower WACC.

Matthiesen and Salzmann (2015) examines the relationship between CSR and the cost of equity, looking at cross country variations and cultural differences. The study looks at 3.439 firms in 42 countries and finds a stronger relationship between CSR and the cost of equity in countries with low assertiveness. By conducting a multi-regression model the authors finds evidence that companies which are more engaged in CSR are awarded with lower cost of equity. In addition, they find that culture differences between countries influences the social preferences of a society.

Nguyen (2020) look at mandatory quotas on firms in France to find a possible linkage between board gender diversity and the cost of equity. The sample consists of 80 French listed firms over the period 2006-2017. Nguyen find empirical results supporting his key arguments of woman directors leading to lower cost of equity for firms. From the regression results the author find an increase in woman on the board of directors to have a significant negative effect on the cost of equity.

### 2.4 Summary

The previous studies we present provide different and, in some cases, contradictory results on the relationship between ESG score and the cost of equity and cost of debt. ESG score is a non-financial measurement widely used in various research topics as a proxy for firms' performance on environmental, social and governance aspects. The majority of the previous studies have used Thomson Reuters or Bloomberg data as their source of information related to this non-financial information on ESG. Studies related to specific governance aspects such as board gender diversity are conducted on a relatively small sample size (Nguyen, 2020). Several studies find ESG to have a negative relationship with cost of capital (El Ghoul et al., 2011; Matthiesen & Salzmann, 2015; Ould Daoud Ellili, 2020), while others find cost of capital to have a positive relationship (Atan et al., 2018; Gjergji et al., 2021; Nazir et al., 2021). The fact that the general results show contradictory empirical outcomes makes it interesting to look at newer data and larger samples. The studies postulate different time frames, samples sizes, ESG providers and different proxies for cost of debt and cost of equity. In Table 1 a schematic overview is presented.

*Table 1: Previous research*

| Authors | Sample | Time frame | Firm-Year obs. | ESG-provider | Model | Relation |
|---|---|---|---|---|---|---|
| Ruth Johnson | 68 firms from Johannesburg stock exchange | 2011-2018 | 478 | Bloomberg | Panel regression | (-) for consumer goods and services<br>(+) for industrial sector |
| S. El Ghoul et al. | 2809 US firms | 1992-2007 | 12,915 | KLD (csr) | Quantitative (multivariate regression analysis) | (-) for cost of capital |
| Nelja Ould Daoud Ellili | 30 UEA financial markets | 2010-2019 | 300 | Bloomberg | Multivariate regression | (-) for cost of capital |
| Wong et al. | 62<br>Malaysia | 2005-2018 | 663 | Bloomberg | Multivariate | (-) for cost of capital |
| Atan et al. | 54<br>Malaysia | 2010-2013 | 162 | Bloomberg | Regression, OLS, fixed effect and random effect | (+) for cost of capital |
| Gjergji et al. | 87<br>AIM Italia | 2018 | 87 | Bloomberg & PMI capital | Regression | (+) for cost of capital |
| Pellegrini et al. | 182 | 2002-2018 | 3,094 | Thomson Reuters | (Easton Model)<br>Fixed effect regression | (-)<br>U-shaped, increase after threshold |
| Sharfman & Fernando | 267<br>S&P 500 firms | 2001' Risk premium from 1872-2000 | 546 | KLD<br>TRI<br>(Investor responsibility research center) | Quantitative regression model | (-) for cost of capital |
| Suto & Takehara | 481 *(2007)*<br>525 *(2012)* | 2008-2013 | 2,680 | Survey by Toyo Keizai inc | Regression | (-) for equity<br>Not significant for debt |
| Dhaliwal et al. | 1093<br>From 31 countries | 1995-2007 | 5,135 | CSR reports from internet-based sources | Pooled regressions | (-) for cost of equity |
| Nazir et al. | 64<br>Global tech leaders | 2010-2017 | 512 | Thomson Reuters | Random effect<br>Two-step GMM regression | (+) for cost of capital, not significant for debt |
| Matthiesen and Salzmann | 3439 Firms in 42 Countries | 2002-2013 | 18,973 | Thomson Reuters | Quantitative (Multi-regression model) | (-) for cost of capital |
| Pascal Nguyen | 80 Firms in France | 2006-2017 | 736 | Thomson Reuters | GMM regression | (-) for cost of equity |

Table 1 presents an overview of previous research. Sample indicates number of firms and country of origin. Time frame indicates the years data is extracted from. Firm year observations indicate the number of observations in the sample. ESG-provider indicates the third party where ESG related information is extracted from. Model presents what method of regression is used. Relation indicates whether the study finds a positive (+) or negative (-) relation with cost of capital.

## 2.5 Hypotheses

The development of our hypothesis is based on our theoretical framework presented and inspired by the previous literature that is presented in literature review.

Our hypotheses are inspired by stakeholder theory and different incentives and resolutions the EU, US and UN have made as a roadmap for the next decades such as: EU green deal, US green deal and UN sustainable development goals (EU, 2019; The White House, 2021; UN, 2015b). They all prefer financial decision making that is sustainable for the planet and the people that work for the company. A measure that is used by an increasing number of managers and investors is ESG rating. Dhaliwal et al. (2014) also shows that companies with better CSR score are more prone to be transparent in their activities. This reduces the information asymmetry in the agency theory. With more transparency the information gap is smaller and perceived risk is also smaller (Cheng et al., 2014). Our research question is: *Does disclosure of ESG performance affect the cost of equity and cost of debt?* To answer this question, we have created five hypotheses that examines aspects of ESG scores has on cost of equity and cost of debt.

Our first hypothesis investigates if there are negative relationship between higher ESG scores and cost of capital. Building on previous research by El Ghoul et al. (2011), Dhaliwal et al. (2014), and Sharfman and Fernando (2008) they all imply that cost of capital will be lower with higher voluntary reporting on non-financial aspects of the company. Many of these studies also use CSR and not ESG as ESG is a much newer term. As Suto and Takehara (2017) describe that increased CSR or social performance reduce the cost of equity. Even in an emerging market as Malaysia Wong et al. (2021) finds that an increased ESG score will reduce the cost of capital. The hypothesis goal is to find a better understanding of the relation of financial and non-financial activities in a company. How ESG reporting will affect cost of equity and cost of debt. Most of the previous research only focus on a part of capital cost. Our thesis seeks to create an understanding of both cost of equity and cost of debt. The dual hypothesis with both cost of equity and cost of debt will provide and understanding of how capital providers value ESG reporting. We will use financial and sustainable theory to help understand the results of the hypothesis.

> **H1a**. *Higher ESG scores have a negative relationship with the cost of equity.*
> **H1b**. *Higher ESG scores have a negative relationship with the cost of debt.*

The second hypothesis is looking into the different pillars in the ESG score, environmental, social and governance. We assume that environment has the most impact on the capital cost,

as the environmental aspect of companies have been increasingly more debated. Ziegler et al. (2007) finds that holding firms with good environmental performance is value increasing. We also look at the results from Sassen et al. (2016) on the ESG pillars, they find that the social pillar reduces risk, and that environmental pillar reduces idiosyncratic risk. These papers make it clear that environmental and social are the most important pillars. It makes sense that the social pillar is high, as what is included in the social pillar has large overlap with CSR. CSR has been an important part of investing in the past, as our theory uses a lot of CSR research. The latest years have had a focus on environment and climate change. Experts and global leaders are signaling that environmental risk is the most concerning problem we are facing in the coming years (WEF, 2022). Many companies are setting ambitious goals to reduce emissions (Apple, 2020; Equinor, 2022). There is a push from many directions to improve environmental score, EU, UN, companies, and the next generation. All stakeholder's inn the company see the risk of climate change and might therefore put extra value on the environmental pillar (UN, 2022b).

**H2a**. *The environmental score has a larger effect on the cost of equity than the social and governance score.*

**H2b**. *The environmental score has a larger effect on the cost of debt than the social and governance score.*

The next three hypothesis looks at how different governance aspects affects the cost of capital. To further expand our knowledge of why previous research do not find any significant results when looking at the governance pillar (Atan et al., 2018; Johnson, 2020). The hypothesis explores three different board factors that might influence how capital providers evaluate the risk of the company. The first one is board size, second is board gender diversity, and the last is CEO duality.

The third hypothesis looks at the relationship between board size and the capital cost is based on the study by Anderson et al. (2004). In the study they find that a board with more members and increased board independence reduce the cost of debt. Chen et al. (2009) finds that better corporate governance leads to lower cost of equity. This also aligns with ESG reporting that governance should be transparent and boards independent. The studies show that good governance leads to lower cost of capital and aligns with other theory such as stakeholder and trade-off theory. A larger board will open the board to more stakeholders and reduce information asymmetry. This might also then increase the focus on ESG as independent board members have different views on shareholder value.

**H3a** *There is a negative relationship between board size and the cost of equity of firms.*
**H3b**. *There is a negative relationship between board size and the cost of debt of firms.*

The fourth hypothesis investigates how diverse gender representation in the board impacts the cost of capital. Qureshi et al. (2020) did a study on how female members in the board would impact firm value. They find that females on the board increase the firm value, this should then translate to a reduce cost of capital. Tingbani et al. (2020) finds that with increased number of female board members increases non-financial reporting, which loops back to hypothesis 1 of how ESG reporting will reduce cost of capital. Nguyen (2020) also find that with greater board gender diversity the cost of equity is lower. Theory shows that having female board members has a positive financial and non-financial impact (Qureshi et al., 2020; Tingbani et al., 2020) on a limited scale. The hypothesis seeks to find the same results on data that covers the world over a longer time period.

**H4a**. *There is a negative relationship between board gender diversity and the cost of equity of firms.*
**H4b**. *There is a negative relationship between board gender diversity and the cost of debt of firms.*

The fifth hypothesis investigates the potential moderating effect of ESG score on the cost of capital when the CEO is also the chairman of the board. Research by Berger et al. (1997) and Wen et al. (2002) finds that governance factors such as CEO duality influences the cost of capital. Abor (2007) shows that having a CEO serving as chairman can increase the information asymmetry, this increases the cost of external debt. Ali et al. (2019) explores the relationship between CEO duality and cost of equity, their findings are insignificant. Other theory suggest that CEO duality should have some effects on financial numbers. This last hypothesis looks at how CEO duality will moderate the effect of ESG reporting and its effect on cost of capital.

**H5a**. *Does CEO duality moderate the effect of ESG disclosure on the cost of equity.*
**H5b**. *Does CEO duality moderate the effect of ESG disclosure on the cost of debt.*

In table 2 we present a synthesis of theory and previous studies which include the results we expect to discover.

*Table 2: Synthesis of theory*

| Explanatory variable | Relationship of explanatory variables on dependent variable | |
|---|---|---|
| | COE | COD |
| | Expected | Expected |
| ESG | Negative | Negative |
| E | Negative | Negative |
| S | Negative | Negative |
| G | Negative | Negative |
| BDS | Negative | Negative |
| BGD | Negative | Negative |
| ESG*Duality | Positive | Positive |

# 3. Data

In this section we elaborate on the approach in collecting the data and we describe the calculation of our variables.

## 3.1 Data collection

Our data is unbalanced panel data, we have a total of 3,511 companies with observations from 2005-2020, from 70 different countries. Our data amounts to 56,176 firm-year observations. Since our data is unbalanced, each model will have fewer observations than our total firm-year observations. We will state how many observations there are in each model used.

### 3.1.1 Thomson Reuters

To gather data, we used Thomson Reuters Eikon. Thomson Reuters Eikon is the most extensive database our university has access to. This database is widely used by investors, analyst, and researchers. The data stream provides both financial and non-financial reporting on publicly listed companies worldwide. For their analysis on ESG they have over 450 measuring techniques. Annual report, company websites, NGO websites, stock exchange filings, CSR reports and news sources are all being used to create the ESG database (Refinitiv, 2021). The database has data on 67 000+ public companies across the world. All company level data used in this thesis is retrieved from the Thomson Reuters Eikon database.

For our data we filtered by companies that have reported ESG data every year from 2015-2020. As the ESG data is only reported every fiscal year, this limits our data, and we only have one observation per year. Data from 2021 was severely limited at the time when data was collected from the Eikon data stream and is therefore not include. Most of our company datapoints were collected once a year in the fiscal year which is the financial year of the company. Some of the data is collected as end of year per 31/12 since fiscal year was not a

possibility. These are datapoints where share price is needed for the calculation, such as Price close, PE, EPS & BVPS. We include data all the way back to 2005 on all our datapoints.

### 3.1.2 Capital cost

Our dependent variable is cost of equity and cost of debt. These are proxies that are made from data from Eikon. The calculations can be found in the variables table in section 3.3.

### 3.1.3 Countries

Our inclusion criteria for companies are that they have reported ESG data in the last 5 years. This provides us with data for companies from 70 countries. 29.17% of the companies in our dataset is from the US. Other countries that are well represented in the data are Japan (9,4%), UK (6,8%), Australia (5,4%), Canada (5,2%), China (3,5%). France, Germany, Hong Kong, India, Korea, South Africa & Taiwan each have around 2% of the total observations. (See appendix 1 for further country information)

## 3.2 ESG proxy

Our proxy for ESG is ESG score collected from the Thomson Reuters data stream called Asset4. As demand for ESG disclosure increases among investors several agencies are now offering third party ratings of ESG performance on firms all over the world (Berg et al., 2019). The six largest providers of ESG ratings which includes KLD, Sustainalytics, Moody's ESG, S&P Global, Thomson Reuters (Asset4) and MSCI are all assessed by Berg et al. (2019) as they find divergence between the agencies. The data set from Berg et al. (2019) finds a correlation on ESG score between 0.38 to 0.71 based on these six agencies. This large discrepancy makes it difficult to evaluate the performance on ESG from each company. Further on, this might also reduce the incentives from companies to invest in further actions to improve their ESG performance (Berg et al., 2019). Berg et al. (2019) identify three sources of divergence, namely scope, measurement, and weights divergence. For our study we have chosen to use data from the Thomson Reuters database as this is what our school are able to provide. Thomson Reuters database collect publicly available information to preserve objectivity and have more than 150 content research analysts trained to collect ESG data (Refinitiv, 2021). The database has ESG data on over 9,000 companies globally and their coverage provide us with the same standards of ESG score on all companies in order to connect this towards our research on capital structure (Refinitiv, 2021). Douglas et al. (2017) also found that Thomson Reuters database consist of more indicators than other agencies which gives them better coverage of sustainability for firms.

The ESG data included is all collected from the Eikon Screener App (Refinitiv, 2022), an application in Thomson Reuters database. The ESG score from the Screener App is gathered from self-reported information from the companies on environmental, social and governance compliance. Environmental pillar measures the effect the companies' activities have on the environment, accounting for living and non-living ecosystems, air, land, and water. This pillar score also checks if company is aligned with best practices for avoiding environmental catastrophe and do not capitalize on environmental opportunities to generate shareholder value. Social pillar measures the company's ability to create trust and loyalty with its customers, workforce and society through best practices. Governance pillar measures the companies' system that ensures that its board and executives act in the best interest of long-term shareholders. In addition, it reflects its ability to use best practices to manage and control the companies' rights and responsibilities (Refinitiv, 2022). ESG data measurements from the Thomson Reuters database and what they contain are summarized in table 3.

*Table 3: ESG scoring (Refinitiv, 2021)*

| ESGC score | | | |
|---|---|---|---|
| ESG score | | | ESG controversies score |
| Environmental | Social | Governance | ESG controversy |
| Resource use<br>Emissions<br>Innovation | Workforce<br>Human rights<br>Community<br>Product responsibility | Management<br>Shareholders<br>Corporate social responsibility strategy | Controversies across all ten categories are aggregated in one category score |

## 3.3 Variables

Table 4 summarizes the dependent, independent, explanatory and control variables along with their measurement proxies.

*Table 4: Definition of variables*

| Model name | Variable name | Variable level | Proxy |
|---|---|---|---|
| Dependent | Cost of Equity | COE | Gross common dividends/ (Assets – Liabilities) |
| | Cost of Debt | COD | Interest expense/total debt |
| Explanatory | ESG Score | ESG | Thomson Reuters |
| | Environmental pillar | E | Thomson Reuters |
| | Social pillar | S | Thomson Reuters |
| | Governance pillar | G | Thomson Reuters |
| | Board gender diversity | BGD | Percentage of female board members |
| | ESG*CEO duality | ESG*Duality | ESG times CEO duality where duality is a dummy variable "1" if CEO is also chairman of the board, "0" if otherwise |
| | Board size | BDS | Natural logarithm of total number of board members |
| Control | Firm size | SIZE | Natural logarithm of total assets |
| | Market-to-book | MTB | (Book value of total assets –book value of equity + market value of equity)/book value of total assets |
| | Leverage | LEV | Total debt/total assets |

### 3.3.1 The dependent variable

In this study the dependent variable is the cost of capital (COC). Further on, we have divided the COC into the cost of debt ($K_d$) and cost of equity ($K_e$) making our study a lot more extensive, but at the same time yielding us interesting results about how equity investors and debt holders differently penalize or award companies focusing on ESG related aspects. This provides us with a more in depth understanding of our results. In portfolio selection Reverte (2012) describes the cost of equity capital as the rate of return an investor demand in order to keep the underlying investment in the portfolio. The cost of equity is a parameter which is difficult to measure as it is not possible to observe it directly. This have led to authors using different proxies to measure this parameter. A recent study from Wong et al. (2021) used the CAPM to compute the cost of equity. A different study by Raimo et al. (2020) used the PEG ratio method developed by Milton Easton (2004), to calculate the cost of equity capital. The PEG ratio has considerable bias as analyst forecasts are incorporated in this approach (Easton, 2004). Prior to these studies Atan et al. (2018) used a different approach by selecting data from the Bloomberg database to find the weighted average cost of capital which also includes the cost of equity within it. Due to the database provided by our school which limits our access to some datapoints and the considerable bias of other approaches, a slightly adjusted approach will be conducted for the cost of equity calculation.

In the case of calculating the cost of debt there are fewer approaches by former authors as this parameter is less difficult to measure. A recent study conducted by Maaloul et al. (2021) used the Bloomberg calculation method to compute the cost of debt (Bloomberg, 2013). Several other studies have used the accounting measure by calculating the cost of debt as the ratio of a firm's interest expense divided on the average debt of the firm (Eliwa et al., 2021; Francis et al., 2005; Gray et al., 2009). In this study we will use the accounting measure as Orlitzky et al. (2003) found that the performance of ESG is less correlated with market-based measures than accounting-based measures. We follow Gray et al. (2009) and Eliwa et al. (2021) and extract the accounting-based data from Thomson Reuters for the cost of debt ($K_d$) as follows:

$$K_d = \frac{Interest\ expense}{total\ debt}$$

We follow Botosan (1997), Botosan and Plumlee (2002) and Gebhardt et al. (2001), and obtain estimates of the cost of equity capital using an accounting-based valuation model developed in Feltham and Ohlson (1995) and Ohlson (1995). Our empirical implementation

of the model is an innovative ex-post variant of the method employed by Gebhardt et al. (2001). For the ex-post calculation of the cost of equity ($K_e$), the accounting data is extracted from the Thomson Reuters database.

$$K_e = \frac{Gross\ common\ dividend}{(assets - liabilities)}$$

### 3.4 R-squared

R-squared is a measure of variance, meaning how much of the variance to the dependent variable is measured by the independent variable (Stock & Watson, 2020, p. 154). R-squared is a number between 0 and 1, as more independent variables are added to the model the R-squared number increases regardless of the relevance of the independent variable in connection with the dependent variable. To deal with this issue and truly understand the explanatory power of a certain model it is common to look at the adjusted R-squared (Stock & Watson, 2020, p. 223). The adjusted R-squared is a goodness-of-fit measure that penalize additional independent variables in a model by adjusting the degrees of freedom when estimating the error variance (Wooldridge, 2016, p. 567).

### 3.5 Coefficients

In addition to interpreting the R-squared of a model, coefficients are commonly used to interpret to what degree an independent variable affect the dependent variable in a regression model (Stock & Watson, 2020, p. 218). The coefficients of a regression can be defined as the change in the dependent variable, Y, when the independent variable, X, increases or decreases by one unit. The sign on the variable tells us to what effect X has on Y, either positive or negative. Coefficients size, sign and significance level help us interpret the models (Wooldridge, 2016, p. 121).

## 4. Methodology

In this chapter, we will present the methodology for our models. Further on, we will elaborate around the statistical tests and robustness tests which will be conducted to ensure as valid and trustworthy results as possible.

### 4.1 Models

Our models containing cost of equity and cost of debt will be presented separately in this subchapter.

### 4.1.1 COE model 1

In our analysis we start out with a base model consisting of our dependent variable cost of equity and then a set of control variables. We use this model as a starting point to find the affect from these financial variables on the cost of equity. The model equation is as follows:

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \varepsilon_{i,t} \text{ (e1)}$$

Cost of equity, $COE_{i,t}$, of company *i* at year *t* is the dependent variable in all COE models. The three independent variables in COE model 1 is the natural logarithm of the assets (SIZE) of company *i* at year-end *t*, leverage (LEV) of company *i* at year-end *t*, and market to book ratio (MTB) of company *i* at year-end *t*. The unobserved factor ($\varepsilon_{i,t}$) of company *i* at year-end *t* accounts for the variation in the dependent variable that the independent variable does not explain (Stock & Watson, 2020, p. 145).

Further on, we isolate each independent variable by constructing models containing only one independent variable at the time to see the individual effect on cost of equity, this approach is also followed in the later models as it is useful when we start to integrate non-financial variables into the models to see the effect on cost of equity.

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \varepsilon_{i,t} \text{ (e1.1)}$$

$$COE_{i,t} = \beta_0 + \beta_1 LEV_{i,t} + \varepsilon_{i,t} \text{ (e1.2)}$$

$$COE_{i,t} = \beta_0 + \beta_1 MTB_{i,t} + \varepsilon_{i,t} \text{ (e1.3)}$$

### 4.1.2 COE model 2

We extend our model by adding ESG score as a variable to see the influence on cost of equity.

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 ESG_{i,t} + \varepsilon_{i,t} \text{ (e2)}$$

In COE model 2 ESG is added on into the baseline COE model 1. Where ESG score is the variable for company *i* at year-end *t*. The ESG score variable is a non-financial variable which is believed to be relevant for a company's cost of equity. Previous research has been inconsistent, showing ESG to both have a positive as well as negative effect on cost of equity (Dahiya & Singh, 2020; Dhaliwal et al., 2014). From hypothesis 1a the expected outcome based on the theoretical framework is that the coefficient $\beta_4$ (ESG) will be significant and have a negative relationship with the cost of equity. This outcome will support our hypothesis as well as the stakeholder theory. In addition, the individual effect of the three pillars of ESG for each company is added to find the individual pillar effect on the cost of equity.

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 E_{i,t} + \varepsilon_{i,t} \text{ (e2.1)}$$

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 S_{i,t} + \varepsilon_{i,t} \text{ (e2.2)}$$

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 G_{i,t} + \varepsilon_{i,t} \text{ (e2.3)}$$

### 4.1.3 COE model 3

We extend our model by separately including three more explanatory variables namely, board size (BDS), board gender diversity (BGD) and duality interaction term. The duality interaction term is divided into ESG*DUALITY, E*DUALITY, S*DUALITY and G*DUALITY. The extension is building on our base model with the purpose of looking at how any of the new variables may affect the cost of equity.

Board size:

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 ESG_{i,t} + \beta_5 BDS_{i,t} + \varepsilon_{i,t} \text{ (e3.1)}$$

Board gender diversity:

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 ESG_{i,t} + \beta_5 BGD_{i,t} + \varepsilon_{i,t} \text{ (e3.2)}$$

Duality interaction:

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 ESG_{i,t} + \beta_5 ESG_{i,t} \cdot DUALITY_i + \varepsilon_{i,t}$$
(e3.3)

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 E_{i,t} + \beta_5 E_{i,t} \cdot DUALITY_i + \varepsilon_{i,t}$$
(e.3.3.1)

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 S_{i,t} + \beta_5 S_{i,t} \cdot DUALITY_i + \varepsilon_{i,t}$$
(e3.3.2)

$$COE_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 G_{i,t} + \beta_5 G_{i,t} \cdot DUALITY_i + \varepsilon_{i,t}$$
(e3.3.1)

### 4.2.1 COD model 1

The same approach as used in COE model 1 is used to construct COD model 1 as a baseline model. The independent variable is cost of debt and the same control variables as previously are implemented into the model to generate equation d1.

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \varepsilon_{i,t} \text{(d 1)}$$

For cost of debt, we find it just as useful to isolate each independent variable to see the individual effect on cost of debt as shown in equation d1.1-d1.3.

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \varepsilon_{i,t} \text{ (d1.1)}$$

$$COD_{i,t} = \beta_0 + \beta_1 LEV_{i,t} + \varepsilon_{i,t} \text{ (d1.2)}$$

$$COD_{i,t} = \beta_0 + \beta_1 MTB_{i,t} + \varepsilon_{i,t} \text{ (d1.3)}$$

### 4.2.2 COD model 2

To investigate hypothesis 1b, ESG score is included to the model equation in (d2) to see the potential effect on cost of debt.

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 ESG_{i,t} + \varepsilon_{i,t} \text{ (d2)}$$

In COD model 2 we expect that the coefficient for ESG score will be significant and have a negative relationship with cost of debt, which would support our hypothesis 1b and the stakeholder theory.

Same approach of including the individual effects by implementing the three pillar scores are conducted as shown in equation d2.1-d2.3.

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 E_{i,t} + \varepsilon_{i,t} \text{ (d2.1)}$$

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 S_{i,t} + \varepsilon_{i,t} \text{ (d2.2)}$$

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 G_{i,t} + \varepsilon_{i,t} \text{ (d2.3)}$$

### 4.2.3 COD model 3

We conduct the same approach for COD model 3 as in COE model 3 in order to find a possible connection between how debtholders value different governance aspects by looking at board size, board gender diversity and interaction term with CEO duality leading to the following equations:

Board size:

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 ESG_{i,t} + \beta_5 BDS_{i,t} + \varepsilon_{i,t} \text{ (d3.1)}$$

Board gender diversity:

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 ESG_{i,t} + \beta_5 BGD_{i,t} + \varepsilon_{i,t} \text{ (d3.2)}$$

Duality interaction:

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 ESG_{i,t} + \beta_5 ESG_{i,t} \cdot DUALITY_i + \varepsilon_{i,t} \text{ (d3.3)}$$

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 E_{i,t} + \beta_5 E_{i,t} \cdot DUALITY_i + \varepsilon_{i,t} \text{ (d3.3.1)}$$

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 S_{i,t} + \beta_5 S_{i,t} \cdot DUALITY_i + \varepsilon_{i,t} \text{ (d3.3.2)}$$

$$COD_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEV_{i,t} + \beta_3 MTB_{i,t} + \beta_4 G_{i,t} + \beta_5 G_{i,t} \cdot DUALITY_i + \varepsilon_{i,t} \text{ (d3.3.3)}$$

### 4.2 Panel data

Panel data which is often referred to as longitudinal data is consisting of multiple entities/observations which is being observed for two or more periods of time (Stock & Watson, 2020, p. 52). Our dataset from the Thomson Reuters Eikon regarding the relationship between ESG score and the cost of capital is an example of a panel dataset. In this panel dataset the number of observations fluctuates as we are using an unbalanced dataset.
The number of observations is denoted "*n*" and the number of time periods are denoted "*t*". In this dataset there is 3,511 observations denoted "*i*" and 16 time periods "*t*" for a theoretical maximum of 56,176 observations. Our final sample is an unbalanced dataset that consist of 53,831 firm-year observations with a time dimension of 2005-2020 and a cross section dimension of 3,511 different firms. Panel data is a dataset consisting of both time series data and cross-sectional data. Panel data is a good tool to analyze economic contexts, in particular when there are several different observations for several time periods (Stock & Watson, 2020, p. 53). Some of the advantages of using panel data are more control over omitted variables, more observations, and the possibility to tackle more complex problems compared to using only time-series or cross-sectional data (Brooks, 2014, p. 527).

### 4.3 Robustness test

To verify the robustness of the analysis, we perform several variations and modifications to the baseline model to ensure that the model statistics and conclusions are valid. After running the panel regression, a Hausman test is performed to see whether a random or fixed effect model is best suited for our data (Wooldridge, 2016, p. 399). The results from the test show that a fixed effect model is best suited for our data. We include fixed effects as a robustness test in our panel data regression analysis as this lets us control for company fixed effects (Brooks, 2014, p. 533).

## 5. Results and discussion

In this chapter we will analyze the data and present our results and discussions. The dataset will be properly prepared for further analysis by cleaning data and running several tests in STATA. Then we will present the descriptive statistics and correlation matrix, before we discuss handling of potential multicollinearity and heteroskedasticity. In section 5.3 and onwards we present our results, while we analyze and discuss the findings according to previous research and theory in order to answer our hypotheses. Lastly, we will conduct robustness tests to ensure and investigate that our models are reliable and valid.

## 5.1 Data cleaning

To strengthen the reliability and make our analysis more accurate we have chosen publicly listed firms which have reported data on ESG for the last 5 years (2020-2015). For companies meeting these criteria we include data on all variables from 2005-2020. We have unbalanced data which contains missing values on certain variables for certain years. We follow the reasoning of Fama and French (1992) by excluding all financial firms from our analysis as financial firms have different access to debt and a normal leverage much higher than other sectors making their financial data less comparable to the other sectors. In addition, we drop data from reported sales revenue containing negative numbers, the same is done for negative numbers on cost of equity and cost of debt (Dhaliwal et al., 2006). All data are denominated in US dollars to ease the comparability of the results.

To deal with outliers we use a couple of different approaches, for cost of equity and cost of debt we decided to remove all negative observations (Dhaliwal et al., 2006) as discussed earlier. Then we also decided to drop all observations that reported higher than 0,5 (50%) cost of equity or cost of debt. This means we drop 1043 observations for COE and 776 for COD. From Botosan (1997) we find it reasonable to limit cost of equity estimates at 50% as it covers 99% of the observations in her study, the same is observed for our data. This makes sure we deal with our extreme outliers. The same is also true for cost of debt, where in Van Binsbergen et al. (2010) they have cost of debt observations at 40,98% at 99% of observations. Then we use winsorizing as (Caragnano et al., 2020; Eliwa et al., 2021; Oikonomou et al., 2014) did. Winsorizing replaces extreme values with values closer to the mean value (Vinzi et al., 2010). We did this for our leverage and market-to-book variable. We did this at a 5% winsorize, as we had several large observations that made the right tail long. This changed our skewness and kurtosis for the variables. For leverage, skewness went from 19,297 to 0,233 and kurtosis from 1290,52 to 2,152. As for market-to-book skewness went from 207,01 to 1,432 and kurtosis from 44780,47 to 4,283.

Finally, our sample consist of an unbalanced panel dataset containing 53,831 firm-year observations with a time dimension of 2005–2020 and a cross-section dimension of 3,511 different firms for which we use the fixed effects technique of panel data analysis.

## 5.2 Descriptive statistics and correlation matrix

In table 5 the descriptive statistics of the number of observations, mean, median, standard deviation, minimum value, maximum value, skewness, and kurtosis from the dependent and

independent variables are presented. From the number of observations, we see the variations in observations from the unbalanced data ranging from 37,995 to 53,831 observations.

*Table 5: Descriptive statistics*

| | OBS | Mean | Median | STD | Min | Max | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|---|
| COE | 37995 | .07 | .049 | .07 | 0 | .5 | 2.434 | 10.545 |
| COD | 45139 | .05 | .042 | .045 | 0 | .5 | 3.943 | 27.799 |
| ESG | 41393 | 47 | 47.004 | 20.428 | .359 | 95.154 | .033 | 2.123 |
| E | 41388 | 42.011 | 42.278 | 27.695 | 0 | 99.12 | .057 | 1.822 |
| S | 41388 | 46.814 | 45.767 | 23.953 | .053 | 98.628 | .101 | 2.04 |
| G | 41393 | 51.873 | 52.825 | 22.123 | .199 | 99.246 | -.131 | 2.123 |
| SIZE | 53831 | 22.028 | 22.057 | 1.646 | 2.832 | 27.859 | -.41 | 4.963 |
| LEV | 53831 | .253 | .246 | .168 | 0 | .581 | .233 | 2.152 |
| MTB | 53831 | 1.69 | 1.379 | .905 | .744 | 4.185 | 1.432 | 4.283 |
| BDS | 41206 | 2.28 | 2.303 | .331 | .693 | 3.784 | -.216 | 3.886 |
| BGD | 40944 | 14.505 | 12.5 | 12.977 | 0 | 100 | .718 | 3.058 |
| DUALITY | 41401 | .38 | 0 | .485 | 0 | 1 | .494 | 1.245 |

Table 5 presents the descriptive statistics of all variables. There are different number of observations for different variables as an unbalanced dataset is used.

Skewness measures the lack of symmetry of a distribution and zero skewness represents a normal distribution (Stock & Watson, 2020, p. 63). Both our dependent variables COE and COD are positively skewed with a skewness of 2.43 and 3.94. This means that the tail of the distribution is stretched towards the right-hand side and the datapoints are grouped on the left-hand side. This is reasonable as most large, listed companies will have both a cost of equity and a cost of debt fairly in the same range creating several datapoints in the same area. Then there will be some smaller companies and companies' investors, or banks will consider riskier and therefore will have a risk premium leading to a higher cost of equity and cost of debt creating the datapoints observed towards the right-hand side of the distribution. From the dummy variable DUALITY in table 5 we find that 38% of the 41401 firm-year observations are observations where the CEO is also the chairman of the board.

Kurtosis measure the mass in tails of the distribution, meaning how much of the variance in Y comes from extreme values, also called outliers. A normally distributed random variable will have a kurtosis of 3, and a random variable which exceeds 3 will have more mass in the tails and likewise a kurtosis of less than 3 will have less mass in tails (Stock & Watson, 2020, p. 64). A normal distribution is symmetric around its mean (Stock & Watson, 2020, p. 75). Both dependent variables in this analysis have what is called a leptokurtic distribution, meaning the distribution is heavy tailed and is more peaked at the mean than normally distributed random variables with a kurtosis of 10.5 for COE and 27.8 for COD. Leptokurtic distribution is likely to characterize economic time series (Brooks, 2014, p. 67). E, S, G, ESG, BGD, BDS and DUALITY indicates a platykurtic distribution as all values are below 3, meaning they are less peaked at the mean, more of the distribution is in the “shoulders” and the tails are thinner

compared to a normal distribution (Brooks, 2014, pp. 66-67). When the tails are thinner there are fewer extreme positive or negative events and with fatter tails there are more extreme positive or negative events in comparison to a normal distribution.

*Table 6: Pairwise correlation*

| Variables | COE | COD | ESG | E | S | G | SIZE | LEV | MTB | BDS | BGD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COE | 1.000 | | | | | | | | | | |
| COD | 0.099* | 1.000 | | | | | | | | | |
| ESG | 0.063* | -0.087* | 1.000 | | | | | | | | |
| E | 0.001 | -0.124* | 0.863* | 1.000 | | | | | | | |
| S | 0.101* | -0.048* | 0.897* | 0.720* | 1.000 | | | | | | |
| G | 0.045* | -0.031* | 0.647* | 0.359* | 0.397* | 1.000 | | | | | |
| SIZE | -0.142* | -0.245* | 0.450* | 0.468* | 0.387* | 0.239* | 1.000 | | | | |
| LEV | 0.058* | -0.171* | 0.076* | 0.069* | 0.085* | 0.034* | 0.265* | 1.000 | | | |
| MTB | 0.428* | 0.060* | -0.015* | -0.097* | 0.035* | -0.009 | -0.249* | -0.213* | 1.000 | | |
| BDS | -0.069* | -0.112* | 0.247* | 0.297* | 0.218* | 0.054* | 0.476* | 0.098* | -0.090* | 1.000 | |
| BGD | 0.172* | 0.019* | 0.327* | 0.217* | 0.330* | 0.251* | 0.049* | 0.070* | 0.092* | 0.020* | 1.000 |

The table presents the results of pairwise correlation between the two dependent variables, explanatory, and control variables. COE is gross common dividend to assets minus liabilities. COD is interest expense to total debt. ESG, E, S, G is the pillar scores retrieved from Thomson Reuters. SIZE is the natural logarithm of total assets. LEV is total debt to total assets. MTB is book value of total assets minus book value of equity plus market value of equity to book value of total assets. BDS is the natural logarithm of total number of board members. BGD is percentage of females on the board.

** p<0.05,*

Table 6 presents the pairwise correlation matrix of our data. A correlation coefficient is a number between the value of 1 and –1. A correlation of 1 indicates a perfect correlation between two variables and a correlation of –1 would indicate a perfect negative correlation (Brooks, 2014, p. 69). We find all variables to be significant at the 5% level, except from MTB with governance score and environmental score with cost of equity, which all have a non-significant coefficient. In cost of equity, we find negative correlations with SIZE and BDS. For cost of debt, we find negative correlations with ESG, E, S, G, SIZE, LEV, and BDS.

### 5.2.1 Multicollinearity

Multicollinearity occurs when there is little variation to estimate the slope coefficient, this is due to the high correlation between the explanatory variables (Wooldridge, 2016, p. 84). This will impact the standard errors and may give non-significant T-test. With multicollinearity small changes in the model can bring big consequences to the slope coefficient (Tufte, 2020). This is because the explanatory variables are correlated to each other (Brooks, 2014, p. 217). To test for multicollinearity, we look for signs of high uncertainty and large standard errors (Tufte, 2020). The better test is the VIF (variation inflation factor), the test tells what the variation of the estimate is affected by the correlation between one and other explanatory variables (Wooldridge, 2016, p. 86). The rule of thumb for VIF test are that values higher than 10 means there is an issue with multicollinearity (Tufte, 2020; Wooldridge, 2016). The test

for both models show that our VIF results are less than 10, also the more conservative estimate of VIF result by 5 (Tufte, 2020) show that we do not have any issues with multicollinearity.

### 5.2.2 Heteroskedasticity

If the variance of the conditional distribution is constant then the error term in the model is homoscedastic, otherwise it is heteroskedastic (Stock & Watson, 2020, p. 188). To reveal any potential heteroskedasticity we perform both White`s test and Breusch-Pagan in combination with plotting the estimated residuals against one of the explanatory variables. In both scatterplots there is no pattern to be recognized that would indicate that the error terms are homoscedastic for COE or COD model. The results from White`s test and Breusch-Pagan test in STATA gives a clear indication that we should reject the null hypothesis of constant variance and homoscedasticity. Test results in combination with the graphical method of looking at scatterplots, all indicate that both models suffer from heteroskedasticity in the data. After acknowledging that our data is suffering from heteroscedasticity, we apply an approach developed in econometrics by White (1980) and the early work of Eicker (1967) and Huber (1967) (Wooldridge, 2016, p. 215) As the sample size is large, we apply heteroskedasticity-robust standard errors. This approach is being followed more and more in applied work when the sample size is large (Wooldridge, 2016, p. 217). Throughout our analysis we will employ heteroskedasticity-robust standard errors unless explicitly stated otherwise.

## 5.3 Effect on the cost of capital

In this section results from both our analysis with COE and COD are presented separately to get a deeper insight on the individual effect ESG and governance aspects has on COE and COD. The models presented are in line with previously developed hypotheses in order to answer the research question and discuss the results of how ESG score affect the cost of equity and cost of debt.

### 5.3.1 COE model 1

In COE model 1 (1 – 7) shown in table 7 we present the results from the regression on the base model containing cost of equity as our dependent variable and including a set of control variables, size, leverage, and market-to-book. Table 7 represent the base model for cost of equity which will be used further on in the thesis as a foundation when we start implementing additional independent variables. In table 7 $\beta 1$, $\beta 2$ and $\beta 3$ are all statistically significant at the 1% level in model (1). The coefficient of SIZE has a value of –0.00754. Since the size

variable is log transformed, we divide it by 100 which implies that a 1% increase in the size of the firm leads to on average a decrease in cost of equity of 0.0000754%. Larger firm size is often related to a more well-established firm, there might be several income sources and a larger investor base, generating a more liquid stock to trade. All these possibilities are positive signals for an equity investor and would imply less risk, leading to a lower rate of return demanded by equity investors (Kurshev & Strebulaev, 2015). This result is also visible in this study as size of a firm provides a lower cost of equity. Leverage has a coefficient of 0.0618 and market-to-book has a coefficient of 0.0238 which implies that the cost of equity increases with 0.0618% for every 1% increase in leverage and cost of equity increase with 0.0238% for every 1% increase in market-to-book ratio. For equity investors more leverage means more debt and thus more risk involved if the company should do poorly. As equity investors are the first to lose their money if the company will not perform well and comply with the debt obligation, equity investors will see an increase in leverage as an increase in risk (Lev, 1974). Market-to-book would indicate how the current market value is evaluated compared to the book value of the firm. As the market value increases more than the book value the potential downside risk for equity investors increase as the company might be overvalued (Jensen, 2005). The results from both LEV and MTB indicates the same result as the relation with COE is positive for both variables, indicating that equity investors demand greater return as leverage or market-to-book increases in a firm. The explanatory factor for SIZE, LEV and MTB is 0.0931. This indicates that 9.31% of the variation in cost of equity comes from the variables SIZE, LEV, and MTB.

*Table 7: COE model 1*

| | 1 (Base model) | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| SIZE | -0.00754*** | -0.00959*** | | | -0.0114*** | -0.00526*** | |
| | (0.000952) | (0.001000) | | | (0.00104) | (0.000923) | |
| LEV | 0.0618*** | | 0.0278*** | | 0.0446*** | | 0.0516*** |
| | (0.00684) | | (0.00712) | | (0.00722) | | (0.00677) |
| MTB | 0.0238*** | | | 0.0236*** | | 0.0228*** | 0.0248*** |
| | (0.00100) | | | (0.000997) | | (0.000989) | (0.00103) |
| _cons | 0.183*** | 0.284*** | 0.0631*** | 0.0301*** | 0.313*** | 0.149*** | 0.0153*** |
| | (0.0211) | (0.0223) | (0.00176) | (0.00168) | (0.0229) | (0.0208) | (0.00275) |
| Obs | 37995 | 37995 | 37995 | 37995 | 37995 | 37995 | 37995 |
| F Stat | 207.2*** | 92.03*** | 15.21*** | 562.6*** | 65.27*** | 292.0*** | 292.6*** |
| RMSE | 0.0382 | 0.0399 | 0.0401 | 0.0385 | 0.0398 | 0.0385 | 0.0384 |
| R2 | 0.0931 | 0.0113 | 0.00256 | 0.0780 | 0.0175 | 0.0813 | 0.0866 |
| Adj. R2 | 0.0930 | 0.0112 | 0.00253 | 0.0780 | 0.0174 | 0.0812 | 0.0866 |

Standard errors reported as robust standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

### 5.3.2 COE model 2

In COE model 2 we are seeking answers regarding hypothesis 1a: *Higher ESG scores have a negative relationship with the cost of equity.* This hypothesis is connected to the results presented in table 8. After including the ESG variable in table 8 model (1) the explanatory factor increases to 0.0957. Regression coefficients for all four variables are significant at 1% level. Lev, MTB and ESG have positive coefficients, while SIZE has a negative coefficient of –0.00913. From model (1) we find the variable ESG to be positive and significant with a coefficient of 0.000193 which do not support our hypothesis 1a. Our empirical results indicate that ESG does not have a negative association with cost of equity, rather it has a positive relationship. In line with what we would expect from shareholder theory, but opposite of what we would expect from stakeholder theory that incorporate ESG measures. The empirical results indicate that equity investors penalize firms disclosing higher ESG score by demanding a higher rate of return on their invested equity. This is in line with previous research conducted by Dahiya and Singh (2020) and Johnson (2020). Older research findings from our empirical results show the opposite result from research conducted by El Ghoul et al. (2011) for American firms only and Dhaliwal et al. (2014). This might indicate that there has been a change in behavior form equity providers during the last couple of years.

Hypothesis 2a: *The environmental score has a larger effect on the cost of equity than the social and governance score,* is also discussed based on results from table 8. The results show that environmental score and social score in model (2) and (3) have positive coefficients and are statistically significant at the 1% level, with coefficients of 0.000160 and 0.000150. Governance on the other hand is not significant in model (4) with a coefficient of 0.0000367. This support our Hypothesis 2a that the environmental score has a larger effect on cost of equity than social or governance. Cost of equity increases the most when the environmental pillar score increases in comparison to an increase in the other pillar scores. The empirical results show that equity investors find governance in firms to be irrelevant. Based on our expected outcome from the theoretical framework we surprisingly discover in our empirical results that equity investors penalize increased environmental score the most. Equity investors penalize firms investing and improving their environmental score more than they penalize firms investing in improving their social score through demanding a higher rate of return on their equity investments. In line with Johnson (2020), this could indicate that equity investors especially find investments in the environmental aspect to be considered as an increase in risk and thus demand a compensation. This short-term thinking from capital provides do not properly value the cost of climate change and the increased risk that follows (Financial protection Forum, 2015).

*Table 8: COE model 2*

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| ESG | 0.000193*** | | | |
| | (0.0000336) | | | |
| E | | 0.000160*** | | |
| | | (0.0000245) | | |
| S | | | 0.000150*** | |
| | | | (0.0000279) | |
| G | | | | 0.0000367 |
| | | | | (0.0000238) |
| SIZE | -0.00913*** | -0.00952*** | -0.00864*** | -0.00633*** |
| | (0.00146) | (0.00147) | (0.00143) | (0.00133) |
| LEV | 0.0755*** | 0.0758*** | 0.0756*** | 0.0753*** |
| | (0.00843) | (0.00846) | (0.00846) | (0.00847) |
| MTB | 0.0258*** | 0.0260*** | 0.0258*** | 0.0259*** |
| | (0.00125) | (0.00124) | (0.00125) | (0.00125) |
| _cons | 0.204*** | 0.215*** | 0.195*** | 0.148*** |
| | (0.0319) | (0.0323) | (0.0313) | (0.0297) |
| Obs | 31045 | 31059 | 31059 | 31064 |
| F Stat | 119.2*** | 119.5*** | 119.2*** | 115.0*** |
| RMSE | 0.0359 | 0.0359 | 0.0359 | 0.0360 |
| R2 | 0.0957 | 0.0966 | 0.0954 | 0.0932 |
| Adj. R2 | 0.0956 | 0.0965 | 0.0953 | 0.0931 |

Standard errors are reported as robust in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

### 5.3.3 COE model 3

Hypothesis 3a: *There is a negative relationship between board size and the cost of equity of firms,* is discussed based on table 9 in panel A. We find a negative relationship, but insignificant.

Hypothesis 4a: *There is a negative relationship between board gender diversity and the cost of equity of firm*s, is discussed based on panel B. We find a negative relationship in panel B model (1), but insignificant.

Hypothesis 5a: *Does CEO duality moderate the effect of ESG disclosure on the cost of equity*, is discussed based on panel C. We find a positive relationship, but insignificant.

From table 9 our empirical results show that equity investors find board size and board gender diversity to be irrelevant in determining what return they demand for investing their equity in a firm. Based on the theoretical framework from the agency theory CEO duality is expected to increase information asymmetry leading to investors demanding a higher rate of return for the increased risk, as the CEO have a larger control of the investment decisions (Jensen & Meckling, 1976). Interestingly we do not find a significant result that CEO duality moderate the effect disclosing ESG performance have on the cost of equity. Shareholder theory would indicate that a more diversified board would lead to a lower cost of equity as the company show more responsibility (Smith, 2003).

Our results on board size and board gender diversity are different than other studies conducted on only one country or much smaller sample sizes. For instance Arslan and Abidin (2019) found a negative relationship between the size of the board and the cost of capital. Nguyen (2020) found that greater board gender diversity is associated with lower cost of equity. Our results on the moderating effect of CEO duality are consistent with previous research conducted by (Ali et al., 2019) looking at CEO duality and the direct effect on cost of equity which also show CEO duality to be insignificant with the cost of equity. Results could indicate that equity investors would not moderate the return demanded if the CEO of the firm is also the chairman of the board.

*Table 9: COE model 3*

| | Panel A | | | | Panel B | | | | Panel C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| ESG | 0.000190*** | | | | 0.000195*** | | | | 0.000205*** | | | |
| | (0.0000340) | | | | (0.0000349) | | | | (0.0000348) | | | |
| E | | 0.000158*** | | | | 0.000161*** | | | | 0.000163*** | | |
| | | (0.0000247) | | | | (0.0000251) | | | | (0.0000259) | | |
| S | | | 0.000146*** | | | | 0.000146*** | | | | 0.000157*** | |
| | | | (0.0000280) | | | | (0.0000281) | | | | (0.0000298) | |
| G | | | | 0.0000373 | | | | 0.0000245 | | | | 0.0000507** |
| | | | | (0.0000241) | | | | (0.0000245) | | | | (0.0000246) |
| BDS | -0.00212 | -0.00238 | -0.00239 | -0.00246 | | | | | | | | |
| | (0.00199) | (0.00198) | (0.00198) | (0.00199) | | | | | | | | |
| BGD | | | | | -0.0000110 | 0.00000473 | 0.00000868 | 0.0000745 | | | | |
| | | | | | (0.0000535) | (0.0000526) | (0.0000530) | (0.0000526) | | | | |
| Duality interaction | | | | | | | | | 0.00000676 | 0.00000467 | 0.00000282 | -0.00000436 |
| | | | | | | | | | (0.0000190) | (0.0000168) | (0.0000197) | (0.0000174) |
| SIZE | -0.00905*** | -0.00938*** | -0.00849*** | -0.00624*** | -0.00928*** | -0.00976*** | -0.00881*** | -0.00698*** | -0.00934*** | -0.00954*** | -0.00872*** | -0.00641*** |
| | (0.00147) | (0.00148) | (0.00143) | (0.00134) | (0.00150) | (0.00152) | (0.00147) | (0.00141) | (0.00150) | (0.00150) | (0.00145) | (0.00137) |
| LEV | 0.0749*** | 0.0751*** | 0.0750*** | 0.0746*** | 0.0764*** | 0.0766*** | 0.0764*** | 0.0760*** | 0.0728*** | 0.0730*** | 0.0729*** | 0.0725*** |
| | (0.00849) | (0.00850) | (0.00851) | (0.00851) | (0.00854) | (0.00855) | (0.00855) | (0.00855) | (0.00859) | (0.00861) | (0.00861) | (0.00861) |
| MTB | 0.0259*** | 0.0260*** | 0.0259*** | 0.0260*** | 0.0260*** | 0.0261*** | 0.0260*** | 0.0261*** | 0.0254*** | 0.0256*** | 0.0254*** | 0.0255*** |
| | (0.00125) | (0.00125) | (0.00125) | (0.00125) | (0.00126) | (0.00126) | (0.00126) | (0.00126) | (0.00128) | (0.00128) | (0.00128) | (0.00128) |
| _cons | 0.208*** | 0.218*** | 0.198*** | 0.152*** | 0.207*** | 0.220*** | 0.199*** | 0.162*** | 0.209*** | 0.216*** | 0.198*** | 0.150*** |
| | (0.0324) | (0.0328) | (0.0317) | (0.0301) | (0.0328) | (0.0333) | (0.0322) | (0.0311) | (0.0327) | (0.0329) | (0.0320) | (0.0304) |
| Obs | 30867 | 30906 | 30906 | 30911 | 30627 | 30666 | 30666 | 30671 | 29988 | 30027 | 30027 | 30032 |
| F Stat | 94.71*** | 95.10*** | 94.80*** | 91.65*** | 95.15*** | 95.50*** | 95.00*** | 91.94*** | 88.52*** | 88.74*** | 88.62*** | 84.89*** |
| RMSE | 0.0360 | 0.0359 | 0.0359 | 0.0360 | 0.0360 | 0.0360 | 0.0360 | 0.0360 | 0.0357 | 0.0356 | 0.0357 | 0.0357 |
| R2 | 0.0955 | 0.0963 | 0.0952 | 0.0930 | 0.0965 | 0.0974 | 0.0961 | 0.0942 | 0.0924 | 0.0930 | 0.0919 | 0.0896 |
| Adj. R2 | 0.0954 | 0.0962 | 0.0950 | 0.0929 | 0.0964 | 0.0973 | 0.0960 | 0.0940 | 0.0923 | 0.0928 | 0.0918 | 0.0894 |

Panel A the board size effect on COE; Panel B the board gender diversity effect on COE; Panel C the interaction with CEO duality, 1: ESG*CEO duality 2: E*CEO duality 3: S*CEO duality 4: G*CEO duality
Standard errors reported as robust standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

### 5.3.4 COD model 1

In table 10 the base model for cost of debt which our analysis will build on throughout this thesis is presented. Table 10 present the results from the regression on our base model containing cost of debt as our dependent variable and including the same set of control

variables as previously. If only one of the three financial variables are included in the model (2), (3) and (4) we find that both SIZE and LEV are significant at the 1% level and negatively correlated with cost of debt with coefficients of –0.0136 and –0.101 respectively. MTB is insignificant with a positive coefficient of 0.000470. With all three explanatory variables put in one model (1) we see that all variables are negatively correlated and significant at the 1% level. Increased size of a firm is also sending a positive signal to debt providers as a larger firm size is considered as a lower risk also for debt providers which is in line the findings of LEV in this model. Debt providers will not allow a company to take on an unlimited amount of debt, they will only allow it up until the point where the potential default risk gets too high (Myers, 1977). But from zero leverage and up until that point it would be reasonable that the actual cost of debt would gradually decrease as only firms which is considered to be low risk would be granted more debt. In addition, fees and other expenses is likely to be a lower percentage of the overall cost as leverage increases. The actual interest rate paid is generally higher when borrowing small amounts compared to borrowing larger amounts (Kurshev & Strebulaev, 2015). These are all factors leading to an overall lower cost of debt as leverage increase. Higher market-to-book is also reasonable to think would imply a lower cost of debt as an overvalued company on the stock market would provide the firm with more opportunities to secure equity financing at higher price than actual book values and thus be a lower risk investment for the debt providers. From the base model (1) the result show that debt providers reduce the cost of debt required to a firm as size increases, leverage increases and market-to-book increases, in line with previous arguments.

*Table 10: COD model 1*

| | 1 (Base model) | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| SIZE | -0.0117*** | -0.0136*** | | | -0.0114*** | -0.0138*** | |
| | (0.000639) | (0.000673) | | | (0.000632) | (0.000678) | |
| LEV | -0.0920*** | | -0.101*** | | -0.0906*** | | -0.102*** |
| | (0.00406) | | (0.00420) | | (0.00403) | | (0.00424) |
| MTB | -0.00254*** | | | 0.000470 | | -0.00126** | -0.00124** |
| | (0.000605) | | | (0.000632) | | (0.000626) | (0.000610) |
| _cons | 0.339*** | 0.353*** | 0.0782*** | 0.0496*** | 0.328*** | 0.359*** | 0.0805*** |
| | (0.0145) | (0.0150) | (0.00116) | (0.00103) | (0.0141) | (0.0153) | (0.00164) |
| Obs | 45132 | 45132 | 45132 | 45132 | 45132 | 45132 | 45132 |
| F Stat | 268.0*** | 409.3*** | 576.1*** | 0.555 | 398.4*** | 206.2*** | 288.4*** |
| RMSE | 0.0331 | 0.0339 | 0.0335 | 0.0346 | 0.0331 | 0.0339 | 0.0335 |
| R2 | 0.0853 | 0.0382 | 0.0579 | 0.0000462 | 0.0840 | 0.0385 | 0.0582 |
| Adj. R2 | 0.0852 | 0.0382 | 0.0579 | 0.0000240 | 0.0839 | 0.0385 | 0.0582 |

Standard errors reported as robust standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

### 5.3.5 COD model 2

In COD model 2 we investigate the possible link between ESG score and cost of debt through our hypothesis 1b: *Higher ESG scores have a negative relationship with the cost of debt.* From table 11 model (1) we see ESG is statistically significant at the 1% level and having a negative relationship with cost of debt with a coefficient of –0.000169. This result support our hypothesis 1b based on the theoretical framework that ESG score in fact reduce the cost of debt. The empirical results indicate that debt providers rewards firms who invest in ESG performance by offering a lower rate of return on their debt capital. This is also in line with previous research from Sharfman and Fernando (2008) looking at US. firms. Our findings are inconsistent with Suto and Takehara (2017) as they do not find any significance between ESG and the cost of debt in their study of Japanese firms from 2008-2013. This result could also indicate that taking on new debt for ESG investments could be beneficial for firms if internal funds are not sufficient, in line with the pecking order theory. The lower cost of debt for firms doing well on ESG aspects is also an incentive for these firms to take on more debt if the tax shield benefit is larger than the risk of distress in line with the trade-off theory.

Hypothesis 2b: *The environmental score has a larger effect on the cost of debt than the social and governance score,* is discussed based on the results from table 11. The results show that environmental score, social score, and governance score in model (2), (3) and (4) all have negative coefficients and are statistically significant at the 1% level, with coefficients of -0.0000877, -0.000121 and -0.0000996. This does not support our Hypothesis 2b that the environmental score has a larger effect on cost of debt than social or governance. In fact, we see from the results that an increase in social score would have the largest effect on cost of debt by decreasing it with a coefficient of -0.000121. An increase in environmental score actually decreases the cost of debt by the lowest amount compared to social and governance score. The empirical results surprisingly find that debt providers are most rewarding in terms of offering a lower cost of debt to firms who disclosure an increased social score rather than an increased environmental score. This discovery could be related back to CSR history as investors might be more knowledgably on how to better valuate social score compared to the other non-financials as environmental and governance (Gillan et al., 2021).

*Table 11: COD model 2*

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| ESG | -0.000169*** | | | |
| | (0.0000224) | | | |
| E | | -0.0000877*** | | |
| | | (0.0000163) | | |
| S | | | -0.000121*** | |
| | | | (0.0000185) | |
| G | | | | -0.0000996*** |
| | | | | (0.0000160) |
| SIZE | -0.0124*** | -0.0132*** | -0.0130*** | -0.0140*** |
| | (0.000914) | (0.000935) | (0.000903) | (0.000843) |
| LEV | -0.0806*** | -0.0806*** | -0.0804*** | -0.0808*** |
| | (0.00435) | (0.00434) | (0.00436) | (0.00433) |
| MTB | -0.00272*** | -0.00275*** | -0.00265*** | -0.00276*** |
| | (0.000664) | (0.000666) | (0.000666) | (0.000664) |
| _cons | 0.360*** | 0.374*** | 0.372*** | 0.394*** |
| | (0.0205) | (0.0211) | (0.0204) | (0.0193) |
| Obs | 36194 | 36198 | 36198 | 36203 |
| F Stat | 173.6*** | 168.4*** | 171.5*** | 163.1*** |
| RMSE | 0.0287 | 0.0288 | 0.0288 | 0.0288 |
| R2 | 0.0817 | 0.0795 | 0.0804 | 0.0798 |
| Adj. R2 | 0.0816 | 0.0794 | 0.0803 | 0.0797 |
| Standard errors reported as robust standard errors in parentheses | | | | |
| * p < 0.10, ** p < 0.05, *** p < 0.01 | | | | |

### 5.3.6 COD model 3

Hypothesis 3b: *There is a negative relationship between board size and the cost of debt of firms,* is discussed based on table 12 in panel A. We find a negative relationship, but insignificant.

Hypothesis 4b: *There is a negative relationship between board gender diversity and the cost of debt of firm*s, is discussed based on panel B. We find a negative relationship, significant at the 1% level with a coefficient of –0.000323.

Hypothesis 5b: *Does CEO duality moderate the effect of ESG disclosure on the cost of equity*, is discussed based on panel C. We find a positive moderating effect of ESG disclosure on the cost of debt when the CEO is also the chairman of the board. The result is significant at the 1% level with a coefficient of 0.0000512.

From table 12 our empirical results show that debt providers find board size to be irrelevant in determining what return debtholders demand for providing debt to a firm. Furthermore, our results show that debt providers reward firms with a higher percentage of females on the board by reducing the cost of debt for the firm. On the other hand, debt providers will penalize firms where the CEO is also the chair on the board of directors by moderating their reward on disclosure of ESG performance on the cost of debt. From the results we also notice that the interaction terms with the individual pillars in panel C model 2,3 and 4 are all significant and showing a moderating effect. In line with the theoretical framework and the agency theory, our empirical results show that debt providers punish firms with entrenched CEO`s. This could possibly be caused by the overall concern that weak firm governance can impair the financial position of a firm and ultimately leave debtholders vulnerable to losses (Lorca et al., 2011).

*Table 12: COD model 3*

| | Panel A | | | | Panel B | | | | Panel C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| ESG | -0.000168*** | | | | -0.0000746*** | | | | -0.000176*** | | | |
| | (0.0000226) | | | | (0.0000222) | | | | (0.0000238) | | | |
| E | | -0.0000885*** | | | | -0.0000329** | | | | -0.000104*** | | |
| | | (0.0000164) | | | | (0.0000161) | | | | (0.0000178) | | |
| S | | | -0.000121*** | | | | -0.0000510*** | | | | -0.000129*** | |
| | | | (0.0000186) | | | | (0.0000178) | | | | (0.0000199) | |
| G | | | | -0.000102*** | | | | -0.0000485*** | | | | -0.000114*** |
| | | | | (0.0000162) | | | | (0.0000163) | | | | (0.0000173) |
| BDS | -0.000770 | -0.000529 | -0.000572 | -0.000719 | | | | | | | | |
| | (0.00143) | (0.00143) | (0.00143) | (0.00144) | | | | | | | | |
| BGD | | | | | -0.000323*** | -0.000342*** | -0.000332*** | -0.000338*** | | | | |
| | | | | | (0.0000344) | (0.0000339) | (0.0000339) | (0.0000349) | | | | |
| Duality interaction | | | | | | | | | 0.0000512*** | 0.0000525*** | 0.0000500*** | 0.0000438*** |
| | | | | | | | | | (0.0000132) | (0.0000121) | (0.0000132) | (0.0000126) |
| SIZE | -0.0124*** | -0.0131*** | -0.0130*** | -0.0139*** | -0.0117*** | -0.0120*** | -0.0119*** | -0.0122*** | -0.0130*** | -0.0136*** | -0.0135*** | -0.0143*** |
| | (0.000933) | (0.000944) | (0.000912) | (0.000852) | (0.000937) | (0.000950) | (0.000922) | (0.000870) | (0.000952) | (0.000961) | (0.000931) | (0.000872) |
| LEV | -0.0801*** | -0.0806*** | -0.0805*** | -0.0808*** | -0.0791*** | -0.0793*** | -0.0793*** | -0.0794*** | -0.0808*** | -0.0813*** | -0.0812*** | -0.0814*** |
| | (0.00435) | (0.00436) | (0.00437) | (0.00434) | (0.00434) | (0.00434) | (0.00435) | (0.00433) | (0.00450) | (0.00451) | (0.00452) | (0.00449) |
| MTB | -0.00267*** | -0.00275*** | -0.00265*** | -0.00276*** | -0.00244*** | -0.00245*** | -0.00242*** | -0.00246*** | -0.00253*** | -0.00261*** | -0.00251*** | -0.00259*** |
| | (0.000667) | (0.000669) | (0.000669) | (0.000667) | (0.000668) | (0.000669) | (0.000670) | (0.000668) | (0.000681) | (0.000684) | (0.000684) | (0.000681) |
| _cons | 0.362*** | 0.374*** | 0.373*** | 0.394*** | 0.344*** | 0.350*** | 0.349*** | 0.356*** | 0.373*** | 0.384*** | 0.383*** | 0.400*** |
| | (0.0207) | (0.0212) | (0.0205) | (0.0193) | (0.0210) | (0.0214) | (0.0208) | (0.0198) | (0.0214) | (0.0217) | (0.0211) | (0.0199) |
| Obs | 36001 | 36044 | 36044 | 36049 | 35766 | 35809 | 35809 | 35814 | 34959 | 35003 | 35003 | 35008 |
| F Stat | 139.0*** | 134.7*** | 137.3*** | 130.5*** | 146.8*** | 145.4*** | 146.4*** | 145.1*** | 130.7*** | 127.1*** | 129.3*** | 124.2*** |
| RMSE | 0.0287 | 0.0288 | 0.0288 | 0.0288 | 0.0286 | 0.0287 | 0.0287 | 0.0287 | 0.0286 | 0.0287 | 0.0287 | 0.0287 |
| R2 | 0.0814 | 0.0795 | 0.0803 | 0.0798 | 0.0868 | 0.0861 | 0.0863 | 0.0863 | 0.0822 | 0.0805 | 0.0811 | 0.0809 |
| Adj. R2 | 0.0813 | 0.0794 | 0.0802 | 0.0797 | 0.0867 | 0.0860 | 0.0862 | 0.0862 | 0.0821 | 0.0804 | 0.0809 | 0.0807 |

Panel A the board size effect on COE; Panel B the board gender diversity effect on COE; Panel C the interaction with CEO duality, 1: ESG*CEO duality 2: E*CEO duality 3: S*CEO duality 4: G*CEO duality
Standard errors reported as robust standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

## 5.4 Robustness tests

As previously shown by performing the VIF test (appendix 2), our results are robust for multicollinearity (Ott & Longnecker, 2016, p. 650). We recognize that a large number of the firm-year observations come from the United States. US firms represent 29.17% of all

observations. US firms are heavily overrepresented, and we conduct a robustness test on both COE and COD model to verify the robustness of our results. First, we run the regression excluding US firms. Secondly, we test the robustness of the results by running the same regression with only US firms.

*Table 13: COE robustness excluding US firms*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| ESG | -0.000202*** | | | | -0.000202*** | -0.0000740*** | -0.000203*** |
| | (0.0000277) | | | | (0.0000279) | (0.0000273) | (0.0000287) |
| E | | -0.000110*** | | | | | |
| | | (0.0000203) | | | | | |
| S | | | -0.000146*** | | | | |
| | | | (0.0000220) | | | | |
| G | | | | -0.000106*** | | | |
| | | | | (0.0000196) | | | |
| BDS | | | | | -0.00126 | | |
| | | | | | (0.00162) | | |
| BGD | | | | | | -0.000429*** | |
| | | | | | | (0.0000396) | |
| ESG* Duality | | | | | | | 0.0000608*** |
| | | | | | | | (0.0000151) |
| SIZE | -0.0124*** | -0.0132*** | -0.0129*** | -0.0143*** | -0.0124*** | -0.0115*** | -0.0127*** |
| | (0.00113) | (0.00114) | (0.00111) | (0.00105) | (0.00114) | (0.00114) | (0.00116) |
| LEV | -0.0856*** | -0.0851*** | -0.0853*** | -0.0854*** | -0.0849*** | -0.0839*** | -0.0858*** |
| | (0.00536) | (0.00532) | (0.00533) | (0.00529) | (0.00534) | (0.00531) | (0.00547) |
| MTB | -0.00333*** | -0.00325*** | -0.00313*** | -0.00317*** | -0.00323*** | -0.00298*** | -0.00297*** |
| | (0.000878) | (0.000875) | (0.000874) | (0.000871) | (0.000879) | (0.000879) | (0.000893) |
| _cons | 0.362*** | 0.374*** | 0.370*** | 0.400*** | 0.363*** | 0.341*** | 0.366*** |
| | (0.0253) | (0.0258) | (0.0251) | (0.0240) | (0.0255) | (0.0256) | (0.0260) |
| Obs | 26797 | 26813 | 26813 | 26818 | 26646 | 26413 | 25973 |
| F Stat | 127.1*** | 122.7*** | 125.4*** | 119.3*** | 101.9*** | 113.9*** | 95.54*** |
| RMSE | 0.0302 | 0.0302 | 0.0302 | 0.0302 | 0.0302 | 0.0301 | 0.0301 |
| R2 | 0.0779 | 0.0752 | 0.0765 | 0.0748 | 0.0773 | 0.0870 | 0.0778 |
| Adj. R2 | 0.0778 | 0.0751 | 0.0763 | 0.0746 | 0.0772 | 0.0868 | 0.0776 |

*Table 14: COE robustness only US firms*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| ESG | 0.000480*** | | | | 0.000488*** | 0.000400*** | 0.000510*** |
| | (0.0000697) | | | | (0.0000709) | (0.0000742) | (0.0000796) |
| E | | 0.000374*** | | | | | |
| | | (0.0000489) | | | | | |
| S | | | 0.000433*** | | | | |
| | | | (0.0000652) | | | | |
| G | | | | 0.000121** | | | |
| | | | | (0.0000483) | | | |
| BDS | | | | | 0.00364 | | |
| | | | | | (0.00641) | | |
| BGD | | | | | | 0.000370*** | |
| | | | | | | (0.000119) | |
| ESG*Duality | | | | | | | -0.0000242 |
| | | | | | | | (0.0000492) |
| SIZE | -0.0144*** | -0.0155*** | -0.0135*** | -0.00772*** | -0.0150*** | -0.0156*** | -0.0161*** |
| | (0.00305) | (0.00309) | (0.00311) | (0.00291) | (0.00326) | (0.00316) | (0.00332) |
| LEV | 0.205*** | 0.209*** | 0.206*** | 0.210*** | 0.206*** | 0.203*** | 0.205*** |
| | (0.0172) | (0.0174) | (0.0172) | (0.0175) | (0.0174) | (0.0174) | (0.0178) |
| MTB | 0.0258*** | 0.0260*** | 0.0256*** | 0.0268*** | 0.0258*** | 0.0253*** | 0.0258*** |
| | (0.00229) | (0.00227) | (0.00231) | (0.00234) | (0.00229) | (0.00229) | (0.00237) |
| _cons | 0.270*** | 0.304*** | 0.252*** | 0.132** | 0.278*** | 0.297*** | 0.309*** |
| | (0.0676) | (0.0688) | (0.0691) | (0.0655) | (0.0694) | (0.0698) | (0.0735) |
| Obs | 7117 | 7112 | 7112 | 7112 | 7087 | 7084 | 6837 |
| F Stat | 54.92*** | 57.86*** | 53.30*** | 47.93*** | 43.35*** | 44.70*** | 41.98*** |
| RMSE | 0.0364 | 0.0363 | 0.0364 | 0.0367 | 0.0365 | 0.0364 | 0.0362 |
| R2 | 0.190 | 0.194 | 0.189 | 0.178 | 0.190 | 0.193 | 0.187 |
| Adj. R2 | 0.190 | 0.193 | 0.189 | 0.177 | 0.189 | 0.193 | 0.186 |

In table 13 and 14 the robustness of the COE model is tested. The results from both robustness tests stay consistent for the main explanatory variables with previous results from table 8 and 9, except for board gender diversity which is now positive and significant at the 1% level with cost of equity in table 14. Board gender diversity is negative and significant at the 1% level in the regression excluding US firms in table 13. In table 14 we no longer find support for H2a, as social score is more impactful on cost of equity when only including US firms in the regression. The results on the robustness tests on COE model further strengthens

our findings for hypothesis H1a, H3a and H5a. In addition, the results from table 13 gives partial support for hypothesis H4a.

*Table 15: COD robustness excluding US firms*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| ESG | -0.000202*** | | | | -0.000202*** | -0.0000740*** | -0.000203*** |
| | (0.0000277) | | | | (0.0000279) | (0.0000273) | (0.0000287) |
| E | | -0.000110*** | | | | | |
| | | (0.0000203) | | | | | |
| S | | | -0.000146*** | | | | |
| | | | (0.0000220) | | | | |
| G | | | | -0.000106*** | | | |
| | | | | (0.0000196) | | | |
| BDS | | | | | -0.00126 | | |
| | | | | | (0.00162) | | |
| BGD | | | | | | -0.000429*** | |
| | | | | | | (0.0000396) | |
| ESG*Duality | | | | | | | 0.0000608*** |
| | | | | | | | (0.0000151) |
| SIZE | -0.0124*** | -0.0132*** | -0.0129*** | -0.0143*** | -0.0124*** | -0.0115*** | -0.0127*** |
| | (0.00113) | (0.00114) | (0.00111) | (0.00105) | (0.00114) | (0.00114) | (0.00116) |
| LEV | -0.0856*** | -0.0851*** | -0.0853*** | -0.0854*** | -0.0849*** | -0.0839*** | -0.0858*** |
| | (0.00536) | (0.00532) | (0.00533) | (0.00529) | (0.00534) | (0.00531) | (0.00547) |
| MTB | -0.00333*** | -0.00325*** | -0.00313*** | -0.00317*** | -0.00323*** | -0.00298*** | -0.00297*** |
| | (0.000878) | (0.000875) | (0.000874) | (0.000871) | (0.000879) | (0.000879) | (0.000893) |
| _cons | 0.362*** | 0.374*** | 0.370*** | 0.400*** | 0.363*** | 0.341*** | 0.366*** |
| | (0.0253) | (0.0258) | (0.0251) | (0.0240) | (0.0255) | (0.0256) | (0.0260) |
| Obs | 26797 | 26813 | 26813 | 26818 | 26646 | 26413 | 25973 |
| F Stat | 127.1*** | 122.7*** | 125.4*** | 119.3*** | 101.9*** | 113.9*** | 95.54*** |
| RMSE | 0.0302 | 0.0302 | 0.0302 | 0.0302 | 0.0302 | 0.0301 | 0.0301 |
| R2 | 0.0779 | 0.0752 | 0.0765 | 0.0748 | 0.0773 | 0.0870 | 0.0778 |
| Adj. R2 | 0.0778 | 0.0751 | 0.0763 | 0.0746 | 0.0772 | 0.0868 | 0.0776 |

In table 15 US firms are excluded from the regression. Results from main explanatory variables stay consistent with previous findings in table 11 and 12. Robustness test for COD model by excluding US firms strengthens our support on the results of hypothesis H1b, H2b, H3b, H4b, and H5b.

*Table 16: COD robustness only US firms*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| ESG | -0.0000873** | | | | -0.0000844** | -0.000112*** | -0.0000937** |
| | (0.0000355) | | | | (0.0000360) | (0.0000360) | (0.0000425) |
| E | | -0.0000368 | | | | | |
| | | (0.0000264) | | | | | |
| S | | | -0.0000312 | | | | |
| | | | (0.0000310) | | | | |
| G | | | | -0.0000887*** | | | |
| | | | | (0.0000273) | | | |
| BDS | | | | | 0.000832 | | |
| | | | | | (0.00297) | | |
| BGD | | | | | | 0.000115** | |
| | | | | | | (0.0000583) | |
| ESG*Duality | | | | | | | 0.0000117 |
| | | | | | | | (0.0000288) |
| SIZE | -0.0127*** | -0.0135*** | -0.0138*** | -0.0134*** | -0.0130*** | -0.0133*** | -0.0141*** |
| | (0.00152) | (0.00160) | (0.00154) | (0.00140) | (0.00163) | (0.00159) | (0.00162) |
| LEV | -0.0693*** | -0.0699*** | -0.0698*** | -0.0694*** | -0.0693*** | -0.0700*** | -0.0692*** |
| | (0.00726) | (0.00739) | (0.00746) | (0.00730) | (0.00739) | (0.00741) | (0.00777) |
| MTB | -0.00192** | -0.00215** | -0.00217** | -0.00217** | -0.00198** | -0.00212** | -0.00193** |
| | (0.000854) | (0.000869) | (0.000870) | (0.000874) | (0.000868) | (0.000858) | (0.000908) |
| _cons | 0.368*** | 0.385*** | 0.392*** | 0.386*** | 0.373*** | 0.381*** | 0.399*** |
| | (0.0344) | (0.0363) | (0.0349) | (0.0320) | (0.0352) | (0.0359) | (0.0365) |
| Obs | 9397 | 9385 | 9385 | 9385 | 9355 | 9353 | 8986 |
| F Stat | 49.40*** | 47.90*** | 48.66*** | 46.98*** | 40.67*** | 39.94*** | 41.77*** |
| RMSE | 0.0239 | 0.0241 | 0.0241 | 0.0241 | 0.0239 | 0.0239 | 0.0239 |
| R2 | 0.103 | 0.102 | 0.102 | 0.104 | 0.104 | 0.104 | 0.106 |
| Adj. R2 | 0.103 | 0.102 | 0.101 | 0.104 | 0.103 | 0.104 | 0.105 |

In table 16 the main explanatory variable ESG stay consistent with the main model in table 12. Looking only at US firms we discover some interesting results compared with the main analysis. Variables E, S, BDS and ESG*Duality are no longer significant. In addition, board gender diversity is positive and significant at the 5% level. This result could indicate that US debt providers have a different view on female board members as the cost of debt for US firms increase as the percentage of females on the board increase, in stark contrast to what we find in the main analysis. In our opinion this result could have several different explanations related to culture differences and would be an interesting topic for future research.

*Table 17: Summary of hypotheses*

| Cost of equity | Hypothesis | | Results |
|---|---|---|---|
| | H1a | Higher ESG scores have a negative relationship with the cost of equity. | Rejected |
| | H2a | The environmental score has a larger effect on the cost of equity than the social and governance score | Accepted |
| | H3a | There is a negative relationship between board size and the cost of equity of firms | Not significant |
| | H4a | There is a negative relationship between board gender diversity and the cost of equity of firms | Not significant |
| | H5a | Does CEO duality moderate the effect of ESG disclosure on the cost of equity | Not significant |
| **Cost of debt** | H1b | Higher ESG scores have a negative relationship with the cost of debt | Accepted |
| | H2b | The environmental score has a larger effect on the cost of debt than the social and governance score | Rejected |
| | H3b | There is a negative relationship between board size and the cost of debt of firms | Not significant |
| | H4b | There is a negative relationship between board gender diversity and the cost of debt of firms | Accepted |
| | H5b | Does CEO duality moderate the effect of ESG disclosure on the cost of debt | Accepted |

*Table 18: Synthesis of theory and empirical evidence*

| Explanatory variable | Relationship of explanatory variables on dependent variable | | | |
|---|---|---|---|---|
| | COE | | COD | |
| | Expected | Observed | Expected | Observed |
| ESG | Negative | Positive | Negative | Negative |
| E | Negative | Positive | Negative | Negative |
| S | Negative | Positive | Negative | Negative |
| G | Negative | Not significant | Negative | Negative |
| BDS | Negative | Not significant | Negative | Not significant |
| BGD | Negative | Not significant | Negative | Negative |
| ESG*Duality | Positive | Not significant | Positive | Positive |

Based on the theoretical framework we expected equity investors to award firms disclosing better ESG performance and the individual ESG pillars as shown in table 15. From an equity investor perspective, the empirical evidence clearly points in the direction that despite increasing focus on ESG commitment from society the reward does not outweigh the increased risk. In light of recent years commitment towards ESG, equity investors still penalize firms who prioritize increasing their ESG rating. Prior research on the topic have been contradictory, while our worldwide dataset empirically shows a negative relationship on

all ESG pillars except for governance pillar which was not significant and considered irrelevant by equity investors. Digging deeper into the governance aspect we expected board size and board gender diversity to have a negative association with cost of equity. In addition, we expected CEO duality to have moderating effect on the disclosing ESG performance score on the cost of equity as entrenched CEO`s are increasing the information asymmetry which is related to increased risk from the theoretical framework of the agency theory and previous research (Cheng et al., 2014). The results interestingly shows that equity investors find all these explanatory variables to be irrelevant as none of them were significant in relation with cost of equity.

On the other side, debtholders seemingly find firms with better ESG score to be preferred in terms of offering a lower cost of debt, in line with our expected result based on the theoretical framework. In contradiction to the expected result, board size is not considered relevant by debt investors. The empirical results show that board gender diversity is in line with the expected result based on the theory as the relationship is negative. Lastly, we also find that debt holders indeed punish firms with entrenched CEO`s by increasing the cost of debt and at the same time awarding those firms with an independent chairman on the board of directors.

# 6. Conclusion

In this last section we conclude our analysis. In addition, we highlight some important policy implications discovered through this thesis. Lastly, we discuss limitations in our study as well as highlighting possible new areas to study for further research on this topic.

## 6.1 Conclusion

We theorize that the disclosure of ESG performance affect the return both equity investors and debtholders demand. Our analysis seeks to analyze and answer the research question: *Does disclosure of ESG performance affect the cost of equity and cost of debt?*

Based on our findings, we discover that ESG performance would lower the cost of debt provided by debtholders, which is value increasing in line with the stakeholder theory. On the other hand, equity providers find ESG performance to increase the risk of the firm and therefore penalize good performing ESG firms through higher cost of equity, opposite of what we initially expected based on theoretical framework. Previous research has shown a predominantly negative relationship between ESG performance and the cost of equity (El Ghoul et al., 2011; Matthiesen & Salzmann, 2015; Ould Daoud Ellili, 2020), while only a few

studies have shown a positive relationship (Atan et al., 2018; Nazir et al., 2021). Profit maximizing and investments in ESG being assessed as an additional risk factor for equity providers could both be possible explanations to why we obtain a positive relationship between ESG performance and the cost of equity in this thesis.

Secondly, despite the increasing reliance of investors on ESG for firm valuation (Folqué et al., 2021; Qureshi et al., 2020), our results demonstrate a varying degree of affect and appreciation on the three different ESG pillars for both equity providers and debt providers. Equity providers penalize better performance on all pillars except from the governance pillar, which is not significant. We also discover that debt providers award better performance on all three ESG pillars.

Third, we discover that different governance aspects do not have a significant impact on the cost of equity when gender diversity, board size or the moderating effect of CEO duality on ESG disclosure is investigated. On the other hand, debt providers appreciate a higher percentage of females on the board of directors in line with our expectations, but do not find increased board size to be relevant. We also find that CEO duality have a moderating effect of ESG disclosure on the cost of debt.

Based on our main findings we can answer our research question and conclude that ESG performance does indeed affect both the cost of equity and the cost of debt. We discover that the actual effect is working in opposite directions for cost of equity and cost of debt as only debtholders would award firms disclosing higher ESG performance, while equity investors will penalize. Secondly, we conclude that the individual effects of the ESG pillars vary, and debt providers and equity providers have different appreciation for each of the individual pillars.

Third, we conclude that board size, board gender diversity and the moderating effect of CEO duality does not affect the cost of equity, which also substantiates the results from our second main findings that governance is not considered to be a relevant factor for equity providers in determining the cost of equity offered to a firm. For debt providers we conclude that a higher percentage of females on the board are appreciated and awarded with a lower cost of debt. We also conclude that CEO duality will moderate the appreciation of higher ESG performance on the cost of debt, in line with our expectations.

## 6.2 Policy implications

Increasing pressure from international organizations to focus on sustainability has indeed reached the debt holders as they now reward good performing companies. Based on our main conclusion the equity providers still seem to be quite reluctant to do the same. The profit maximization of equity providers considers the focus on ESG as an increase in risk. To deal with this problem and possibly fill the gap between debt providers and equity providers, ESG needs to be put on the agenda of governments all around the world. The need for an even more transparent and universal ESG standard is necessary (Eccles & Mirchandani, 2022). The universal standard needs to clearly filter out which firms are performing good or bad in terms of ESG and enlighten investors of what they invest in. If a trusted system in distinguishing firms performing good and bad from each other is implemented in the future, governments can introduce tax benefits or similar rewards for companies performing good. Tax benefits or other financial rewards will likely gain the attention from equity providers. If this system also can award the different pillars of ESG, equity providers might also appreciate better performance on governance in the future.

On the opposite side, harder regulations by governments to penalize those who perform badly in a more severe way could also be an effective way to gain the attention of equity providers in demanding a lower rate of return on their investments. As equity investors are profit maximizing regulations should be implemented in such a way that equity investors would want to offer equity at a lower return to the firm who perform better in terms of ESG scores. The starting point however needs to be with a good trusted ESG rating system which would increase the incentives for firms, in wanting to report on ESG on an annual basis. This system can be rooted in impact investing where the goal is to do good and to do well (Villiers & Levine, 2021). This could be achieved by generating a positive social and environmental impact that is measurable by UNSDG, while simultaneously generating financial profits to investors.

## 6.3 Limitations

The variation in ESG data from different providers show that there is a gap in understanding what ESG actually measures. Since there are different methodologies a study that also incorporates the findings of van Duuren et al. (2016) would greatly increase the significance of our results. As mentioned earlier our study is limited to non-financial information from Thomson Reuters as this is the only extensive database our school have access to. Further on, sector is a variable not controlled for in this study. The uneven number of companies

reporting for each country may influence the results as some countries are overrepresented such as the US with 16,384 firm-year observations, while others are underrepresented such as Zimbabwe with only 16 firm-year observations.

### 6.4 Further research

Studying the weighted average cost of capital which is the combined effect of our results would be interesting as our empirical results show that there is a positive relationship with ESG score and cost of equity, while there is a negative relationship with ESG score and cost of debt. We would also recommend conducting the same study of a rich dataset with different third-party providers of ESG information to get a more robust measurement of ESG related information. In the robustness test of our data, we found indications that US debt providers might have a different appreciation on female board members compared with the main analysis including all countries, this would be an interesting topic to investigate further.

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# Appendix

## Appendix 1: List of countries

| SR # | Country | Firms | Freq | Percent | Cum | ESG | BGD |
|---|---|---|---|---|---|---|---|
| 1 | Argentina | 10 | 160 | 0,28 | 0,28 | 47,73 | 6,02 |
| 2 | Australia | 189 | 3024 | 5,38 | 5,67 | 40,69 | 15,61 |
| 3 | Austria | 13 | 208 | 0,37 | 6,04 | 48,24 | 16,07 |
| 4 | Belgium | 20 | 320 | 0,57 | 6,61 | 50,43 | 19,54 |
| 5 | Bermuda | 12 | 192 | 0,34 | 6,95 | 40,51 | 11,92 |
| 6 | Brazil | 60 | 960 | 1,71 | 8,66 | 54,15 | 8,34 |
| 7 | Canada | 184 | 2944 | 5,24 | 13,90 | 41,11 | 15,52 |
| 8 | Cayman Islands | 3 | 48 | 0,09 | 13,98 | 34,26 | 6,52 |
| 9 | Chile | 26 | 416 | 0,74 | 14,73 | 42,54 | 6,04 |
| 10 | China | 125 | 2000 | 3,56 | 18,29 | 36,11 | 8,46 |
| 11 | Colombia | 8 | 128 | 0,23 | 18,51 | 54,75 | 19,37 |
| 12 | Cyprus | 1 | 16 | 0,03 | 18,54 | 69,48 | 21,11 |
| 13 | Czech Republic | 2 | 32 | 0,06 | 18,60 | 43,43 | 7,15 |
| 14 | Denmark | 23 | 368 | 0,66 | 19,25 | 50,98 | 18,51 |
| 15 | Egypt | 3 | 48 | 0,09 | 19,34 | 17,46 | 0,00 |
| 16 | Finland | 23 | 368 | 0,66 | 19,99 | 57,88 | 27,11 |
| 17 | France | 79 | 1264 | 2,25 | 22,24 | 60,46 | 27,11 |
| 18 | Germany | 77 | 1232 | 2,19 | 24,44 | 56,11 | 19,61 |
| 19 | Gibraltar | 1 | 16 | 0,03 | 24,47 | 43,94 | 13,81 |
| 20 | Greece | 7 | 112 | 0,20 | 24,67 | 50,09 | 5,75 |
| 21 | Guernsey | 2 | 32 | 0,06 | 24,72 | 52,00 | 39,17 |
| 22 | Hong Kong | 95 | 1520 | 2,71 | 27,43 | 37,70 | 10,07 |
| 23 | Hungary | 3 | 48 | 0,09 | 27,51 | 60,23 | 12,78 |
| 24 | India | 80 | 1280 | 2,28 | 29,79 | 50,55 | 10,63 |
| 25 | Indonesia | 27 | 432 | 0,77 | 30,56 | 49,35 | 6,37 |
| 26 | Ireland | 27 | 432 | 0,77 | 31,33 | 49,14 | 16,88 |
| 27 | Isle of Man | 2 | 32 | 0,06 | 31,39 | 46,26 | 18,71 |
| 28 | Israel | 10 | 160 | 0,28 | 31,67 | 36,82 | 16,85 |
| 29 | Italy | 25 | 400 | 0,71 | 32,38 | 62,28 | 19,85 |
| 30 | Japan | 331 | 5296 | 9,43 | 41,81 | 45,10 | 3,58 |
| 31 | Jersey | 3 | 48 | 0,09 | 41,90 | 35,36 | 11,47 |
| 32 | Kenya | 1 | 16 | 0,03 | 41,93 | 43,17 | 25,35 |
| 33 | Korea | 76 | 1216 | 2,16 | 44,09 | 53,44 | 1,44 |
| 34 | Kuwait | 3 | 48 | 0,09 | 44,18 | 51,61 | 8,05 |
| 35 | Luxembourg | 12 | 192 | 0,34 | 44,52 | 53,21 | 16,78 |
| 36 | Macau | 3 | 48 | 0,09 | 44,60 | 47,12 | 14,74 |
| 37 | Malaysia | 45 | 720 | 1,28 | 45,88 | 42,86 | 16,86 |
| 38 | Malta | 1 | 16 | 0,03 | 45,91 | 44,52 | 21,79 |
| 39 | Mexico | 30 | 480 | 0,85 | 46,77 | 50,15 | 8,11 |
| 40 | Monaco | 2 | 32 | 0,06 | 46,82 | 23,34 | 15,22 |
| 41 | Morocco | 1 | 16 | 0,03 | 46,85 | 50,37 | 0,00 |
| 42 | Netherlands | 32 | 512 | 0,91 | 47,76 | 57,55 | 18,72 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 43 | New Zealand | 36 | 576 | 1,03 | 48,79 | 37,82 | 23,98 |
| 44 | Norway | 16 | 256 | 0,46 | 49,25 | 53,55 | 38,67 |
| 45 | Oman | 2 | 32 | 0,06 | 49,30 | 16,72 | 2,85 |
| 46 | Pakistan | 2 | 32 | 0,06 | 49,36 | 25,86 | 8,37 |
| 47 | Panama | 2 | 32 | 0,06 | 49,42 | 34,60 | 1,07 |
| 48 | Peru | 10 | 160 | 0,28 | 49,70 | 40,00 | 9,37 |
| 49 | Philippines | 19 | 304 | 0,54 | 50,24 | 40,93 | 7,38 |
| 50 | Poland | 18 | 288 | 0,51 | 50,75 | 38,42 | 16,29 |
| 51 | Portugal | 7 | 112 | 0,20 | 50,95 | 59,44 | 11,73 |
| 52 | Puerto Rico | 1 | 16 | 0,03 | 50,98 | 28,72 | 17,78 |
| 53 | Qatar | 2 | 32 | 0,06 | 51,04 | 35,42 | 5,62 |
| 54 | Russia | 31 | 496 | 0,88 | 51,92 | 40,48 | 5,61 |
| 55 | Saudi Arabia | 4 | 64 | 0,11 | 52,04 | 36,41 | 0,00 |
| 56 | Singapore | 31 | 496 | 0,88 | 52,92 | 39,43 | 9,23 |
| 57 | South Africa | 90 | 1440 | 2,56 | 55,48 | 50,49 | 23,48 |
| 58 | Spain | 37 | 592 | 1,05 | 56,54 | 61,55 | 15,56 |
| 59 | Sri Lanka | 1 | 16 | 0,03 | 56,57 | 55,47 | 6,87 |
| 60 | Sweden | 53 | 848 | 1,51 | 58,07 | 57,82 | 29,80 |
| 61 | Switzerland | 51 | 816 | 1,45 | 59,53 | 53,31 | 12,92 |
| 62 | Taiwan | 103 | 1648 | 2,93 | 62,46 | 42,80 | 8,47 |
| 63 | Thailand | 29 | 464 | 0,83 | 63,29 | 54,62 | 11,02 |
| 64 | Turkey | 17 | 272 | 0,48 | 63,77 | 50,48 | 9,07 |
| 65 | Ukraine | 1 | 16 | 0,03 | 63,80 | 29,56 | 30,52 |
| 66 | United Arab Emirates | 4 | 64 | 0,11 | 63,91 | 35,59 | 4,65 |
| 67 | United Kingdom | 241 | 3856 | 6,86 | 70,78 | 50,30 | 17,22 |
| 68 | United States of America | 1024 | 16384 | 29,17 | 99,94 | 46,19 | 17,98 |
| 69 | Uruguay | 1 | 16 | 0,03 | 99,97 | 49,85 | 14,36 |
| 70 | Zimbabwe | 1 | 16 | 0,03 | 100,00 | 37,18 | 14,21 |
| | Total | 3511 | 56176 | 100 | | | |

# Appendix 2: Results from tests in STATA for COE

## Variance inflation factor (VIF)

| Variable | VIF | 1/VIF |
|---|---|---|
| SIZE | **1.46** | **0.683580** |
| ESG | **1.29** | **0.776827** |
| MTB | **1.16** | **0.861759** |
| LEV | **1.11** | **0.898886** |
| Mean VIF | **1.26** | |

## Breusch-Pagan and White`s test for heteroskedasticity

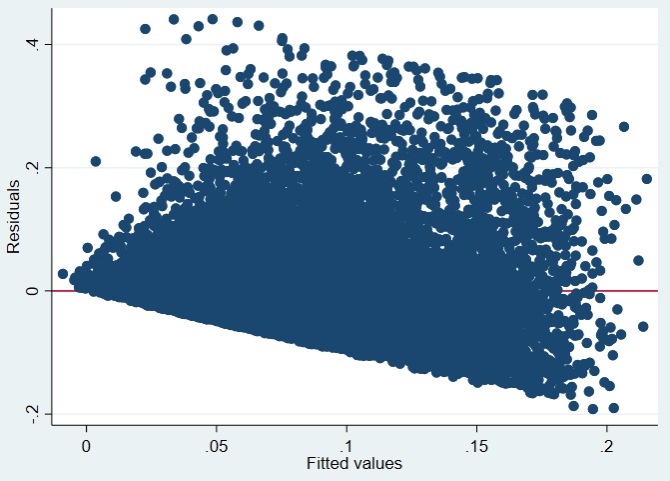
```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of COE

         chi2(1)      = 11605.68
         Prob > chi2  =   0.0000

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(14)     =   2989.86
         Prob > chi2  =    0.0000
```

## Scatter plot against residuals




## Hausman test

| | Coefficients (b) fixed | (B) random | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| ESG | .0001925 | .0002052 | -.0000127 | 7.34e-06 |
| SIZE | -.0091253 | -.0076737 | -.0014516 | .0005087 |
| LEV | .075473 | .0783216 | -.0028486 | .0014326 |
| MTB | .0258315 | .0280115 | -.00218 | .0001935 |

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 141.84
Prob>chi2 = 0.0000

# Appendix 3: Results from tests in STATA for COD

## Variance inflation factor (VIF)

| Variable | VIF | 1/VIF |
|---|---|---|
| SIZE | 1.37 | 0.730867 |
| ESG | 1.27 | 0.787095 |
| MTB | 1.09 | 0.920381 |
| LEV | 1.04 | 0.962971 |
| Mean VIF | 1.19 | |

## Breusch-Pagan and White`s test for heteroskedasticity

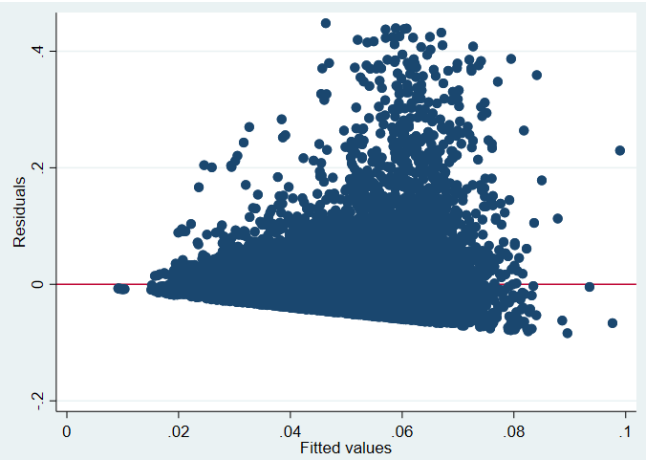
```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(14)     =   2678.47
         Prob > chi2  =    0.0000

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of COD

         chi2(1)      = 15566.99
         Prob > chi2  =   0.0000
```

## Scatter plot against residuals



## Hausman test

| | Coefficients | | | |
|---|---|---|---|---|
| | (b) fixed | (B) random | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
| ESG | -.0001694 | -.0001723 | 2.87e-06 | 6.21e-06 |
| SIZE | -.0123546 | -.0075835 | -.0047711 | .0003926 |
| LEV | -.0805567 | -.06958 | -.0109767 | .0011004 |
| MTB | -.0027221 | -.0018625 | -.0008596 | .0001813 |

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 408.02
Prob>chi2 = 0.0000