Why Does the Norwegian Bond Market Issue So Few Green Bonds?

A Comparative Study of the Norwegian and Swedish Green Bond Markets

Marius Dahl and Sindre Karlsen

Supervisor: Aksel Mjøs

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NORWEGIAN SCHOOL OF ECONOMICS

Acknowledgments

Abstract

To uncover the underlying reasons why the Norwegian bond market issues so few green bonds, the thesis contains two objectives. The first objective is to analyze the performance of green bonds in the primary and secondary Norwegian and Swedish bond markets, while the second objective is to study the motives of investors and issuers.

Concerning the first objective, the primary green bond markets does not indicate a greenium. Therefore, we base the analysis of green bond performance in Norway and Sweden, on the secondary market. The thesis examines the green bond yield premium by matching 13 Norwegian and 88 Swedish green bonds, from 2015 to 2019, with constructed synthetic bonds. A two-step regression procedure exhibits a green bond yield premium of -0.8 bps in total for the entire sample, -1.2 bps for Sweden, and 1.7 bps for Norway. There is, therefore, a yield discrepancy which creates a disincentive for Norwegian issuers of green bonds. Furthermore, the results demonstrate that the main determinants of the green bond yield premium are country, greenness, sector, issue amount, and coupon type.

The second objective investigates the motives of market professionals, through a survey and in-depth interviews, and support the findings of a tighter credit spread in the Swedish market. Our findings suggest that this is due to the history and composition of the bond market in Norway, leading to less sustainable focus. These factors negatively impacts the supply and especially demand of green bonds in the Norwegian market.

Therefore, the Norwegian issuers experience direct and indirectly negative incentives in terms of a higher borrowing cost and lower moral benefits. However, the green bond market is expected to grow in both countries and the green bond volume discrepancy between Norway and Sweden is likely to reduce in the future.

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1 Introduction

Climate change is one of the most pressured issues of our time, causing devastating global consequences (UN, 2019). Therefore, global climate initiatives, such as the Paris Agreement (2015, are essential to reduce the rise in temperature and sea-level. One of the strategies to accommodate the Paris Agreement's temperature goal, of below 2 degrees Celsius above pre-industrial levels, is for financial flows to be consistent with a pathway towards low greenhouse gas emissions and climate-resilient development (Article 2c) (UN, 2015).

The increased sustainable focus causes the emergence of new sustainable financial instruments, such as green bonds. Since the first issuance of a green bond in 2008 by The World Bank, the market for green bonds has developed rapidly. Norway and Sweden are arguably leading the development of the green bond market by example, but Sweden is still more than four times as large (CBI, 2018). Sweden is a natural benchmark for the Norwegian bond market, and research on the Norwegian green bond market is insufficient. For that reason, the main research question is: "Why does the Norwegian bond market issue so few green bonds?"

The thesis divides the main research question into two objectives, to uncover the underlying reasons. Firstly, it explores the performance of green bonds in the Norwegian and Swedish bond markets. Secondly, it aims to examine issuers' and investors' attitudes toward green bonds in both countries. The two underlying research questions are, therefore: "Can we explain why the Norwegian bond market issues so few green bonds by...:

1. "... analyzing the existence of a greenium[1] and its determinants in the Norwegian and Swedish bond markets?"

2. "... studying differences in motives of issuers and investors in the two markets?"

The secondary green bond market is the basis of the greenium analysis, as the primary market does not reveal a greenium and is less suitable. We utilize a matching method to create triplets consisting of one green bond and two conventional bonds from the

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[1]Greenium is the yield spread difference between a green bond and a conventional bond from the same issuer. The difference in yield spread is the yield premium, and since it is the green label that causes the positive or negative premium, it is named "greenium".

Norwegian and Swedish secondary bond market. The analysis then creates synthetic bonds through linear interpolation[2] or extrapolation of two conventional bonds from the same issuer. Consequently, we use a two-step regression, and the results exhibit a negative greenium of -0.8 bps[3] for the entire sample, -1.2 bps for Sweden, and 1.7 bps for Norway. The analysis identifies greenness, rating, sector, and issue amount as determinants of the greenium.

Concerning the second research question, we conduct interviews with experienced market professionals. The analysis also contains a customized survey of issuers, investors, and third party participants in Norway and Sweden, and bases its questions on the utility function of Levitt and List (2007). Our findings reveal that both countries expect the credit spread of green bonds to be tighter than conventional bonds, although the Swedish respondents experience a more negative yield premium. The green bond yield disparity is likely caused by a less informed and sustainable aware Norwegian green bond market. The lower Norwegian green bond knowledge level and sustainable awareness is likely due to the historical development and industrial composition difference between the countries.

The combined results indicate higher positive green bond yields in the Norwegian secondary market compared to the Swedish. The primary source of this yield disparity is insufficient demand in the Norwegian market due to a lack of focus on sustainability. The positive green bond yield level in Norway and reduced moral benefits, creates a financial disincentive for Norwegian issuers, which limits green bond issuance. However, the thesis further predicts the continued growth of the green bond market and a natural reduction of the volume discrepancy between Norway and Sweden.

The master thesis is structured as follows. Firstly, the thesis provides a background of the green bond market in Norway and Sweden. Secondly, the thesis summarizes and reviews previous green bond research. We then analyze the research question through the two underlying analyses, which both start by describing the methodology and dataset, before presenting the results and limitations. Lastly, the thesis presents a combined discussion and conclusion of the overall research question:

Why does the Norwegian bond market issue so few green bonds?

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[2] The linear interpolation and extrapolation uses the equation: $y = y_1 + \dfrac{y_2 - y_1}{x_2 - x_1} \times x - x_1$.

[3] Basis points (bps) is a standard unit of measure in finance. One basis point equals 0,01%.

2 Background

The green bond market has increased rapidly since the first issuance in 2008 by the World Bank, and this trend is expected to continue in the future (The World Bank, 2018). Despite the growth of green bonds, there still is an absence of robust reseach on the subject. The background section aims to introduce the climate challenges and how it sparked the sustainable finance field. Consequently, it examines the basic concepts of green bond market and its framework. Finally, the authors review the development of the green bond markets in Norway and Sweden, and discuss its future challenges.

2.1 Nordea

This master thesis is a collaboration with Nordea through Finans|Bergen[4]. Nordea is the leading financial services group in the Nordic region and one of the biggest banks in Europe, with more than 10 million customers, 30.000 employees, and approximately EUR 282.6bn in assets under management, as of 31st of December 2018 (Nordea, 2018, 2019). The financial service group is among the leaders within the banking industry when it comes to sustainable and responsible investment, and was one of the first signatories of the UN Principles of Responsible Investment in 2007 (Nordea, 2018).

Nordea's focus on sustainability and desire to study the development of the green bond market in Norway and Sweden was the starting point of this master thesis. The representatives from Nordea wanted to compare and understand why the Norwegian bond market issues so few green bonds compared to Sweden.

2.2 Climate

The earth's climate has throughout history changed considerably, with glacial advantages and retreats over time and the last ice age 7,000 years ago (NASA, 2019). Despite the historical variation to the climate, the changes in recent times are unprecedented,

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[4]Finans|Bergen connects the financial service industry in Bergen with finance faculty and students at NHH.

with temperature changes affecting several critical areas of our planet. According to IPCC (2013): "the atmosphere and ocean have warmed, amounts of snows and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased." Figure 2.1 indicates this exponential temperature rise for the last 50 years. The temperature of our planet has risen approximately 0.9 degrees Celsius since the late 19th century, and the majority of the warming has occurred in the last 35 years. In addition to this, the five warmest years in history have happened since 2010, with 2016 being the warmest year on record (IPCC, 2013). These results show the effects of climate change, and the threat it possesses (Poushter and Huang, 2019).

Figure 2.1: Global Land-Ocean Temperature Index

The graph illustrates the change in global surface temperature relative to 1951-1980 average temperatures (NASA, 2019)
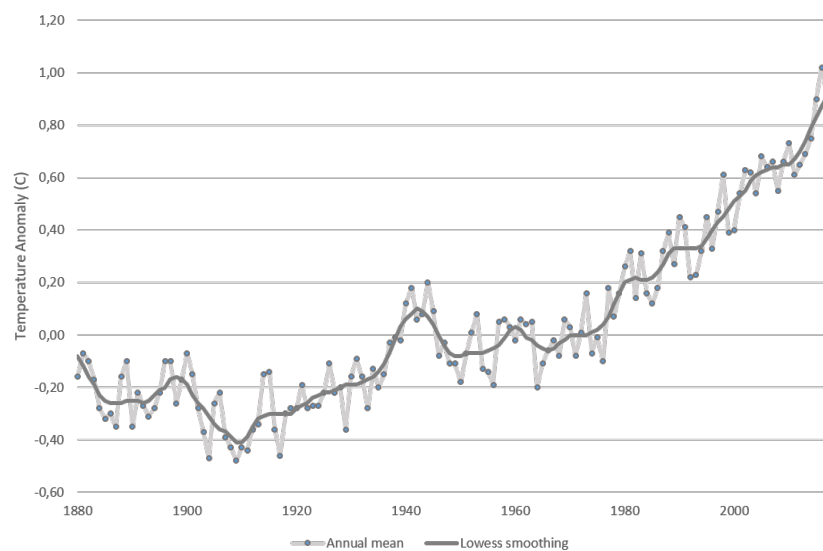
One of the leading causes of the rise in temperature and overall changes to our planet's climate is the emissions of gasses such as carbon dioxide. Carbon dioxide (CO_2) emission causes climate change by trapping the sun's heat through the greenhouse effect (United Nations, 2019). The enormous rise in carbon emissions and its effect on the planet's temperature are incredibly likely to be caused by human activity (IPCC, 2013).

The public and private sector, and the international community, are taking action to fight climate change. Consequently, climate change initiatives ranging from school strikes to multilateral agreements are emerging. The Paris agreement (2015) is a multilateral agreement, and was the first of its kind in terms of unifying all nations (Rajamani, 2016).

It is a landmark agreement that aims to bring together all countries into a common cause to combat climate change (United Nations, 2019). As of 2019, 196 states and the European Union have signed the agreement, and only 13 of which have not ratified the treaty (World Population Review, 2019).

The central aim of the Paris Agreement is to limit the changes to the climate by mitigating the temperature rise to 2°C from the pre-industrial levels. However, the consensus is that 2°C is still too high and that 1.5°C will help mitigate some of the devastations. If the greenhouse gas (GHG) emissions continue at the same pace as today, we are likely to exceed the temperature goal of 2°C in 30 years (IPCC, 2013). The temperature goal of 2°C does not limit severe effects, but is somewhat realistic to achieve and is politically feasible to communicate. There are continued discussions in the academic field as to which temperature will cause irreversible damage to the climate.

The Paris Agreement highlights several critical areas to prevent the temperature rise, namely: mitigation, climate change education, global peaking, and transparency (United Nations, 2019). Carbon budget and nationally determined contributions (NDCs) are initiatives within mitigation, which is the cumulative amount of CO2 each country can emit over time while still keeping the temperature commitment. Global peaking of GHG as soon as possible is necessary but will take longer for developing countries. Therefore, the developed countries have to take action and reduce their GHG targets to ensure the attainment of the goals. The Paris Agreement relies on robust and continued transparency to assure that countries maintain their duties, and share information and progress.

2.3   Sustainable Finance

The demand for investment products that support the environment has increased and has lead to the creation of sustainable finance. In its purest form, sustainable finance bases itself on the principles of sustainability (Lagoarde-Segot, 2019). The Brundtland Commission (1987) presented one of the most well-known definitions of sustainability. The definition states that "sustainable development meets the needs of the present without compromising the ability of future generations to meet their own need." This statement emphasizes that sustainability has a long term perspective, as it outlines that present

generations must align the needs for future generations in their preference.

Companies need to incorporate the principles of sustainability to be competitive in the market[5]. From a company's point of view, there are mainly two essential environmentally friendly perspectives, as presented in figure 2.2. The first perspective is how companies' activities are affecting the environment (e.g., externalities), while the second perspective is how climate change is impacting the company (e.g., more extreme weather and public perception of firms). The same two perspectives are as much of relevance for private individuals as well.

Figure 2.2: Sustainability and Climate - Two Perspectives
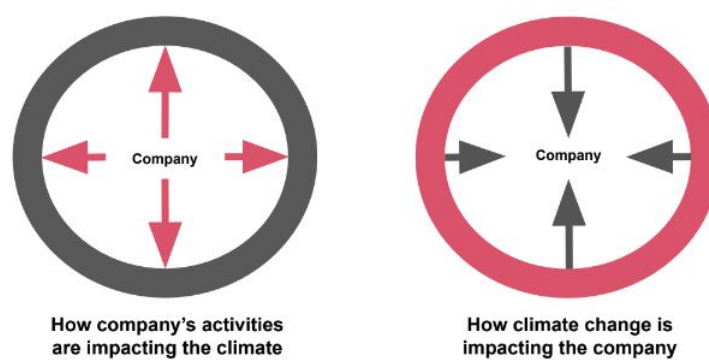
Climate change affects both companies and private individuals, therefore, joint efforts must be made to impede the consequences. As the financial markets create opportunities for such interactions between investors and issuers and represent the deepest pool of long-dated capital, it is crucial to utilize the fixed income market as a preventive action (Kochetygova and Jauhari, 2014). Sustainable finance is one way to use the forces in the financial markets to work towards sustainability. Sustainable finance is a broad term, and the appearance of a universal definition is yet to be known (Wilson, 2010). This thesis chooses to use the following definition of sustainable finance:

"Sustainable finance refers to any form of financial service integrating environmental, social and governance (ESG) criteria into the business or investment decisions for the lasting benefit of both clients and society at large." (SSF, 2019).

With a background in the definition above, one could argue that the overall goal of sustainable finance is to take advantage of a rational financial perspective while focusing

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[5]See, for instance Bonini and Gorner (2011) or Epstein and Roy (2003).

on sustainability. Following the definition, sustainable finance consists of several different financial instruments such as green bonds, impact investing, microfinance, and sustainable funds (Hall, 2019; SSF, 2019). It is, however, essential to separate sustainable finance and climate finance, as they are often confused. According to G20 Green Finance Study Group, climate finance, hereby referred to as green finance, aims to "internalize environmental externalizes and adjust risk perceptions in order to boost environmental-friendly investments and reduce environmentally harmful ones." Therefore, one could argue that sustainable finance is focusing on all of the ESG factors, while green finance concentrates only on the environmental dimension. The common denominator is that both terms originate from the desire to create a more environmental and sustainable future. As a result, the green bond field is arguably closest related to green finance, and the next section discusses the basic concepts of green bonds.

2.4   Green Bonds

Green bonds are fixed-income securities that finance investments with environmental or climate-related benefits (Ehlers and Packer, 2017)[6]. More generally, green bonds are sub instruments of green-finance, as discussed previously in section 2.3.

Like any other fixed-income security, green bonds have primarily two parties, namely an issuer of the bond and an investor. The issuer of the bond could be supranational institutions such as the World Bank, governments, or companies. The dynamics of green bonds separates itself from other fixed income securities by the "green label." The green label also provides a more dual nature of green bonds compared to regular bonds, meaning that the financial instrument includes more than financial aspects (Døskeland and Pedersen, 2016). Green bonds also appear more complex than conventional bonds, as the market is still developing, and there are no formalized requirements. Furthermore, green investors differ from conventional investors, as their motives exceed pure profit, meaning an allocation of capital to something of more "ethical" value (Helm, 2016).

There are mainly two sets of standards[7] that have influenced the market, namely the green bond principles (GBP) and climate bonds standard. Given that GBP is the prominent

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[6]The authors of this thesis acknowledge that there is no universal definition of green bonds.
[7]See table A1.1 in the appendix for various standards.

industry standard, this thesis chose to focus on this set of principles.

Green Bond Principles

The green bond principles, developed by the International Capital Markets Association (ICMA), "promote integrity in the green bond market through guidelines that recommend transparency, disclosure, and reporting." In this subsection, we will present (1) the different components, (2) the types of a green bond, and (3) outline the external review (ICMA, 2018).

The green bond principles have mainly four components:

1. Use of proceeds

2. Process for project evaluation and selection

3. Management of proceeds

4. Reporting

The first component, the use of proceeds, is the cornerstone of a green bond. This component elaborates on the utilization of the raised capital. As ICMA (2018) presents, there are several project categories expected to be supported by the green bond market. For instance, projects within renewable energy, pollution prevention and control, energy efficiency, and green buildings are such categories[8].

The second component involves a framework to secure information from the issuer to the investor. It emphasizes that an issuer should make an effort to communicate: (1) the objectives for the bond, (2) which green bond project category the project fit within, and (3) environmental and social risks of the project[9].

The third component, management of proceeds, elaborates on the control of the proceeds. Explicitly, the proceeds should be linked to the green bond project and be traceable. The component ensures that a company does not use the proceeds from a green bond to finance projects that do not comply with the green bond use of proceeds.

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[8]See the green bond principles 2018 for an extensive list of the project categories.
[9]The green bond principles contains the extensive list (ICMA, 2018).

The fourth component, reporting, ensures transparency in the green bond market, as it highlights vital information that issuers should outline.

Types of green bonds

As ICMA (2018) presents in the green bond principles annual report, there are mainly four types of green bonds:

- Standard green use of proceeds bond: a standard recourse-to-the-issuer debt obligation aligned with the green bond principles.

- Green revenue bond: a non-resource-to-the-issuer debt obligation aligned with the green bond principles. This type of bond has a connection between the debt resource and the cash flows, fees, and taxes.

- Green project bond: the link between a bond for a single or multiple green projects and the green bond principles.

- Green securitized bond: a bond collateralized by one or more specific green projects, including but not limited to covered bonds, asset-backed securities, mortgage-backed securities, and other structures; and aligned with the GBP. The first source of repayment is generally the cash flows of the assets (ICMA, 2018).

External Review

The green bond principle further recommends that issuers of green bonds "appoint (an) external review provider(s) to confirm the alignment of their bond or bond program with the four core components" of the green bond principles above (ICMA, 2018). As of today, the green bond principles are a voluntary framework. On the other hand, to be listed as a green bond on the stock exchange in Norway or Sweden, one must provide an external review.

There are currently two third party companies, namely Cicero and DNV GL, who have provided external review on the green bonds listed at Oslo Børs. The two companies have reviewed 80% and 20%, respectively, of the listed companies[10]. This thesis will elaborate on Cicero's framework since it reviews the majority of listed companies at Oslo Børs and is the leading global provider of second opinions on green bond frameworks (CICERO,

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[10]Own calculations based on the Green list provided by Oslo Børs.

2015).

Cicero has an essential role in the green bond market to secure the quality of green solutions (CICERO, 2015). In 2015, Cicero introduced the shades of green methodology: "which gives transparent information on how well a green bond aligns with a low-carbon climate-resilient future." The shades of green methodology is a framework developed by Cicero, where the company utilizes a four-step process to provide their second opinion:

Step 1: Request second opinion

Step 2: Assessment begins

Step 3: Draft second opinion

Step 4: Final second opinion

A standard process for the final second opinion delivered by Cicero starts with a request from the issuer for a second opinion. In this phase, Cicero gain inputs from the issuer, which includes green bond framework, sustainability strategy and reports, and other relevant documentation. In the next step, Cicero begins their assessment with a background in green bond principles, applicable standards, and their expertise on climate science. Based on their evaluation, they draft their suggestion for the second opinion and present it to the issuer. After clarifying with the issuer, Cicero delivers the final second opinion[11]. Furthermore, in their second opinion, Cicero utilizes a scale of "greenness", ranging from brown to dark green, where brown is the lowest[12] (CICERO, 2015).

Commonly Cited Advantages of Green Bonds

Issuers of green bonds could communicate the sustainability strategy, and thus positively affect the company's reputation and brand (Shishlov et al., 2017). One could argue that issuers of green bonds gain visibility and, therefore, attract more attention from investors since the market is still in its early stage of developments, and green bond issuance creates media attention and curiosity. Green bonds could, therefore, develop an enhanced awareness of sustainability and increase the underlying green investment activity. The effect of heightened awareness might be a necessary evolution of the financial culture (The UNEP Inquiry Report, 2015). Bloomberg New Energy Finance (2014) also states

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[11]See figure A1.1 in the appendix for visualization of the process.
[12]See figure A1.2 in the appendix for an explanation of the different ratings.

that green bonds open up a new supply of finance. The argument is that the "green" label enables non-specialist investors to locate climate-friendly investments. Another argument explained by Shishlov et al. (2017) is the possibility of enhanced awareness of sustainability internally in the organization, and strengthened ties between financial and sustainable departments.

Furthermore, the enhanced information provided through green bonds issuance could bring added value in itself for investors. Therefore, the additional information from a green bond issuance could strengthen the communication between the issuer and investor, as the investor gains more insights into the use-of-proceeds and the issuer's strategies. However, this argument builds on the assumption that investors have both the capacity and interest to take additional information into account when making their investment decision. The violation of this assumption might cause additional information to be seen purely as a higher transaction cost, and thus disfavor investments in green bonds.

Moreover, green bonds could create further diversification opportunities (Shishlov et al., 2017). For instance, socially responsible investment-funds or individually responsible investors face the challenges of a restricted investment base due to their various screening methods, as Heinkel et al. (2001) illustrates. Green bonds also allow for the isolation of a specific investment project within a given company. It could hence contribute to decreasing the restricted investment base, and thus allow for further diversification.

The mentioned advantages impose an indirect positive impact on the environment. Therefore, it is difficult to provide an accurate estimate of the green bond market's environmental impact. One can argue that increased awareness will have a direct effect on the environment, as it will be aligned with the necessary evolution of the financial culture (The UNEP Inquiry Report, 2015). Also, increasing the capital flow towards finance investments with environmental benefits will have a positive effect on the environment. To guide the capital towards such investments, issuers and investors must be incentivized (Reichelt, 2010). In such matters, green bonds may impose a considerable impact on the environment, as the mentioned advantages provides various incentives for both issuers and investors.

2.5   The Green Bond Market in Norway and Sweden

The green bond markets in the Nordic region have been at the forefront of the shift within sustainable finance, as the Climate Bond Initiatives' report of 2018 states. Given that Norway and Sweden have had the largest markets for green bonds within the Nordics and is the scope of this thesis, this section will elaborate on the development of the green bond markets in these two countries (Filkova, 2018).

Norway

As a small open economy, holding considerably international financial wealth, Norway is highly dependent on international events, as stated in NOU (2018a). For that reason, Norway must adopt a global perspective in addition to a national one. The climate change issue is a global concern and it is important for Norway as a small open economy, dependant on fossil fuels, to execute a green transition. The Norwegian government is trying to implement a green transition through several environmental reforms and initiatives. The Planning and Building Act of 2009 presents guidelines for addressing climate change at the local government level (Filkova, 2018). The *building code* adopted in 2017 currently supports the reform. Since 2010, counties and municipalities in Norway are obliged to prepare energy and climate plans as part of their annual budgets. Despite this, the government of Norway is receiving backlash for postponing the most critical climate actions, as critics are skeptical of the proposal for the national budget of 2020. With the proposal from the government, Norway would only be able to cut the climate emission by 12% within 2030 (Royal Ministry of Finance, 2020).

In addition to governmental action, the Norwegian stock exchange has been progressive concerning the green bond market. NOU (2018b) outline that this market will play a more significant part in the financing or more climate-friendly solutions in the long run. In January 2015, Oslo Børs became the first stock exchange in the world with a separate list for green bonds and is currently a member of the Sustainable Stock Exchange Initiative by the UN[13] (OBX, 2019). The list aims to increase the visibility of green investment choices. To feature on the green list at the Oslo Børs, one must present an independent review on the project (OBX, 2019). There are currently 30 green bonds from 20 individual issuers

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[13]See https://sseinitiative.org/.

on the stock exchange, with an total outstanding amount of approximately NOK 26bn[14] (OBX, 2019). Out of the 20 individual issuers, the majority operate within the energy sector. In the long run, green bonds will play a more significant part in the financing of more climate-friendly solutions, also in Norway .

The number of issued green bonds in Norway is rising (figure 2.3). The full issued amount in 2019 is not yet available, but the figure indicates that 2019 will be the best year in terms of green bond issuance to this date.

Figure 2.3: Green Bonds' Development in Norway

The graph presents the issued amount (NOK) for each year of green bonds at the primary axis, and the number of issuers at the secondary axis (Stamdata, 2019b)
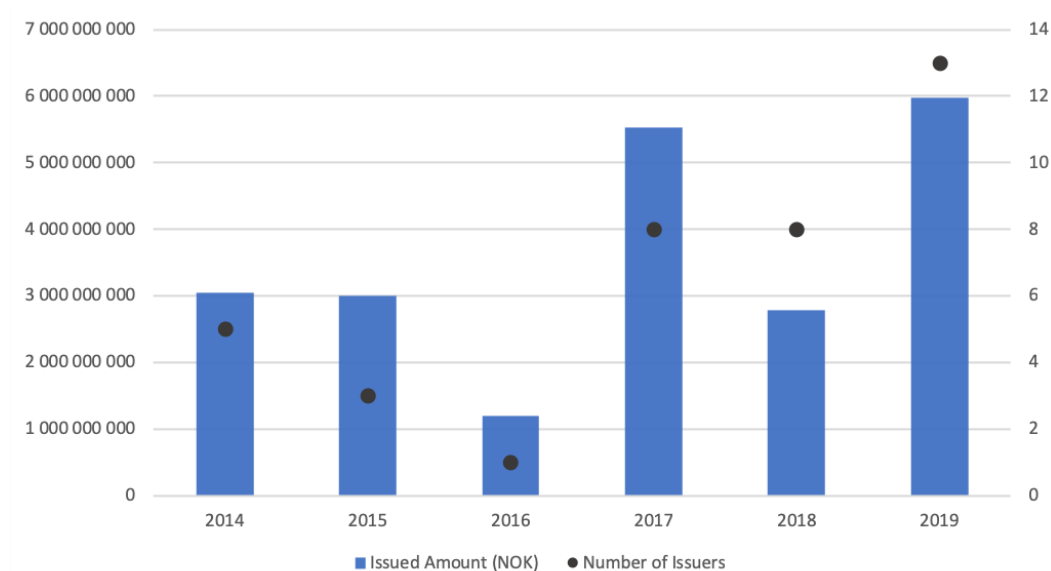
Sweden

The market for green bonds in Sweden has existed longer than the equivalent in Norway and is both more extensive and more developed (NOU, 2018b)[15]. One could argue that Sweden's green bond market is more mature because SEB and the World Bank instituted the first green bond in 2007 (SEB, 2018).

Similar to Norway, Sweden is showing a growing governmental focus on sustainability. In 2009 The Swedish Association of Local Authorities and Regions issued a position paper where they outlined their priorities for energy and climate policy (Filkova, 2018). The

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[14]Calculated with 24.10.2019 fx ratio for the given currency.
[15]The source is not available in English, free translation by the authors.

Climate Act of the 1st of January 2018 supports the proposition paper (Ministry of the Environment, 2018). In addition to governmental action, the school strikes for climate was started in Sweden by Greta Thunberg[16].

The Swedish green bond market has since its first issuance been the most significant market among the Nordic countries and is also a relatively notable contributor to the growth of green bonds from a global perspective. As presented in the first quarterly report by the Climate Bonds Initiative, Sweden places at the fourth position of the top 15 countries with an issuance volume of approximately USD 3bn (CBI, 2019).

Nasdaq Nordic currently lists its green bonds on its listing of sustainable bonds (Nasdaq, 2019). To feature as green on the sustainability list at the Nasdaq Nordic, one must present an independent review on the project. There are currently 137 green bonds listed in Sweden, with an total outstanding amount of approximately NOK 117bn. Of the 137 listed, there are 41 individual issuers of green bonds with the majority of issuers from the real estate industry.

Figure 2.4 displays the development of the Swedish green bond market. The green bond issuance in Sweden has increased steadily and the upward sloping trend is distinctive compared to Norway.

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[16]Greta Thunberg was recently awarded as the person of the year 2019 by Time magazine (Arbugaeva et al., 2019)

Figure 2.4: Green Bonds' Development in Sweden

The graph presents the issued amount (SEK) for each year of green bonds at the primary axis, and the number of issuers at the secondary axis (Stamdata, 2019b)
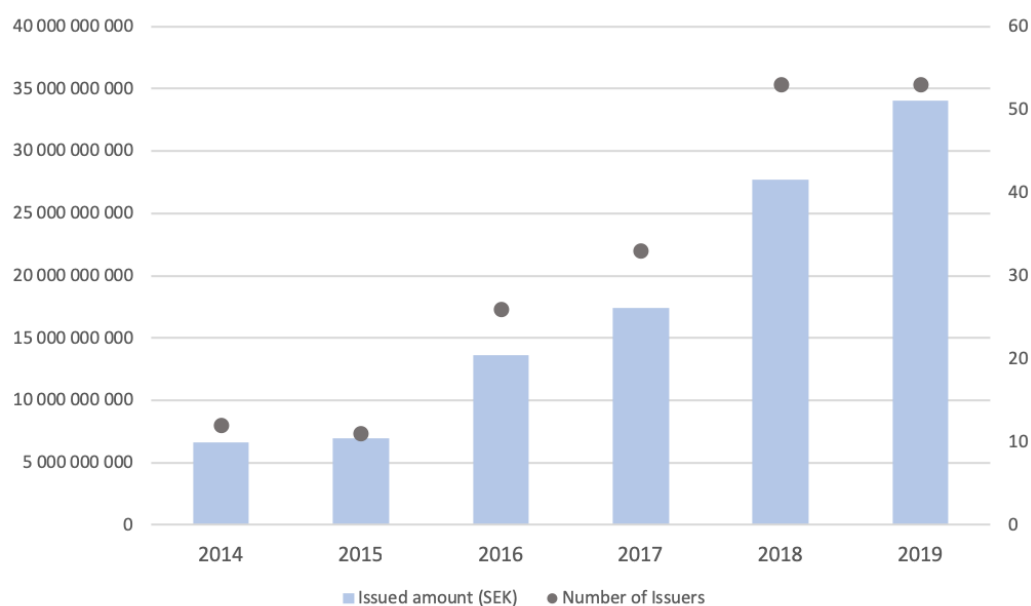
Norway and Sweden

The two countries combined currently have 167 listed green bonds, with a total amount outstanding of NOK 143n, as presented in table 2.1. With the global markets of green bonds having an outstanding amount of approximately NOK 6700bn, the market in Norway and Sweden is relatively small, but not insignificant.

Table 2.1: Overview of the Norwegian and Swedish Green Bond Markets

Country	Number of Listed GB	Number of unique issuers	Amount Outstanding (NOK)
Norway	30	20	26bn
Sweden	141	41	117bn
Total	171	61	143bn

Although the amount outstanding in Norway and Sweden is not more than approximately two percent of the global green bond market, the two countries are arguably leading the green bond market by example (CBI, 2018). CBI lists several milestones within the green bond market that originates from the two countries, see table 2.2.

Table 2.2: Norway and Sweden As Pioneers in the Green Bond Market

Sector in which first	Green bond Issuer	Issuer domicile	First issue date	Size
European state-owned Bank	Kommunalbanken AS	Norway	May 2010	EUR 85m (Two bonds)
City	City of Gothenburg	Sweden	Oct 2013	EUR 57m
Corporate & Real Estate	Vasakronan AB	Sweden	Nov 2013	EUR 145m
Forestry & Paper	Svenska Cellulosa AB	Sweden	Mar 2014	EUR 170m
Wind Energy	Arise AB	Sweden	Oct 2014	EUR 121m
Municipal Housing	Fastighets AB	Sweden	Oct 2014	EUR 43m
European Municipal Energy	BKK AS	Norway	Oct 2014	Eur 131m
Green MTN program	Fabege	Sweden	May 2016	EUR 64m

Figure 2.5 presents the development of GHG emissions in the EU, as well as Norway and Sweden. The Swedish emissions are almost precisely in line with the EU and are decreasing, while the Norwegian emissions are at a steadily significantly higher rate. This might indicate that Sweden is increasing its environmental investment activity too a larger extent than Norway.

Figure 2.5: GHG Emission, EU, Norway and Sweden

The figure indicates the total national emissions of GHG, using 1990 as an index. The GHG emission inventories are submitted annually by the EU Member States to the United Nations Framework Convention on Climate Change (UNFCCC) (eurostat, 2019)
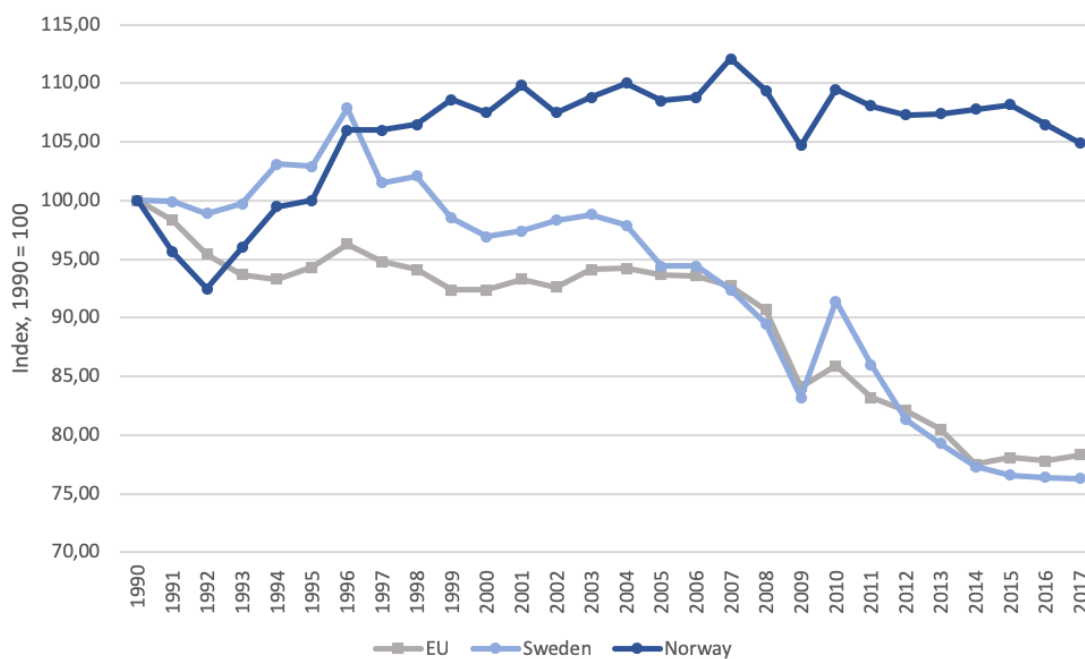
2.6   Challenges

Despite the overall progress of the green bond market and its success in the Nordic region, there are still several remaining challenges. This section discusses some of the most relevant challenges for the green bond market globally and for the Nordic region.

Berensmann and Lindenberg (2016) outline that one of the main challenges for the growth of green finance is the lack of clarity in the classification of "green." The green bond market inhabits the same issue, as there does not exist an universal framework. The lack of one green bond framework causes uncertainty and the emergence of phenomena such as *greenwashing*. Greenwashing occurs when companies appear more "green" to the public than they are, which reduces the trust in the green bond market and curtails the growth of the market. Therefore, it is demanding to create trust between the issuers and investors. This reduces the differentiation between different shades of green and green bond issuers might obtain the same funding cost regardless of the effect on the environment.

The continued growth of the green bond market and the standardization of the framework should influence the pricing of green bonds. For instance, Nordic Bond Pricing currently price green and non-green bonds on the same price curve, which might cause discretion due to the subjective perception of the demand and supply in the market. On the other hand, Shishlov et al. (2017) argue that green bonds will need to provide tangible financial benefits for issuers and investors before pricing it differently. The intangible benefits issuers or investors are receiving will vary greatly and are complicated to calculate. Therefore, one can argue that the primary market will never correctly estimate the exact price of green bonds.

To mobilize finance for sustainable growth, as the Paris Agreement stipulates, the EU launched an Action Plan in 2018 (EUs High-Level Expert Group, 2018). The plan has three main objectives:

1. Reorient capital flows towards sustainable investment to achieve sustainable and inclusive growth

2. Manage financial risks stemming from climate change, environmental degradation, and social issues

3. Foster transparency and long-term focus in financial and economic activity

The *Taxonomy*, which is an establishment of a universal EU classification system, is one of the concrete actions within the European Union's Action Plan. In-depth, the taxonomy is based on the latest research and industrial experience and will be a list of economic activities, with relevant criteria and thresholds for each one. The hope is that the taxonomy will bring standardization to the market, create transparency, and alleviate greenwashing.

On the 11th of December 2019, the European Union presented the European Green Deal, which is an initial road map for becoming the world's first climate-neutral continent by 2050 (European Union, 2019). To successfully achieve this highly ambitious goal, easy access to financing is essential. Therefore, the European Union will deliver a sustainable investment plan supporting €1 trillion of investment over the next decade. In March 2020, the European Union will propose the first European climate law to chart the way ahead and improve long-term investment planning (von der Leyen, 2019). The European Parliament has also agreed on a "green" list of recognised sustainable investments, as well as additional "green" transparency. The expansion of "green" transparency includes an obligation to explicitly declare non-sustainable products.

The next section will highlight the relevant research done on the green bond market.

3 Literature Review

The literature review aims to outline and discuss available literature on green bonds. It will consist of two parts, whereas the first part will focus on the existing literature on green bonds yield premium, while the second part will seek to explore research on investors' and issuers' motives in their decision making.

Overall, the literature on green bonds has increased in recent years, and experts perform continuous research to match developments in the market.

3.1 Performance of Green Bonds

There are currently several studies addressing the effects of corporate social performance, or CSP[17]. In specific, the majority of the research papers focus on the effects related to good environmental performance on companies' stock returns[18]. Also, the majority of the published papers on this matter suggests a positive impact from CSP on companies' financial performance. The equivalent research in the bond market is increasing, but there does not exist a universal conclusion.

The same inconsistency in conclusions applies to whether or not a green bond would provide a yield premium[19]. However, Ehlers and Packer (2017) find a mean difference in the spreads, on average, in the US municipal bonds market of -18bps, by comparing the credit spreads at issuance between green and conventional bonds.

Moreover, Zerbib (2019) constructs a synthetic bond yield for each green bond in the study through a matching process using conventional bonds and compares the green bonds yield to its synthetic comparable. The study reveals a small negative yield premium, meaning that the yield of a green bond is lower than that of conventional bonds. Similarly to Zerbib (2019), Febi et al. (2018) analyze the effects of liquidity premium on the green bond credit spread, in the period between 2013-2016. Febi et al. (2018) used a sample consisting

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[17]Luo and Bhattacharya (2009) defines CSP as a company's overall performance in corporate pro-social programs, ranging from cause-related marketing to any activities that are intended to protect and improve social welfare.

[18]See for instance Mǎnescu (2011) and Thomas (2001).

[19]A yield premium means that green bonds have either a tighter or larger spread than conventional bonds.

of 64 labeled green bonds listed on the London Stock Exchange and Luxembourg Stock Exchange and found that, on average, the credit spread for green bonds is lower than that of conventional bonds by 5bps to 30bps. These results are consistent with Zerbib (2019).

Hachenberg and Schiereck (2018), on the other hand, observes the pricing difference in daily interpolated-spreads (i-spreads) between green and matched non-green bonds. Their findings suggest a small negative yield premium for green bonds compared to non-green bonds from the same issuer.

Opposite to the studies presented above, Bhimalingam (2019) found that there is no yield premium for green bonds. The conclusion came as a result of monitoring green bonds' performance against the Euro Corporate Index over several years. Moreover, focusing on the US municipal bonds market, Karpf and Mandel (2018) found that green bonds have 7.8bps higher yield than conventional bonds.

Although the research in the field of green bond yield premium has been inconsistent, there seems to be a tendency that the findings exhibit a small negative yield premium for green bonds globally. Table 3.1 and 3.2 summarizes the reviewed literature in this section.

Table 3.1: Overview of Literature Review(1)

Study	Zerbib (2019)	Ehlers and Packer (2017)	Karpf and Mandel (2018)	Baker et al. (2018)
Alignment with the Green Bond Principles	Yes	Yes	No	No
Scope	Global (Bloomberg green bond labeled)	Euro and US	US municipal bonds market	US corporate and Municipal bonds (Bloomberg green bond labeled)
Market	Secondary	Primary	Secondary	Primary
Number of Bonds	110	21	1880	2083
Time period	2013-2017	2014-2017	2010-2016	2010-2016
Method	Comparison	Comparison	Oaxaca-Blinder decomposition	OLS regression
Liquidity control	Yes	No	Yes	Yes
Strict maturity control	Yes	Yes	Yes	Yes
Yield premium	-2bps	-18bps	7.8bps	-7bps

Table 3.2: Overview of Literature Review(2)

Study	Hachenberg and Schiereck (2018)	Febi et al. (2018)	Bhimalingam (2019)
Alignment with the Green Bond Principles	Yes	Yes	Yes
Scope	Global	London and Luxembourg Stock Exchange	Global
Market	Secondary	Secondary	Primary
Number of Bonds	63	64	N/A
Time period	Oct. 2015 - March. 2016	2013-2016	2014-2019
Method	Comparison	Comparison	Comparison
Liquidity control	Yes	Yes	N/A
Strict maturity control	Yes	Yes	N/A
Yield premium	-1.18bps	-69.2bps	0bps

On the matter of the green bond yield premium, this thesis will contribute to the existing literature in two critical areas, by:

1. increasing the research on green bond yield premium in general.

2. providing insights on the green bond yield premium in a market that has low research, namely Norway and Sweden.

3.2   Factors Affecting Decision Making

According to financial theory, an investment decision is a trade-off between risk and return (Markowitz, 1952). Therefore, an investor will choose the portfolio that maximizes the return based on the investor's risk preferences. Nagy and Obenberger (1994) support the ideas of Markowitz (1952), and found that individuals mainly focus on classical wealth-maximization criteria.

However, the majority of research reveals that other non-financial decision criteria also affect investment decisions (Nagy and Obenberger, 1994; Barreda-Tarrazona et al., 2011).

For instance, Nagy and Obenberger (1994) argue that investors' decision criteria are diverse and broad. In their findings, "feelings for the firm's products and services," ranks third of the variables affecting investor decisions (Nagy and Obenberger, 1994). Consequently, one could argue that investors do not behave in rational mean-variance maximization, as proposed by traditional finance theory (Beal et al., 2005).

A modern way of addressing the subject of interest is that both financial and non-financial factors affect decision making, as suggested by Døskeland and Pedersen (2016), Beal et al. (2005), Nagy and Obenberger (1994), and Barreda-Tarrazona et al. (2011). This is the goal of sustainable finance, as it combines both financial and non-financial factors to maximize investors' dual nature utility function, see section 2.4.

(Ross, 2015) argues that investors, to a more considerable degree than previously, seek projects with a capacity to make a difference, and society is accepting more responsibility for global challenges, such as climate change. Voica et al. (2015) argue that the non-financial factors affecting decision making are essential drivers of financial performance. For instance, reputation is pointed out as a driver of revenue, as it increases demand for the product. Non-financial factors are crucial for companies' performance, and issuance of green bonds, as well as green bonds in investors' portfolios, will support a better reputation.

In a report, Kochetygova and Jauhari (2014), imply that both environmental and sustainable factors affect the decision-making process. From an issuer's point of view, they need to meet the increased demand for such investments and also meet new occurring mandates following these factors (Kochetygova and Jauhari, 2014). Therefore, companies have a growing focus on sustainability, and acknowledge that they must adapt to the changes caused by climate change also in the financial sector.

On the matter of issuers' and investors' motives, this thesis will contribute to the existing literature in two critical areas, by:

1. increasing the research on issuers' and investors' motives in general.

2. providing insights on issuers' and investors' motives in the Norwegian and Swedish green bond markets.

4 Study of the Greenium in the Norwegian and Swedish Bond Markets

The thesis will, in this section, focus on the first research question: "Can we explain why the Norwegian market issues so few green bonds by analyzing the existence of a greenium in the Norwegian and Swedish bond markets?"

We start by conducting an anecdotal analysis of the primary market, which indicates that the secondary bond market is more suitable for the estimation of the greenium. The main analysis is, therefore, on the secondary green bond market.

The greenium section on the secondary bond markets in Norway and Sweden, begins by explaining and performing a matching method, where green bonds are matched with a synthetic bond from two conventional bonds, and provide descriptive statistics of the dataset. We employ a fixed effect method to estimate the greenium in the two countries. The analysis then uses a regression with several characteristics, which includes greenness, estimates the determinants of the greenium. Lastly, it discusses the result and limitations of the study.

This section will, therefore, provide insight into primarily two areas:

1. The estimated greenium in the Norwegian and Swedish bond markets.

2. The determinants of the estimated greenium in the two markets.

4.1 Primary Bond Market

This section performs an anecdotal analysis of the primary bond market in Norway and Sweden.

4.1.1 No Evidence of a Greenium in the Primary Market

The primary bond market is where the bonds "enter" the market upon issuance, where pricing analysts such as Nordic Bond Pricing estimates the daily bond prices and distribute

it to their customers. The secondary bond market, on the other hand, is where investors trade the bonds and reach an equilibrium price. Due to the moral value of green bonds, it is harder to price this sustainable financial instrument without observing the supply and demand movements in the market over time. Nordic Bond Pricing have informed us that they currently utilize the same pricing curve for green and conventional bonds. It is, therefore, unlikely to discover a greenium in the primary market. Discussions with representatives at Nordea and other fields of expertise, in both Norway and Sweden, also argue that the secondary bond market is more suitable for the analysis. The analysis determinants of potential price and yield discrepancies between green and conventional bonds is also more applicable through the secondary market.

Although the secondary bond market is the main focus of this thesis, we also analyze the pricing of green bonds in the primary bond market. The study of issuers' and investors' motives also discusses green bonds in the primary market, section 4. Figures 4.1 and 4.2 presents the issue price levels and price curves for both green and conventional bonds from the same company. Note that the two figures contain bonds with various maturities. Thus, one should not directly compare the different data points, as disparities might correlate with maturity (Sundal, 2018).

Figure 4.1: Entra ASA, New issues levels, various maturities (bps over 3m NIBOR)
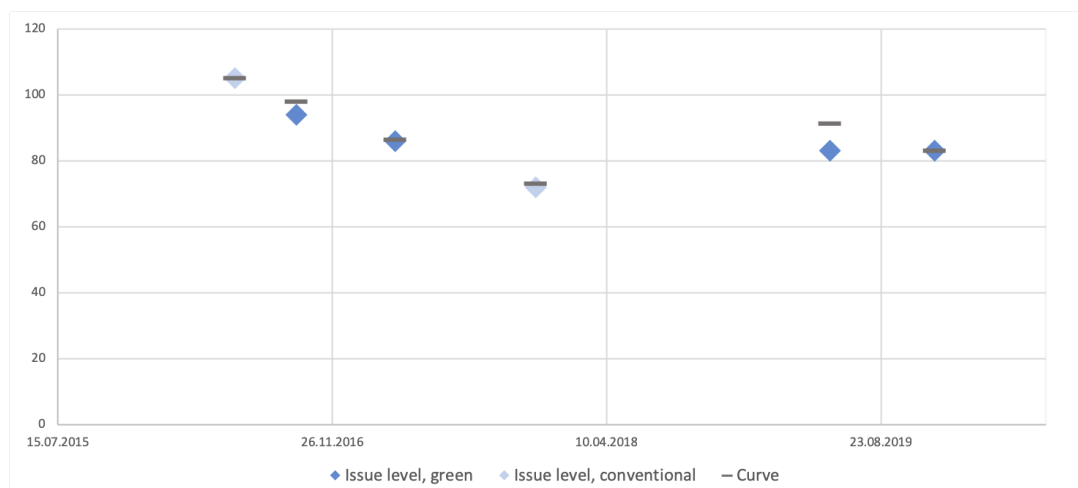
Source: NBP (Underlying data), Further calculations by the authors

Figure 4.2: BKK AS, New issues levels, various maturities (bps over 3m NIBOR)
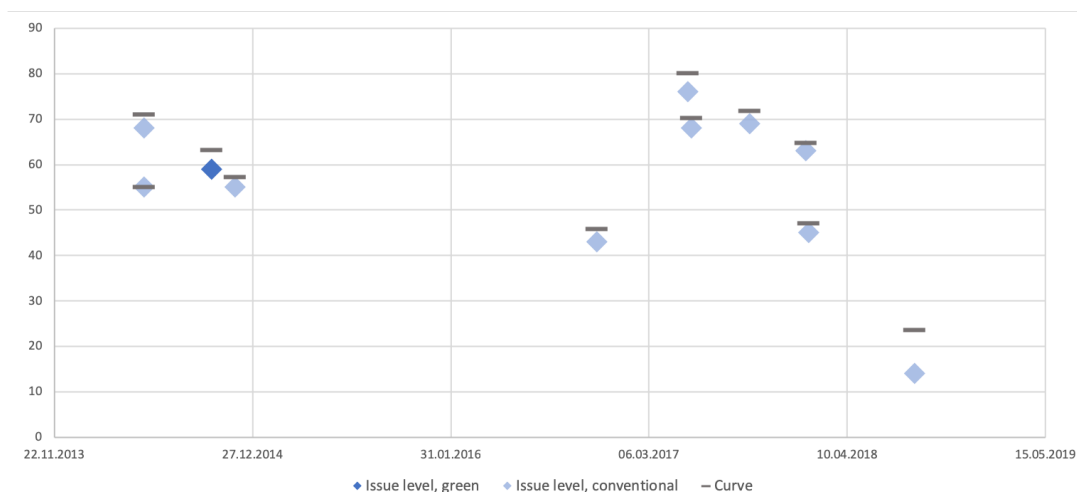
Source: NBP (Underlying data), Further calculations by the authors

Figure 4.3 presents a total of four bonds issued by Entra ASA with 5-years maturity, two conventional and two green bonds. The graph plots the bonds against the indicative spread levels over time, which is how Nordic Bond Prices performs the pricing of the bonds.

Figure 4.3: Entra ASA, 5Y maturity versus indicative spread level (bps over 3m Nibor)

Source: NBP (Underlying data), Further calculations by the authors

Similar to Sundal (2018), we find limited evidence of a greenium in the primary bond

markets of Norway and Sweden. It is, however, important to note that several international papers have found evidence of a greenium in the primary market, see the literature review in section 3. It might, therefore, be of value to study the existence of a greenium in the primary market of Norway and Sweden in even more detail. However, as the research question is not only focusing on a green bond premium, it is more relevant to analyse price discrepancies in the secondary market and study the differences in motives.

We will, therefore, focus on the secondary bond markets in Norway and Sweden in the following greenium analysis.

4.2   Secondary Bond Market

4.2.1   Matching Method and Dataset

Matching Method

The matching method is a statistical technique in which one performs a treatment on one of two identical groups. The observed differences should, therefore, be caused by the treatment since the groups have similar observable characteristics. The method thereby enables a comparison of outcomes to estimate the exact effect on the groups, reducing bias and increasing the credibility of the estimated effect.

The matching method is achievable in the bond market where there are a large number of issued conventional bonds and recently a rapid increase of issued green bonds, often from issuers who have already issued a conventional bond. Therefore, it is a suitable approach in our research question since it is possible to evaluate the difference between a green bond and a conventional bond from the same issuer. Thereby removing the differences in characteristics between different issuers and reducing the bias of the estimated green label effect. Of that reason, the matching method has been favorable to determine whether there exists a yield premium on green bonds, as it is used by Kreander et al. (2005), Bauer et al. (2005), Helwege et al. (2014) and Zerbib (2019).

Figure 4.4 presents the matching process for each country. The process is initiated by extracting the issuers who have issued at least one green bond (GB) and two conventional

bonds (CB), thereby increasing the quality of the synthetic bond. The synthetic bond is created from the two conventional bonds, and is more precise than just matching the green bond with the closest conventional bond (Zerbib, 2019). Once the green bonds with at least two corresponding conventional bonds are selected, the next step is to choose the two conventional bonds that are the most similar to the corresponding green bond from each issuer. The matched bonds have the same coupon type, currency, seniority, and security. There are also requirements to the maximum difference in maturity, issue amount and issuance between the green bond and the two conventional bonds. These traits are essential in terms of similarity, but we also set requirements for the characteristics and remove the bonds that do not meet these requirements.

Figure 4.4: Matching Process
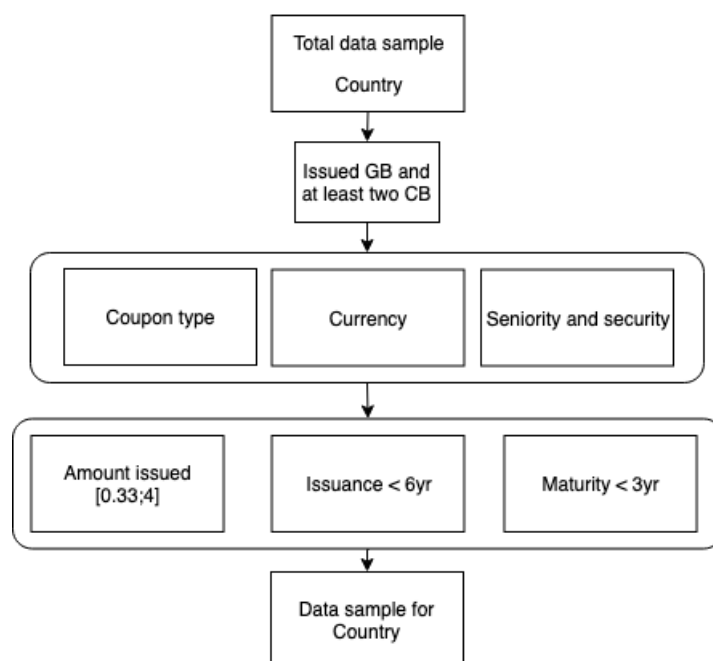
To improve the quality of the matching of bonds, reducing the difference in liquidity[20] is essential as it will influence the estimated yield premium (Elton and Green, 1998). The liquidity effect on bonds is well documented, as mentioned in the literature review in 3.1, due to the difficulty of liquidating a bond position. If a bond is illiquid, investors will demand a compensation for the additional risk, and the liquidity premium will increase (Bao et al., 2011). It is, therefore, crucial to limit the bias liquidity can infer in our

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[20]Liquidity is defined as the rate to which an asset can be bought or sold in the market at a price reflecting its intrinsic value. Another way of explaining this, is the ease of converting the asset position into cash.

estimation of the green bond yield premium. The mitigation of the liquidity effect[21] is possible through restricting the difference in amount issued, maturity, and issuance between the green bonds and its corresponding conventional bonds. The restrictions of maximum difference to the green bond are four times or 1/3 of the issue amount, three year in maturity and six years in issuance since these are characteristics which affect liquidity (Houweling et al., 2005). Thereby decreasing the liquidity effect and assuring that the two groups are as identical as possible, while still maintaining a sufficient sample size.

After establishing the correct sample of green bonds with two corresponding conventional bonds from the same issuers, it is possible to create a synthetic bond with the same maturity as the green bond from the two conventional bonds.

With a^* as the slope and b^* the intercept of the function passing through $(Maturity_{CB1}, y^{CB1})$ and $(Maturity_{CB2}, y^{CB2})$, the yield of the synthetic conventional bond is:

$$\tilde{y}^{CB} = a^* Maturity_{GB} + b^* \tag{4.1}$$

Linear inter- extrapolation is also used within the matching method in previous research and well documented to be a flexible tool to create a synthetic instrument (Zerbib, 2019). The construction of synthetic bonds causes the only difference between the green bond and the synthetic bond to be the green label, liquidity, and probably some omitted variables.

The credit spread between the green bond and conventional bond is

$$\triangle \tilde{y}_{i,t} = y_{i,t}^{GB} - \tilde{y}_{i,t}^{CB} \tag{4.2}$$

where $y_{i,t}^{GB}$ and $\tilde{y}_{i,t}^{CB}$ is the green bond and conventional bond i's ask yields, respectively, on day t.

Dataset

The utilization of Stamdata and Bloomberg permits the overview of the green bond market in Sweden and Norway. As described in detail in section 4.2.1, we need to match each green bond with two conventional bonds from the same issuer within the required

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[21]The methodology section 4.2.2.1 reduces the omitted variable bias by adding a proxy variable for liquidity.

characteristics. Stamdata[22] has detailed information on the Nordic bond market and
provides the necessary information to gather the triplets[23] that meet the requirements
(Stamdata, 2019a). The thesis also chooses to only use bonds with NOK as currency
from OBX and SEK from Nasdaq Sweden. We map the triplets of interest and then use
Bloomberg to download the data. The analysis uses the bond's ask yield and not the
price to compare the bonds.

In the dataset, we delete the triplets that inhabit missing trading days. It is thereby
ensuring that every bond in each triplet contains the necessary data. The reasons for
missing trading days are either from a difference in maturity and issuance, the low
frequency of trade, or error.

The final sample consists of 31693 observations from 101 total triplets (303 bonds). 13 of
the triplets and 3038 observations are Norwegian, while 88 triplets and 28655 observations
are Swedish. The 101 triplets are from 34 different companies, of which eight are from the
public sector, and the remaining 26 are private. There are bonds from seven industries in
the dataset, as table 4.1 presents. The real estate sector dominates the dataset with 70
triplets, which is reasonable since this industry has been an early adopter of green bonds,
especially in Sweden. Of the 88 triplets from Sweden, 65 are within the real estate sector.
The greenium analysis in section 4.2.3 shows the composition of sectors. The bonds in
the dataset are all labelled as "Senior Unsecured Bonds" or "Government Guaranteed",
and within each triplet the security and seniority is identical.

Table 4.1: Sectors in the Dataset

Sector	Real estate	Utilities	Bank	Consumer Services	Transportation	Pulp, paper and forestry (ppf)	Public sector
Number of triplets in Norway	5	4	2	1	0	0	1
Number of triplets in Sweden	65	2	1	0	6	3	11
Total	70	6	3	1	6	3	12

The number of Swedish green bonds in the dataset is approximately 53 percent of the
current green bond market in Sweden, with 88 of the 167 bonds. The Norwegian dataset
makes up 13 out of the current market of 30 green bonds, approximately 43 percent. In
terms of volume, the dataset contains approximately NOK 49 billion of the current NOK

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[22]Stamdata delivers reference data for Nordic debt securities. The data includes detailed information
on bonds, certificates, and structured debt securities.
[23]Triplets are the green bonds matched with two conventional bonds

143 billion green bond market in Norway and Sweden. The dataset represents roughly 34 percent of the current market in terms of volume. The sample is, therefore a large percentage of the green bond markets' population.

The data collection is a trade-off between quantity and quality. To ensure a sufficiently large dataset, there are no restrictions to coupon type. Of that reason, the sample contains both floating and fixed coupon type, with 37 fixed and 64 floating coupon type triplets. Despite including fixed and floating coupon types, the coupon type is the same within each triplet. To check the robustness of the dataset graphically, figure 4.5 plots the yield spread $\triangle \tilde{y}_{i,t}$ of all the triplets and indicate the coupon type below. The figure shows some outliers in the data set for both coupon types. However, these are only a few values, and the majority are near the expected zero. The fitted fixed-rate and the fitted floating-rate also support the robustness of the dataset. Thereby, the distribution is arguably the same for both coupon types.

Figure 4.5: Distribution of Ask Yield Differences for Fixed and Floating Coupon Type

The plot presents each observation of the ask yield difference between green and conventional bonds between 2016 and 2019. To gain a better overview of the entire dataset, the observations are displayed according to their coupon type.
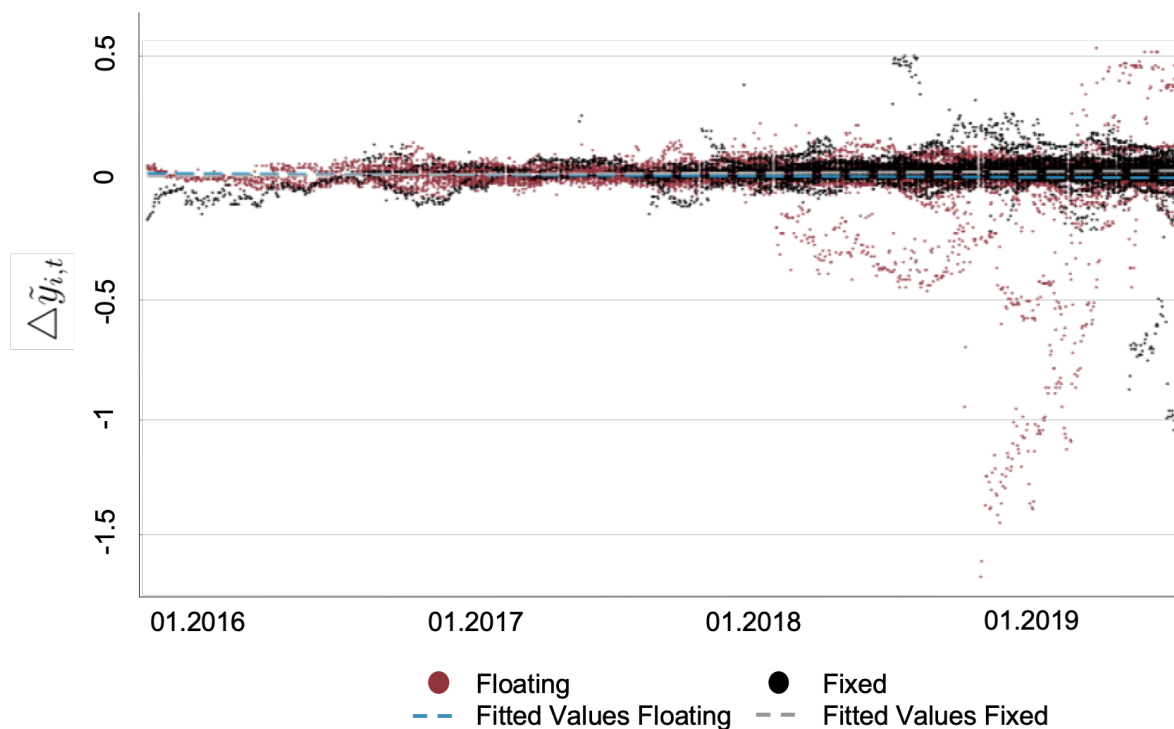
Table 4.2 shows descriptive statistics of the number of trading days per bond, the ask

yields of green bonds and synthetic bonds, the dependent credit spread variable $\triangle \tilde{y}_{i,t}$[24], green bond maturity, and issue amount. The $\triangle \tilde{y}_{i,t}$ of the total dataset, is of particular importance, has a negative mean of approximately -0.72 basis points, and a median of 0. The yield difference $\triangle \tilde{y}_{i,t}$ skews to the left with a minimum value of -2.46 percentage points and a maximum value of 0.65 percentage points. It is unlikely that there exists discrepancies as large as two percentage points between green and conventional bonds, and is probably due to the linear inter- extrapolation of synthetic bonds (limitation section 4.3). However, the outliers are relatively few, as the distribution graph illustrates, and previous research contains similar distribution.

Table 4.2: Descriptive Statistics of the Dataset

The table presents descriptive statistics of the triplets in our dataset, containing the secondary bond market in Norway and Sweden. Stamdata and Bloomberg are used for the matching of bonds and downloading of the dataset, respectively.

	Sample					
	Min	1st Quart.	Median	Mean	3rd Quart.	Max
Number of trading days per bond	15	130	282	313.8	428	830
Ask yield of GB $y_{i,t}^{GB}$	-0.54	0.05	0.35	0.5653	0.82	4.5
Ask yield of CB $\tilde{y}_{i,t}^{CB}$	-0.73	-0.05	0.36	0.5958	0.86	5.67
Yield difference $\triangle \tilde{y}_{i,t}$	-2.46	-0.02	0.0	-0.0072	0.02	0.65
GB Maturity 17.09.2019 (years)	0.010	2.100	3.140	3.208	4.190	11.280
GB Issue Amount (NOK bn)	0.075	0.287	0.5	0.57	0.7	2.5

4.2.2 Methodology

The methodology section aims to explain the methodology used to estimate the yield premium on green bonds and the determinants of the green bond yield premium. The section also presents and explains the equations in the analysis and measures to mitigate liquidity effects.

4.2.2.1 Step 1: Estimation of the Greenium

In the matching method, section 4.2.2, introduces $\triangle \tilde{y}_{i,t}$ as the difference between the green bond's ask yield and the synthetic bond's ask yield. This value might be close to the

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[24]Which is the ask yield of a green bond minus the comparing synthetic bond.

actual green bond yield premium. However, we need to account for the liquidity effect[25] to ensure a precise result (Alexander et al., 2000). For that reason, the regression inhabits an explanatory proxy variable for liquidity. The regression uses the liquidity proxy to accurately estimate the unobserved fixed-effect green bond yield premium, ρ_i:

The analysis defines the absolute yield difference $\triangle \tilde{y}_{i,t}$ between $GB_{i,t}$ and $CB_{i,t}$ as

$$\triangle \tilde{y}_{i,t} = \rho_i + \beta \triangle Liquidity_{i,t} + \epsilon_{i,t} \tag{4.3}$$

where ρ_i and $\epsilon_{i,t}$ is the green bond yield premium and the error term, respectively, on day t.

$\triangle Liquidity_{i,t}$ is:

$$\triangle Liquidity_{i,t} = \triangle Liquidity_{i,t}^{GB} - \triangle Liquidity_{i,t}^{CB} \tag{4.4}$$

There are several methods to create the liquidity proxy and characteristics such as daily trading volumes, issue amount, and maturity. Similar to Fong et al. (2017), we use the closing bid-ask spread as a proxy for liquidity.

$$\triangle BA_{i,t} = BA_{i,t}^{GB} - BA_{i,t}^{CB} \tag{4.5}$$

The bid-ask spread of the green bond is intuitive to calculate, the bid-ask spread of the synthetic bond demands a bit more calculation. In the matching method, section 4.2.2, the synthetic bond was created from the two conventional bonds, the bid-ask spread of the synthetic bond can, therefore, be calculated as the weighted average of the two conventional bonds' bid-ask spread:

$$BA_{i,t}^{CB} = \frac{d1}{d1 + d2} \, BA_{i,t}^{CB1} - \frac{d2}{d1 + d2} \, BA_{i,t}^{CB2} \tag{4.6}$$

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[25]The matching method section 4.2.1 reduces the liquidity effect by impeding strict requirements to each triplet.

Where

$$d1 = Maturity_{i,t}^{GB} - Maturity_{i,t}^{CB1}$$
$$d2 = Maturity_{i,t}^{GB} - Maturity_{i,t}^{CB2}$$

(4.7)

Table 4.3 shows that $\triangle BA_{i,t}$ has a mean close to zero and a low standard deviation, which is similar to research done by Zerbib (2019). This liquidity test indicates that the requirements for the final sample mitigate the liquidity effects of issue amount, maturity, and issuance.

Table 4.3: Descriptive Statistics of the Liquidity Proxy, $\triangle BA_{i,t}$

			$\triangle BA_{i,t}$			
min	1st Quart.	Median	Mean	3rd Quart.	Max	Std. Dev.
-0.6700	-0.0100	0.0000	-0.0017	0.0100	0.5100	0.0263

The analysis uses panel data to capture the yield premium and runs the regression with fixed effect (FE), random effect (RE), and first difference. The fixed effect model assumes that the individual-specific effects are correlated with the independent variables, while the random effects model requires that the group-level effects and the liquidity variable are uncorrelated.

The Hausman test has the null hypothesis that the fixed effect and random effect models are equal. If the test does not reject the null hypothesis, both methods are consistent and unbiased. However, if the test fails to reject the null hypothesis, RE is the most efficient. On the other hand, if the test rejects the null hypothesis, FE is the only one that is unbiased and therefore preferred.

4.2.2.2 Step 2: The Determinants of the Greenium

Equation 4.3 isolates and captures the estimated yield premium, $\hat{\rho}_i$. The next step is, therefore, to understand the determinants of the green bond yield premium. The characteristics explored to evaluate and measure the effects of the yield premium are the coupon type, sector, rating, country, and issue amount. The reason for these characteristics is due to the extensive research indicating their effect on bond prices (Hand et al., 1992). The analysis also performs and adds a valuation of the greenness of the green bonds based

on Cicero and its shades of green, and other published external reviews. In cases where the second opinion report does not contain an explicit greenness rating, we perform a subjective assessment. The regression adds the variable greenness and allocates the value 1 to green bonds with a shade of green or a subjective assessment equal to dark green. Green bonds with a greenness scale of less than dark green receive the value 0.

Creating the greenness variable enables the analysis to evaluate if investors are informed and value the environmental effect of the green bond. It is thereby testing the hypothesis that a higher score in greenness corresponds to a more substantial negative greenium. No previous green bond research, as far as the authors are aware, contains a greenness determinant within the green bond market (3). Table 4.4 presents an overview of the mentioned characteristics as well as the other essential variables in the dataset.

Table 4.4: Description of Variables

Variable	Description	Type
Date	Pricedate	mm.dd.yyyy
TTM	Time to maturity (actual/360)	decimal
Bid	Bid yield for green bond	Percent(decimal)
Ask	Ask yield for green bond	Percent(decimal)
Bid S	Bid yield for synthetic bond	Percent(decimal)
Ask S	Ask yield for synthetic bond	Percent(decimal)
BA Method	Liquidity proxy	Decimal
triplets ID	Unique identifier for each triplet	Ordinal
Issue amount	Amount issued at issue date	NOK
Issue amount high	Dummy = 1 if the bond has issue amount equal or above NOK 1bn	Dummy
Issue amount.medium	Dummy = 1 if the issued amount is less than NOK1bn and higher or equal to NOK 0.5bn	Dummy
Sector	Dummy = 1 if the issuer is categorized in the utility, bank, real estate, consumer services, or paper pulp and forestry (ppf) sector. The reference group is the public sector. Note that we create a dummy for each sector.	Dummy
Rating	Dummy = 1 if the bond has investment grade, else 0.	Dummy
Coupon type	Dummy = 1 if coupon type is fixed. The reference group is floating.	Dummy
Greeness	Dummy = 1 if the bond is labeled dark green, else 0.	Dummy
Swedish	Dummy = 1 if the bond is Swedish. The reference group is Norway.	Dummy
Year	Dummy = 1 if the trading day is in 2016, 2017, 2018, or 2019. The reference group is 2015. Note that we create a dummy for each year.	Dummy

The regression to estimate the determinants of the greenium is as follows:

$$
\begin{aligned}
\hat{\rho}_i = \quad & \alpha_0 + \sum_{j=1}^{N_{sector}-1} \alpha_1 \, sector_j 1 sector_j \\
& + \sum_{j=1}^{N_{issueamount}-1} \alpha_2 \, issueamount_j 1 issueamount_j \\
& + \alpha_3 greenness + \alpha_4 rating + \alpha_5 swedish + \alpha_6 coupontype \\
& + \sum_{j=1}^{N_{year}-1} \alpha_7 \, year_j 1 year_j + \epsilon_i
\end{aligned}
\tag{4.8}
$$

4.2.3   Analysis

The main objective of this analysis is to explore the performance of green bonds in the secondary Norwegian and Swedish bond markets. The study consists of two parts, whereas the first estimates the green bond yield premium, $\hat{p}_i$, and the second aims to detect its determinants.

4.2.3.1   Step 1: A Significant Small Negative Greenium in Sweden and a Significant Small Positive Greenium in Norway

The analysis performs the Hausman test, which rejects the null hypothesis that both estimators are consistent. Thus, we prefer the fixed effect estimator since its estimator is unbiased and consistent. Moreover, three individual effect tests imply that there exists an unobserved heterogeneous effect. The analysis detects the presence of autocorrelation and heteroskedasticity in the dataset[26]. To mitigate the robustness issues, the study implements robust estimations of the standard errors through the methods of Newey-West and Beck-Katz. Thereby accurately estimating the green bond yield premium's significance and size.

The analysis uses the fixed effect method to capture the effect of the bond's green label within each triplet. In addition, we also perform weighted regressions based on issue amount to increase the robustness of the estimation. Since the issuers are the same within each triplet and the dataset separates the two countries, the fixed effect should contain only the difference between a green bond and a conventional bond. The R^2 in the fixed effect regression is low at approximately 0.1 percent (table 4.5), which should indicate that the relationship between the liquidity variable and the yield difference variable is

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[26]See table A2.2 in the appendix for the tests of the step 1 regression.

quite weak. Despite the low R^2, the liquidity variable is significant in all three regression, with Newey-West and Beck-Katz robust estimator of the standard error. Therefore, the liquidity variable should not be discarded based on its R^2. The low R^2 in the fixed effect regression is comparable to other studies, such as Zerbib (2019).

Table 4.5: Results of Step 1 Regression

	Dependent variable: $\triangle \tilde{y}_{i,t}$		
	Within	Newey-West	Beck-Katz
	(1)	(2)	(3)
$\triangle Liquidity_{i,t}$	-0.125***	-0.125***	-0.125**
	(0.021)	(0.032)	(0.065)
Observations	31,434	31,434	31,434
R^2	0.001	0.001	0.001
F Statistic (df = 1; 31332)	34.935***	34.935***	34.935***
Note:			*p<0.1; **p<0.05; ***p<0.01

The estimated fixed effect of the green label ($\hat{p}_i$) of each of the total 101 bonds from both Sweden and Norway indicate the negative greenium. The descriptive statistics range from -87 to +13 with a mean of -0.83 and a median of -0.06 bps (table 4.6). Figure 4.6 illustrates the green bond yield premium, $\hat{p}_i$, distribution. There are more negative values than positive values, with some extensive negative outliers, as the min of -0.87 bps and the distribution shows. The issue amount weighted fixed effect regressions produce similar estimations of the $\hat{p}_i$, but reduces the yield premium discrepancy marginally, see table A2.3 in the appendix. This increases the credibility of the results.

Table 4.6: Green Bond Yield Premium

| | | | $\hat{p}_i$ | | | | |
	min	1st Quart.	median	mean	3rd Quart.	max	N
Norway	-0.1018	-0.0178	-0.0011	0.0170	0.0643	0.1280	13
Sweden	-0.8665	-0.0135	-0.0006	-0.0121	0.0190	0.1200	88
Total	-0.8665	-0.0135	-0.0006	-0.0083	0.0213	0.1282	101

Figure 4.6: Distribution Green Bond Premium, $\hat{p}_i$, for the entire dataset

Note that the figure presents the distribution for the entire dataset. Figure A2.2 in the appendix presents the distribution within each country.
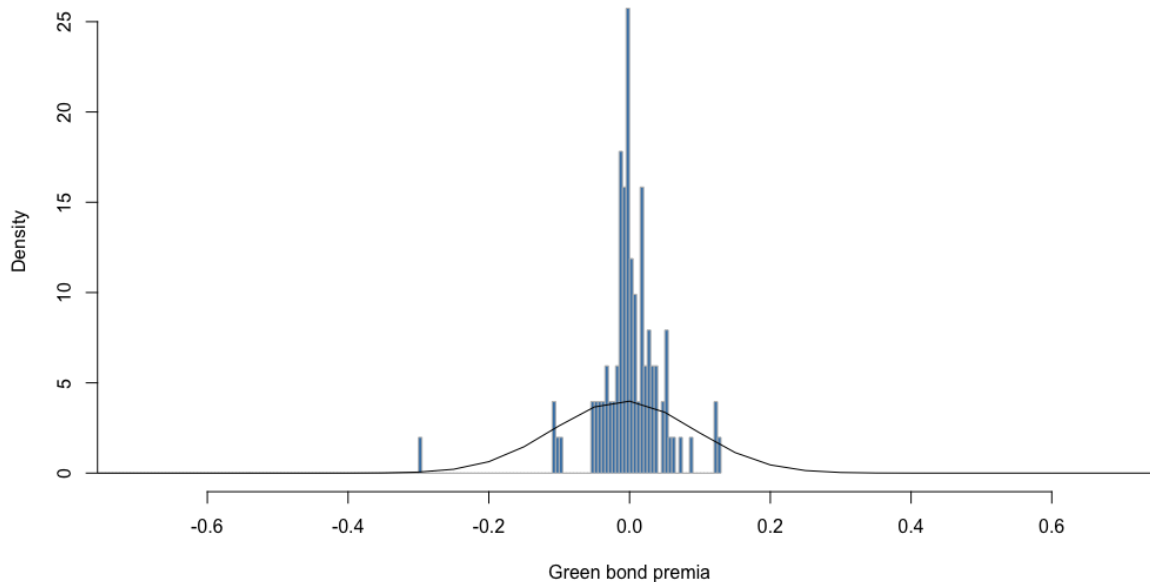
Table 4.7 shows that the green bond yield premium of the Norwegian and Swedish market is approximately -0.83 basis points. The premium is significant on the 99 confidence level, with a p-value of less than 1 percent. The analysis uses sector, rating, issue amount, coupon type, and greenness, as characteristics to evaluate the determinants. The currency characteristic is also relevant, but as mentioned in section 4.2.1, the sample of bonds from the Norwegian and Swedish markets are all NOK and SEK, respectively. The average yield premium in each sub-sample with at least ten bonds is estimated and tested if it significantly differs from zero. The analysis uses the Shapiro-Wilk normality test to check the normality of the sub-samples, and the Wilcoxon signed-rank test as the normality assumption does not hold for all subgroups. In the total sample, the normality assumption does not hold for all sectors, rating, and issue amount, and this indicates the need for the Wilcoxon signed-rank test. We also compute a correlation matrix to ensure the exclusion of multicollinearity. As table A2.1 in the appendix presents, none of our explanatory variables have a correlation of more than 0.5 or -0.5. This suggests that none of the variables inhibit a strongly positive or negative correlation, and thus provides additional

reliability to our estimated coefficients.

In the total sample investment-grade rating, the real estate sector, high greenness, fixed coupon type, and floating coupon type are all highly significant with a p-value of less than 1 percent with a green bond yield premium of -0.55, -1.07, -1.09, +0.94 and -1.86 bps, respectively. The Swedish sample has a total negative greenium of -1.21 basis points, significant on the 99 percent confidence. The Norwegian total sample, on the other hand, has a significant positive yield premium of approximately 1.7 basis points.

Table 4.7: Green Bond Yield Premium in Subgroups

Category	Subcategory	Mean ($\hat{p}_i$)	Median ($\hat{p}_i$)	($\hat{p}_i$)$\neq 0$	Triplets
	Total	-0.0083	-0.0005	***	101
Country	Sweden	-0.0121	-0.0006	***	88
	Norway	0.0170	-0.0011	***	13
Greenness	High	-0.0109	-0.0041	***	47
	Low	-0.006	0.0012	***	54
	Bank	0.0031	0.0019		3
	Consumer Services	-0.0128	-0.0128		1
	Public	-0.0004	-0.0024	***	12
Sector	PPF	-0.0146	-0.0147		3
	Real Estate	-0.0107	-0.0001	***	70
	Transportation	-0.0056	0.0009		6
	Utilities	-0.0003	0.0072		6
Rating	Investment Grade	-0.0055	-0.0003	***	100
	High Yield	0.3342	0.3342		1
	High	-0.0076	-0.0176	**	15
Issue Amount	Medium	-0.0029	0.0000	**	39
	low	-0.0093	-0.0001	***	47
Coupon Type	Fixed	0.0094	0.0028	**	37
	Floating	-0.0186	-0.0036	***	64

Note: *p<0.1; **p<0.05; ***p<0.01

The analysis of the yield premium indicates that the Norwegian and Swedish markets are different. While the Norwegian market has a small positive green bond yield premium of 1.7 bps, the Swedish market has the expected small negative green bond yield premium of -1.21 bps. An overall negative yield premium is aligned with other studies on the US bond market through research by Zerbib (2019) and others, as the literature review in section 3 states. Although the Norwegian sample is rather small, the findings are significant and might give answers to why Norway issues so few green bonds compared to Sweden.

4.2.3.2   Step 2: The Greenness Determinant is Significant and Negatively Affects the Greenium

To estimate the determinants of the green bond yield premium, the analysis runs ordinarily least squared regressions with $\hat{\rho}_i$ as the dependent variable and the characteristics from the methodology section 4.2.2 as explanatory variables. The determinants analysis also includes dummies for each year from 2015-2019, and the dummy for year 2015 is excluded to avoid multicollinearity. In addition to including dummy variables for each year in the greenium determinants analysis, figure A2.3 in the appendix presents the development of the $\hat{\rho}_i$ over time.

Table 4.8 shows the three regressions for the total dataset: a) regression with every explanatory variable, b) regression of every variable except issue amount, and c) regression without explanatory variables for the country and issue amount. The constant in each regression indicate the green bond yield premium if the other variables are equal to zero, which table 4.4 shows. For example the constant in regression a) presents the yield premium for a less than dark green bond in the Norwegian public sector with an issue amount lower than NOK 0.5bn, a floating coupon type and a high yield rating in 2015.

Table 4.8: Determinants of the Green Bond Yield Premium

	Dependent variable: $\hat{\rho}_i$		
	Linear regressions with determinants of the greenium		
	(a)	(b)	(c)
Greenness	−0.030***	−0.033***	−0.030***
	(0.001)	(0.001)	(0.001)
Swedish	−0.023***	−0.026***	
	(0.002)	(0.002)	
Issue Amount High	0.018***		
	(0.002)		
Issue Amount Medium	0.017***		
	(0.001)		
Coupon Type	0.036***	0.035***	0.034***
	(0.001)	(0.001)	(0.001)
Rating	0.291***	0.283***	0.284***
	(0.006)	(0.005)	(0.005)
Sector Utilities	−0.028***	−0.025***	−0.011***
	(0.003)	(0.003)	(0.003)
Sector Bank	−0.017***	−0.017***	−0.011***
	(0.004)	(0.004)	(0.004)
Sector Real Estate	−0.020***	−0.025***	−0.025***
	(0.002)	(0.002)	(0.002)
Sector Consumer Services	−0.007	−0.021**	0.001
	(0.009)	(0.009)	(0.008)
Sector Transportation	−0.033***	−0.034***	−0.035***
	(0.003)	(0.003)	(0.003)
Sector PPF	−0.033***	−0.041***	−0.041***
	(0.003)	(0.003)	(0.003)
d19	0.098***	0.088***	0.091***
	(0.006)	(0.006)	(0.006)
d18	0.091***	0.082***	0.084***
	(0.006)	(0.006)	(0.006)
d17	0.107***	0.098***	0.099***
	(0.007)	(0.007)	(0.007)
d16	0.088***	0.078***	0.078***
	(0.007)	(0.007)	(0.007)
Constant	−0.365***	−0.330***	−0.358***
	(0.009)	(0.009)	(0.009)
Observations	31,693	31,693	31,693
R^2	0.127	0.122	0.118
Residual Std. Error	0.100 (df = 31676)	0.100 (df = 31678)	0.101 (df = 31679)
F Statistic	287.704*** (df = 16; 31676)	313.017*** (df = 14; 31678)	326.385*** (df = 13; 31679)

Note: *p<0.1; **p<0.05; ***p<0.01

Regressions a) and b) shows that every explanatory variable is significant with a p-value of less than one percent, except for the utilities and consumer services sector. In regression a), consumer services are significant on the 95 percent confidence level; however, in regression b), it is not even significant at the 90 percent confidence level. In regression c), every explanatory variable is significant with a p-value of less than one percent, except for the consumer services sector.

Regressions a), b) and c) show that the rating variable is significant on the one percent p-value level, and that a better rating leads to a higher positive yield premium. However, the green bonds in our sample are almost all investment-grade. It is, therefore, necessary to be careful when interpreting the rating variable. The high issue amount coefficient is positive and significant, which indicates that a more substantial issue amount leads to a more positive green yield premium. The year dummies also have a positive significant coefficient as the reference year 2015 had a lowest average green bond yield premium.

In regressions a) and b), the explanatory variable Swedish is significant on the one percent level and affects the green bond negatively. The coefficient of the variable Swedish is aligned with the results from the previous section.

The greenness variable is significant on the 99 percent confidence level in every regression and indicates that a greenness label of dark green or similar leads to a more significant negative green yield premium. The greenness coefficient varies between -0.033 and -0.030 in the three regressions. The negative effect of greenness on the yield premium is intuitive and indicates that investors are informed and value the greenness of the green bonds.

4.3   Limitations

A challenge in the greenium analysis is the limited number of green bonds and the time of which they have existed. There is especially a lack of range within the rating and sector characteristics, which may influence the results. Approximately 70 percent of all green bonds in the sample are within the real estate sector. In addition to this, about 98 percent of the green bonds in the sample has an investment-grade rating. There might occur an imprecise estimate yield premium in the two countries by the fact that a dominating percentage of Swedish green bonds are within the real estate sector, compared

to the Norwegian green bonds. The same estimation error could exist when it comes to the determinants of the green bond yield premium. The greenness variable might also be somewhat biased since it is influenced by our subjective judgment. However, it is not possible to collect more data without reducing the quality extensively, and previous research inhibit an even more limited data sample (Zerbib, 2019; Ehlers and Packer, 2017; Febi et al., 2018; Hachenberg and Schiereck, 2018).

The dataset is also sensitive to the requirements set for each bond and triplet. Adjusting the conditions affects the results, and this indicates that the results are quite fragile. The issue is, as mentioned in the dataset section 4.2.1, that stricter requirements increase the similarities within the triplets but reduces the size of the dataset. In addition to this sensitivity, the creation of synthetic bonds is not necessarily precise. The interpolation and extrapolation method is accessible and does overall perform well, see figure A2.1. There is, however, a reason to suspect that the synthetic bonds might inhabit some estimation errors, as well as underfitting, due to nonlinearity of the yield curve in the bond market. However, the creation of synthetic bonds through linear interpolation and extrapolation are well documented, as Zerbib (2019) and several more research papers show.

The robustness tests done in the analysis indicates the presence of heterogeneity, autocorrelation, and endogenous issues. The implementation of the Newey-West and Beck-Katz robust standard errors address these dataset issues. The liquidity proxy variable reduces the omitted variable, confounding, and simultaneous bias. The analysis uses the fixed effect method as the assumption of the random effect that individual-specific effects and independent variables are uncorrelated, is unrealistic. Despite the efforts to reduce bias and obtain a robust result, there are still several biases that the analysis might contain. The most critical bias might be the omitted variable bias, as it is likely to be more than just the green label that differentiates a green bond and a conventional bond, such as the perceived risk of a new bond instrument. Despite this, the analysis performs adequate robustness efforts and should be as robust, if not more, than similar previous research.

The green bond market is underdeveloped, changes to the market are continuous, and the results of green bond performance might, therefore, change rapidly. There are new bonds issued in the last weeks in both markets that this analysis does not encompass.

Although it is unlikely that this will influence the results significantly, it highlights the evolution of the market and the difficulty of inference from the analysis. As the green bond market has existed for approximately one decade, it is challenging to infer macroeconomic, governmental policy, and regulatory effects on the estimated green bond premium (The World Bank, 2018). For that reason, this section advocates further and continuous research on the green bond topic.

5 Study of Issuers' and Investors' Motives in the Norwegian and Swedish Green Bond Markets

5.1 Introduction

The thesis will, in this section, focus on the second research question; "Can we explain why the Norwegian bond market issues so few green bonds by studying differences in motives of issuers and investors in the two markets?"

We conduct a survey and in-depth interviews of green bond issuers' and investors' motives in Norway and Sweden. The survey and interviews complement the greenium results from section 4.6 and help uncover the underlying reason for the lack of green bond issuance in Norway. Seasoned issuers, investors, and third party professionals[27] in both countries participate in the interviews.

This section will, therefore, provide insight into primarily two areas:

1. Attain more knowledge of the motives for issuers and investors in the green bond market

2. Studying the differences between issuers' and investors' motives in Norway and Sweden

The first sections explain the survey design and statistical techniques. The thesis then presents the data screening before we discuss the results and the limitation of the survey analysis.

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[27]Note that we define third party as a company delivering second-opinions to ensure that the green bond is in line with market expectations and industry best practices.

5.2 Methodology

5.2.1 Survey Design

As a basis for our survey, we have drawn inspiration from the studies done by Døskeland and Pedersen (2016) and Nagy and Obenberger (1994). Although the focus of Døskeland and Pedersen (2016) is on responsible investments, their ideas apply to issuance and investment in green bonds as well. For the construction and distribution of the survey, the analysis utilizes Qualtrics[28]. The Qualtrics survey design is appealing, and the reporting and distribution are efficient and straightforward. In addition, it enables the customization of emails sent to the different respondents, which increases the respondent rate[29].

The chosen language for the survey is English, as it targets both the Norwegian and Swedish markets. The use of English for both countries also minimizes bias wording, which might occur with different translations. It is also an advantage to use an international language, as most of the literature and terms on bonds are global.

The questions in the survey are compiled in connection to the utility function constructed by Levitt and List (2007). Figure A3.1 in the appendix presents the defined variables and their measure in the survey[30]. In their study, Levitt and List (2007) state that an utility-maximizing individual i is faced with a choice regarding a single action a. The choice of actions, a, influence an agent's utility through two channels, whereas the first effect is the individual's wealth (W), and the second effect is the non-pecuniary moralistic cost or benefit (M).

The utility function by Levitt and List (2007):

$$U_i(a, v, n, s) = M_i(a, v, n, s) + W_i(a, v)$$

Where:

- U_i is the utility for individual i

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[28]See https://www.qualtrics.com/ for more information.

[29]See appendix for an example of one of the emails.

[30]Note that we have not defined variables for the third parties as this is used to support the respondents from investors and issuers.

- M_i is the moral cost or benefit for individual i associated with an action. Three aspects influence the M_i variable: 1. externalities (v), 2. social norms (n), and 3. scrutiny (s).

- W_i is the wealth for individual i, which the action, a, and the stakes, v affects.

Given the dual nature of green bonds, as discussed in the background section 2.4, it is reasonable to apply the theoretical framework from Levitt and List (2007), in order to study the motives behind investors' demand and issuers' supply of green bonds. The applied theoretical framework has the underlying hypothesis that issuers and investors both have financial and non-financial factors affecting their decision-making.

After drafting the survey, we distribute a pilot test to three individuals, which each represent each of the main market roles, namely issuer, investor, and third party. This pilot test was made to (1) ensure that the questions captures the utility function of Levitt and List, and (2) receive feedback on the structure and wording of the survey. Specifically, experts at Nordea Asset Management, Cicero, and the Norwegian School of Economics provided valuable feedback.

The survey customizes the questions based on three socio-demographic questions concerning (1) market role, (2) country, and (3) industry. Such a categorization enables us to analyze differences between the countries and within groups. To gain a more profound understanding of the current regulatory framework in the green bond markets, the survey includes third party professionals as they have more in-depth insights into the current framework and regulation in the green bond market. The questions for investors and issuers are closely related since many factors apply to both groups. The questions for the third party professionals aim to receive more in-depth insight into the differences in regulations. For an overview of the full survey flow chart, see figure A3.1 in the appendix.

Table A3.1 provides an overview of the variables for both investor and issuers. Note that the variables have the same underlying meaning, but with slightly different wording to fit the respondents' role in the market. Overall, the survey follows Pallant (2013) in terms of wording[31]. The following examples highlight the essential questions provided for issuers,

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[31]Pallant (2013) lists several things to avoid in wording, for instance, complex questions, leading questions, and emotionally labeled words.

as they are the most relevant for our research question[32].

The fourth question in the survey considers issuers' thoughts on green bonds at the current time and focuses on three main variables. Statements one, three, and four capture the issuers' current knowledge, return expectations, and risk perception, respectively.

Further, the survey separates issuers of green bonds and issuers of conventional bonds, through question six. The separation of GB issuers and none-GB issuers enables the examination of the differences between active and non-active green bond market participants, through questions eight and nine, respectively. In more detail, both questions investigate financial and non-financial drivers behind the respondents' decision making. For instance, the question aims to capture the environmental concern of the participants and the importance of injunctive norms for green bond issuers. The reasoning for including these questions is to evaluate if green bond issuance are internally or externally motivated.

Questions ten and twelve observe issuers' perception of the current regulations in the green bond market, and the green bond market's impact on the environment, respectively. The last statement in question thirteen examines the suitability of the governance structure for green bonds. The survey also explores issuers' perception of the future green bond markets in Norway and Sweden, through three specific questions at the end of the survey.

The data from the survey is cross-sectional as it studies the bond market participants for a specific point in time. The cross-sectional data structure enables the immediate analysis of the motives and preferences in the two countries' bond markets. Moreover, one could argue it is sensible to utilize a cross-sectional survey, since motives are relatively constant over time (Connelly, 2016).

Concerning the scoring, the majority of questions in the survey have a 7-point Likert scale, a psychometric technique, which measures human attitude (Joshi et al., 2015). It is debatable whether one should use a 5-point or 7-point Likert scale, but we prefer a 7-point scale as it increases the chances of better performance with regards to the reliability of the respondents. The questions that do not inhabit a 7-point Likert scale is either binary or multiple choices.

The finalized survey consists of 16, 15, and 9 questions in total for issuers, investors, and

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[32]See A3 in the appendix for the three surveys distributed.

third-party members, respectively. The survey adds the feature of displaying specific questions based on display logic. For instance, if a given investors' response to the question, "Have you invested in green bonds," is "No," that investor is directly put forward to the next question of relevance. Therefore, the survey does not display all questions to the respondents, meaning that the true survey number is closer to ten questions for both investors and issuers. Given the number of questions and the low estimated time of five minutes, the survey satisfies the optimal survey length (Sheehan, 2001).

The population of issuers in this survey is the listed companies on Oslo Børs and Nasdaq Nordic. As described in the section of green bonds in Norway and Sweden, both stock exchanges offer a separate list of green bonds. In both countries, we distributed the survey to all issuers listed on the green bond list, and all non-GB issuers in both countries. Moreover, we distributed the survey to members of Swesif and Norsif and other investors recommended by the experts at Nordea, thereby gaining investors to participate. The population of unique issuers of bonds in Norway and Sweden is approximately 500 (Stamdata, 2019a). The survey contains respondents from 45 issuers, and should, therefore, be a representative sample size.

5.2.2   Statistical Techniques

This section utilizes both parametric and non-parametric techniques to analyze the results of the survey. The applied method depends on if the variables of interest are categorical or continuous. The non-parametric test treats categorical variables, as Pallant (2013) argues the best way of analyzing such data. Otherwise, a parametric test is a suitable technique.

The analysis utilizes an independent-samples t-test on the questions with a Likert-scale, to compare the differences between issuers and investors of green bonds and their counterparts from a different country. The most critical assumptions of the independent-samples t-test, are random sampling, independence of observations[33], normally distributed data, homogeneity, and level of measurement. The following paragraph discusses these assumptions; section 5.5 also addresses these issues.

One could argue that the assumption of random sampling is true since the full population

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[33]In other words, one respondent's answer does not affect other respondents answer (Pallant, 2013).

of bond issuers at Oslo Børs and Nasdaq Nordic received the survey. Concerning the second assumption, it is difficult to imagine the violation of this assumption as the survey is conducted individually and designed to measure one's personal opinions. The third assumption holds if the data is normally distributed, by measuring if the score for skewness and kurtosis is in the range between -2 and 2. This assumption holds for both investor and issuer, for all except two variables[34](Tabachnick et al., 2007). The analysis utilizes the Levene's test provided by Stata to test for heterogeneity. This test deploys all individual samples t-test, and if the p-value from Levene's test exceeded the 5% significance level, we present p-values with equal variance assumed for the t-test.

The non-parametric version of the individual samples t-test is the Mann-Whitney U test, with the main difference being the assumed distribution (McKnight and Najab, 2010). The analysis also employs the chi-squared test to determine if issuers and investors of green, and conventional bonds, in the sample are independent or not (Zibran, 2007).

5.3   Data Screening and Cleaning

After exporting the raw data from Qualtrics, we subset the dataset into three, one for each category, to investigate differences between the countries and within groups.

After the establishment of the three categories, Pallant (2013) outlines two steps for the data screening process:

Step 1: Checking for errors

Step 2: Finding and correcting the error in the data file

In step 1. the analysis utilizes SPSS for descriptive statistics for each variable to check that the response is within a reasonable range. SPSS reviews the categorical variables, namely question one, two, and six for issuers, and confirm that the answers are within a reasonable range. After checking the categorical variables, it checks the continuous variables, e.g., the Likert-scale questions, and repeat it for the investors. The analysis concludes that the survey variables have reasonable responses.

Furthermore, we utilize the function of Summarize Cases in SPSS to investigate any

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[34]See table A3.3 in the appendix.

missing values in the dataset. It checks all of the continuously defined variables and assures that there are, in many cases, three excluded answers. The results indicate that five issuers have not completed the survey and exclude these participants from the dataset. After deleting the non-finished responses, only four questions with one excluded case each remain.

5.4 Analysis

The main objective of this analysis is to highlight the behavior and attitudes toward green bonds in Norway and Sweden. The analysis consists of two parts, the first part outlines descriptive statistics of the dataset, and the second part presents a comparative study. Specifically, the study aims to detect the underlying motives of green bond market participants and the difference between the two countries.

5.4.1 Descriptive

The response rate for the deployed survey was 16.3%, which is somewhat higher than in comparable studies. For instance, Sheehan (2001), states that most of the surveys distributed over email receive, on average, a response rate of 10%.

Table 5.1 presents the descriptive statistics of the entire dataset before it divides it into three. The majority of respondents operate in the Norwegian market, and issuers constitute the largest category. The analysis also decomposes the issuers and investors into two categories based on whether or not they have issued, or invested, in the green bond market (table 5.2). As presented, the survey sample for Sweden skews towards those who have issued green bonds in Sweden, while it is closer to a normal distribution for Norway.

Table 5.1: Finalized Survey Dataset All

	Norway			Sweden		
	Issuer	Investor	Third-Party	Issuer	Investor	Third-Party
Number of respondents	27	11	5	18	3	3

Table 5.2: Respondents Active in the Green Bond Markets

	Norway		Sweden	
	Issuer	Investor	Issuer	Investor
Active in GB market	8	6	12	3
Not active in GB market	19	5	6	0
Total	27	11	18	3

5.4.2   Comparative Analysis

Investment Factors

The comparative analysis starts by examining the difference in mean for factors impacting investments in Norway, where it bundles the issuers' and investors' responses. Environmentally-conscious issuers or investors (Econ), are active in the green bond market, while non-environmentally conscious issuers or investors are not (Non-Econ). Table 5.3 presents the results, and it includes both financial and non-financial factors that perhaps impact an investment decision. From table 5.3 two things become apparent. Firstly, expected returns have the highest mean for both environmentally-conscious and non-environmentally conscious market participants $\bar{x}=6.05$ and $\bar{x}=5.81$, respectively. These findings are consistent with the findings by Nagy and Obenberger (1994). Secondly, only two of the nine included factors have a significant difference in mean (at 5% level). Firm's stated long-term vision of low carbon and climate-resilient future, and firm's previous record of sustainability measures, are significantly more critical for environmental conscious participants than non-environmental conscious participants. The survey, therefore, support evidence for the intuitive hypothesis that issuers and investors in the green bond market add more weight to factors regarding sustainability.

The results indicate that environmental and non-environmental conscious respondents share the same investment preferences, except for their sustainability focus. Our findings of investment factors demonstrate that participants distinguish green and conventional bonds by the sustainability aspect. For that reason, one could argue that the market perceives green bonds as an effective sustainable finance instrument.

Table 5.3:   Factors Impacting Investment Decision for Environmental and Non-Environmental Conscious Market Participants

	Econ				non-Econ				Mean	Sign.	Std.Error
	$\bar{x}$	$\tilde{x}$	SD	N	$\bar{x}$	$\tilde{x}$	SD	N	Difference	(Twotailed)	Difference
Expected Return (yield)	6.05	6	0.84	22	5.81	5.5	1.02	14	0.47	0.16	0.31
Diversification	5.42	6	1.22	22	5.15	5	0.69	14	0.3	0.36	0.32
Overall economic growth in the market	5.09	5	1.23	22	4.92	5	1.04	14	0.17	0.68	0.41
Historical financial performance of company	5.45	6	1.14	22	5.54	6	0.78	14	-0.08	0.68	0.41
Firm's stated long-term vision of a low carbon and climate resilient future	5.45	5	0.8	22	4.08	4	0.86	14	1.38	0.00	0.29
Firm's previous record of sustainability measures	5.18	5	0.73	22	4.23	4	0.93	14	0.951	0.00	0.28
The management of the company	5.48	6	1.03	22	5.69	6	0.75	14	-0.22	0.52	0.33
Rating	5.32	6	1.54	22	5.23	5	1.01	14	0.09	0.86	0.48
Security type	5.27	5	1.08	22	5.23	5	0.83	14	0.04	0.91	0.35

Table 5.4 presents the results from the same test as above, but with the country as the grouping variable. The findings indicate that respondents from Norway focus less on the two significant sustainability factors in their investment decision than their Swedish colleagues. The difference in investment factors between the countries are similar to the discrepancy between environmental and non-environmental conscious market participants. For that reason, the analysis implies that the Norwegian bond market contains a higher percentage of non-environmental conscious individuals than the Swedish bond market. However, it is essential to note that the difference could arise from the composition of environmental conscious respondents in the sample.

Table 5.4: Factors Impacting Investment Decisions in Norway and Sweden

	Norway				Sweden				Mean	Sign.	Std.Error
	$\bar{x}$	$\tilde{x}$	SD	N	$\bar{x}$	$\tilde{x}$	SD	N	Difference	(Twotailed)	Difference
Expected Return (yield)	5.83	6	0.89	23	5.92	6	1.04	13	-0.1	0.77	0.33
Diversification	5.45	5.5	0.86	22	5.15	6	1.35	13	0.3	0.42	0.371
Overall economic growth in the market	4.77	5	1.23	22	5.46	6	0.88	13	-0.69	0.09	0.39
Historical financial performance of company	5.68	6	0.78	22	5.15	5	1.28	13	0.53	0.14	0.35
Firm's stated long-term vision of a low carbon and climate resilient future	4.59	4.5	1.05	22	5.54	6	0.78	13	-0.95	0.01	0.38
Firm's previous record of sustainability measures	4.55	5	0.91	22	5.31	5	0.75	13	-0.762	0.02	0.3
The management of the company	5.67	6	0.8	22	5.38	6	1.12	13	0.28	0.4	0.33
Rating	5.5	6	0.91	22	4.92	5	1.85	13	0.58	0.22	0.47
Security type	5.45	5.5	0.86	22	4.92	4	1.12	13	0.53	0.12	0.34

Maturity of the Green Bond Market

The underlying alternative hypothesis is that the knowledge level of green bonds differs between the Norwegian and Swedish bond market. To test this alternative hypothesis, a t-test controls the statement: "I have good knowledge of green bonds." The results exhibit a strongly significant difference in knowledge at the 1% level (p=0.00), causing a rejection of the null hypothesis of no knowledge difference. The Swedish respondents has a higher mean, which implies a higher knowledge level of green bonds.

Table 5.5: Knowledge

	Norway				Sweden				Mean	Sign.	Std.Error
	$\bar{x}$	$\tilde{x}$	SD	N	$\bar{x}$	$\tilde{x}$	SD	N	Difference	(Twotailed)	Difference
Knowledge of GB	5.37	6	1.16	30	6.37	6	0.6	19	-1.1	0.00	0.29

The survey also tests the green bond percentage out of the total bonds issued or invested. In Norway, the range is between 4-37%, while the equivalent for Sweden is 10-100%, indicating a vast difference in green exposure. It might demonstrate repeated green issuance due to the more developed green bond market in Sweden.

Asbjørn Torvanger, senior researcher at Cicero, points to a cultural difference between the two countries. The high number of green bonds issuance is "likely due to a culture with emphasis on sustainability that is earlier and more developed in Sweden than Norway, and to Norway being more dependent on resource extraction with less industrial basis, not

the least oil and gas. In addition green bonds were developed by Skandinaviska Enskilda Banken, headquartered in Sweden, in collaboration with the World Bank." Thus, one can argue that cultural differences, and more matured market could explain the higher level of knowledge in Sweden.

Perceived Performance of Green Bonds

We perform individual samples t-test on issuers' perception of green bonds' financial performance compared to conventional bonds, through the three statements: "I expect green bonds...

1. "...compared to conventional bonds to have a tighter Credit Spread."

2. "...would be less risky compared to conventional bonds."

3. "...provide diversification."

The first and third statements have a significant difference with a 95 percent confidence, while there is a non-significant difference in mean for the second statement (table 5.6). The mean of $\bar{x}$=5.69 for Swedish and $\bar{x}$=4.43 for Norwegian respondents, indicate that Swedish green bonds have a tighter credit spread than Norwegian green bonds. Moreover, as the second statement is inconclusive due to a high p-value (p=0.33), it is false to draw inference from the statement. It is, however, interesting to note that the mean for Norway and Sweden are $\bar{x}$=3.67 and $\bar{x}$=4.23, respectively. Therefore, one could argue that issuers in both countries are uncertain of the riskiness of green bonds as the values are close to neither agree or disagree[35].

The third statement is significant with a 95 percent confidence level, which shows that Swedish market participants believe that green bonds provide diversification to a more considerable extent than their Scandinavian equivalents. Jacob Michaelsen at Nordea Markets supports this result by arguing that green bonds could diversify the investor base.

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[35]Given the 7 point Likert-scale, zero equals four (neither agree nor disagree).

Table 5.6: Perceived Performance of Green Bonds in Norway and Sweden

	Norway				Sweden				Mean	Sign.	Std.Error
	$\bar{x}$	$\tilde{x}$	SD	N	$\bar{x}$	$\tilde{x}$	SD	N	Difference	(Twotailed)	Difference
Green bonds have tighter credit spread than conventionals	4.43	5	1.66	21	5.69	6	1.03	15	-1.26	0.02	0.51
Green bonds are less risky compared to conventional bonds	3.67	4	1.43	21	4.23	5	1.92	15	-0.56	0.33	0.57
GB provides diversification	4.69	5	1.70	21	5.31	5	1.21	13	-0.62	0.03	0.52

Fredrik Skarsvåg, Jacob Michaelsen, Stein Johnsgård and Thomas Nystedt[36] all agree that there are tendencies towards a tighter spread for green bonds. However, they express caution as the evidence remains anecdotal. Statements from Jacob Michaelsen and Stein Johnsgård discussing the tighter credit spread, are enclosed below.

Anecdotal evidence meanwhile clearly suggest that there is a pricing advantage in the SEK market, and in certain cases also the EUR market. Again, one should be mindful about comparing the different levels as relative credit spread levels will result in various price savings. In the SEK IG market we have typically seen around 0-10bp in tighter spreads for Green bonds compared to non-Green bonds (Jacob Michaelsen, Head of Sustainable Finance Advisory, Nordea Markets). *On a general basis, my observation is that there is a limited willingness to pay a higher prices for green bonds than non-green bond in the domestic market. Nevertheless, we see occasionally deals being absorbed by the market at lower margins, dependent on market conditions and investor demand. Further, my impression is that there is more common to see lower margins for green bonds internationally* (Stein Johnsgård, Group Treasurer, Agder Energi).

The analysis merges the issuers in both countries to investigate their reasoning for debt issuance. As table 5.7 displays, issuers of green bonds highlight the contribution to the environment as the main reason for issuing green bonds ($\bar{x}$=5.39). Also, the desire to increase the "greenness" of the brand exhibits a mean of $\bar{x}$=5.22. The second statement could indicate that contribution to the environment might be a moral obligation. On the other hand, increasing the "greenness" of the brand could be more of a dual nature, as this has a more considerable impact on investment decisions today. Moreover, the

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[36]Fredrik Skarsvåg is CEO at Sparebank Vest Boligkreditt. Jacob Michaelsen is Head of Sustainable Finance Advisory at Nordea Markets. Stein Johnsgård is Group Treasurer at Agder Energi. Thomas Nystedt is Group Treasurer at Vasakronan.

counterpart argues that there are currently too high costs and insufficient information to issue green bonds. In combination with the p-value of green bond knowledge, this could explain why there are so few bonds issued in Norway.

Table 5.7: Reasoning for Debt Issuance

Reasons for issuing Green bonds	mean
Financial indicators of Green Bonds	4.39
Contribute to the environment	5.39
Making our brand more "green"	5.22
Reasons for not issuing Green bonds	Percentage
GB market not regulated enough	26
Too costly	31
Lack of Information	29
Other reasons	14

We also utilize an individual samples t-test to explore the statements referring to unconventional return expectation and governance structure. This is done to investigate the willingness and ability to issue GB. Table 5.8 presents a non significant difference between the countries. Issuers in Sweden also seem to be more aligned with the statement regarding suited governance structure ($\bar{x}$=5.07).

Table 5.8: Willingness and Ability to Issue Green Bonds

	Norway				Sweden				Mean Difference	Sign. (Twotailed)	Std.Error Difference
	$\bar{x}$	$\tilde{x}$	SD	N	$\bar{x}$	$\tilde{x}$	SD	N			
Our company would be willing to experience higher costs in the short run, when issuing a green bond, as it will pay off in the long run	3.9	4	1.89	20	4.07	3.5	1.9	14	-0.17	0.79	0.66
Our company has a governance structure that enables us to issue green bonds	4.35	3	2.39	20	5.07	6	2.09	14	-0.72	0.37	0.79

Sustainability Focus

The analysis studies the sustainability focus of issuers in Norway based on question five. We utilize an independent-sample Mann-Whitney U test to test the distribution. The non-parametric test for "commercial business strategy" fails to reject the null hypothesis, indicating similar distribution for both categories in Norway. However, the test for the "funding strategy" is significant at a 5% significance p-value level. It is therefore reasonable, given the sample, to assume that sustainability is more important in companies who have issued green bonds, as table 5.9 shows. The analysis uses the same test for respondents

from Norway and Sweden by changing the grouping variable to country instead of GB or non-GB issuers (table 5.10).

Table 5.9: Mann-Whitney U Tests Issuers in Norway - GB Issuers vs. Non-GB Issuers

To what extent is sustainability a part of your company's overall	Sign	Test-statistic
... funding strategies	0.02	19.5
... commercial business strategy	0.11	25

Table 5.10: Mann-Whitney U Tests Issuers - Norway vs. Sweden

To what extent is sustainability a part of your company's overall	Sign	Test-statistic
... funding strategies	0.49	130
... commercial business strategy	0.28	113

The analysis also study issuers' perception of green bonds' climate impact. Table 5.11 displays the results with a one-sample test, and the response is significantly different from zero, using a 5% level of significance. The respondents from both countries share the opinion that the green bond market contributes to reaching the goals constituted by the Paris Agreement. Thomas Nystedt at Vasakronan supports the environmental contribution of green bond issuance. "By issuing green bonds the focus on sustainability has increased within the whole company. We have experienced a closer cooperation between the Sustainability and the Treasury team. Green bonds can be seen as a way of demonstrating everything good that our employees do within the field of sustainability."

Table 5.11: One-Sample Test - Perceived impact

				95% CI of difference				
Test Value = 4								
	Mean	SD	SE mean	Lower	Upper	t	df	Sign.(2-tailed)
GB will contribute to reach the goal constituted by the Paris Agreement	4.56	1.42	0.24	0.06	1.05	2.3	33	0.03

The analysis uses the statement: "The greenness of a bond is very important for our company, and we strive to issue the green bonds with an environmental impact," to estimate the importance of the bond's greenness. An individual sample test, utilized to

compare the difference in mean, exhibits a non-significant difference (p-value = 0.325). The mean is, however, higher in Sweden ($\bar{x}$=5.15) compared to Norway ($\bar{x}$=4.6), which indicates that issuers in Sweden have a greater focus on the bonds' greenness. The same trend constitutes for investors, as the Norwegian investors have a mean of $\bar{x}$=4 and Swedish investor have a mean $\bar{x}$=5.5.

Regulation

Table 5.12 indicates that respondents in both countries have a significant positive perception towards the external review, with a mean of ($\bar{x}$=4.85) and ($\bar{x}$=5.29) for Norwegian and Swedish respondents. However, there does not exist a significant difference between the countries.

Table 5.12: Issuers Perception of the External Review

| | Test Value = 4 | | | | | |
| | Norway | | | Sweden | | |
	Mean	SE mean	Sign.	Mean	SE mean	Sign.
I have full confidence to the external review, and believe that it is aligned with our firms own perception of the green bond issuance	4.85	0.319	0.00	5.29	0.4	0.00

The response from third party respondents to the question of difference in regulations between Norway and Sweden supports the findings in the second statement. With a mean of 4.75, the third party respondents confirm that assurance and certification is similar in Norway and Sweden.

In the interviews, when discussing disadvantages of green bonds, Jacob Michaelsen at Nordea Markets, responds: "Disadvantages are probably not the best way of referring to these but typically issuers note that it requires a lot of time setting up frameworks and following up on reporting. Some also note that it is not always easy to identify relevant Green assets." This response illustrates that the regulation of the green bond market is still in development, as the upcoming taxonomy exemplifies. Asbjørn Torvanger, Cicero, argues that the taxonomy on sustainable finance will be a useful step towards more standardization. He points out that the weaknesses of the current framework is that it does not contain "shades of green" and implementing it will be challenging. In

addition, he is unsure whether the upcoming taxonomy will be accepted, at least in part, as a standard in other regions of the world.

Development

NOU (2018b) argues that "...in the long run, green bonds will play a greater part in the financing of more climate-friendly solutions, also in Norway." Firstly, to discover if the respondents' perception is similar to the findings of NOU (2018b), we use an individual sample test. The individual sample test exhibits no significant difference in the mean across countries (5.13). This indicates that Norway and Sweden share a similar view for the future development of the green bond market.

Table 5.13: Future Expectations for the Development of the Two GB Markets

	Norway				Sweden				Mean	Sig.	Std.Error
	$\bar{x}$	$\tilde{x}$	SD	N	$\bar{x}$	$\tilde{x}$	SD	N	Difference	(Twotailed)	Difference
The Norwegian GB market will develop in the same fashion (in terms of volume) as the Swedish and are a few years behind	4.86	5	1.06	29	4.59	4	0.87	17	0.27	0.37	0.3
I expect both markets to expand (in terms of volume) in the future	5.96	6	0.79	29	5.76	6	0.97	17	0.2	0.46	0.27
The Norwegian GB market would never reach the same levels of volume as the Swedish	4.14	4	1.43	29	3.88	4	1.11	17	0.26	0.53	0.41

Secondly, we utilize a one-sample t-test for all issuers in the sample, and table 5.14 presents the results. The respondents share NOUs opinions, as the mean is significantly different from zero for the first and second statements. Therefore, the results suggest a similar optimistic view of growth in the Swedish and Norwegian green bond market. Table 5.14 also illustrate that the Norwegian green bond issuance will catch up to the Swedish volume.

Table 5.14: One-Sample Test - Future Development

	Mean	SD	SE mean	95% CI of difference		t	df	Sign.(2-tailed)
Test Value = 4								
				Lower	Upper			
The Norwegian GB market will develop in the same fashion (in terms of volume) as the Swedish and are a few years behind	4.76	0.99	0.15	0.47	1.06	5.2	45	0.00
I expect both GB markets to expand in the future	5.89	0.86	0.13	1.63	2.15	14.76	44	0.00
The Norwegian GB market would never reach the same levels of volume as the Swedish	4.04	1.32	0.19	-0.35	0.43	0.22	45	0.82

The interviewees demonstrates optimism for the future development of the green bond market. Thomas Nystedt at Vasakronan argues that the market will keep developing, as Norwegian investors are catching up and increase the demand, which in return will increase the issuance of green bonds in Norway. Stein Johnsgård at Agder Energi supports the idea of growth in the green bond market, and highlights the increasing green focus, as well as ESG awareness. Asbjørn Torvanger at Cicero argues that the continuous growth depends on the ability to meet the climate targets in the Paris Agreement. He also argues that the development of related bonds, and the standardization of the market will affect the green bond development.

Fredrik Skarsvåg and Jacob Michaelsens full predictions of the development of the green bond market are enclosed below: *I think it will grow massively. Especially if we get some regulatory preferential treatment going forward (risk weights or perhaps ECB QE focusing on green). In the future I reckon that green focus will be more a "license to operate" thing; all our lending will have to have some focus on sustainability. And the reason for this is not that we want to save the world, but that is really really risky not to have focus on this; you do not want to be the last bank focusing on this in you lending book and end up with all the stranded victims of regulations, carbon tax, change in consumer behaviour etc...* (Fredrik Skarsvåg, Sparebank Vest Boligkreditt).

I have very high expectations in the medium term. The momentum in Norway has increased dramatically in the last 12 months, probably as a result of the decision by Norges Bank IM to sell off oil and gas activities. Just in the last few weeks we have seen a number

of bonds issued by Norwegian issuers that have previously not looked at Green, such as Teekay Shuttle Tankers and Norske Tog. We should expect a dramatic increase next year but it is probably fair to expect Green bond issuance in the NOK market to increase to above 5% of the total market – today it is around 3% (Jacob Michaelsen, Nordea Market).

Utility

This section utilizes a paired samples test to examine the wealth and moral component of the utility function, outlined by Levitt and List (2007), for Norwegian issuers. The authors of this thesis utilize questions 9.1, 9.2 and 9.3 as proxies for the financial and moral components. Table 5.15 displays that the moral component in the utility function has a significant role (10% level in both tests). The significance proves the complexity of the green bond market, as it is a mixture and trade-off between financial and moral components. The significance of the moral component makes it difficult for investors and issuers to maximize their utility function, and the moral component might get neglected by more tangible financial benefits.

Table 5.15: Paired Samples Test Issuers

Norway				95% CI of difference				
	Mean	SD	SE mean	Lower	Upper	t	df	Sign.(2-tailed)
Financial - Moral	-0.93	1.9	0.49	-1.98	0.12	-1.95	13	0.07

Sweden				95% CI of difference				
	Mean	SD	SE mean	Lower	Upper	t	df	Sign.(2-tailed)
Financial - Moral	-1.15	1.73	0.55	-2.39	0.09	-2.1	14	0.06

5.5   Limitations

Despite robustness efforts, there are some limitations to the analysis above, which require further consideration. Firstly, the sampling in our survey analysis might be affected by sampling bias since it was not possible to reach all desired investors and third party representatives. Sampling bias could damage our findings, as the sampling pool might not be representative and contain the full diversity in the population (Olson, 2006). As the number of sent requests is fewer than optimal, the survey may not capture all the parts of the market. For example, the number of investors reached in both countries is limited. However, the survey focuses on issuers, as it is more relevant for the main

research question. The survey is also distributed to all companies with issued conventional and green bonds in Norway and Sweden, and to participants and companies recommended by experienced professionals. Of that reason, the response bias should be small.

Secondly, nonresponse bias might affect the results in the survey. Although the distribution of the survey reaches a broad audience, the most involved and sustainable parties have a higher response rate. The nonresponse bias is a known issue, as the most active and sustainable parties find the research question more exciting and want to communicate their contribution (Olson, 2006). For that reason, the survey might be inaccurate as eminently sustainable participants could be overrepresented. On the other hand, Qualtrics provides an overview of the nonresponsive market segments, which enables us to target nonresponsive market segments and reduce the nonresponsive bias.

Thirdly, response bias and question order bias might cause difficulties with inference (Pouwer et al., 1998). The most relevant response biases might include social desirability and acquiescence. Social desirability is challenging to eliminate, as participants might try to appear as better versions of themselves and their company. The evasive answers could, therefore, lead participants to magnify the value of sustainability to improve their "status." To prevent exaggeration in the survey, participants are anonymous, and questions are compiled not to judge or nudge participants. Acquiescence bias could also cause the results to be inaccurate since respondents answer and agree to uphold the hypothesis of the interviewer. The survey consists of different types of answer options, such as writing an answer in an empty cell, and ranking of statements, to prevent acquiescence bias. The order of the questions might also cause bias. To prevent this bias, we have selected to randomize the question order.

Lastly, the reporting of the survey and interviews are as objective as possible. However, unconscious biases such as confirmation bias might influence the reporting (Mynatt et al., 1977). The analysis has been carried out without emphasis on the growing hypothesis of the thesis. The additional and continuous interviews with experienced professionals of merit have made the findings more robust. It is also essential to factor in the power dynamics, as these professionals are unlikely to restrain their opinions when addressed by students.

The survey and interviews cover the market reasonably well, although a larger sample size

will naturally increase the robustness. The green bond market is also rapidly changing, and the attitudes might alter over time[37]. For that reason, repeating the survey over time is favorable. However, both analyses do support the overall results, which improves the overall robustness. The survey implement appropriate robustness efforts, as stated in this section, and the authors are, therefore, quite confident of the main findings.

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[37]As mentioned in the limitations of the analysis 4.3.

6   Discussion

The greenium analysis and study of issuers' and investors' motives reveal several reasons why the Norwegian bond market issues so few green bonds compared to the Swedish bond market. This section starts by addressing the Norwegian green bond market's performance, and the historical development's effect on the green bond issuance level. In addition, we argue that the composition of the Norwegian bond market negatively influences the sustainability awareness, which reduces demand. Finally, we discuss the future development of the green bond market in Norway and Sweden.

The analysis of green bond performance in the two countries partly explains the relative low issuance level in Norway. The greenium analysis of the secondary bond markets estimate a positive green bond yield premium of 1.7 bps in the Norwegian market, and a negative green bond yield premium -1.2 bps in the Swedish market. However, the survey and interview indicate a negative yield premium for green bonds in both countries. This is more reasonable, as a tighter green bond yield spread is consistent with the findings of Ehlers and Packer (2017), Zerbib (2019), Hachenberg and Schiereck (2018), and Karpf and Mandel (2018). The stakeholder theory concludes that a better environmental performance decreases the cost of capital, and thus also support a tighter green bond credit spread. Therefore, the positive greenium in Norway is unlikely to remain long term, as a green bond arguably inhabits additional benefits and are of a dual nature (Døskeland and Pedersen, 2019).

However, both the greenium analysis and survey observe a green bond yield discrepancy between Norway and Sweden. The findings show that Swedish respondents experience a tighter credit spread for green bonds significantly more than the Norwegian respondents. Therefore, the results from both analyses indicate the existence of a tighter green bond credit spread in the Swedish market compared to the Norwegian. Since the cost of issuing a green bond is somewhat identical in both markets, the Swedish issuers have a financial incentive to issue green bonds, compared to the Norwegian issuers (CICERO, 2015). This disadvantageous financial effect is likely a decisive factor for the limited green bond issuance level in Norway (Voica et al., 2015).

The tighter credit spread in the Swedish green bond market could create an additional

liquidity benefit, as demand is currently exceeding supply (Shishlov et al., 2017). We notice that investors report that it is easier to liquidate their green bond position, which reduces their risk and adds value. The liquidity effect causes a self-reinforcing effect, where increases in demand for green bonds create liquidity effects, which again increases demand for the bonds. Therefore, the lower demand and in turn lower liquidity in the Norwegian market curtail green bond issuance.

Even with a tighter credit spread in the Swedish green bond market of only a few basis points, it is not sufficient enough for Norwegian issuers to emigrate to the neighboring market. Foreign bond issuance increases the risk due to adverse currency fluctuations, and the uncertainty of green bonds could cause issuers to reduce external risks and thereby prefer the domestic market (Burger et al., 2018). Green bond issuers might also want to improve their brand's "greenness" and media exposure in their domestic market.

The tighter credit spread in the Swedish green bond market compared to the Norwegian could be explained by the history and development of green bonds. Analyzing the development of the green bond market might thereby clarify the low issuance level in Norway. The Swedish bank SEB issued the first green bond in 2007, which gave the Swedish green bond market a head start over the Norwegian market. This is likely to have caused a chain reaction, that has accelerated the knowledge of green bonds in Sweden, which again furthered the development and growth of the market (SEB, 2018). Jacob Michaelsen, at Nordea Markets, argues that Sweden has a leading green bond position over Norway, due to investors and issuers being willing to take lead and develop the market coupled together with a strong focus on sustainability. The detected lower Norwegian knowledge level of green bonds supports the notion of a more immature market in Norway. Thus, it is reasonable to expect that Norway is lagging behind the Swedish green bond market (NOU, 2018b). However, the greenness variable, in the greenium determinant analysis, is significant for the green bond yield premium in both countries. This indicates that the greenness rating of green bonds affects demand and that both markets, therefore, inhabit knowledge of green bonds.

The composition of the domestic financial bond markets in Norway and Sweden, could also affect the green bond issuance level significantly. Asbjørn Torvanger argues that both the composition and history of the countries' bond markets influence sustainability

levels. "This is likely due to a culture with emphasis on sustainability that is earlier and more developed in Sweden than Norway, and to Norway being more dependent on resource extraction with less industrial basis, not the least oil and gas. In addition green bonds were developed by Skandinaviska Enskilda Banken, headquartered in Sweden, in collaboration with the World Bank." This indicates that there is a substantial difference in composition between the countries as the Swedish bond market is dominated by the real estate sector. The Swedish real estate sector is also arguably more environmentally friendly than its Norwegian counter part (Thomas Nystedt, Vasakronan).

Therefore, the large shipping, oil and offshore sectors in Norway could negatively affect the supply of green bonds in Norway, as there could exist fewer "green" investment opportunities. However, Stein Johnsgård, CFO at Agder Energi, disputes the suggestion of a limitation in supply. He believes that demand factors, and not supply factors, limit green bond issuance. The less sustainable industrial composition in Norway could also present significant green investment opportunities in the future. Thus, the potentially Norwegian green investment activity is arguably higher than in Sweden (Ahlstrand and Stokstad, 2019).

The disparity in financial markets between the countries, could also influence sustainable awareness, which in turn affects green bond demand. Our findings from the interviews and survey indicate that Swedish respondents within the bond market value sustainable factors significantly more than their Norwegian colleagues, see section 5.4.2. Fredrik Skarsvåg at Sparebanken Vest Boligkreditt supports this notion: "Investors in Norway are not ready for this yet, but we do see increased focus on sustainability; the big asset managers in Norway want us to have green programs so that they know that we have a focus in ESG." Thus, the lower emphasis on the moral aspect in the Norwegian utility function diminishes intangible benefits, such as improved branding. In addition, the Swedish companies' stock could react more positively to the announcement of a green bond issue and thereby create additional benefits for issuers (Flammer, 2018). This in turn, is likely to cause an insufficient demand and supply of green bonds in Norway.

However, in a broader sustainable perspective, Norway and Sweden are at the forefront and are pioneers within socially responsible investing (SRI) (Scholtens and Sievänen, 2013). The politics and governmental intervention in terms of environmental taxation

are also similar in both countries (OECD, 2019). For that reason, it seems that Norway and Sweden have akin sustainable behavior outside of the bond market (MESSELT, 2019; Strand et al., 2015). The Norwegian bond market might be more conservative and less environmentally aware than the national average. This supports the argument that the composition of the domestic financial bond markets and the immaturity of the Norwegian green bond market reduces the sustainability focus.

We are of the opinion that the relative low green bond issuance level in Norway will improve and thereby reduce the volume discrepancy. "The market will keep on growing. Norwegian investors are catching up there will be more demand and issuances of green bonds in Norway" (Thomas Nystedt, Vasakronan). Norges Bank Investment Management's recent decision to sell off oil and gas activities could also fuel the short-term momentum in the Norwegian green bond market (Norges Bank, 2019). However, the reduction in green bond volume discrepancy between the two countries could be neutralized by permanent moral differences between Norway and Sweden (Scheepers et al., 2002; Pettit, 2014). In this case, the policymakers in Norway might have to intervene and stimulate the shift to environmental friendly bonds (NOU, 2018b).

The continued expansion of the green bond market is crucial to politicians and policymakers all over the world, as the green bond market is approximately 1.5 percent of the global bond market (Yong, 2019). The background section 2.6 presents the EU road map for the upcoming taxonomy and recently introduced the European Green Deal. These initiatives should improve the standardization of the green bond framework, reduce complexity and improve the information for the investors and issuers in the market. Arguably, the Norwegian green bond market will benefit greatly from the EU initiatives, as it is a smaller and less developed market than the Swedish. The European Green Deal and its goal of a climate natural Europe by 2050 will also require immense future environmental friendly investment, and should further expedite green bond issuance globally (European Union, 2019).

In addition to the European initiatives, fiscal policies, such as tax benefits, could indirectly improve green bond issuance by stimulating green investment activity. If governments correctly price the externalities of climate emissions, green investment activity will likely multiply, and the progress of the green bond market should follow (Leiter et al., 2011).

Although Norway issues fewer green bonds than Sweden at this moment, both countries are sustainable pioneers and are expected to continuously contribute to the development of green finance.

To conclude, this section argues that the composition and immaturity of the Norwegian green bond market have negatively impacted the supply and in particular demand. This causes direct and indirectly negative incentives for Norwegian green bond issuers, in terms of a higher borrowing cost and lower moral benefits. However, the Norwegian demand for green bonds is expected increase and likely create a negative greenium in the Norwegian market as well. Thus, the Norwegian green bond issuance level will rise and reduce the volume discrepancy to the Swedish market.

7   Conclusion

To uncover the underlying reasons why the Norwegian bond market issues so few green bonds, the thesis contains two objectives. The first objective analyzes the performance of green bonds in the primary and secondary Norwegian and Swedish bond markets, while the second objective study the motives of investors and issuers. The analysis of the green bond performance in the secondary market matches green bonds with synthetic bonds and runs a two-step regression to estimate the greenium, $\hat{p}_i$ and its determinants. The study of issuers' and investors' motives performs in-depth interviews with market professionals and a survey of issuers, investors and third party individuals.

The secondary green bond market is the basis of the greenium analysis, as the primary market does not reveal a greenium and is less suitable. The results indicate that the total sample containing both countries has a significantly[38] negative $\hat{p}_i$ of -0.8 bps, and the Swedish market has a negative green bond yield premium of -1.2 bps. The Norwegian market, on the other hand, has a significant positive green bond yield premium of 1.7 bps. Secondly, the determinants of the $\hat{p}_i$ indicate that high greenness within green bonds negatively affects the premium. The real estate sector, investment-grade rating, low issue amount, and floating coupon types all have a significant negative effect on the green bond yield premium. The yield difference causes a higher funding cost for the Norwegian issuers and might explain the lower green bond issuance level.

The second study performs in-depth interviews and a survey on issuers, investors, and third party market participants. These studies support and provide additional reasons for a tighter credit spread in the Swedish bond market, compared to the Norwegian bond market. Our findings show that the Norwegian green bond market is underdeveloped, and focuses less on sustainability than the Swedish bond market, which might reduces the demand for green bonds. Norway's domestic industrial composition might affect sustainable awareness and thereby negatively influence green bond demand. In addition, the Norwegian dependency on fossil fuels and shipping could lower green investment activity, which reduces green bond issuance directly. In addition to the higher borrowing

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[38]Note that all mentions of significance in the conclusion section are on the 99 percent confidence, due to a p-value of <0.01.

cost, Norwegian green bond issuers also have an additional disincentive, as sustainable awareness and branding is less valuable.

The lack of regulatory standardization and the high cost of green bond issuance will also reduce the supply of green bonds in both markets. However, the upcoming EU taxonomy reform should create a standardization framework and reduce the complexity and cost of green bond issuance. This will arguably affect the less developed Norwegian green bond market more than the mature Swedish market.

The greenium analysis and the study of market participants' motives both point to a yield disparity between the countries, which creates a disincentive for the Norwegian issuers. We argue through the survey and in-depth interviews that the yield difference is caused mainly by an insufficient demand in the Norwegian bond market. Although there are motivational differences, both nationalities agree that the global green bond market positively impacts the environment and is optimistic to the future development of the two green bond markets. Our findings also suggest that the green bond market in Norway will develop significantly, which will increase the focus on sustainability and thereby the demand of green bonds. Therefore, the discrepancy in green bond issuance between the two countries should reduce in the future.

Due to limited data and rapid growth in the market, future research with a similar research question could be favorable. Further research on the domestic industrial composition in Norway and its effect on the underlying sustainability activity, is also a valuable research area. Another exciting future research avenue is analyzing the effect on the green bond market of the upcoming taxonomy reform and the European Green Deal.

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Appendix

A1   Background

Figure A1.1: Illustration of Cicero's Process for Delivering Second Opinions

(CICERO, 2015)
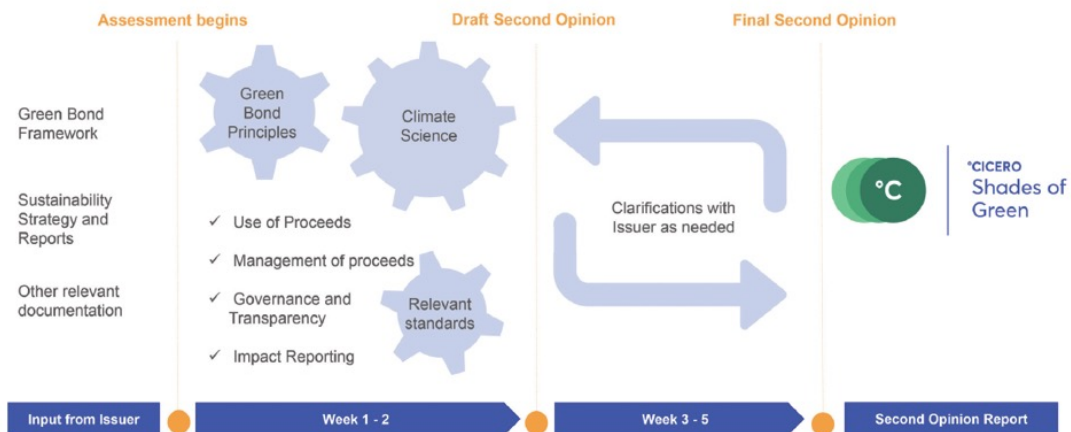
Figure A1.2: Cicero Shades of Green

The scale ranging from brown to dark green, where dark green is highest (CICERO, 2015)

Table A1.1: Characteristics of Different Green Bond Identification and Certification Schemes

The table has been replicated from the work of Ehlers and Packer (2017)

	Green Bond Principles	Climate Bond Initiative	Green Bond Indices	CICERO 2nd Opinion	Moody's Green Bond Assessments
Use of funds must be tied to "green" investments	Yes	Yes	Yes	Yes	Yes
Sector-specific eligibility criteria		Yes	Yes		
Ex post monitoring					Yes
Granular assessments of greeness				Yes	Yes
Quantitative weights for different factors					Yes

A2 Study Greenium

Figure A2.1: Interpolation Examples

The four figures illustrates interpolation (extrapolation) for the ask and bid yield. For each figure the dark line and the gray line represents the actual and interpolated values, respectively. Note that these four are examples where interpolation (extrapolation) is quite accurate. However, the figures presents the intuition behind the used method.

(a) ATRLJ111 Bid

(b) ATRLJ111 Ask

(c) ENTRA12 Bid

(d) ENTRA12 Ask
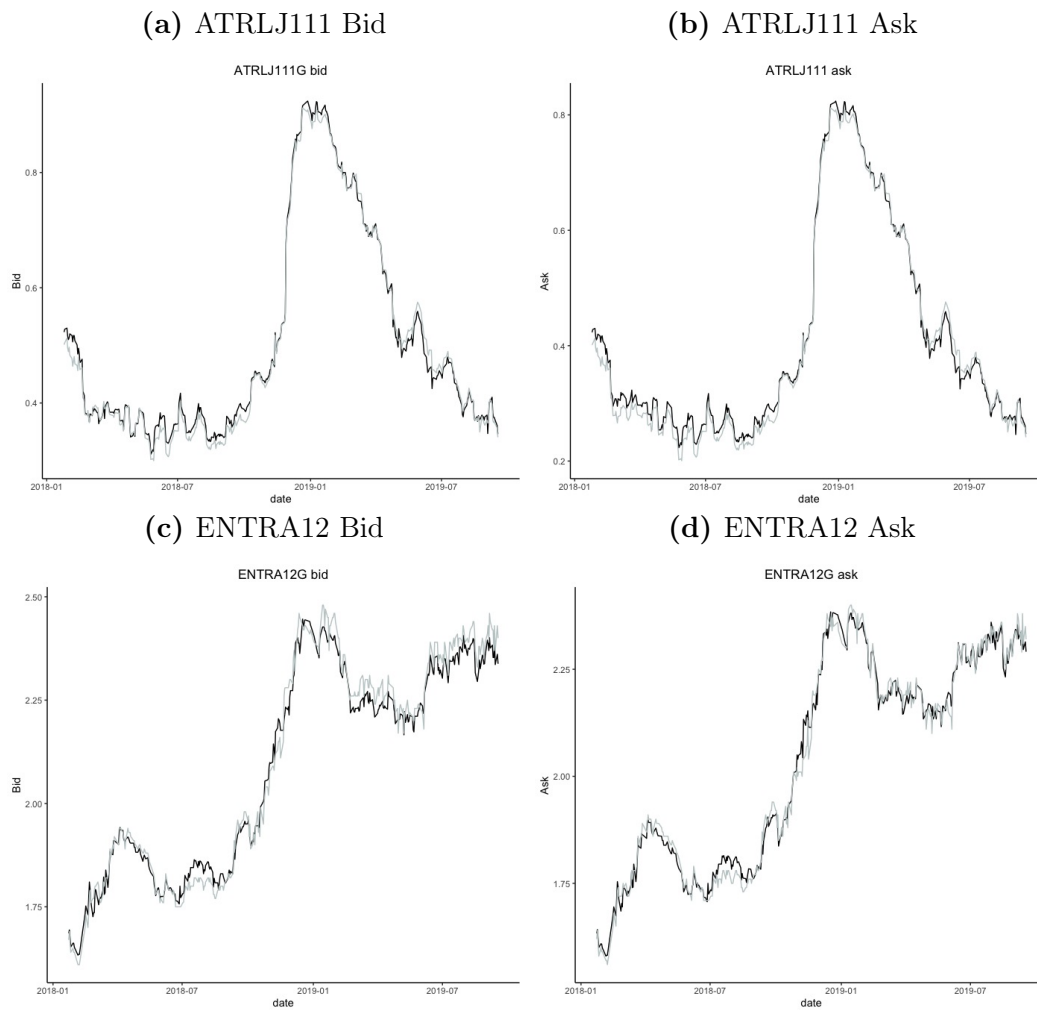
Figure A2.2: Distribution Green Bond premium, $\hat{p}_i$, for Norway and Sweden

The two figures plots the distribution of the greenium for both countries.
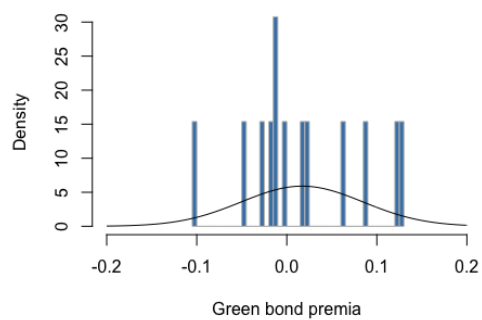
(a) Norway   **(b)** Sweden
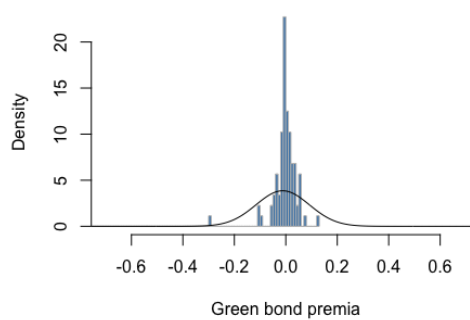
Figure A2.3: Green Bond Premium, $\hat{p}_i$, Over Time

The figure presents $\hat{p}_i$ from January 2016 until September 2019 for the entire dataset.
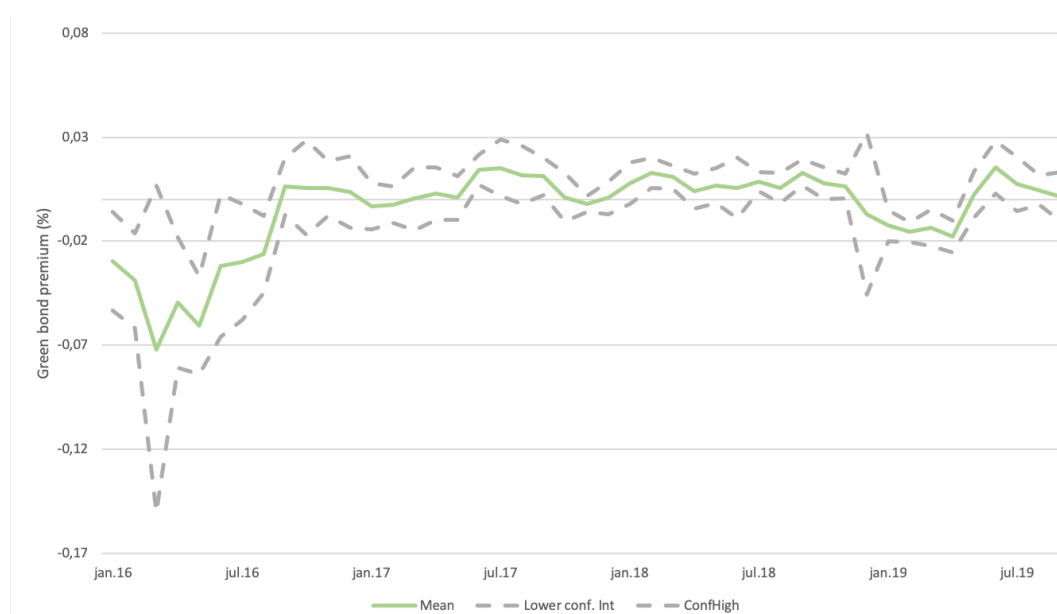
Table A2.1: Correlation Matrix of Subgroups

The table presents the correlation between subgroups used to analyse the determinants of the green bond yield premium through equation 4.8. Note that p-values are presented in parenthesis

	IssueAmtHigh	IssueAmtMedium	sector.utilities	sector.bank	sector.realestate	sector.consumerservices	sector.transportation	sector.ppf	rating	coupontype	greenness	swedish
IssueAmtMedium	-0.32 (0.00)	1.00										
sector.utilities	0.30 (0.00)	-0.03 (0.00)	1.00									
sector.bank	0.00 (0.58)	0.11 (0.00)	-0.04 (0.00)	1.00								
sector.realestate	-0.11 (0.00)	-0.12 (0.00)	-0.39 (0.00)	-0.24 (0.00)	1.00							
sector.consumerservices	-0.03 (0.00)	-0.05 (0.00)	-0.02 (0.00)	-0.01 (0.06)	-0.11 (0.00)	1.00						
sector.transportation	0.09 (0.00)	-0.00 (0.77)	-0.05 (0.00)	-0.03 (0.00)	-0.31 (0.00)	-0.01 (0.01)	1.00					
sector.ppf	-0.09 (0.00)	-0.03 (0.00)	-0.06 (0.00)	-0.03 (0.00)	-0.34 (0.00)	-0.02 (0.00)	-0.04 (0.00)	1.00				
rating	-0.27 (0.00)	0.09 (0.00)	0.03 (0.00)	0.02 (0.00)	-0.07 (0.00)	0.01 (0.19)	0.02 (0.00)	0.02 (0.00)	1.00			
coupontype	0.04 (0.00)	-0.15 (0.00)	0.07 (0.00)	-0.12 (0.00)	0.07 (0.00)	-0.05 (0.00)	0.05 (0.00)	-0.02 (0.00)	0.08 (0.00)	1.00		
greenness	0.08 (0.00)	-0.19 (0.00)	0.14 (0.00)	-0.12 (0.06)	0.08 (0.00)	0.07 (0.00)	-0.21 (0.00)	0.02 (0.00)	0.11 (0.00)	0.33 (0.00)	1.00	
swedish	-0.36 (0.00)	0.12 (0.00)	-0.47 (0.00)	-0.10 (0.06)	0.24 (0.00)	-0.21 (0.00)	0.06 (0.00)	0.07 (0.00)	-0.04 (0.00)	-0.01 (0.02)	-0.21 (0.00)	1.00

Table A2.2: Tests of Step 1 Regression

The table presents the statistics, p-value and the conclusion for each performed test.

		Panel: $\triangle \tilde{y}$ controlled by $\triangle BA$		
	Test	Statistics	p-value	Conclusion
Fixed vs. Random effect	Hausman	4.1624	0.04	Fixed effect
		(df1 = 1)		
Individual effect	F-test	236.84	<2.2e-16	Individual effect
		(df1 = 100, df2 = 31332)		
	Breusch-Pagan	385102	<2.2e-16	Individual effect
		(df1 = 1)		
	Honda	620.57	<2.2e-16	Individual effect
Serial correlation	Breusch-Godfrey Wooldridge	28094	<2.2e-16	Serial correlation
		(df1 = 15)		
	Durbin Watson	0.12144	<2.2e-16	Serial correlation
	Wooldridge	3337.2	<2.2e-16	(AR1) Serial correlation
		(df1 = 1)		
Heteroskedasticity	Breusch-Pagan	616474	<2.2e-16	Heteroskedasticity
		(df1 = 101)		

Table A2.3: Estimated Greenium with Weighted Fixed Effect Regression

The table presents the distribution of the greenium using weighted fixed effect regression, using issue amount as weight.

	$\hat{p}_i$						
	min	1st Quart.	median	mean	3rd Quart.	max	N
Norway	-0.10271	-0.01772	-0.0007	0.01706	0.06444	0.1281	13
Sweden	-0.86676	-0.01407	-0.0009	-0.01195	0.01924	0.12151	88
Total	-0.86675	-0.01506	-0.00117	-0.00824	0.01942	0.12783	101

A3   Study Motives

Figure A3.1: Survey Flow Chart
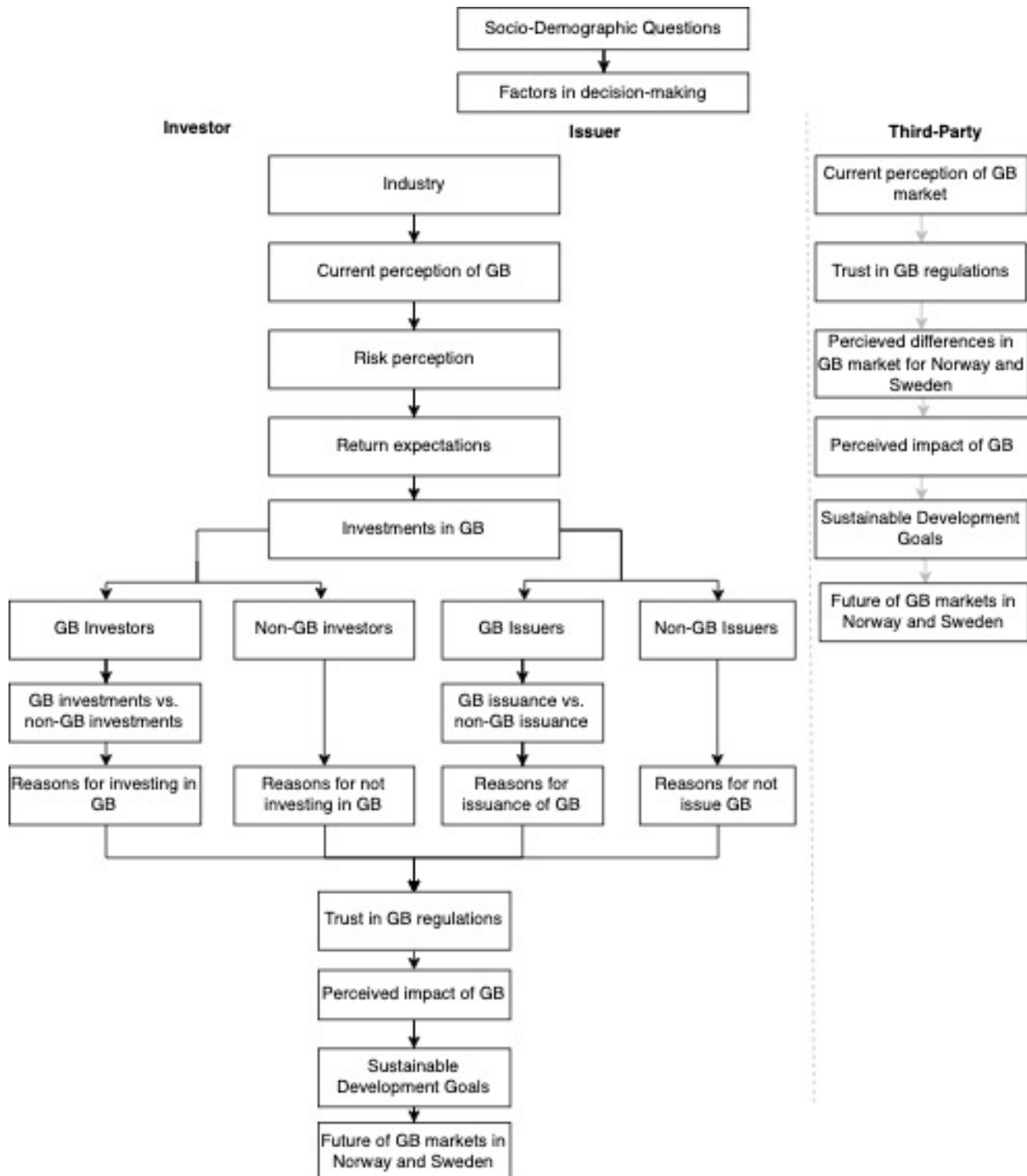
Table A3.1: Variables in Survey

Variable name	Measure Investor	Measure Issuer
Return Expectations	I expect that Green Bonds compared to conventional bonds would have a tighter credit spread	Same
Risk Perceptions	I expect that Green Bonds would be less risky than conventional bonds	Same
Knowledge of Green Bonds	I have good knowledge of Green Bonds	Same
Concern for the environment in investments	My investment decision was mainly driven by the motivation to contribute to the environment and the ranking of factors impacting investments	Our decision to issue was mainly driven by the motivation to contribute to the environment
Injunctive Norm	My investment decision was mainly driven by improving my social environment perception of my portfolio	Our decision to issue was mainly driven by improving our social environments perception of our company (I.e. the greenness of our brand)
Perceived impact of Green Bonds	I believe that green bonds will contribute to reach the Paris agreement of limiting the temperature rise to well below 2 degrees Celcius	Same
Greeness	The greeness of a Bond is very important to me and I strive to hold the green bonds with the most environmental impact	The greenness of a bond is very important for our company, and we strive to issue the green bonds with the most environmental impact
Trust in Green Bonds Framework	If a bond is listed as green, I have full confidence that the bond is actually green	I have full confidence to the external review, and believe that it is aligned with our firms own perception of the green bond issuance
Long-term Strategy	I believe that is important to be active in the green bonds market today, in order to develop experience and expertise	Same
Unconventional Return Expectation	I am willing to experience lower returns in the short run, when investing in green bond as I expect that this will pay off in the long run	I believe our company would be willing to experience higher cost in the short run, when issuing a green bond, as it will pay off in the long run
Perceived future for Green Bond market in Norway and Sweden	The Norwegian Green Bond market will develop in the same fashion as the Swedish and are a few years behind	Same

Table A3.2: Ranking of the Sustainable Development Goals

By outlining the 17 sustainable development goals (SDGs), the survey investigates underlining drivers for the respondent. That is, on a higher level than the factors displayed earlier in the survey. Each response is pooled in order to see the ranking as one for the respective group. it seems that investors in Norway and Sweden have, to a certain degree, the same ranking for the SDGs. For issuers, however, the ranking varies more.

Goal	Investor		Issuer	
	Norway	Sweden	Norway	Sweden
Take urgent action to combat climate change and its impact	1	1	2	4
Responsible consumption and production	2	2	9	5
Affordable and clean energy	3		7	3
Good health and well-being	4	5	6	13
Sustainable manage forests, reverse land degradation, and halt biodiversity loss	5		13	10
Sustainable energy for all	6		8	2
Food Security with sustainable and resilient agriculture	7	3	11	11
Sustainable cities and communities	8		1	1
Decent work and economic growth	9	4	5	8
No poverty	10		14	9
Clean water and sanitation	11	6	3	7
Concern and sustainable use of the oceans, seas and marine resources	12		10	17
Peace justice and strong institutions	13		12	12
Quality education	14		15	14
Achieve gender equality and empower all women and girls	15		16	15
Reduce inequality within and among countries	16		17	16
Industry, innovation and infrastructure	17	7	4	6

Table A3.3: Skewness and Kurtosis Issuers and Investors

Issuer	Skewness	SE of Skewness	Kurtosis	SE Kurtosis
Knowledge of green bonds	-0.79	0.4	-0.1	0.78
Risk perception	-0.02	0.4	-0.96	0.79
Expected return	-0.65	0.4	-0.08	0.79
Diversification	-0.67	0.4	0.14	0.78
Firm´s stated long-term vision of a carbon and climate resilient future	-0.88	0.46	1.52	0.9
Rating	-1.12	0.46	0.96	0.9
Governance structure	-0.01	0.4	-1.97	0.79
Financial indicators	-0.64	0.54	-0.32	1.04
Motivation to contribute to the environment	-1.41	0.54	3.72	1.04
Social perception	-2.07	0.54	5.74	1.04
Perceived impact	-0.97	0.4	0.57	0.79
Trust in green bond framework	-1.14	0.4	1.877	0.79
Investor	Skewness	SE of Skewness	Kurtosis	SE Kurtosis
Expected return	-0.59	0.66	-0.29	1.28
Diversification	-0.18	0.66	0.19	1.28
Overall economic growth in the market	-0.77	0.66	1.21	1.28
Historical financial performance of company	0.59	0.66	-0.29	1.28
Firm´s stated long-term vision of a carbon and climate resilient future	0	0.66	0.42	1.28
Firm´s previous record of sustainability measures	0.21	0.66	1.25	1.28
The management of the company	-0.27	0.69	-0.9	1.33
Rating	-0.34	0.66	-0.05	1.28
Security type	-0.12	0.66	-1.31	1.28
Financial indicators	-0.31	0.75	-2.36	1.48
Motivation to contribute to the environment	0.31	0.75	-1.24	1.48
Social perception	0	0.75	-2.04	1.48
Perceived impact	-0.43	0.69	-1.21	1.33
Trust in green bond framework	0	0.69	-1.76	1.33

Email to Issuer

To whom it may concern,

As an issuer of a bond in the Swedish bond market, we value your opinion.

In collaboration with Finance|Bergen and Nordea, we are writing a master thesis at the Norwegian School of Economics with the research question: «Why does the Norwegian green bond market issue so few green bonds?» A comparative study with the Swedish green bond market.

After analyzing the premium on green bonds compared to conventional bonds, we would kindly ask you to set aside five minutes to help us disclose the motives for issuers in the market.

The survey is anonymous, and will take approximately five minutes to complete.

The master thesis will be made available through https://www.nhh.no/bibliotek/nhh-brage/ at the end of December.

We are confident that our research will contribute to information improvement into the green bond market, and provide you and your company with valuable insights of the green bond markets in Norway and Sweden.

We would like to thank you for taking the time to respond to the survey.

Follow this link to the Survey:

Take the Survey

BR,

Marius Dahl and Sindre Karlsen

Survey

Start of Block: General Questions

Q1 Concerning green bonds, which of the following three categories do you find yourself in?

       a Investor

       b Issuer

       c Third Party

Q2 If you were to choose one, which of the two countries below do you primarily operate in?

       a Norway

       b Sweden

       c None of the above

Start of Block: Investor

Q3 With respect to your current occupation, which of the following industry do you find yourself in?

       a Seafood, Fishing and Aquaculture

       b Oil & Gas

       c Maritime

       d Renewable energy

       e Process & Manufacturing

       f Information & Communications

       g Defense & Security

       h Research & Development

       i Public sector

       j Asset management

       k Other

Q4 Rank the following factors by its importance to you/your investor base when making an investment decision (Skip this question if this does not apply to you)

	Not at all important	Low importance	Slightly unimportant	Neutral	Moderately important	Very important	Extremely important
Expected Return (yield)	1	2	3	4	5	6	7
Diversification	1	2	3	4	5	6	7
Overall economic growth in the market	1	2	3	4	5	6	7
Historical financial performance of company	1	2	3	4	5	6	7
Firm's stated long-term vision of a low carbon and climate resilient future	1	2	3	4	5	6	7
Firm's previous record of sustainability measures	1	2	3	4	5	6	7
The management of the company	1	2	3	4	5	6	7
Rating	1	2	3	4	5	6	7
Security type	1	2	3	4	5	6	7

Q5 Respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I have good knowledge of green bonds	1	2	3	4	5	6	7
All else equal, I would be indifferent when choosing between a green bond and a conventional bond	1	2	3	4	5	6	7
I expect green bonds compared to conventional bonds to have a tighter Credit Spread	1	2	3	4	5	6	7
I expect that green bonds would be less risky than conventional bonds	1	2	3	4	5	6	7
Green bonds provide diversification	1	2	3	4	5	6	7
I mainly invest in the international bond market	1	2	3	4	5	6	7
I am more likely to invest in green bonds today compared to five years ago	1	2	3	4	5	6	7

Q6 Have you invested in green bonds in the past five years?

a Yes

b No

Q7 Of the total amount invested in bonds, what percentage is invested in green bonds?

> Respondents enter a numerical value

Q8 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
The invested volume per green bonds is the same as for conventional bonds	1	2	3	4	5	6	7

Q9 When did you first enter the market?

a More than five years ago

b Four years ago

c Three years ago

d Two years ago

e One year ago

f Just entered

g Do not remember

Q10 Please respond to the following statements regarding your investment in green bonds

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
My investment decision was mainly driven by good financial indicators of the chosen green bond	1	2	3	4	5	6	7
My investment decision was mainly driven by the motivation to contribute to the environment	1	2	3	4	5	6	7
My investment decision was mainly driven by improving my social environment's perception of me through my investment pattern	1	2	3	4	5	6	7

Q11 Which of these alternatives is most aligned with your reasoning in choosing not to invest in green bonds?

a I do not believe green bonds framework are developed enough

b I do believe that it would be less profitable than other investments

c Lack of information about green bonds

d Too few green bonds issued

e Environmental factors do not affect my investment decisions

f I do not invest my money

g Other reasons

Q12 Please respond to the statement regarding "greenness"

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
The greenness of a bond is very important to me and I strive to hold the green bond with the most environmental impact	1	2	3	4	5	6	7
If a bond is listed as green, I have full confidence that the bond is actually green	1	2	3	4	5	6	7
The reporting of green bonds is satisfying, and provides deeper insight in the use of proceeds and the effect on the environment	1	2	3	4	5	6	7
The quality of third-party reviews varies greatly between third-parties (e.g. DNV GL, Cicero, etc.)	1	2	3	4	5	6	7
I think the green bond market will become more regulated and controlled in the future	1	2	3	4	5	6	7

Q13 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I believe that green bonds will contribute to reach the Paris agreement of limiting the temperature rise to well below 2 degrees Celsius	1	2	3	4	5	6	7

Q14 Out of the following sustainable development goals, which are most important to you? (Possible to choose more than one alternative)

a Take urgent action to combat climate change and its impact

b Sustainable energy for all

c Food security with sustainable and resilient agriculture

d Sustainable cities and communities

e Affordable and clean energy

f Decent work and economic growth

g Responsible consumption and production

h Peace justice and strong institutions

i No poverty

j Good health and well-being

k Clean water and sanitation

l Industry, innovation and infrastructure

m Quality education

n Achieve gender equality and empower all women and girls

o Reduce inequality within and among countries

p Conserce and sustainably use the oceans, seas and marine resources

q Sustainably manage forests, reverse land degradation, and halt biodiversity loss

Q15 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I believe that it is important to be active in the green bonds market today, in order to develop experience and expertise	1	2	3	4	5	6	7
Environmental financial instruments will play an important part in order to meet established investors demand, and at the same time appeal to the younger market	1	2	3	4	5	6	7
I am willing to experience lower returns in the short run, when investing in green bond, as I expect that this will pay off in the long run	1	2	3	4	5	6	7

Q16 With regards to the development of the Norwegian and Swedish green bond markets, please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
The Norwegian green bond market will develop in the same fashion (in terms of invested volume) as the Swedish and are a few years behind	1	2	3	4	5	6	7
In my opinion, the Norwegian green bond market would never reach the same levels of volume as the Swedish	1	2	3	4	5	6	7
I expect both green bond markets to expand in the future	1	2	3	4	5	6	7

Start of Block: Issuer

Q3 With respect to your current occupation, which of the following industry do you find yourself in?

Alternatives equal to the equivalent in investors survey

Q4 Respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I have good knowledge of green bonds	1	2	3	4	5	6	7
All else equal, our company would be indifferent when choosing between issuing a green bond and a conventional bond	1	2	3	4	5	6	7
I expect green bonds compared to conventional bonds to have a tighter Credit Spread	1	2	3	4	5	6	7
I expect that green bonds would be less risky compared to conventional bonds	1	2	3	4	5	6	7
Green bonds provide diversification	1	2	3	4	5	6	7
My company are more likely to issue green bonds today compared to five years ago	1	2	3	4	5	6	7

Q5 To what extent is sustainability a part of your company's overall ...

	Minimum	To some extent	To a great extent
... commercial business strategy?	1	2	3
... funding strategy?	1	2	3

Q6 Has your company issued green bonds in the past ten years?

    a Yes

    b No

Q7 Of the total amount issued in bonds, what percentage (approximately) is issued in green bonds?

Respondents enter a numerical value

Q8 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Our decision to issue was mainly driven by good financial indicators of the other green bonds	1	2	3	4	5	6	7
Our decision to issue was mainly driven by the motivation to contribute to the environment	1	2	3	4	5	6	7
Our decision to issue was mainly driven by improving our social environments perception of our company (I.e. the greenness of our brand)	1	2	3	4	5	6	7

Q9 Which of these alternatives is most aligned with your reasoning in choosing not to issue green bonds?

a I do not believe green bonds framework are developed enough

b I do believe that it would be more costly, compared to other ways of raising capital (e.g. the fees are currently too high)

c Lack of information about green bonds

d Too few green bonds issued

e Environmental factors do not affect our decision making

f We do not raise capital through bonds

g Other reasons

Q10 Please respond to the statement regarding "greenness"

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
The greenness of a bond is very important for our company, and we strive to issue the green bonds with the most environmental impact	1	2	3	4	5	6	7
I have full confidence to the external review, and believe that it is aligned with our firms own perception of the green bond issuance	1	2	3	4	5	6	7
The quality of third-party reviews varies greatly between third-parties (e.g. DNV GL, Cicero, etc.)	1	2	3	4	5	6	7
I think the green bond market will become more regulated and controlled in the future	1	2	3	4	5	6	7

Q11 Out of the following sustainable development goals, which are most important to you? (Possible to choose more than one alternative)

Alternatives equal to the equivalent in investors survey

Q12 Please respond to the following statements

Alternatives equal to the equivalent in investors survey (Paris agreement)

Q13 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I believe that it is important to be active in the green bond market today, in order to develop experience and expertise	1	2	3	4	5	6	7
Environmental financial instruments will play an important part in order to meet established investors demand, and at the same time appeal to the younger market	1	2	3	4	5	6	7
I believe our company would be willing to experience higher costs in the short run, when issuing a green bond, as it will pay off in the long run	1	2	3	4	5	6	7
I believe our company has a governance structure that enables us to issue green bonds (i.e. the ability to handle such issuance)	1	2	3	4	5	6	7

Q15 With regards to the development of the Norwegian and Swedish green bond markets, please respond to the following statements

Alternatives equal to the equivalent in investors survey

Start of Block: Third Party

Q3 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I have good knowledge of green bonds	1	2	3	4	5	6	7
All else equal, a company would be indifferent when choosing between issuing a green bond and a conventional bonds	1	2	3	4	5	6	7
Companies are more likely to issue green bonds today compared to five years ago	1	2	3	4	5	6	7
I expect that green bonds compared to conventional bonds would have a tighter credit spread	1	2	3	4	5	6	7
I expect that green bonds would be less risky than conventional bonds	1	2	3	4	5	6	7

Q4 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I have full confidence in the external review and believe that it is aligned with the firm's own perception of the green bond issuance	1	2	3	4	5	6	7
In my opinion, companies do strive to make, and keep, readily available up-to-date information on the use of proceeds	1	2	3	4	5	6	7

Q5 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
It is difficult to correctly assess the greenness of a green bond and provide understandable and easy information to both investors and issuers	1	2	3	4	5	6	7
Assurance and certification of green bonds are done in a similar fashion in Norway and Sweden	1	2	3	4	5	6	7
The EU green bond standard will make the green bond market more trustworthy and will assure that certification is done in a similar fashion between countries	1	2	3	4	5	6	7

Q6 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
The greenness of a bond is very important, and therefore companies strive to issue the green bonds with the most environmental impact	1	2	3	4	5	6	7
I believe that green bonds will contribute to reach the Paris agreement of limiting the temperature rise to well below 2 degrees Celsius	1	2	3	4	5	6	7

Q7 Out of the following sustainable development goals, which are most important to you? (Possible to choose more than one alternative)

Alternatives equal to the equivalent in investors survey

Q8 Please respond to the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I believe the issuer must be willing to experience lower returns in the short run when issuing a green bond, which I expect will pay off in the long run	1	2	3	4	5	6	7
I believe the investor must be willing to experience lower returns in the short run, when investing in a green bond, which I expect will pay off in the long run	1	2	3	4	5	6	7

Q9 With regards to the development of the Norwegian and Swedish green bond markets, Please respond to the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
The Norwegian green bond market will develop in the same fashion as the Swedish (in terms of invested amount) and are a few years behind	1	2	3	4	5	6	7
In my opinion, the Norwegian green bond market would never reach the same level (in terms of issued amount) as the Swedish	1	2	3	4	5	6	7
I expect both green bond markets to expand in the future	1	2	3	4	5	6	7