Antti Jormalainen

Impact of Green Bonds on Firm's Valuation

UNIVERSITY OF VAASA
School of Finance and Accounting

Author:	Antti Jormalainen
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ABSTRACT:

Among all the previous and current market-based solutions, green bonds have created one of the most potential market to channel funds to various investment projects. The main purpose of this thesis is to investigate whether the green bonds are priced lower than ordinary ones and how this would impact the fundamental value of the company through valuation methods. This thesis is focusing on rather new and interesting subject because green bonds and its markets have been studied since the inception of the first green bond in 2007 and even more widely when volumes have grown rapidly.

Prior studies have concluded that the green bonds are priced more cheaply than conventional ones and the market has similar risk compared to the traditional bond market. Even though previous findings indicate different coefficient and level of significant degrees for the results, they are in the line with each other indicating the premium of green bonds can be investigated. This study finds that green bonds are little bit cheaper than conventional bonds with 0,60-0,84% premium in the studied data sample during 2013-2020. Although the green bond issuance is associated with other respective costs such as third-party assessment and certification, these costs do not exceed the available pricing advantage according to the findings.

This study also investigates how the achieved premium from green bond issuance will result in cost of debt and therefore impact the valuation of a company by using the traditional DCF valuation model. Results of this thesis indicate that there are clear differences in how the fundamental value of a company grows depending on its capital structure if the cost of debt decreases by the premium of green bonds.

According to the CAR tests of a company stock price that issued a green bond, shows that not every time windows have statistically significant abnormal returns, but the shortest time window [−5,5] indicates statistically significant excess returns (4,18%) during the green bond issuance.

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1. Introduction

Traditionally, public interventions have been done by proposing regulation, taxes or sanctions. There are many opinions about the ways of public interventions, but latest interventions have created more like opportunities than barriers. Undoubtable, all interventions or acts to change companies' and investors' behavior requires a huge amount of capital and therefore finance has a major role to play. Among all the current market-based solutions against the climate change, green bonds have created one of the most potential market to channel funds to various investment projects. Green bonds have attracted countries, supranational institutions, corporations and investors to invest in environmentally friendly investments. Hence, this study also provides insight of the costs for the borrowers as raising funds for projects.

The first issued green bond is named as "climate awareness bond", issued by the European Investment Bank (EIB) in 2007 (Tang and Zhang, 2018). Since the inception of the green bond market in 2007, volumes in the issuance of the green bonds increased to 20bn EUR in 2014 and coming to 2018 issuance was 93bn. Even though the market has growth with exponential rate, its potential can be limitless (Fatica, Panzica and Rancan, 2019). Reason for this is that it is not only the supranational institutions anymore that are raising funds through green bond market. Interest towards green bonds has growth materially in private sector also as companies and investments funds are issuing green bonds.

This study examines the green bond markets and whether they are priced cheaper than ordinary ones and how this affects to the value of the company. This thesis is specifically targeted to the European area and to analyse data for the last 7 years from 2013 to 2020. The study will also focus primarily on non-financial companies where traditional valuations such as the DCF model are more applicable.

In general, company's fundamental value can be calculated by discounting its future cash-flows into present value with a certain discount rate. This study focuses particularly on the divider of that equation, discount rate or in other words cost of capital. Whether green bonds can be proved to be cheaper than ordinary ones, company's future cash flows are now discounted with a lower rate into present value which increases their present value.

This equation creates various promising opportunities as private investors, analysts and investment banks are performing company valuations and considering investment targets. In addition, as private equity companies establish funds for capital to make leverage buyouts, acquisition of an environmentally friendly target company could be done with green bond issuance. These examples show how the opportunities could increase even further and therefore studying green bond market is more than appropriate. Climate Bond Initiative institution and its websites contain a lot of useful researches, data and surveys about the green bond markets.

One interesting point of view is that for which kind of projects green bonds are issued to raise capital. For example, according to the Green Bond European Investor Survey 2019, almost 80% of issued green bonds were allocated to Energy, Buildings and Transport. This gives a clear view about the usage of the green bond and is also in the line of this study. For example, if looking into real estate private equity firms, green bonds could be an excellent way to raise funds for their real estate investments.

1.1.   Purpose of this study and the hypothesizes

The purpose of this study is to find whether the green bonds are priced lower than ordinary bonds and how this will impact the fundamental value of the company. Green bonds and its markets have been studied since the inception of the first green bond in 2007 and even widely when volumes have grown rapidly. This study is structured with the idea of combining something new with the old, which means that this paper will

examine whether newly founded green bonds can increase the fundamental value of the company by using older valuation methods.

As mentioned, this study uses newly founded financial market products in order to see whether they increase the value of company. John Burr Williams was one of the first notably economist who articulated the theory of intrinsic value of stock. In discounted cash flow model, future cash flows of the company are discounted into present value by dividing them with discount rate (Williams, 1938). In general, weighted average cost of capital (WACC) is widely accepted and used determination of the discount rate used in valuation method. Cost of capital comes from both, cost of equity and cost of debt with weighted average (Farbera, Gillet and Szafarz 2006). As Fatica, Panzica and Rancan (2019) study results show, green bonds issued by supranational and corporations are priced with the premium compared to ordinary bonds with statistically significant level. Hence, this study investigates how this premium can impact the value of the company by using Discounted Cash Flow model since it is appropriate method for taking cost of debt into account.

Thus, whether green bonds can be proved to be issued with significantly cheaper yield it should also mean that if company is using green bonds to fund its operations and investments, the discount rate is lower as resulting higher present value of the company's future cash flows.

Following hypotheses guide for the structure of this study and are the main issues to be explored. Initially, the purpose is to find out how green bonds are priced relative to normal ones (H1). It is then necessary to examine how this possible price difference affects the cost of capital (H2) of the firm and thus the fundamental value (H3).

The first hypothesis states that green bonds are not priced any differently than ordinary bonds and therefore there is no impact to the firm's fundamental value in this regard. If

the green bonds are not priced with the environmental premium or there is not any significant lower rates, neither it has any impact on the weighted average cost of capital.

H1:   *There is not difference between the price of a green bond and ordinary bond and will not have any effect on the cost of debt, and therefore on cost of capital overall.*

As Fatica, Panzica and Rancan (2019) study results show, green bonds issued by supranational and corporations are priced with the premium compared to ordinary bonds with statistically significant level. In contrast, prior study (see e.g. Hachenberg & Schiereck 2018) suggests, green bonds are not priced with significantly lower levels than ordinary ones in the secondary markets. Hence, this hypothesis will be tested with simple OLS regression to find significant difference between these yields.

The second and third hypothesizes are the main points of this thesis' motivation and purpose as they answer to the questions how usage of green bonds might affect the fundamental value of the company. Thus, by obtaining an answer to these hypotheses, this study achieves its goal in the subject.

The second hypothesis states that green bonds are priced with lower interest rate and therefore there will be material decrease in the firm's cost of capital.

H2:   *Issuing a green bond company will pay lower yield than issuing an ordinary bond and therefore cost of capital will be lower.*

The third hypothesis states that whether green bonds are cheaper than ordinary ones, it should increase the fundamental value of the company. This requires that the first hypothesis will be rejected, and the second hypothesis accepted.

H3:   *Using green bonds fundamental value of the company will increase.*

According to prior (Binsbergen, Graham and Yang, 2010) findings, the marginal cost function of debt is positively sloped with the value of the company. Hence, decrease in cost of debt can result in higher valuation of the company.

Findings of this thesis are notably in line with previous research results and will provide answers to study problem. This study will also investigate how the green bond issuance is associated with other respective costs such as third-party assessment and certification and whether these costs are compared to the available pricing advantage. This study also examines how this cheaper cost of debt affects the valuation of a company using the traditional DCF model. Results indicates that there are clear differences in how the fundamental value of a company grows depending on its capital structure if the cost of debt decreases by the premium of green bonds. In the end, this thesis also looks at how the company's stock price reacts to the moment of the green bond issue.

1.2.   Motivation, Intended Contribution and Limitations of the study

The exponential growth of the green bond markets creates an opportunity for the market-based solution in the fights against the climate change. If the markets are pricing green bonds with lower yields than ordinary ones, companies can take this into account in the regard of making new investment and project strategies. Furthermore, this kind of public intervention to the markets could be itself de-risking strategy for companies if they choose to modify their operations into more environmentally friendly. In addition, green financing markets creates also opportunities for private equity firms where leverage buyouts are funded mostly with debt.

The intended contribution of this thesis is to combine prior studies and models company valuations and to find whether this public market-based intervention actually has positive impact on firm's fundamental value. Investigations are examined through regression test and sensitive analysis whether green bonds are cheaper than ordinary ones and how these can impact on firm's value.

The limitations of this study could obviously be the lack of data available and prior studies of this subject. This is a real risk to this study and can have some effect on its results. Green bonds and the green finance markets are so new that there cannot be too many researches to support this thesis. But as this matter being worldwide and widely encouraged by the international institutions like EU for example, the number of various case studies and prior tests have occurred in recent years and therefore can support this study. Another limitation worth of mentioning is that this thesis is using only one valuation method which should not be used as an absolute truth but more like a indicative range.

1.3.   Structure of the Study

This thesis has six chapters and sections with a conclusion. First chapter is the introduction to the topic and to provide some background in this field. The second and third chapters cover the general knowledge about the green bond markets and company valuation theory. This section starts from basic describes of the green bonds and some prequels. It will also go through some expectations and threats to the markets and issuers. This section will also cover some basic studies and researches about the fundamentals of the corporate finance from discount rate to valuation.

The fourth chapter shows some prior studies related to the green bond markets and to corporate finance. Basically, the review of the related studies is from 1938 to 2019. Older studies are covering the corporate finance field and new ones are about the green bond markets.

The fifth chapter describes the data and the methodology in this thesis and. The data is constructed mostly from data bases where access is provided by University of Vaasa and Climate Bond Initiative website which contains large amount of details about green bonds and their issuance. The methodology of prior studies is described, and this study follows some examples introduced in them. This chapter covers in detail how green bonds are priced in the markets and how it can affect to the fundamental value of the company.

The sixth and the seventh chapter represents the results and conclusions of this thesis and provides some discussion about the future possibilities and implications of this field of study.

2. Green Bonds

This chapter will cover some basic descriptions of the green bonds and principles of their usage. It will also go through some real-life examples of green bond issuance and expectations and threats to the markets and issuers. The market size of green bonds has been, and still is increasing rapidly every year. Yearly allocation to various proceeds of the green bonds shows increasing volume of assets distributed to renewable energy and low-carbon projects or investments.
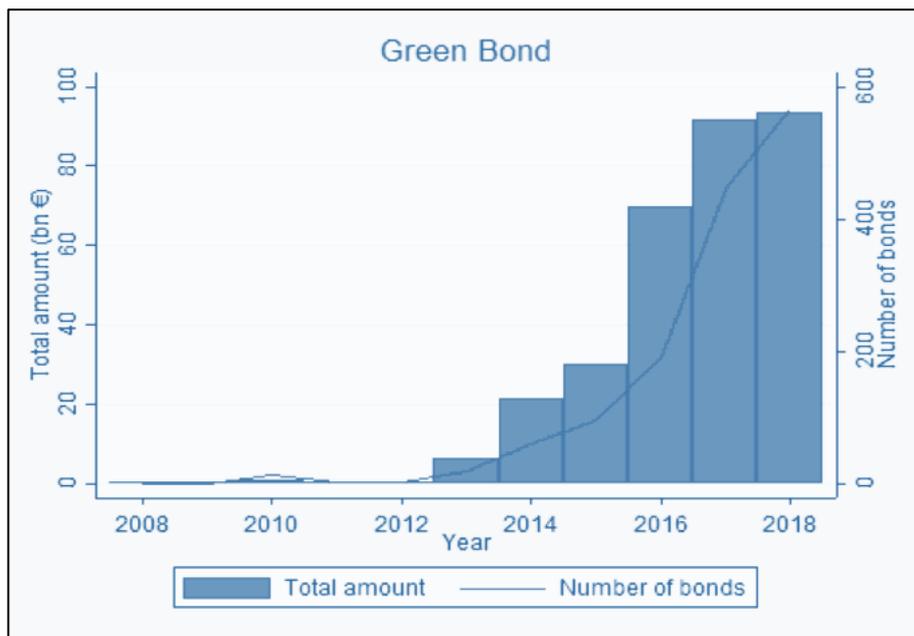
Figure 1 The Green Bond Market. The figure represents the total amount of issued Green Bonds (blue bars) on a yearly basis. The red line shows how many of green bonds are issued from 2007 to 2018. Fatica, Panzica and Rancan, 2019.
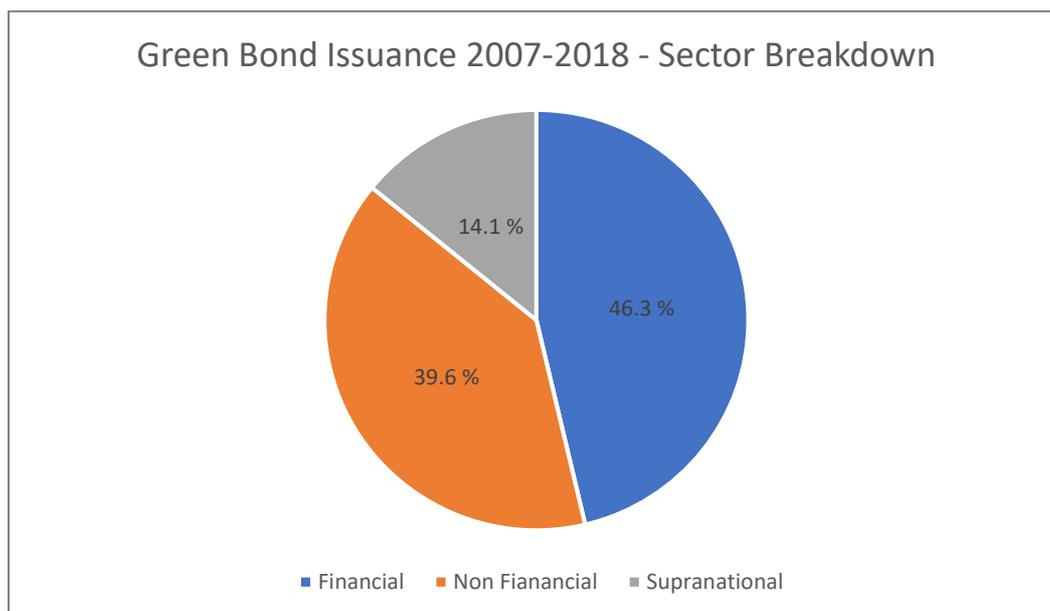
Figure 2 Distribution of issuance**.** The figure above shows the percentage of issued Green Bonds from 2014 to 2018. Fatica, Panzica and Rancan, 2019.

These figures are illustrating the material growth of the green bond market and also the change in the weight of which kind of companies are issuing green bonds. As we can see, non-financial institutions are covering almost 40% of the total green bond issuance in 2019. This is a notably change as supranational institutions like European Investment Bank and World Bank were covering the major part of the issuance in the beginning of green bond markets.

2.1. Definitions and Principles

Green bonds are a newly founded asset class that aims to be used as a financing tool for low carbon investments. It also creates a marketplace which aims to increase the transparency of the information given to investors about the underlying asset and companies using it. The definition of green bond is very crucial for the purpose and the agenda of the green bond market and as a quite new way of financing assets, there is

not yet widely accepted or confirmed definition of a bond with green label on it. If this description is misunderstood, it can lead to wrong outcomes. ICMA, which is one of the key institutions behind green bonds, published in 2018 a Voluntary Process Guidelines for Issuing Green Bonds. International Capital Markets Association (ICMA) has defined green bond as an "any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects" (ICMA, 2018).

Same paper also concludes a well described set of use of proceeds where green bonds can be used. Green Project categories according to ICMA Guidelines for Issuing a Green Bonds:

- Renewable energy
- Energy efficiency
- Pollution prevention and control
- Environmentally sustainable management of living natural resources and land use
- Terrestrial and aquatic biodiversity conservation
- Clean transportation
- Sustainable water and wastewater management
- Climate change adaptation
- Eco-efficient and/or circular economy adapted products, production technologies and processes
- Green buildings

(ICMA, 2018)

As the following picture shows, the issue of green bonds is no longer solely on the shoulders of institutions, as companies have begun to issue a large amount of green

bonds. This is a very promising thing regarding the purpose of this thesis. The financial sector like banks and financial corporations are accounting 46,3% of all issuance during 2007-2018 and non-financial corporations for almost another half (39,6%). Approximately rest of the issuance is done by international organizations and supranational institutions like World Bank, World Developing Bank and European Investment Bank for instance
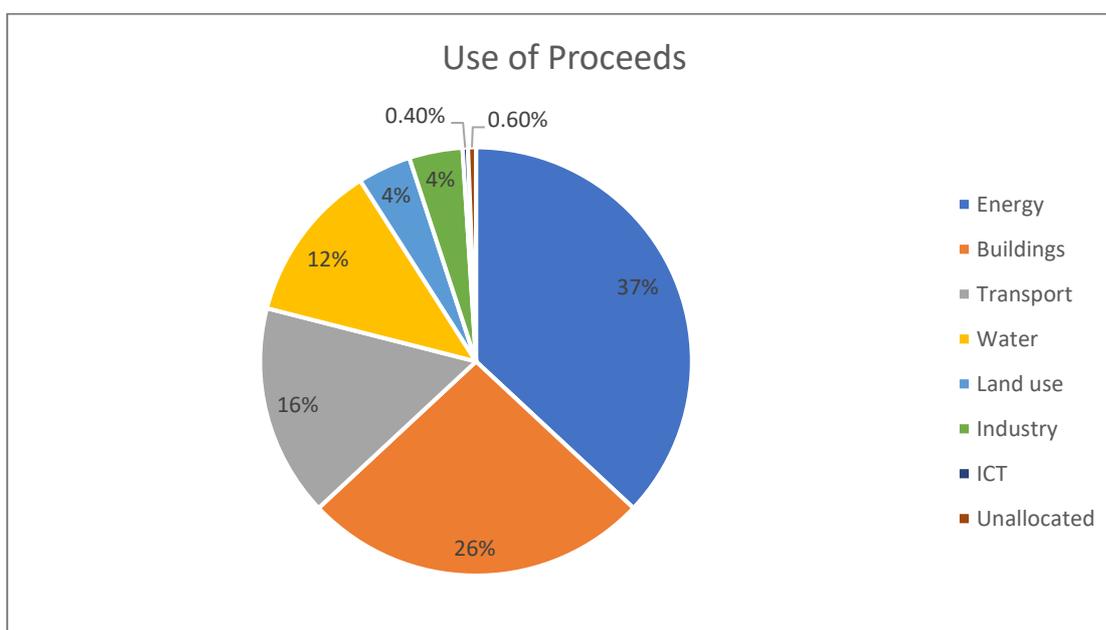
Figure 3 Allocation of issuance. The figure above shows the allocation of capital issued with Green Bonds in 2019. Climate Bonds Initiative Green Bond Survey 2019.

As mentioned earlier, the green bond market aims to create an opportunity and market-based solution that debt markets, investors and companies could use in funding projects. According to the ICMA's categories of the usage of green bonds, one can see that there are wide range of possibilities for investments and projects where company

can issue a green bond to finance them. This can also be seen from the distribution of the issuers of green bonds in 2019 (Figure 3).

2.2. Bond Pricing

Companies must consider how to fund their operations and projects and generally there are two options, equity and debt. In case of debt, at the same time as company considers how much it has to borrow capital, it needs to consider which type of debt they are using. There are various chances to raise external capital but generally this is divided into groups, short-term and long-term debt. This study is focusing more on the long-term debt and the instruments in this case are called corporate bonds.

To conclude, corporate bond is a security and it is used to raise external capital with different terms than equity. The company issues the bond with the obligation to pay back its principal amount to the bond holders with an additional interest (the coupon) that is determined by the riskiness of company's ability to pay back. Interest is generally fixed and set during the issuance and thus bonds are called fixed income. The price of the bond can be determined as companies, discounting future cash flows with certain discount rate. (Brealey, Myers and Allen, 1988:452-453)

Bonds are generally priced with the relative value of risk-free government bond and bond holders' required premium which is described as a risk premium regarding the credit rating of the company behind the issuance. Study of Heath, Jarrow & Morton (1992) divides pricing process into two pieces. Firstly, corporate bond is priced based on all zero coupon (default free bonds like US treasuries) bonds with various maturities with several economic fundamentals which are called the state variables. After that bond is priced to all interest rate sensitive contingent claims like convertible and callable features.

The following chapters will show prior studies and theoretical backgrounds how markets are pricing bonds with the green label with them.

2.3.   Green Bond Prices

As the price of green bonds are at the core of this study, it is a needed to look at how prior researches have analyzed this topic and what they have found. The two most important studies in this chapter are Fatica, Panzica and Rancan (2019) as well as Karpf and Mandel (2017) because they have examined this very subject and have found very important and interesting results. Mentioned studies will be reviewed through in general terms because later in this thesis, green bonds will be regression tested more carefully in order to compare them with the ordinary or so called "brown" ones.

Study of Fatica, Panzica and Rancan (2019) is one of the base studies of this thesis as they examine the pricing implications of green bonds compared to ordinary ones. In the regression model they analyze what determinants of the bonds are affecting to the yield. They have a similar approach for their study as Fama and French in 2007 as their state that "If the appetite for certain types of assets enters the utility function of investors in addition to their return/risk expectations, investors' tastes modify equilibrium prices (Fama & French, 2007)".

In overall, their study finds that there is not always a premium in green bond issuance price but in the case where supranational or corporate is behind the issuance, the premium is found, and bonds are priced more cheaply than ordinary ones. They also study whether the second time issuance of green bond from the same company can provide some premiums on the yield. The results suggest that repeat issuance of green bond have some price difference compared to ordinary one. Same result does not apply for the first-time issuance even though there is also some difference in price. In addition, Fatica et. all (2019) find that after the issuance of green bond, issuers tend to reduce their exposure of pollution activities. According to their opinions about the price differences, researchers argue that greenwashing might be one reason why green bonds are not always priced with lower levels.

Next table is from the study of Fatica et. all (2019) and provides some descriptive data about the numbers of bonds of sample in each class (green or ordinary), issued amount in billions of euros and the average yield by the type of issuer. This table also compares the prices of green and ordinary bonds.

Panel A.

	Green			Ordinary		
	Number	Amount	Average Yield	Number	Amount	Average Yield
Supranational Institutions	228	44.44	3.52	7478	1430.80	5.19
Financial Firms	538	145.55	3.02	169061	23961.65	3.18
Non-Financial Firms	631	124.36	3.62	93376	19587.93	4.73
Total	1397	314.36	3.37	269915	44980.38	3.77

Table 1 Bond comparison**.** The table above is taken from the study of Fatica, Panzica and Rancan (2019) and it presents the comparison of issued Green Bonds during 2007-2018.

The table above is probably the biggest source of motivation for this study. It shows very clearly how green bonds are on average slightly cheaper than regular bonds. It also shows how the biggest beneficiaries would be non-financial companies with a yield difference of 1.11% cheaper (Fatica et. all (2019). With some logical thinking, this would also mean that when calculating company's fundamental, an analyst should now

discount future cash flows with around 1% cheaper rate depending on the capital structure of the firm. Looking at the data sample, from 268,083 fixed income products issued over the period, 1,131 are green bonds. This also means that the data sample is not as big as probably hoped but results are promising. Later on, the same study, Fatica et. all show on their results that green bonds are issued at significantly lower yields compared to ordinary ones but there are some differences across the sectors and the type of company or institution.

In addition, Karpf and Mandel (2017) investigates the yield term structures of green and ordinary bonds by using data from US bond markets. They argue that, even if the returns of ordinary or so called "brown" bonds are higher compared to green bonds on average, this can be explained by profile and determinants of issuing company or the bond.

In general, a flattening slope on the yield curve reflects that the investors are expecting lower returns from the bond. According to the study of Karpf and Mandel (2017), flattening yield curve is more present in green bonds than in ordinary bonds. They state that according to the results, a significant spread of yields between green and normal bonds occurs on the markets. This is undoubtedly in favor of brown bonds in the investors point of view but from issuers angle, it results cheaper for them to issue green bonds.

The following picture shows how differently green and normal bonds are priced in the market. A particularly important graph is the top right which compares the market spot rate of these bonds. In the case of green bonds, this rate is lower and the spread increases as the maturity increases. This finding is well in line with the study (Fatica et. all (2019) on the differences on yields between green and normal bonds.
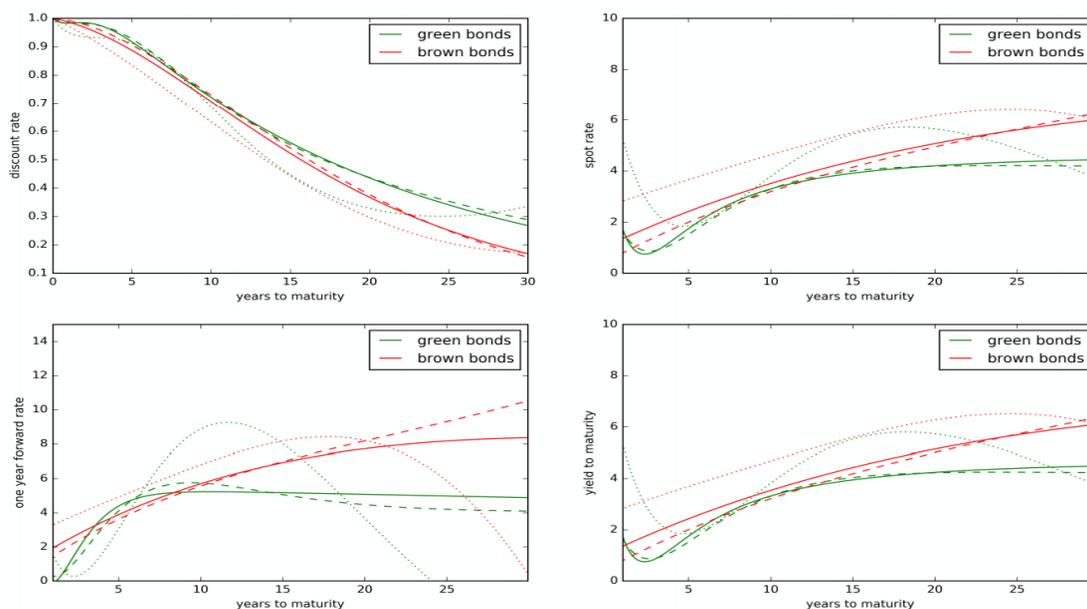
Figure 4 Yield term structures of green and ordinary bonds**.** Figures goes as follow, upper left is a discount rate, upper right is a spot rate, lower left is a one-year forward rate and lower right is a yield to maturity. Solid line is overall, hashed line is A rated bonds and dotted line is B rated bonds. Karpf and Mandel (2017).

This study also concludes, that there is positive and statistically significant spread between ordinary and green bonds on average. This finding is in the line with the study of Fatica, Panzica and Rancan (2019).

As mentioned earlier, these two studies are the core parts in order with this thesis. From here, it is a good point to start exploring more of the green bond market and then work on this thesis' own regression on yield differentials between green and normal bonds.

2.4. Experiences and Mechanisms of Green Bond Markets

These subchapters are focusing on the practical side of the green bond markets and usage of green bond in financing projects or investments. It contains one real life case

study about the issuance of green bond in London and also the challenges of green bond markets through its liquidity and so called "greenwashing".

2.4.1. Real Life Case study from London

Climate Bonds Initiative keeps a case study library which includes a detailed interview and real-life experiences of the green bond issuers. One of the cases involved issuance of a green bond in 2015 by Transport for London (TfL) in order to finance their transport system project. According to the case-study, the issuance of green bond was more than suitable for them as their core business is to change people's habitants from using high-emission cars into low-carbon public transport system. Assistant Treasurer of TfL explained the decision and drivers to issue green bond firstly, to see if their assets could fit to the categories of green bond issuance and by achieving a larger diversification of investors and moreover by attracting wider geographically investing base. They also wanted to promote TfL's purpose and environmental performance towards low-carbon projects.

The green bond was issued in 17th of April in 2015 and the amount was £400m maturing in 10 years at 2,125%. As a comparison, around that time U.K. government issued 10-year bond was yielding at 1,804% (Investing.com), which is a reference rate to a corporate bond yields where spread is added in the line with company's the credit rating. At issuance of the case study's green bond, TfL's green bond was a great success as the bond was oversold by 50% and the goal to achieve more geographically diversified investor base was also succeeded. (CBI Case Study Library, 2015)

Overall, this case study is a perfect example how green bonds can be used to finance various projects with cost-efficient way. According to the study of Fatica, Panzica and Rancan (2019), financial sector, like banks and asset management firms, accounts almost half of the issued green bonds in 2018 (46.30%) and non-financial corporations for almost the rest of the half (40%). This finding can be also viewed as a promising turn

in the green bond market and for the purpose of this study as this thesis focuses on the corporate side of green bond issuance.

2.4.2. Green Bond Market Mechanisms

As the green bond markets continues to grow as such a huge rage and the popularity of green bonds is increasing, it is even more important to understand the mechanisms and risks of the markets. This chapter is one of the most important chapters of this study because even when there is a motivation to study the positive sides of the green bond markets, it is also crucial to obtain understanding about the risks. According to the prior studies, there are two major risks in the issuance of green bond and in the markets. Firstly, liquidity risk is one of the key risk factors in this market and it has impacts for the issuer and also for investors. Liquid and stable markets are something that investors seek, and in order to get the attention of investors and certainty of investment products functionality these are factors that are important.

Study of Febi, Schäfer, Stephan & Sun (2018) examines how liquidity risk affects the bond yield spreads in the green bond markets by pooled OLS model which analyzes the yield spreads between corporate and government bonds. Their finding suggests that green bonds are more liquidly priced than ordinary conventional bonds during 2014–2016. In addition, they also find that liquidity risk on yield spread of green bonds has become almost insignificant over the past years which can be associated with the growing maturity of the markets. Correlation between green bonds and non-green bonds is also studied by Hachenberg and Schiereck (2018). Their study finds that the correlation of green and non-green is relatively high, and for most of the rating classes correlation is even 0,99 and for A-rated bonds correlation is 0,94.

For the second part of this chapter, study of Pham (2016) examined the volatility behavior of the green bond markets by using data of daily prices of the S&P green bond index from April 2010 to April 2015. This study finds that there is a time-varying volatility

relation between the green bond and the ordinary bond market. To summarize, the current volatility of green bond market is depended of the volatility in previous time. This finding is also a crucial information to understand for both, investor and issuer of the green bond. Hence, these findings are also related to the pricing of green bonds.

2.4.3. Greenwashing

Even though the green bond market has grown with a remarkable speed and corporations is coming to be more and more familiar with socially responsible ways of doing business there are always those who are trying to benefit from it without real actions. As the purpose of this thesis among many other researches, the benefits of "going green" have been found and documented, and the fact that investors are preferring more and more how companies are handling environmental issues it is not a secret anymore. Situation where company achieves monetary benefits from the environmental-friendly operations creates also possibilities for the dishonest actions. Greenwashing is one of these and the risk of its existence brings uncertainty to markets that are intended to be an effective place for capital allocation, and in the case of green bond market, place to make world a better place.

In general, greenwashing can be described as a form of marketing or advertising company's green values or environmental healthy operations with purpose to persuade the public and investors that the company's products, operations and aims are environmentally friendly, even if they are not.

These issues have been studied more closely in prior papers. For example, in the United States climate change legislation and mandatory recycling are becoming the more normal every day, firm's in a various of sectors are trying to achieve the benefits of promoting their green and eco-friendly operations in advertisements (Dahl, 2010). Same study also concludes that even the greenwashing has been there around for many years, its occurrence has escalated rapidly over the last years. We can see the same evolve in

the green bond markets for instance. Dahl (2010) is also worried in the paper that the problem lies also in the legislations and regulations of environmental advertising which is not too tightly considered.

Studies of Laufer (2003) and Beder (1997) give couple of examples about how companies are practicing so called greenwashing and how these actions can be categorized into confusion, fronting, and posturing. Figure 4 presents these with examples:

Confusion	Fronting	Posturing	Examples
	Cast doubt on the severity of the problem or danger	Employ "front groups" or coalitions of firms to oppose solution or legislation	Promote image that assumes ethical leadership in the field
	Disclose or publish exaggerated claims	Employ "front groups" or coalitions of firms to support solution or legislation	Unveil projects that have negligible value but appear on surface to be significant
	Emphasize uncertainty associated with problem or accusation	Use front group to promote moderate "middle ground" positions	Promote image of a committed corporate culture
	Acknowledge problem by questioning available solutions	Use data to suggest that front groups enjoy widespread public or "grassroots" support	Publicly align firm with NGOs that are sympathetic to cause or issue
	Rebrand to avoid past association; use image advertising to suggest a "green" association	Employ front groups to examine, define, and redefine industrial standards	Publicly align firm with NGOs that offer certification, accreditation, or award without provisions for accountability or verification

Figure 5 Elements of Greenwashing**.** The figure above shows the elements of greenwashing. Adapted from Laufer (2003) & Beder (1997)

According to these prior study findings, greenwashing is a prevailing issue and it also might have an impact to green bonds. If green bonds are priced cheaper than the

ordinary ones and the second and the third hypothesizes of this study hold, it creates one motivation more for companies to practice green washing.

2.5. Strategic point of view

Thus, the use of green bonds is increasing in the world and their markets growing, their direct benefit from pricing of green bonds has not yet been fully clarified for every case, the strategic benefits of their use can still be determined. The benefits of green financing are not only the benefits of its pricing but also the benefits of a sympathetic and future looking action in the terms of the general political climate. Laws and regulations always create risks to the business and its continuity. In other words, environmentally unfriendly practices and polluting operations are at the core of this risk. In contrast, eco-friendly projects and operations are currently perceived as less risky for major negative political changes in regulation and laws.

One of the major studies to support this thesis' purpose is from Steckel and Jakob (2018), in which they examine benefits of strategies in clean energy business in terms of financing cost and policy de-risking.

2.5.1. Clean energy, financial costs and ESG

Company making business investments will have to consider how to finance the capital. At the same time, company have to think about how to run machines, for example, using either carbon fuel or fossil fuels. These are costs that are affecting to the whole rate of return of the project. In general, technologies and machines with low carbon consumption, such as renewable energy, are classified as high capital-intensity objects which mean that they require high share costs that are needed to finance in advance. In the other hand, technologies with high carbon consumption, as coal or natural gas, are categorized to a lower capital-intensity class. (Schmidt, 2014)

This conclusion is perfectly in the line of the purpose of this study. To continue previous finding, operations and projects with a high intensity of capital costs are benefiting more from lower capital costs in a logical sense. The study of Steckel and Jakob (2018) assumes that technologies using renewable energy do not require further extra costs over their usage lifetime, and in contrast, fossil fuel machines require fuel costs as well as costs due to carbon pricing and legislation over whole time of the project. Their study also states that if starting with a profit that would make renewable energy sources competitive without the price of coal, doubling the interest rate requires that coal costs be matched with fuel costs. In addition, Ondraczek, Komendantova and Patt (2015) state that changes in capital costs are far more important and crucial for the profitability of the investment than other factors. These findings and conclusions are driven also by the ratio of cost of equity and debt as well as systemic risk in the market, rather than variation in interest rates.

To present these calculations and assumptions in illustrative form, next figure will show a clear trade-off between weighted average cost of capital, carbon prices and proportion of renewable energy used Steckel and Jakob (2018) & Hirth and Steckel (2016).
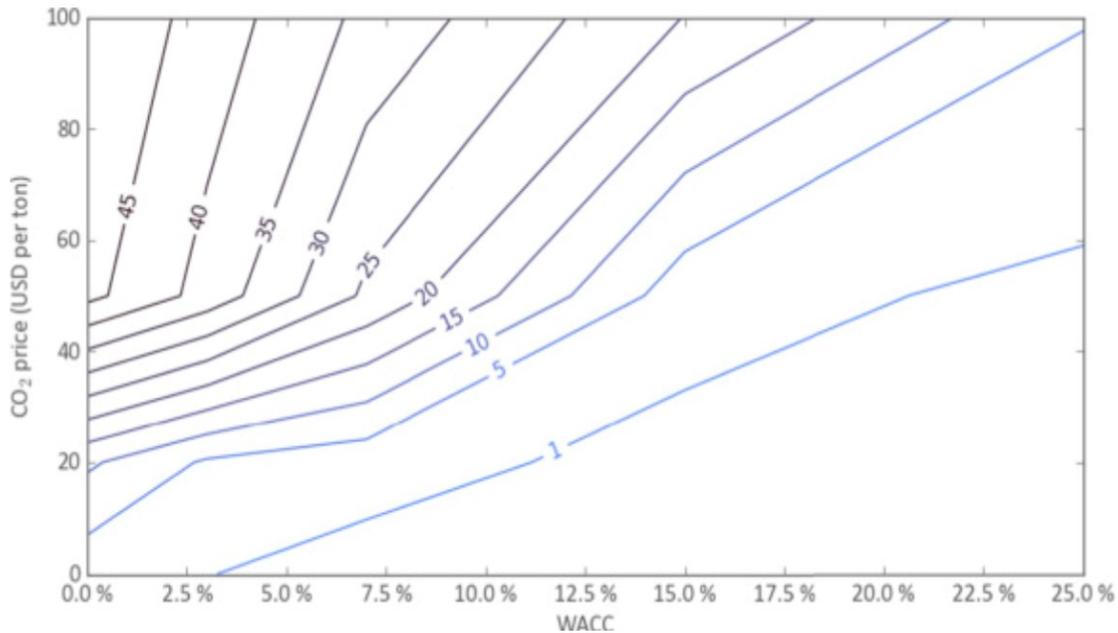
Figure 6 WACC and Carbon Price. This figure illustrates the relationship between cost of capital, carbon prices and usage of renewable energy during the project. Steckel and Jakob (2018) & Hirth and Steckel (2016)

To explain this figure above, using 10% renewables of energy and increasing WACC from 5% to 10% allows the carbon price increases from 20 to 35 dollars. In contrast, using 30% renewable energy and by the same change in WACC rate would increase the carbon price significantly from 45 to 100 dollars. To conclude this finding, with larger proportion of renewable energy used in investments will result with lower cost of capital and the company will be less sensitive to the carbon price fluctuations. Steckel and Jakob (2018)

Atan, Alam, Said and Zamri (2018) studied the impact of company specific ESG factors on the performance of company's profitability, value and cost of capital using data of Malaysian public-limited companies from 2010 to 2013. They state that these days investors and stakeholders are more concerned and aware about the company's ESG factors. Transparency and given information in these areas are important to investors in order to know how company invests capital and where the company does business and operations. Same principle goes to the environmental issues as the eco-friendly

processes and the impact of climate change are close to business operations of companies.

According to study findings, factors of ESG as individually do not produce significantly lower cost of capital but if ESG factors are combined it results positive and significant impacts on company's cost of capital. Atan et. all. (2018)

In addition, Atan et. all (2018) state that the prior literature provides findings that well practiced corporate governance on all ESG areas has an impact on the cost of debt. These findings support the hypothesis that more the company is going green and socially responsible, more are positive impacts of that in reduced debt costs and tighter credit spreads. In terms of fundamental value, non-financial performance like company's environmental as well as social performance can be transported into a higher valuation of publicly listed firms according to Al-Najjar and Anfimiadou (2012).

All findings above regarding the environmental performance of the company and its impact on cost of capital and company value are supporting the purpose of this study. In addition, when combined with previous findings the idea of environmentally friendly projects and operations may be financed by green bonds, creates even more cost-effective opportunities for businesses which will effect on its value.

3. Valuation of the Company

The following section deals with the theory of company's valuation and how changes in capital structure and debt costs would affect a company's fundamental value. Green bonds are recognized in the balance sheet as a liability of the company and are considered when calculating the discount rate used to discount future cash flows into present value.

The need to determine the value of a business can come from various reasons. However, the need for all valuations ultimately comes down into the need to know more accurately about the company and its value. Only the purpose of the information is different. These chapters open the process for determining the value of a company based on traditional theories and examples from previous research. The end use of the information provided by the process is determined by the user's own needs, be they private or institutional investors, management consultants or private equity firms. This chapter introduces you to the background of valuation and how these theories support the purpose of this thesis.

3.1. Efficiency of the Stock Markets

According to the widely accepted theory and one of the founders of efficient markets, Fama (1970) states that markets are efficient when every investor has access to all the available information that influences price changes in the market. Therefore, in an efficient stock market all actors have access to the public information as well as inside information. Thus, in efficient markets, there is no opportunity to gain returns, for example through stock research. However, the same study reminds that the market has seen a number of indications that the market efficiency would be semi-strong. According to this theory, the market is believed to follow a market line that shows combinations

of returns and risks. This market line consists of portfolios that offer a mix of risk-free assets and market portfolios

This theory is probably as accepted as disputed. Numerous subsequent studies have responded to the Fama (1970) study and have attempted to dispute the theoretical model of market efficiency and the dependence of stock prices on the market line. Green (1986) examined the robustness of the Security Market Line (SML). According to his findings, there are some errors and movements of prices occurring in the stock market that are not in the line of SML theory. This study also states that these errors are somewhat continuous behavior and predictable.

3.2. Discounted Cash Flows and Intrinsic Value

As these previous studies emphasize, stock markets are expected to work efficiently, but they also have pricing errors that can be reliably expected. At this point, stock valuation comes into play when an investor can analyze the future cash flow of the company at its present value, and the resulting fundamental value of the company. Emphasized, this calculated fundamental value is never objective and ultimately true result but indicative as well as outlining a certain estimated range of stock price. If the fundamental value of a share is below its market price, the share can be said to be undervalued and if its intrinsic value is above its market price, the share is overvalued.

In the late 1930 first public study about the intrinsic value of the company was made by John Burr Williams who stated that company's fair value is based on the discounted cash flows. Today this method is well known approach and known as the discounted cash flow model (DCF-model). (Schmidlin, 2014: 120-123)

As Schmidlin (2014) states, the valuation result of a company is concerned to be the fair or intrinsic value of a company and there are several methods and styles how to calculate this fair value. This intrinsic value of a company cannot be viewed as objective

result, but it can be viewed as a compromise of various approaches, which lead to a specific range of the fair value of the company (Schmidlin, 2014). The valuation result is used by investors to make investment decisions, buyer and seller to determine the purchase price, companies listing on the stock exchange, buying back their own shares from the market and private equity companies to analyze the price of the target company. Therefore, the implications of this subject are wide.

As Kaplan and Ruback (1995) and Berkman et. all. (2000) mention, the accuracy of DCF-model method is still accuracy and can result similar outcomes of the company's value as the other methods like multiple methods for example. Even though, both studies find that comparable approach tends to result quite accuracy values for the company but used together with a discounted cash flow they result relatively accurate value ranges for the company.

Aswath Damodaran is generally considered expertise professor as well in terms of valuation. His book (2016) presents the general formula for value the entire company by using DCF model based on the Free Cash Flow for Firm (FCFF) approach. According to Damodaran (2016), valuation of a company can be done by using following formula.

$$Present\ Value\ of\ Firm = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+WACC)^t} + \left(\frac{[FCFF_{n+1}/(WACC-g_n)]}{(1+WACC)^n}\right)$$

(1)

where, $FCFF_t$ = Free Cash Flow to firm in year t

WACC = Weighted Average Cost of Capital to firm

g_n = Growth rate   (Damodaran, 2016)

In this model, discounted cash flows are separated into two parts; first 1-5 years with assumptions about the cash flows and after final year terminal value is calculated. This approach takes cash flows to all stakeholders into account and therefore the result is the value of entire firm. This approach is used in later chapter when this thesis conducts a sensitive analysis where impact of cost of debt and capital structure to firm's value will be examined.

The discounted cash flow model values the company based on its future cash flows, which are discounted into present value with certain discount rate. This study focuses more on the cost of capital and therefore to discount rate. In order to analyze the company's cost of capital, factors like interest rates and business risks are required to considered.

3.3. Discount Rate

The company's future cash flows are generated with a certain amount of capital. Generally, a company seeks to finance its operations from its own resources like equity or cash financing, but often also through debt. And by using debt as financing instrument, with its leveraging effect company is able to grow its operations larger that by using only its own capital.

Thus, the cash flows generated by a company can be calculated from the income statement, but according to the general financial theorem, future cash and cash flows have a time value. Therefore, future cash flows will be discounted to the present with a given yield requirement. Because the company uses both equity and debt to generate its cash flows, this return requirement is a combination of the two and as one can expect, required rate of return of equity and debt are not the same.

The total return of capital is a key factor in valuation models as it describes the overall risk of a company in terms of used capital. Calculating the exact required rate of return

on company's capital is very important, because even small errors in its determination can affect the values of a company through valuation models. As mentioned, the requirement for return on total capital is divided into the requirement for return on equity and debt. This chapter outlines the methods to determine cost of capital overall and cost of debt. Determination of cost of equity will be mostly excluded from this thesis, as its focus is in cost of debt.

3.4. WACC

As mentioned, the company's total capital required rate of return is calculated by combining the cost of equity and debt. The average return on capital is calculated as the weighted average of the return on equity and debt, where the tax shield of debt is considered. The tax shield's benefit refers to the deductibility of interest on debt. The proportion of the interest expense can be deducted from the taxes company has to pay. (Brealey et. all. 1988)

Initially, the average return on total capital was introduced by Modigliani and Miller (1958) in their paper. This thesis will use their theory of weighted average cost of capital as principal theory but also takes analysis of Brealey, Myers and Allen (1988) into account. In order to present this in a mathematical form, the weighted average cost of capital after taxes is calculated as follows in the formula (2):

$$After-tax\ WACC = (1 - T_c) \times r_d \times \frac{D}{V} + r_e \times \frac{E}{V}$$

(2)

where, T_c = Company specific tax-rate

                r_d = Cost of debt

                r_e = Cost of equity

                D = Amount of debt

                E = Amount of equity

                V = Amount of capital   (Brealey, Myers and Allen, 1988)

More practical studies around this subject are Larkin's (2011) paper where he examines the impact and usefulness of WACC in the company valuation. This study argues that even as the implications and utility of the WACC is widely accepted in company valuation, the theorem still causes confusion around its users. This misunderstanding and confusion have also decreased the usage of DCF models and led to the favor of multiples-based valuation methods. Larkin (2011) reminds that as these models can be useful and easier to understand they can also result less accurate outcomes.

3.5.   Cost of Debt

As stated earlier, the cost of capital and WACC moreover, is calculated as a weighted average of the cost of equity and debt. This chapter goes through the basic theory about the cost of debt and general assumptions. Determining the cost of debt is, in its simplicity, much easier than the cost of equity, but the complexity comes with the assumptions about the capital structure of a company, which will be discussed after this

paragraph. In accordance with the purpose of this study, and in order to keep the theoretical assumptions as clear as possible, cost of debt theorem is reviewed in a very general way, and later in the methodology section clear assumptions are followed.

According to Pratt (2003: 213-215), only long-term liabilities are concerned to be part of cost of debt calculations. Even though, some companies might use mostly short-term liabilities to fund their operations. Thus, in terms of the valuation analysis, it comes to the maker's judgement to decide which debt to include to calculations. Pratt (2003) also guides that cost of debt in the equations is determined by the company's interest expenses after taxes from its financial statement.

The book of Brealey, Myers and Allen (1988) has similar notes regarding the cost of debt. They define cost of capital as expected rate of return of company's all existing securities as that portfolio consist both debt and equity. Cost of debt is considered as the interest rate borrower firm is required to pay for their debt. It can consist various forms of debt financing and therefore company's cost of debt is the interest rate paid overall. In general, cost of debt is less than company's cost of capital and cost of equity. Reason for this is that debt is considered as safer asset than equity and in the case of bankruptcy, debt holders are paid before equity holders. In addition, when calculating the cost of debt in WACC formula, interest rates are tax deductibles so that will decrease the weighted part of cost of debt even more.

In addition to the general theorem of cost of debt, the study Anderson, Mansi and Reeb (2004) analyzes the impact of company-specific characters on borrowing costs. Their sample consists of S&P 500 companies and found results in factors that influence debt cost, including board independence and size. The study also found that the cost of debt financing is likely to be lower due to independent audit committees. In addition, the size of the internal audit committee and the frequency of meetings tend to decrease the cost of debt.

The study of Binsbergen, Graham and Yang (2010) uses data from US companies from 1980 to 2007 to examine corporate debt's function of marginal cost. Their research methodology generates debt tax benefit curves assuming that the marginal benefit curve of unrestricted and distressed firms presents the marginal cost curve. According to their findings, this marginal cost function of debt is positively sloped and the benefit of using debt is 3.5% of company's value of assets.

To summarize policies and descriptions of cost of debt above, the cost of debt represents the return to debt investors. The risk of investing in debt is lower than that of an equity investor, because unlike in equity, debt has a fixed repayment period. In addition, in the event of bankruptcy, debt investors are the first to be paid. In the line of these guides, this thesis follows mentioned assumptions in order to calculate cost of debt. Cost of debt can also be reduced by well-practiced complaint functions and transparent reporting. In addition, as Ge and Liu (2015) study concludes that company's Corporate Social Responsibility (CSR) performance has a positive relationship with the cost of debt, green bonds can also have a decreasing impact on cost of debt. This research question will be examined later in this thesis, but all these findings of these chapters are in the line with the purpose of this study.

3.6. Capital Structure and Risk

As both, Larkin (2011) and Brealey et. all. (1988) warn about the leverage in WACC model that even though cost of debt is cheaper than cost of equity, using an overwhelming amount of leverage will eventually affect cost of equity. Lower cost of debt will decrease the weighted average of cost of capital and therefore increase the present value of company's cash flows. Hence, study of Hamada (1972) examines the effect of company's debt and leverage to the systematic risk. According to the findings, around 21-24% of the systematic risk of stocks observed in the study, are due to financial risk of the firm taken from the use of debt and therefore company's leverage ratio has

a significant and considerably impact on the systematic. And as mentioned, this systematic risk will eventually reflect to the cost of equity and increase that.

In contrast, study of Modigliani and Miller (1958) presents this conclusion in a figure that illustrates the relation between return of stock and leverage.
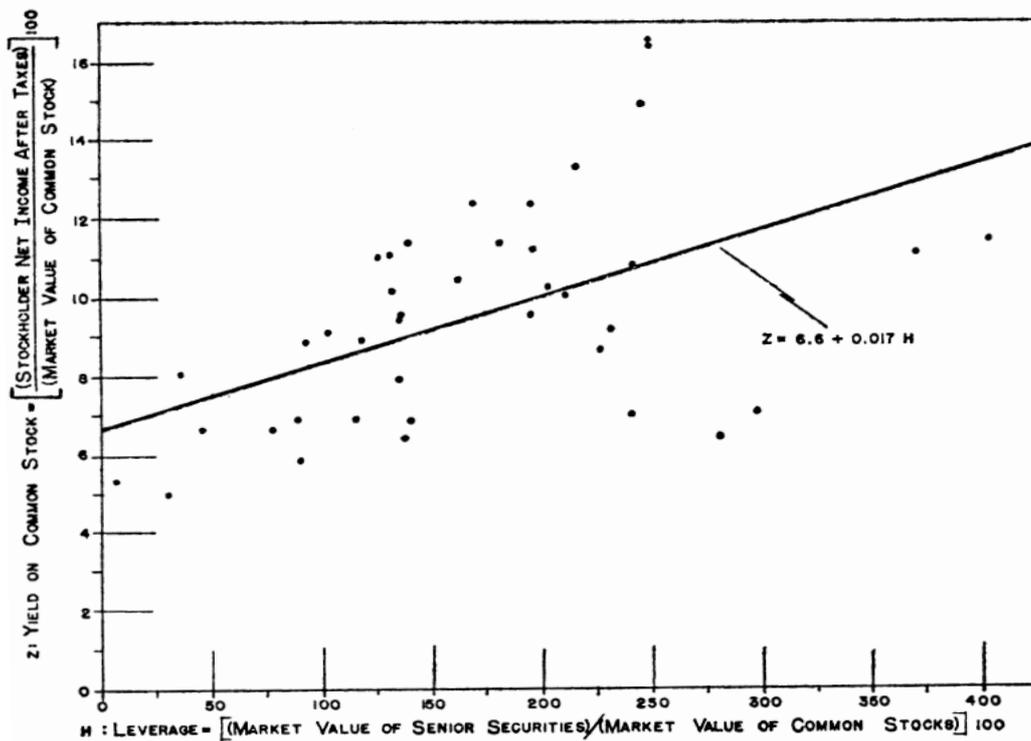
Figure 7 Leverage and Yield of common stock**.** This figure presents the relationship between company's leverage and yield of common stock of electric utility company. Modigliani and Miller (1958)

As shown in the figure above, where Modigliani and Miller (1958) have estimated the relationship between return of stock of electric utility company and leverage, how the company's capital structure and stock return are correlated. However, earlier mentioned warning about overleverage must be kept in mind. Therefore, it is worth of

noticing how the cost of debt affects the value of a firm. In addition, estimated relation added to the green bond pricing, this equation gets more and more valuable in terms of the purpose of this thesis.

This research has gone through the theory and previous research on the pricing, use, and mechanism of green bonds. In the additional theory section of these findings, the fundamentals, implications, and factors affecting these are discussed. Hence, the next step is to do econometric research based on these theories and test if green bonds are priced cheaper than regular bonds in this study and what is the impact on the fundamental value of the company.

4. Literature Review

This thesis relates to various kind of studies around green financing and corporate finance and it combines very lately published literature about green bonds with older studies about cost of capital and valuation. Green bonds and its markets have closely been studied since the launch of green bonds in 2007, when European Investment Bank issued its first green bond called as "Climate Awareness Bond". In contrast, studies of cost of capital and impact of firm's capital structure to its value goes way back to the previous century. The literature review in this paper is not a comprehensive overview of all previous research on the subject, but more selective on important findings. Literature review of related studies gives a better picture of the area and supports the research problem of this study.

As mentioned earlier, this chapter is divided into two kind of related studies; researches about green bond markets and its effect on cost of capital and to corporate finance related studies about capital structure, leverage and valuation.

4.1. Price of Green Bonds

Several papers have studied the prices of green bonds compared to the ordinary ones. For example, Fatica, Panzica and Rancan (2019) find that green bonds issued by supranational and corporations are priced with slight premium compared to ordinary bonds. Chava (2014) analyzed in his study the effect of environmental profile on firm's expected return and interest rate levels. His findings suggest that if firm's operations have some kind of environmental risks, lenders tend to require a significantly higher yield from the loans. This conclusion can be seen as a positive sign for the purpose and motivation of this thesis.

In contrast, Hachenberg and Schiereck (2018) studied the secondary markets of green bonds and find that there could not be any substantial difference between prices. Sharfman and Fernando (2008) studied the effects of environmental risk management on the cost of capital and state that in their case firms with lower cost of capital has had better environmental risk management and environmental performance.

Gianfrate and Peri (2019) studied also the additional costs of issuing green bonds. They argue that even when green bonds do have additional transaction, certifying, monitoring and reporting cost about the green use of proceeds, the monetary benefits for issuers do exceed these costs. For example, the Climate Bonds Initiative, takes 0.1 basis points fee for every in order to certificate the green label. This means that if the amount of green bond issuance is 1.000.000 EUR, these costs will be 1.000 EUR. Sometimes CBI also requires that all the reports and procedures are verified by the third-party which will also increase the costs. Even still, Gianfrate and Peri (2019) states that there is a statistically significant prove that when a bond is labelled as green and issued, these benefits will exceed costs. According to their results, this yield premium is around 18 basis points which equals 0.18% of the overall bond value.

In addition, Ge and Liu (2015) find that company's Corporate Social Responsibility (CSR) performance has a positive relationship with higher credit ratings and lower yields in terms of new bond issues. They also find that the strength and better performance of CSR score is related with lower yields and the concerns regarding CSR of the company is related with higher yields. In general, use of green bond in order to finance environmental projects an operation is part of the Corporate Social Responsibility activity.

All these previous findings show that, even when all the extra-costs associated with issuance of green bonds are taken into account, these financing instruments still relatively cheaper and efficient form of financing for the issuers. As a result, green bonds

are not only benefiting the society and world's climate, but they have also significant benefits to the issuers in terms reduced cost of debt.

Agliardi and Agliardi (2019 Our results have direct policy implications and suggest that an improvement in credit quality could ultimately lead to a lower cost of capital for green bond issuers and that governmental tax-based incentives and an increase in investors' green awareness play a significant role in scaling up the green bonds market

4.2. Market reactions

Even if green bonds are priced cheaper than regular bonds, it is important to find a link between the issue and the stock price of those bonds. Some studies have commented on this, for example, using an event study model to determine how shareholders and investors respond to the issuance of a corporate green bond. These papers give a good idea of how the market is responding to these new instruments and it would be interesting to investigate the causes that some markets and investors are reacting to as the surveys look like. The question is whether it is a pure mathematical improvement of pricing the shares or the company's general image enhancement which satisfies the investors.

In the line of this study, findings from the event studies about the market reactions when a publicly traded company issues a green labeled bond are promising. For example, Tang and Zhang (2018) study concludes a positive reaction between green bond issuance and stock price of the company. In addition, their study presents the finding that the proportion of shares owned by institutions and more specific, domestic institutions, tends to increase after the event of green bonds issuance. Also, an interesting finding is that stock when company issues a green bond, liquidity of the company's stocks is improved significantly. Overall, our findings suggest that the firm's issuance of green bonds is beneficial to its existing shareholders.

This finding is also very important for this study because even if one looks at the impact of green bonds on the theoretical fundamental value of a company, the way the market is pricing this is what is visible to investors. The research of Tang and Zhang (2018) and its methodology will guide the methodology of this study and will provide a good direction for data analysis.

Similar study of Roslen, Yee and Ibrahim (2017) examined how green bond and company's issuance is felt by investors and their study tries to find the equity investors' reactions of green bond issuance by multi-country event-study and data from 118 announcements. This study concludes almost same findings than Tang and Zhang (2018), as they state that stockholders and investors have positive reaction a day after the company announce about the Green Bond issuance.

On the other hand, using a methodology based on Capital Asset Pricing Model (CAPM), study of Climet and Soriano (2011) find that the return performance of environmental funds is lower compared to conventional funds during the 1987–2009. Hence, during the more present period from 2001 to 2009, adjusted returns of the green funds did not differ significantly from the Social Responsible Investment (SRI) and conventional funds.

According to these findings, it can be concluded that issuing a green bond has monetary benefits for the existing shareholders and probably for the new ones. These studies could be used also to conduct a possible investment strategy, but moreover, company's risk management should be aware of these things also.

4.3.   Volatility of Green bonds

As mentioned, since the launch of green bond its market has grown with huge annual rate which means that it is even more important to understand the mechanisms of the market. Since that several prior studies have focused on the volatility and liquidity risk of the green bond markets.

For example, Pham (2016) was one of the first studies to analyze the volatility behavior occurred on the green bond market. This study is using data from 2010 to 2015 from S&P green bond index between and found some interesting results. Using the multivariate GARCH model, study finds that the green bond market has large volatility clustering compared to ordinary bonds. This means that the current volatility levels are depended with the previous volatility and its even stronger compared to the so called "unlabeled" bonds of the market.

To simplify, green bonds are not proved to be more volatile than ordinary bonds but if market sees high volatility of the green bond prices in the past, it is likely to continue in the near future. This finding provides some insightful information of the green bond markets and is important to take into account when analyzing the green bond markets and their behavior whether participants are investors or issuers. Pham (2018) also concludes that a shock in the bond market as whole is likely to spread over the the green bond market. Findings also provide that effect is changing over the analyzed period.

It is important to internalize the findings above because although the green bond market has been a relatively successful success story, it is not yet complete. And even if a company finds green debt issuance a successful and cost-effective way to raise finance, it does not guarantee the future success of the market.

4.4.   Valuation Methods

As stated above, corporate valuation is the other half of this study and thus the following paragraphs will deal with earlier research on corporate valuation. According to Schmidlin (2014: 304-307), company valuation is concerned to result the intrinsic value of a company and there are various ways to calculate this fair value. Same study argues that the intrinsic value of a company is not the right and only value for the company but

can and should be used as a with other methods, in order to understand a specific range of the fair value of the company (Schmidlin, 2014).

One very popular and widely studied valuation method is called discounted cash flow model, where future cash flows of the company are discounted into present value with particular discount rate (Williams, 1938). According to Kaplan and Ruback (1995) DCF-model method can result similar outcomes of the company's value as the other methods. Nonetheless, they find that the other valuation method called comparable approach tends to be accuracy but combined with a discounted cash flow they result quite accurate outcomes.

Similar study of Berkman, Bradbury and Ferguson (2000) comes with the same finding that so called market-based valuation methods like DCF-model and P/E multiples provide lower errors than other industry-based approaches. In order to take discount rate into account when conducting a valuation analysis of the companies, this thesis focuses in the discounted cash flow method.

4.5. Weighted Average Cost of Capital

As mentioned, the interest rate on future cash flows is at the core of this study. Cash flows generated by a company are often financed by debt as well as equity. There is an extensive literature review about the discount rate to be used in valuations, but this thesis highlights some of the most important research on the subject. First theories to determine the average return on total capital is constructed Modigliani and Miller (1958) in their paper.

In general, Weighted Average Cost of Capital (WACC) is the average rate that all stakeholders are requiring from the company. Book of Brealey, Myers and Allen (1988: 403-410) gives a general describe of WACC as follows: "The weighted average cost of capital is the expected return on the market value of all of the firm's securities". Even

though Brealey, Myers and Allen (1998) state that cost of debt is less than cost of equity and therefore decreases the cost of capital it is dangerous to add more and more debt in order to reduce cost of capital. Levels of debt will eventually affect the firm's risk level and therefore cost of equity. There is a clear trade-off between these two.

Larkin (2011) examines the impact of WACC in the company valuation. This study concludes that as the cost of debt is lower than cost of equity, if company uses higher debt to equity ratio this will result lower WACC rate and therefore higher company value. The same study warns that using WACC in valuation is appropriate when the analyst for example is aware of the target debt to equity ratio of the company as this will impact the final outcome. Larkin (2011) also states that WACC based valuation methods can be used specially for the capital budgeting projects as well as mergers and acquisitions where debt ratio and capacity can be estimated with better confidence.

4.6.   Capital Structure and Cost of Debt in the Valuation

Barclay and Smith Jr. (1995) argue that the one of the major issues in field of corporate finance is how companies should decide what might be the optimal leverage ratio, or on the other words' debt to equity ratio as there are relatively little evidence about the best structure. In contrast, study of Masulis (1983) stated that there is wide and extensive amount of literature about the theoretically optimal capital structure yet there is little evidence about the relation between company's leverage ratio and overall value.

Hence, Masulis (1983) finds that stock price and firm's value are positively correlated with the debt to equity ratio. These conclusions are important for this thesis in order to understand the impact of green bonds on the company's fundamental value. Green bonds are debt and there for affecting the cost of capital.

The study of Van Binsbergen, Graham and Yang (2010) estimates net benefits of leverage. According to their results, the net debt benefit is 3.5% of the value of the assets. Theoretically, this means 10.4% of the estimated gross benefit of any debt minus the debt cost of 6.9% results net benefit being 3.5% of the value of the asset. In contrast, the same study also argues that the costs of overleverage are higher than the cost of underleverage. Van Binsbergen at. all (2010) concludes that they also find optimal debt structure policies for company-specific situation, where companies' debt choices can be benchmarked. This is in the contrast of findings of Barclay and Smith Jr. (1995).

Studies about cost of capital and firm's value are indeed in the line of the purpose of this thesis. Especially, the tax shield and therefore the benefit of debt is documented in Farbera, Gillet and Szafarz (2006). Their study find concludes that as interest payments being tax deductible, higher debt/equity ratio increases the cash-flows to equity holders and also to bond holders, hence value of the increases also. In addition, Emery and Lewellen (1986) exploited the differences of levered and unlevered valuation methods and find that valuation outcome differs substantial higher if leverage is considered.

As leverage and capital structure being one of the major parts of this thesis, prior studies of agency cost theory are also worth to look at. For example, Myers (1976) states that if company issues a risky debt it could decrease the future investments and therefore reduce profits of its equity holders. According to same study, optimal leverage strategy for maximizing firm's value for all stakeholders involves a successful tradeoff between tax deductibility of debt and the future investment possibilities.

This thesis contributes to previously mentioned literature by investigating the pricing of the green bonds compared to ordinary ones and its benefits on firm's fundamental value. This study will provide insights for the borrowing decisions and how issuing green bonds would benefit both, borrowers and lenders.

5. Data

The purpose and hoped outcome of this thesis is to examine whether the green bonds are priced differently than conventional ones and how this impacts the fundamental value of firm. In addition, this study focuses on the European area and specifically in non-financial corporate bonds. The following paragraphs describe the data collected and the methodologies used in the study. This thesis uses the same type of data collection and methodology chosen as in the study of Fatica, Panzica and Rancan (2019), which has been very useful in this regard. Green bond data is very recent, and its adequacy and quality have been the biggest risk to the success of this thesis. This study uses three different methodologies in the subject areas for which this thesis wishes to get conclusions. In first, a basic OLS regression will result the statistical difference between green and conventional bonds. In second, a sensitivity analysis will show how companies valuation done by DCF model is affected from changes in WACC resulted from issuance of green bonds. In third, an event study which follows the same methodology as Tang and Zhang (2018) examines whether the announcement of green bond issuance has any impact on company's stock price. As modeling tool, EViews is primarily used for proceeding the regressions and descriptive data tables.

The main data source used in this thesis is Thomson Reuters Eikon, which covers primary and adequately accurate data about the corporate bond issuance and markets. Thomson Reuters Eikon covers detailed bond issue information at the firm specific level and also required information about the bond details. This study chosen to select issued corporate bonds by non-financial companies in European from January 2013 to January 2020. Reason to focus on European bond markets is the similarity of laws and legislations in this area and also to have some geographical point of view. Other bond characteristics are, for example, the credit rating determined by S&P Global, the country of issue, the principal currency, the notional amount, the use of proceeds, the coupon

type, the amount issued and the instrument type. All bonds in this data set are in USD dollar but this has no effect on the results of the study.

In order to analyze the valuation more correctly this study focuses on the non-financial corporations because valuation methods and used approaches are different for financial firms. This study selected corporate bonds based on their characteristic like the instrument type and whether it is a conventional or a green bond. For example, government and supranational bonds are excluded in terms of lack of their valuation needs. Bonds are also classified in order to separate callable and convertible bonds as well as credit rating of the bonds. These classes are used in the methodology of the regression. This study finds 199 green corporate bonds out of 7,965 issued bonds in the sample during this period. Next figure illustrates the green bond issuance by non-financial corporations during the period. Total amount of these 199 issued green bonds between 2013-2020 is 22,823bn USD.
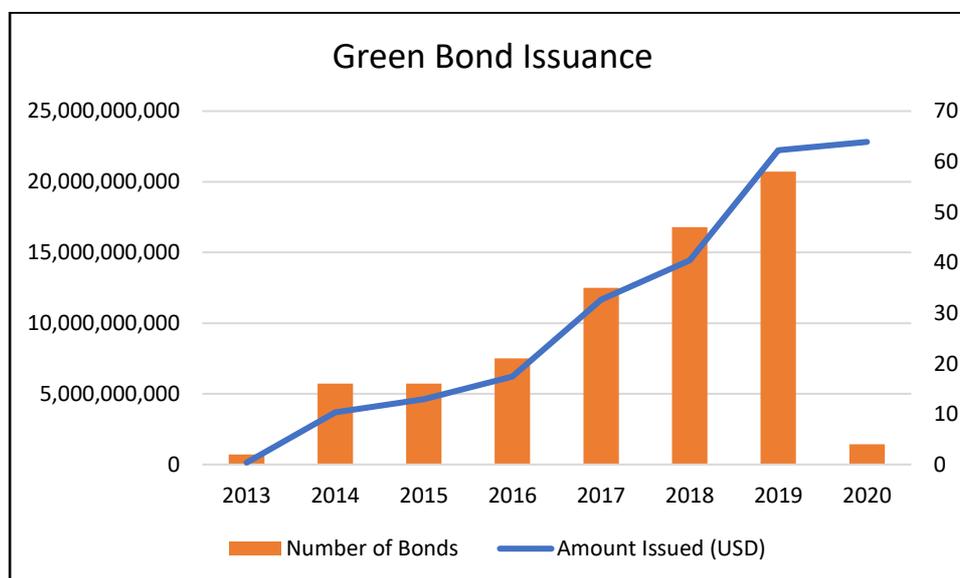
Figure 8 Green bond issuance**.** This figure presents the cumulative issued amount and yearly number of green bonds issued by non-financial corporations in Europe between 2013-2020.

Traditionally, the Nordic countries and Nordic companies have been very active in green business models. This is also reflected in the green bond issuance levels when the issuance is categorized by country. A relatively huge amount of issuance is from Sweden where issuance was 141 of overall 199 corporate green bonds in this sample. This may also be explained by SEB's big activity in underwriting corporate green bonds. After this, most green bonds were issued in Norway (29) and in France (18).
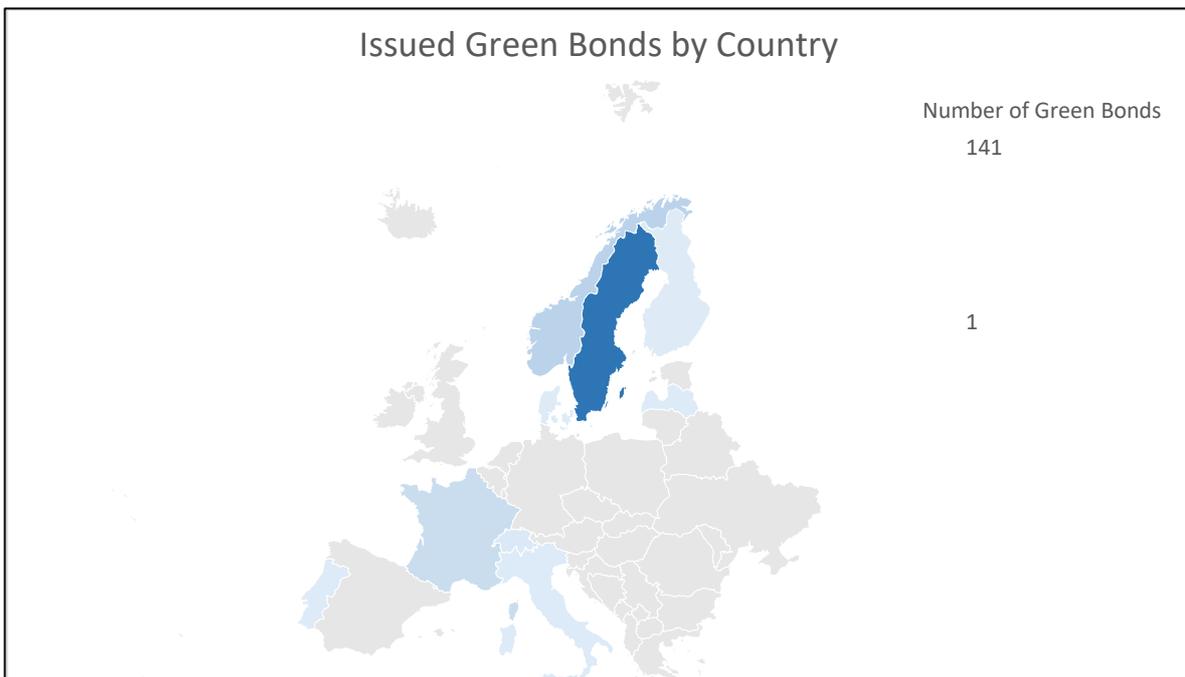
Figure 9 Green bond issuance by countries**.** This figure presents the location of issued corporate green bonds in the sample between 2013-2020.

The next descriptive data table shows the sector breakdown of all selected corporate bonds issued during the period. As mentioned, the overall sample consists 7,965 bonds in Europe. The average coupon on these bonds is 4,59% which seems rather reasonable for corporate bonds.

| Sector	Average Coupon	Number of Bonds
Aerospace	3,00	66
Airline	4,45	42
Automotive Manufacturer	5,18	89
Beverage/Bottling	4,08	46
Building Products	3,65	176
Cable/Media	3,06	35
Chemicals	4,68	168
Conglomerate/Diversified Mfg	3,65	166
Consumer Products	3,99	136
Containers	5,85	29
Electronics	4,29	113
Food Processors	4,84	169
Gaming	5,89	16
Gas Utility - Local Distrib	9,59	27
Gas Utility - Pipelines	3,28	5
Health Care Facilities	4,72	139
Health Care Supply	3,08	36
Home Builders	3,79	1533
Independent Finance	2,63	43
Industrials - Other	4,99	267
Information/Data Technology	4,48	107
Leisure	3,11	76
Lodging	4,37	20
Machinery	5,74	90
Metals/Mining	5,39	176
Oil and Gas	6,55	295
Oilfield Machinery and Services	9,69	23
Pharmaceuticals	3,63	77
Publishing	4,56	18
Railroads	3,93	114
Restaurants	5,34	13
Retail Stores - Food/Drug	6,48	41
Retail Stores - Other	5,89	184
Service - Other	4,54	1998
Telecommunications	4,45	197
Textiles/Apparel/Shoes	11,26	152
Tobacco	4,56	2
Transportation - Other	5,40	151
Utility - Other	4,31	883
Vehicle Parts	1,69	47
Overall	**4,59**	**7965**

Table 2 Sector Breakdown. This figure presents the coupon paid by issuer and number of bonds by sectors from 2013 to 2020. Thomson Reuters Eikon.

As the table above shows, companies in vehicle parts-, independent finance -and aerospace sectors paid the lowest coupons during this period (1,69%-3%). In contrast, gas -, oil -and textiles companies paid the highest (9,59%-11,26%). Issuance was most frequent in service (other)-, home building -and utility sectors (883-1,998 bonds). As a conclusion, the descriptive statistics show that the issuance and coupon price levels differ significantly between sectors.

In contrast, as table 3 shows the average maturity of green bonds is 5,1 years and average coupon is 1,63%. This is a significant difference in the sample and can be seen as a promising finding. All average coupons by sectors are between 1,14% and 3,24%. Average maturities of bonds by sectors are also rather narrow compared to overall data sample as shortest maturity is 4,37 years and longest 10,20 years.

Sector	Maturity in Years	Coupon
Building Products	5,10	1,14
Conglomerate/Diversified Mfg	5,00	1,67
Food Processors	5,00	1,60
Home Builders	4,37	1,21
Lodging	6,00	2,50
Oil and Gas	10,20	1,13
Railroads	4,53	1,15
Retail Stores - Other	5,25	2,46
Service - Other	5,62	1,90
Telecommunications	5,00	2,39
Transportation - Other	5,00	1,59
Utility - Other	6,22	3,24
Overall	**5,10**	**1,63**

Table 3 Sector breakdown (only green bonds included). This table presents the average maturity and average coupon of issued green bonds in the sample from 2013 to 2020.

Following figure illustrates the descriptive statistics of the bond sample and it contains the characteristics mentioned above. It shows the same result as previous table as total average coupon paid during the period is 4,59% and the median coupon is 3%. Other notable finding from data is the average maturity in years occurs to be around 5 years as median is 4 years. Maturity is also one of the independent variables in the regression to determine factors affecting the coupon of issued bonds. This table shows only 7,897 bonds because all bonds did not contain this information which are chosen to be examined.

	COUPON	AMOUNT	MATURITY	GREEN BOND LABEL	CONVERTIBLE	CALLABLE	BOND GRADE
Mean	4.60616	96564215	5.032910	0.025428	0.025684	0.209813	0.061973
Median	3.000000	31288132	4.000000	0.000000	0.000000	0.000000	0.000000
Maximum	72.31457	9.52E+09	1000.000	1.000000	1.000000	1.000000	1.000000
Minimum	-0.200000	0.000000	0.016667	0.000000	0.000000	0.000000	0.000000
Std. Dev.	4.979151	2.51E+08	16.55515	0.157431	0.158200	0.407201	0.241122
Skewness	2.461262	12.01367	55.54408	6.029322	5.996806	1.425364	3.633476
Kurtosis	13.82275	310.4669	3335.158	37.35272	36.96168	3.031663	14.20215
Jarque-Bera	46096.14	31014832	3.62E+09	432230.2	423009.2	2650.292	58139.60
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	36047.84	7.56E+11	39387.55	199.0000	201.0000	1642.000	485.0000
Sum Sq. Dev.	193997.0	4.95E+20	2144620.	193.9398	195.8376	1297.486	454.9431
Observations	7826	7826	7826	7826	7826	7826	7826

Table 4 Descriptive statistics. This figure presents the descriptive statistics of the bond characteristics. Thomson Reuters Eikon

As you can see from the descriptive table, the types of bonds are separated into the following categories and the dummy variables are made based on these. The categories are green bond or not, callable or not, maturity in years, investment grade bond or not. If the classification is yes, the dummy variable is defined as 1 and 0 if not. These methodologies will be explained more fully in the next chapter.

6. Empirical Analysis

The following chapters contains the methodology of this thesis, empirical analysis as well as an explanation of econometric models. There are thus three major methodological studies in this study; a simple multi-factor OLS regression to test whether green bonds are priced differently from conventional ones, a sensitive analysis that examines how much a firm's value fluctuates as cost of debt changes, and an event study that examines whether the issuance of a green bond causes abnormal returns on the company's stock price. With these methodologies, the research answers the questions of whether green bonds are priced differently than conventional ones, what would be the impact of on the theoretical fundamental value of the company, and how the market will price the issue at company value.

6.1.   Multi-Factor Regression on Bond Prices

To investigate whether green bonds are priced differently from the conventional ones this thesis uses a standard OLS regression for bond coupons, as instructed in prior study (Fatica, Panzica and Rancan, 2019). They also state that this econometric strategy follows the traditional cross-sectional OLS regression as Fama and French (2007) used. The model goes as follows:

$$Coupon_{b,i,t} = \alpha + \beta_1 Green_{b,i,t} + \beta_2 \chi + \varepsilon_{b,i,t} \qquad (3)$$

In the model (1) dependent variable Coupon refers to the coupon at issuance of corporate bond b from company i at time t. The variable α refers to intercept term of the regression model. Independent variable $\beta_1 Green$ refers to green bond dummy variable which is determined as 1 if bond is green and 0 if not, and it is the main variable

of this model. Other independent variable $\beta_2\chi$ refers to set of control variables which some of are also determined as dummy variables that may affect the coupon paid by issuer. Control variables are for example callable and convertible features of the bond (1 if yes 0 if no). Maturity in years variable is determined as maturity in years variable where longer the tenor is measured as longer maturity. Currency dummy investigates whether currency effects on the coupon paid by issuer. Next table will represent the results of regression.

Variable	Coefficient	P-value		
C	3.062642***	0.0003		
GREEN_BOND_DUMMY	-0.836383***	0.0000		
CALLABLE_DUMMY	1.963847***	0.0000		
MATURITY_IN_YEARS	-0.002965	0.2290		
CONVERTIBLE_DUMMY	-0.195332	0.3944		
Currency Dummy	Yes			
R-squared	0,43			
Adjusted R-squared	0,43		Mean dependent var	4,59458
S.E. of regression	3,79		S,D, dependent var	5,003889
Sum squared resid	112 986,40		Akaike info criterion	5,5055
Log likelihood	-21 711,47		Schwarz criterion	5,529345
F-statistic	226,97		Hannan-Quinn criter,	5,513667
Prob(F-statistic)	0,00		Durbin-Watson stat	1,774416

Table 5 Multi-Factor Regression Result**.** Coupon is determined as the dependent variable. Panel presents the coefficients of main and control variables. Covariance method Huber-White is set to be used in the regression. Statistical significance of the variable coefficient indicated with an asterix: * 10%, ** 5% and ***1% level of confidence. Sample data is from 2013 to 2020.

As can be seen from the table, the green bond dummy variable, the main coefficient of this study is negative (-0,84) and statistically significant in 1% level of confidence. This means that in this sample, green bond is priced approximately 84 basis points cheaper than normal bond and for the issuer it is cheaper to use green bonds rather than conventional bonds. This comparison seems rather expected compared to prior studies

(Fatica, Panzica and Rancan, 2019) but probably should not be taken as a certain truth but more as an indicative result. Other control variables also produce statistically significant results. For example, if the bond issued by the company has a callable feature, this would result in a higher (1,96) coupon rate according to this sample. In general, callable feature mean that company can repay debt before the maturity and this has been seen as risky factor for investors in term of received coupons being missed. In contrast, if bond is convertible (-0,20) this can be seen as a coupon reducing factor because bond investors are able to convert their bonds into company's equity with certain terms. Maturity in years coefficient indicates that longer the maturity of the bond, smaller the coupon but very slightly. Even though the coefficient was not too large and seems not to be impacting the price too much, this finding is quite illogical as the term structure of the debt goes. But on the other hand, the corporate debt rates in Europe have been relatively low in the recent years. Therefore the maturity cannot be taken as a hugely impacting variable in this sample.

Adding the currency dummies into the regression resulted with significantly higher R-square level. However, the regression coefficient of determination, denoted as R-squared, is relatively medium (42%) which can also indicate a risk of robustness in the regression. This may be explained by the small number of explanatory factors in the sample. This means that although green bonds are statistically significant in this regression, this study cannot be considered as too definite with the resulted coefficient level. Hence, this result supports prior researches and is in line with previous findings.

The next panel consists the same regression with some robustness checks as it adds more control variables such as instrument type which is determined whether the bond is defined as investment grade bond (1) or not (0). It also controls the effect of amount issued in USD and the issue date. Sector dummies are also included into regression to control potential effects in this regard and to increase the coefficient of determination.

Variable	Coefficient	P-value		
C	7,748387***	0,0023		
GREEN_BOND_DUMMY	-0,610938***	0		
CALLABLE_DUMMY	2,239239***	0		
MATURITY_IN_YEARS	-0,000984	0,3504		
CONVERTIBLE_DUMMY	-0,071961	0,742		
AMOUNT_ISSUED__USD_	-1,59E-09***	0		
BOND_GRADE_DUMMY	-2,04775***	0		
ISSUE_DATE	-0,000108**	0,0475		
Currency Dummy	Yes			
Sector Dummy	Yes			
R-squared	0,47		Mean dependent var	4,61
Adjusted R-squared	0,46		S,D, dependent var	4,98
S.E. of regression	3,66		Akaike info criterion	5,44
Sum squared resid	103 744,50		Schwarz criterion	5,50
Log likelihood	-21 217,68		Hannan-Quinn criter,	5,46
F-statistic	100,73		Durbin-Watson stat	1,80
Prob(F-statistic)	0,00			

Table 6 Multi-Factor Regression Result**.** Coupon is determined as the dependent variable. Panel presents the coefficients of main and control variables. Covariance method Huber-White is set to be used in the regression. Statistical significance of the variable coefficient indicated with an asterix: * 10%, ** 5% and ***1% level of confidence. Sample data is from 2013 to 2020.

According to this result panel, the main variable green bond dummy stays at statistically significant levels as coefficient (-0,61) being almost similar with the first regression which indicates that the coefficient is not wholly robust. Results of the callable variable that were also in the first regression remained quite similar. In contrast, convertible dummy variable does not provide statistically significant results anymore. However, added control variables like amount issued in USD (0,00), bond grade dummy (-2,04) and issue date (-0,00) seem to give significant coefficients . Hence, this study shows that if bond is classified as investment grade results a major reducing effect on the coupon of the bond in this sample.

In the second regression, coefficient of determination, denoted as R-squared seems to be a bit higher (47%) than in the first one. This can be explained with the added control variables and sector dummy, but the risk of variables robustness is still present. In contrast, study of Fatica, Panzica and Rancan (2019) is used as an example of regressions methodology in this study and their study received an r-squared degree of more than 70%, which is little bit higher than this study's r-square (42-47%). This may be explained by the fact that in their study the data sample was much larger and from longer period, and the methodology more comprehensive. For example, their study is using a fixed effect maturity × rating × time variable to account for changes in the yield curve. Even though, this thesis does not reach the same level of excellence, it gives similar results. In terms of accuracy of the results received from the regressions in this study, these should not be taken as a certain but more as an indicative results. Improvements could be made by extending the period and widening the data to take financial institutions also into account.

6.2.   Sensitivity Analysis

This chapter explores how the possible changes in cost of debt resulted from the usage of green bonds affects the fundamental value of a company analyzing a theoretical DCF model. The variation in borrowing costs is derived from the previous OLS regression coefficient. To keep the DCF model of the study simple, the section uses the FCFF cash flow formula (1) of Damodaran's book (2016), in which future cash flows for all company stakeholders are discounted with the after-tax WACC (2).

MEUR	t+1	t+2	t+3	t+4	t+5	t+6
EBITDA	100	105	110	116	122	128
Capital expenditure (-)	20	21	22	23	24	26
Tax (-)	4	4	4	5	5	5
Δ Net working capital (-)	-4	5	-3	-2	4	2
FCFF	88	83	96	99	98	105
Discounted FCFF	83	74	80	78	73	74
			Tax %		20 %	
DCFs	462		**Debt Ratio**		50 %	
Perpetuity value	1 603		**Cost of Debt**		4 %	
Net Debt	200		**Equity Ratio**		50 %	
Enterprise Value	2 265		**Cost of Equity**		9 %	
Value of equity	1 865		**WACC**		6,10 %	
			Growth rate		1,50 %	

Table 6 Discounted Free Cash Flows to Firm. This table presents the financial modeling behind the company valuation where future cash-flows are discounted into present value. All numbers are assumptions.

All numbers in the DCF table are assumptions; EBITDA is assumed to be 100 million EUR in the first year and then considered to growth 5% annual growth. Capital expenditure is considered to be stable 5% of the revenue which is assumed to be 450 EUR, and taxes to be 20% of the company's net income. This numbers are not the main part of the analysis. As table 6 presents the basic modeling behind the company valuation, next table illustrates what happens to the value of the company when debt to equity ratio and cost of debt changes.

		Debt to Equity Ratio				
		30 %	40 %	50 %	60 %	70 %
	2 %	1 996 €	2 293 €	2 705 €	3 317 €	4 320 €
	3 %	1 917 €	2 153 €	2 464 €	2 891 €	3 513 €
Cost of Debt	4 %	1 845 €	2 031 €	2 265 €	2 567 €	2 970 €
	5 %	1 778 €	1 923 €	2 098 €	2 312 €	2 579 €
	6 %	1 716 €	1 827 €	1 956 €	2 106 €	2 283 €

Table 7 Sensitive Analysis. This table presents the sensitive analysis as what happens to the value of the company when cost of debt decreases.

The sensitive analysis table shows how changes in cost of debt will impact the final theoretical fundamental value of the company. This analysis in in the line with s studies of Larkin (2011), Brealey et. all. (1988) implied, lower cost of debt will result in lower cost of capital and therefore increase the value of the company. Modigliani and Miller (1958) came to similar outcome as they interpreted that higher leverage will increase the return of the company stock. For example, if cost of debt is decreased by the coefficient from the regression table 5 (-0,6%) it will increase the value of the company around 5% if debt to equity ratio is 30%. In addition, if debt to equity ratio is 50% and the decrease in cost of debt is same (-0,6%), the value of the company would increase by around 10% in this analysis. Even though these are only assumptions, they give a clear picture about the impact of changes in cost of debt on the value of the company. To conclude, in theory based on the regression in table 5, by using green bonds company could decrease the cost of debt approximately by -0,60% and increase the value of the company.

The next figures will illustrate the behavior of company's value derived from previous DCF model calculations if leverage and cost of capital changes. These graphs are constructed by creating a plot points for company's value at various levels of cost of

debt and leverage. These results are very similar to those of Modigliani and Miller (1958).

Value of the company and Leverage
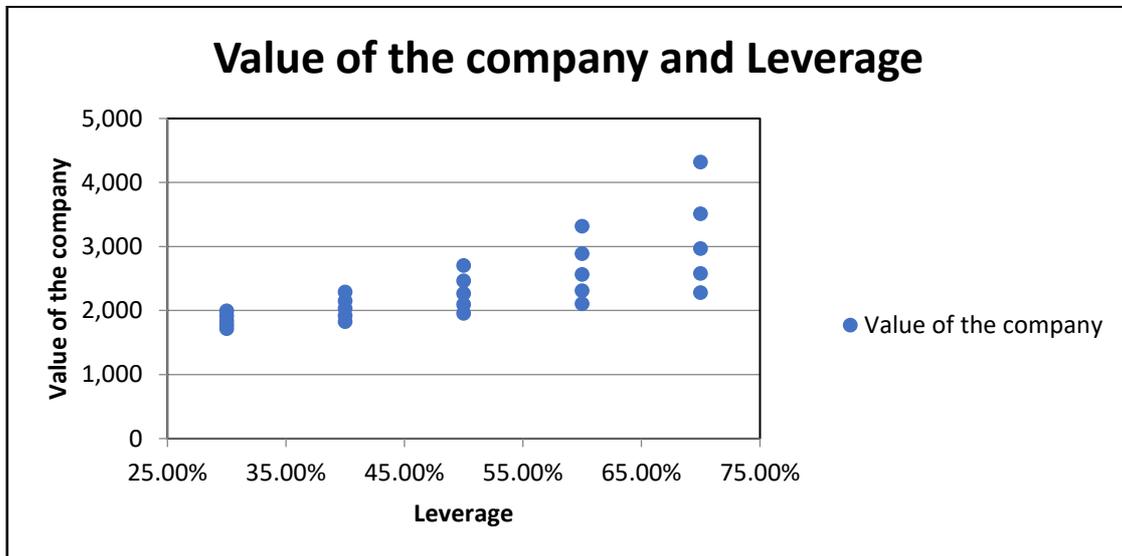
Figure 10 Leverage and the value of the company. This figure presents the relationship between leverage and value of the company based on previous sensitive analysis.

The figure above shows how the value of a theoretical firm changes with the capital structure. From this it can be concluded that a higher amount of debt increases the fundamental value of a company. However, it is good to remember the warnings from previous studies as well as books on how much debt also increases the company's Beta and thus the return on equity requirement, lowering the value of the company at a certain point.

The following figure shows how the value of a theoretical firm changes as the cost of debt changes. As previous findings have concluded, the lower cost of debt reduces the cost of Capital depending on the amount of debt used by the firm and thus increases the fundamental value of the firm.

Value of the company and Cost of Debt
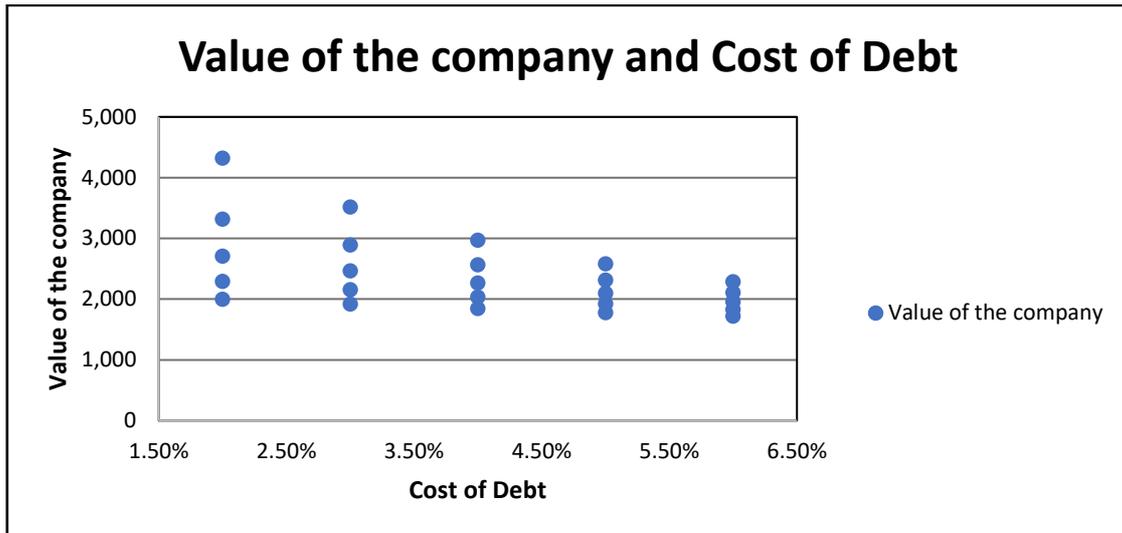
Figure 11 Cost of Debt and the value of the company. This figure presents the relationship between cost of debt and value of the company based on previous sensitive analysis.

As these graphs show, company's fundamental value increases if more debt is used. Same results can be seen if the company's cost of debt decreases. These results and figures shows that this thesis has quite similar results as previous studies. To conclude, this study has now looked at how green bonds are priced versus the conventional bonds and how this change in cost of debt affects the fundamental value of a company. This change also tends to grow exponentially as company reduces the cost of debt of increases amount of debt used until certain point. Next chapter will examine how company's stock and markets react to the green bond issuance.

6.3. Event-Study Analysis

This section explores how the green bond issue is impacting in the stock price. The company for the study is selected from the used data sample in this thesis whose stock would be as liquid as possible in order to obtain accurate and reliable results. Selected stock is Swedish founded media company called Millicom International Cellular SA

(TIGO) which is listed in Nasdaq Composite Index. The idea to conduct this kind of event-study comes from the study of Tang and Zhang (2018) where the impact of green bond announcement is examined through CAR analysis. Instead of using announcement day, this study uses the issuance date in order to see how market prices the cost of green bond. Test is conducted by using 10-, 15 and 20-day windows, and the stock and index prices are retrieved from Yahoo Finance websites.

Stock and index returns are taken from closing prices during June 15th 2018 to June 15th 2019. Hence, methodology consist the market return and the stock return from different time windows.

Following regression and cumulative abnormal returns for firm i and event day t are defined as follows in the formula 4:

$$AR_{i,t} \ = \ R_{i,t} \ - \ Rm_{i,t} \qquad\qquad (4)$$

The following table shows the results of the CAR event study for three different time windows. The results of the study are explained below.

CUMULATIVE ABNORMAL RETURNS OF TIGO			
	(1)	(2)	(3)
EVENT WINDOW	[−10,10]	[−5,10]	[−5,5]
CAR	-1,62 %	0,50 %	4,18 %
T-TEST	(-1,04)	(0,34)	(2,63)**
OBESRVATIONS	20	15	10

Table 8 Event study results**.** This table shows the event-study results by estimating CAR returns for green bond issuance date. Estimations are calculated based on the cumulative abnormal return (CAR) as comparing TIGO stock and Nasdaq index. The stock price and market index are from Yahoo Finance. This tests whether CAR for TIGO stock during the green bond issuance is significantly different from zero. Statistical significance of the variable coefficient indicated with an asterix: * 10%, ** 5% and ***1% level of confidence.

As the study results show, no statistically significant returns are observed for the stock during [−10,10] and [−5,10] time windows. On the other hand, the third time window examined [−5,5] seems to give a statistically significant 4,15% cumulative abnormal return around the issuance. These findings can be explained by the idea that markets are pricing the green bond issuance into stock price in short time window and not reacting in the longer periods as the 20 days' time frame does not provide statistically significance, but the 10 days does.

The result of this study is in line with Tang and Zhang (2018), who found abnormal returns at the same time as the company announces the issuance of green bond. Their study states that the stock price of the green bond issuer tends to increase statistically

significantly in the time frame that includes the announcement of green bond issuance. Although, market reactions tend to be even stronger as for first-time issuers and the effect decreases as company issues second time. They also find that the effect is stronger for ordinary corporate issuers compared with the financial institutions. To conclude, this study indicates that issuance of the green bonds can benefit the shareholders also. Even the study didn't find significant levels of CAR, the [−5,5] window shows that there can be abnormal returns associated with the company's green bond issuance.

This examination is still under the risk robustness as it investigates only one company. This is due the lack of adequate data of companies in this thesis's data. Thus, this example should not be used for overall indicator for stock market behavior around green bond issuances but as a supporting finding with the previous studies. This examination could include companies across the industries and sizes so it would provide even more comprehensive insights.

7. Conclusions

This thesis investigates the green bond markets and examines whether the green bonds are priced more cheaply than conventional bonds. Green bond issuance has increased with rapid growth since the inception in 2007 and should reach 200bn EUR issuance in the coming years. This study focuses on the period from 2013 to 2020 since the green bond issuance increased most during these years. Data sample consists green bond issuance made by non-financial companies in European. The main results of the regressions are viewed with critical thinking and with some robustness checks by adding more control variables into model.

Prior studies (Fatica, et. all. 2019 & Hachenberg and Schiereck 2018) find that the green bonds are priced more cheaply than conventional ones and the market has similar risk compared to the traditional bond market. Even though previous findings indicate various coefficient and significant levels for the results, they are in the line with each other indicating the premium of green bonds can be proved. This study finds similar results.

This study finds that green bonds are priced cheaper than conventional bonds with 0,60-0,82% premium according to the examined sample. As mentioned, this finding is similar with the prior research results. Even though it finds green bonds at a slightly stronger coefficient level, the end result has been the same in same direction. In addition, this result show that the hypothesis 1 (H1:There is not difference between the price of a green bond and ordinary bond and will not have any effect on the cost of debt, and therefore on cost of capital overall) will be rejected and hypothesis 2 will be accepted. Still, it is needed to proceed more wider range of robustness checks on this study subject in order to get more accurate results. As regarding this matter, this thesis recognizes its vulnerability in the regression and data sample.

In contrast, although the green bond issuance will increase other respective costs (Gianfrate and Peri, 2019) such as third-party assessment and certification from the Climate Bond Initiative, these costs are not exceeding the pricing advantage and reduced cost of debt. There are still some liquidity issues with the green bond markets (Febi et. all. 2018) and the clustering volatility (Pham, 2016) as previous studies state, but this problems are playing the major role in green bond issuance, at least not decreasing the growth rate of the markets.

The second part of the investigation in this thesis examines how the fundamental value of the company changes with the theoretical changes in cost of debt associated with green bonds by using the DCF model instructed by Damodaran (2016). These findings show that there is a clear increase in the fundamental value of a company depending on its capital structure if the cost of debt decreases by the coefficient of green bond from the studied regression. This finding is also promising in the earlier mentioned situations if the analyst is making a valuation on the target company or the investment bank is considering the value of the acquisition. Thus, a company using green bonds can increase its theoretical value by using these instruments as debt. Earlier studies have also found that environmental friendly projects are more cost-effective than others (Steckel and Jakob, 2018) and that good ESG scores help in a company's credit rating classification and lowering the cost of capital (Atan et. all. 2018). Hence, the finding of this study is also in line with previous research and these findings can be seen as supportive facts to reject hypothesis 1 and to accept hypothesizes 2 and 3.

As mentioned earlier, the benefits of green bonds for financing costs also apply to private equity firms. Normally, private equity firms finance their acquisitions with about 70-90% of the debt, of which about 50% could consist of a bond issuance. Private equity firms often measure their investments using IRR and Money-on-Money metrics, where annual financial costs play a key role because of the high level of debt. If financing costs could be improved with a green bond issue, this would create entirely new

opportunities. This could also be a good future research topic in this field where implications of this method could focus.

The regressions and investigations of this study thus provide a good picture of the green bond market and its benefits. However, it should be noted that wider data sets and more comprehensive methods could provide better and more accurate results. In addition, in this topic, robustness checks are an important part of determining the correct end result. For example, the regression r-square (14%) of this study should be increased higher by different methods. This study thus opens the way for new experiments and more sophisticated methods in this topic.

Finally, this thesis explores how the theory translates into practice for a company that uses green bonds as a financial instrument. This is a very interesting implication for this topic if green bonds are found to be cheaper than normal and its impact has been assessed on the fundamental value of the company. This study thus examines how a green bond issuance affects a company's stock price by examining the issue-time abnormal return (CAR-model) on different time windows. After the CAR tests, it is clear that not all time windows have statistically significant abnormal returns, but the shortest time window $[-5,5]$ indicates statistically significant excess returns (4,18%). This finding is not free from robustness risk as it investigates only one company but is somewhat in line with (Tang and Zhang, 2018) research.

On the other hand, this could be extended to an even larger number of companies or the differences between different sectors could be clarified. It would be interesting to see how the stock prices of companies in different sectors react to the company's green bond issuance. This could also provide an investigation into which factors investors believe are affecting abnormal returns in the context of a green bond issue.

It will remain interesting to follow academic research on how this topic will be studied in the future as markets and academics learn more about it. As mentioned, one study in

itself cannot provide the only and correct answer, but a broader research base and more comprehensive methods will help in this.

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