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The Effect of Sustainability on Bond Pricing

An empirical study of bonds issued by Norwegian savings and commercial banks

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Abstract

We find that Norwegian banks pay lower bond coupon rates for displaying sustainability-related characteristics or for issuing green bonds. Using data on bonds issued by 29 Norwegian banks in the primary market, we estimate the causal effect of having a sustainability strategy, receiving an ESG rating or being a savings/commercial bank on the coupon rate for both conventional and green bonds. We find that, isolated, banks pay lower coupon rates when issuing green bonds compared to conventional bonds. Furthermore, through using nearest neighbor propensity score matching (NN-PSM), we find that conventional bonds issued by banks that are early adopters of a sustainability strategy have *higher* coupon rates than those of banks that are late adopters of a sustainability strategy. Moreover, we find that conventional bonds issued by banks with higher ESG ratings have *lower* coupon rates than conventional bonds issued by banks with lower ESG ratings. Finally, we find that conventional bonds issued by savings banks have *lower* coupon rates than conventional bonds issued by commercial banks. However, we find no significant effect of the combination of these characteristics with the issuance of green bonds on the coupon rate. Our findings are robust to correlations on the issuer level, and suggest that bank characteristics are more important than offering green products in order to achieve a lower cost of debt for Norwegian banks when contributing to the green transition.

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1 Introduction

The purpose of this thesis is to analyze whether sustainability-related bank characteristics and issuing green bonds have an effect on Norwegian banks' cost of debt, represented by the bond coupon rate. The characteristics are (1) a sustainability strategy, (2) ESG ratings and (3) type of bank. In Norway, banks are among the most active issuers of green bonds, which are issued to finance specific sustainable projects (Migliorelli and Dessertine, 2019), facilitating for reduced information asymmetries for their investors. Less information risk is associated with a lower cost of debt (Healy and Palepu, 2001), indicating that green bonds should be priced differently from comparable conventional bonds. However, the combination of banks displaying the beforementioned characteristics and issuing green bonds does *not* have an effect on the bond coupon rate. Hence, our thesis provides evidence of concrete measures related to sustainability that banks can apply to achieve a lower cost of debt, while contributing to the green transition.

To assess the effect of our characteristics on the bond coupon rate, we study 1,856 bonds issued by 29 Norwegian banks in the last six years. The existing green bond pricing literature mostly focuses on the secondary market and the bonds' spreads and yields (See e.g., Zerbib, 2019; Hachenberg and Schiereck, 2018). Hence, we examine the primary market, and thus the bond coupon rate at issuance, to add to the existing literature, and to identify the initial investor interest for green bonds. To understand which specific aspects of our bank characteristics have an effect on the bond coupon rate, we apply standard and matched pairs OLS regression and use clustered standard errors at the bank level. We control for bond characteristics and add fixed effects to our analyses.

Specifically, we find that green bonds issued by Norwegian banks are on average issued at a 40 bps lower coupon rate than conventional bonds, all else equal. Furthermore, we find that banks pay on average a 10 bps *higher* coupon rate for each additional year since adopting a sustainability strategy, when issuing conventional bonds. Moreover, we find evidence that banks pay a 2 bps *lower* coupon rate when issuing conventional bonds for a better ESG score from Sustainalytics. Finally, we find that savings banks pay a 60 bps *lower* coupon rate compared to commercial banks when issuing conventional bonds.

1.1 Background and motivation

Investor interest in sustainability has increased substantially over the last years and we are seeing global trends regarding the demand for transparency of companies and their supply chain, and for the reduction of greenhouse gas (GHG) emissions (Deloitte, 2021; KPMG, 2014). Within sustainability, the focus could be on either environmental, social or governmental (*ESG*) factors or a combination of all, where *green finance* focuses on the environmental aspect. Green finance can as such be understood as the funding of efforts to face the global environmental crisis (Migliorelli and Dessertine, 2019). The existing literature hypothesizes that involvement of top management, government regulation, financial benefits, competitive advantage, customer demand and attitudes may be various driving forces behind green finance[1].

Regarding regulations, the EU taxonomy, an extensive and widely discussed policy, has been developed and will take effect in 2022. The taxonomy is a classification system, aiming to provide companies, investors and policymakers with definitions and explanations of what can be considered sustainable (EU, 2020). Government regulation, such as the EU taxonomy, is putting pressure on the financial institutions and banks to be precise on how they contribute to the transition to a low-carbon society. Disclosing precise information about what sustainability aspects one can find within business strategies and operations has become more common (Grewal et al., 2021). We therefore expect regulations to continue to structure and change the way financial institutions deal with sustainability.

In Norway, the government has stated that the financial sector plays an important part in the transition to a low-emissions economy (Finansdepartementet, 2020). In January 2015, Oslo Stock Exchange became the first stock exchange in the world to establish a list for green bonds (Climate Bonds Initiative, 2020). Furthermore, banks are among the most active green bond issuers in Norway (Stamdata, 2021). As such, Norway and Norwegian financial institutions are well-positioned to contribute to the green transition, as a result of the challenges and opportunities they face (Finance Norway, 2018; Nosratabadi et al., 2020). This positioning motivates us to focus our thesis on Norwegian banks and the effort they display in the green transition and what they can gain from it.

[1]See e.g., Ahmad et al. (2013), Flammer (2021), Giunipero et al. (2012) and Zerbib (2019)

There are several ways to examine how Norwegian banks contribute to the green transition. For instance, we could investigate green loans, asset management or the effect of sustainability announcements on stock returns (See e.g., Migliorelli and Dessertine, 2019). We choose to focus our thesis on bond issuance in the primary market, and more specifically on green vs conventional bonds. There is a lack of academic research on the topic of green bonds pricing, despite the growth in the green bond market (Torvanger et al., 2021). As such, we assess whether the issuance of green bonds, particularly in combination with sustainability-related bank characteristics, has an effect on the cost of debt for Norwegian banks.

We therefore seek to answer the following research question: *What is the effect of sustainability on bond coupon rates in Norwegian banks?*

2 Literature review

Our literature review allows us to provide the basis for relevant hypotheses which will contribute to answer our research question. We present and review relevant topics associated with Norwegian banks and bond issuance. We commence our review by looking at aspects related to banks themselves, before we continue with some reflections on bonds and sustainability. Then, we end with an assessment of the differences between savings and commercial banks.

2.1 Banks and sustainability strategies

Traditionally, banks earn a profit through attracting deposits in exchange for interest rates and lending the money at higher interest rates (DeYoung and Rice, 2004). They are able to choose who and what they lend money to and invest in, and may as such also choose between industries that are classified as clean or dirty (Cui et al., 2018b). Hence, banks as financial service providers can choose which or any environmental efforts they want to finance, or if they prefer to only focus on earning a profit. The challenge for banks, that are involved in sustainable business processes through financing, is the *tragedy of the horizon*, i.e., taking the cost for sustainable action today for a more sustainable tomorrow (Carney, 2015). Still, banks can engage in environmental challenges through, for instance, offering green credit such as green housing loans; green funds, i.e., investment products; encouraging their employees and customers to take sustainable decisions; and choosing suppliers who follow environmental and social principles (Weber, 2005).

The various ways to engage in environmental challenges emphasize how banks can contribute to the green transition. In Sweden, sustainability is considered a clear norm in the financial sector, and there are stakeholder, institutional and legitimacy incentives for engaging in sustainability practices (Maltais and Nykvist, 2020). In Norway, however, factors such as competition with high yield investments in oil & gas and shipping, and the fact that the Norwegian pension fund can not invest in bonds domestically, may have hindered the process (Torvanger et al., 2021). Still, we are seeing an increasing focus on different aspects of sustainability. Banks operate with different types of strategies based on these focus areas, and although these strategies vary in content, they seem to be

similar in structure (Zimmermann, 2019).

Overall, sustainability strategies stem from a business logic, focusing on e.g., risk reduction and efficiency gain, or from a sustainable logic, with the implication that economic goals are instruments of sustainable development (Zimmermann, 2019). They are developed with the aim to achieve economic prosperity, environmental integrity, and social equity for both the bank and stakeholders. Such strategies are considered to be a result of the demand for sustainable investments from investors and customers, as well as growing pressures in terms of regulation (Zimmermann, 2019). The question is, however, whether the decision to implement a sustainability strategy is formed by a genuine desire or through a sense of duty for the company.

Initially, companies appear to adopt *corporate social responsibility* (CSR) as a reactive as opposed to a proactive strategy, and occasionally as a result of an image scandal or a bad reputation (Vilanova et al., 2009). Thus, pursuing a sustainability strategy can be seen in relation to information asymmetries because investors and other stakeholders do not know if the origin of the strategy is proactive or reactive. With more information available, investors face less risk and are able to make better investment decisions (Lambert et al., 2011). On the other hand, if the strategy is not genuine, there is a risk of *greenwashing*, i.e., the deception of consumers about environmental performance or benefits related to the services (Delmas and Burbano, 2011).

The importance of how banks structure their services is illustrated by the combination of strategy and practice. When properly informing investors about their products and services, a bank can prevent suspicions of greenwashing (Zimmermann, 2019). This will further increase the trustworthiness of their sustainability strategy. Moreover, offering green products is aligned with the *credibility principle*, whereby words are supported by actions, and as such signaling the nature of the strategy to the stakeholders (Flammer, 2021). The depth of a sustainability strategy can as such be portrayed by the disclosure of what the capital raised is used for. Because such a strategy has an impact on identity and branding, it also impacts competitiveness through forcing sustainable development, improving transparency, and strengthening the relationship with stakeholders (Vilanova et al., 2009).

2.2 Credit and ESG ratings

For trustworthiness between banks and their stakeholders to increase, there must be information disclosure (O'Dwyer, 2005). One way to determine the quality of a bank's information disclosure and competitiveness, is through looking at its credit ratings. They are ratings given by a third party, based on the evaluation of a company's risk of default over its life cycle (Hau et al., 2013; Kim et al., 1993). For banks, credit ratings factor into the cost of debt, because of the information provided to the investors about the risk (Hau et al., 2013). Despite the rating agencies' different methodologies, investors rely on credit ratings, which emphasizes the effect of the ratings on banks' competitiveness (Ehlers and Packer, 2017). Still, credit ratings have been criticized for not being completely objective. The size and characteristics, both for the bank and credit rating agency, significantly influence the rating quality (Bolton et al., 2012; Hau et al., 2013). Furthermore, a conflict of interest is the relationship between the company being rated and the agency as the company pays for the service. As such, we can expect the credit ratings to be biased (Hau et al., 2013).

It has been assessed that rating agencies tend to favor good social and environmental performance (Attig et al., 2013). Thus, by receiving an ESG rating we expect this to add to the effect of a credit rating for the issuer, as well as to the total competitiveness of the bank (Hau et al., 2013). The ratings can be given based on positive ESG impact from the bank or be decided by the level of ESG risk connected to the bank and their operations, depending on the rating agency[2]. This again serves as a signal for investors of a lower default risk when the rating is positive (Scholtens and van't Klooster, 2019), especially since the connection between ESG and financial performance is usually exclusively positive (Friede et al., 2015).

For investors, disclosing information about a company's sustainability reduces information asymmetries (Cui et al., 2018a). Hence, when banks receive an ESG rating, it gives the investors more information regarding the bank and its sustainability profile. Still, banks which have paid for ratings, have chosen it themselves. Thus, the ratings can be a signal of the level of a credible ESG focus or it can perhaps be greenwashing (Flammer, 2021). This depends on how integrated sustainability is in the rating criterias (Escrig-Olmedo et al.,

[2]See ESG score methodologies from e.g., Sustainalytics, MSCI, Bloomberg and CICERO.

2019) and what the rating is based on. For instance, if the rating is based on disclosure, we expect it to differ from a rating based on the level of sustainability risk. Either way, ESG ratings reduce information asymmetries by disclosing the banks' sustainability profile.

2.3 The Norwegian green bond market

One signal about a bank's sustainability focus is the issuance of green bonds (Flammer, 2021). They are considered one of the most useful solutions for funding environmentally beneficial projects (Fatica et al., 2021; Migliorelli and Dessertine, 2019). The proceeds from green bonds are solely applied to finance or re-finance, partly or in full, projects with the purpose of improving environmental impacts and/or social welfare (ICMA, 2021). However, an issue related to green bonds is the lack of frameworks and guidelines (Tolliver et al., 2020). This makes it difficult to understand what is considered "green", and how companies can participate in reducing the effect of environmental concerns through green bonds (Tolliver et al., 2020). Still, the use of proceeds from green bonds is restricted to specific projects, verified by a third party as green (Flammer, 2021). For conventional bonds, the use of proceeds is *not* restricted, but can rather be directed towards a wider range of purposes (Hachenberg and Schiereck, 2018). As we will discuss later, this affects the risk profile of the two types of bonds, resulting in differences in pricing and which investors they attract.

The Norwegian green bond market is relatively small, accounting for approximately 6.7 % of the total bond market size (Stamdata, 2021). Banks are among the most active issuers of green bonds in Norway, accounting for about 58 % of the issued amount so far in 2021[3] (Stamdata, 2021). When banks raise capital in the green bond market, the proceeds are typically directed towards green buildings, renewable energy, and clean transportation[4]. Exactly what the proceeds are used for is disclosed in a green bond framework, made available for all potential investors (Maltais and Nykvist, 2020). This in turn may increase the investor base, motivating the issuance of green bonds.

There are several motives for issuing green bonds. First, aligned with the credibility principle, green bonds serve as a signal of banks' commitment to the green transition

[3]September 2021

[4]Gathered from Green Bond Frameworks of the banks in our sample and Migliorelli and Dessertine (2019)

(Flammer, 2021). Second, it could be a form of greenwashing or branding of an existing focus on sustainability. Third, financial benefits such as improved financial performance or reduced financial risk, could explain the issuance (Flammer, 2021; Maltais and Nykvist, 2020). Finally, one of the main drivers of the growth in the green bond market is the demand for sustainable investments, more precisely the demand from environmental profit-seeking investors looking to position their portfolios towards green securities (Chatzitheodorou et al., 2019; Tolliver et al., 2020).

2.4 Investors

As part of the motivation for issuing green bonds is investor demand and financial benefits, we reflect on the importance of investors for the banks. In the last years we have seen the increased focus on sustainability reflected in the amount of investors integrating sustainability into their investment decisions (Khan et al., 2016). The emergence of the green bond market illustrates how investor demand for green products is substantial. As such, green bonds can be perceived as a financial instrument through which investors can participate and contribute to the green transition (Flammer, 2021). This is recognized as *impact investing*, where investors intentionally address social and environmental challenges while pursuing financial returns (Bugg-Levine and Emerson, 2011).

Investing in green bonds is beneficial in various ways. The investor can follow the exact use of proceeds, and in a way select preferred projects (Hachenberg and Schiereck, 2018). As the product selection for sustainable investors is quite limited, green bonds also serve as an extra investment product. Additionally, when investing in specific projects through green bonds, the investor hedges financial risk associated with the project itself (Maltais and Nykvist, 2020). Furthermore, for investors who are conscious to the environment, green bonds are also attractive due to the issuers' improved environmental performance post issuance (Flammer, 2021). This is consistent with the argument that issuing green bonds is a credible signal of a commitment toward the environment, because issuing green bonds implies that the banks are committing to large future debt payments (Berk and DeMarzo, 2020; Flammer, 2021). Additionally, this benefits the issuer by attracting an investor base that values sustainability. Certain investors also expect higher returns from companies with environmental concerns, compared to those without (Chava, 2014),

suggesting that investors are able to drive the market and reward a sustainable focus.

To inform about the sustainable focus in banks, marketing is used as a tool, as well as being a factor that influences the introduction of green banking (Ahmad et al., 2013). It is problematic if the marketing of green bonds and banking, and thus a sustainability strategy, is perceived as greenwashing, damaging the bank's reputation (Vilanova et al., 2009). Reputational risk for banks can increase if they do not perform in alignment with investor preferences, or if they do not meet legal requirements (Ahmad et al., 2013). Hence, even though marketing works to appeal to investors, banks should be aware of the reputational risk that follows the two-way information flow with investors. To reduce this risk, banks can for instance use credit ratings support their green bond marketing, as investors have a considerable higher willingness to pay for certified sustainable investment securities than uncertified counterparts (Gutsche and Ziegler, 2019; Hau et al., 2013). This implies that green bonds should have a larger investor base due to their third party verification.

2.5 Green bond performance

Reaching out to a larger investor base should lead to better financial terms and lower cost of debt, in terms of lower coupon rates, when issuing green bonds (Flammer, 2021). However, there is no consensus on the pricing of green bonds. The existing literature on pricing differs depending on the primary or secondary market, risk profile and type of industry (See e.g., Hachenberg and Schiereck, 2018; Zerbib, 2019). In general, corporate bonds are priced at the time of issuance (Kricheff, 2012). Their coupon rate is determined by how the issuer is perceived, whereby a better issuer results in a preferred bond structure and consequently a lower coupon rate. Market characteristics such as supply, demand and general interest rate levels also affect the coupon pricing (Kim et al., 1993; Kricheff, 2012).

Green bonds, however, will be priced differently than their comparable conventional bonds, as their specified purpose indicates less information asymmetries. The information investors gain through the disclosure on specific projects, gives them an indication of the risk exposure associated, which again can be communicated to the investors' own stakeholders (Maltais and Nykvist, 2020). Furthermore, from the reduced information asymmetries, certain investors with pro-environmental preferences, are found to be willing

to accept weaker returns from green compared to conventional bonds (Zerbib, 2019). We refer to this difference in returns as a *greenium* because of the potentially lower cost of debt for green bond issuers. Green bonds with external reviews, as opposed to self-labeled green securities, and repeat issuers of green bonds can expect to receive such a greenium (Fatica et al., 2021). This applies to financial bonds in particular, making it possible for banks to benefit from focusing on sustainability (Zerbib, 2019).

Still, some research shows that there is no significant pricing advantage for green bonds compared to conventional bonds issued by financial institutions (Fatica et al., 2021; Flammer, 2021; Tang and Zhang, 2020). This illustrates that not all investors are willing to offer returns for sustainable investments. For example, Gutsche and Ziegler (2019) find that only investors with a strong environmental awareness are more willing to sacrifice returns. Moreover, even with pro-environmental preferences, investors do not seem to have a substantial impact on bond pricing (Zerbib, 2019). However, following a green bond issue announcement there are positive effects on stock returns, resulting in a better stock liquidity (Tang and Zhang, 2020). Thus, the bank itself will benefit from issuing green bonds. Finally, Hachenberg and Schiereck (2018) find that financial green bonds are better priced than their comparable non-green bonds in the *secondary market*. As such, banks should see long-term benefits of issuing green bonds.

2.6 Norwegian savings and commercial banks

As banks are among the most active issuers of bonds in Norway, we further examine bank characteristics that can have an effect on the coupon rate for bonds. We classify banks as being savings banks or commercial banks. The main difference between the two lies in the variation in ownership structure, management, and customer relationships (See e.g., Thue, 2014; Bøhren and Josefsen, 2007; Ostergaard et al., 2016). Commercial banks have external, corporate owners and are organized as joint stock companies, whereas savings banks' majority shareholder is a non-profit organization or a combination of members of the community (Thue, 2014). The savings bank model is built with the aim of giving back to the local communities, by contributing to commercial development and value creation (Finance Norway, 2018; Thue, 2014). For instance, savings banks are known to typically sponsor children's sports teams, choirs and school bands, and give grants to locals for

their contribution to the community[5]. Since the first establishment in Norway in 1822, this local commitment and the bank customer relationships have been the advantage of Norwegian savings banks (Thue, 2014).

Related to the difference in ownership structure of savings and commercial banks, it has been found that corporate ownership, found in commercial banks, is negatively associated with CSR performance (Dam and Scholtens, 2012). Savings banks, however, have a combination of non-corporate owners, whose purpose is to use the banks' profit on the local communities[6]. As such, the difference in ownership between commercial and savings banks is associated with a change in the use of proceeds and suggests that savings banks perform better in terms of CSR.

The different vantage points based on the ownership of the banks also influence financial performance. The corporate governance mechanism in commercial banks facilitate for such performance, but this is not an irreplaceable mechanism (Bøhren and Josefsen, 2007). Savings banks are for instance much more centered around all stakeholders, and are collectively governed by them (Ostergaard et al., 2016). This is reflected by the fact that commercial banks do not always outperform savings banks economically and sometimes even underperform significantly (Bøhren and Josefsen, 2007). However, larger banks are found to be more socially responsible than smaller banks, which in turn affect the financial performance positively due to better CSR scores (Cornett et al., 2016). Still, as addressed in section 2.2, rating agencies tend to favor larger banks and may as such be biased. The implication of these mechanisms is that smaller savings banks have a benefit over larger commercial banks in terms of customer relationships and the financial gains from them.

Customer relationship management (CRM) concerns how business processes relate to customers (Buttle, 2004). For banks, we can define this as the way they give back to their communities and provide them with financial services. Since savings banks have a long history and have thus implemented CRM a long time ago, they should see better financial performance than commercial banks (Krasnikov et al., 2009). Still, commercial banks should benefit in terms of cost and profit efficiencies from the fact that their newer history means they have implemented CRM more recently. However, it has been found that, in general, smaller banks manage relationship banking to a greater extent than

[5]Gathered from the websites of the different banks in our sample

[6]Gathered from the websites of the different foundations for the banks in our sample and Thue (2014)

larger commercial banks (Elyasiani and Goldberg, 2004; Udell, 2008). This is intuitive, considering that the employees and management are all strongly connected to the banks' local community (Thue, 2014).

Management itself can also be seen as an aspect explaining the difference between savings and commercial banks. Leadership can be seen as one of the main facets of CSR, in the sense that it is a voluntary action, going beyond what is legally required (Dam and Scholtens, 2012). However, a motive for engaging in CSR is the reduction of conflicts of interest between managers and stakeholders, or *agency conflict*. Although the risk of agency conflict applies to both bank types, we understand it to be a bigger issue for commercial banks, due to savings banks being governed by their stakeholders. Thus, savings banks are expected to be high-CSR. In turn, good CSR performance acts as a motivation for managers to voluntarily disclose additional information about the firm (Cui et al., 2018a). Voluntary disclosure is found to be associated with lower information risk, resulting in a lower cost of debt (Healy and Palepu, 2001). This accentuates how the local commitment of management in savings banks facilitates for reduced information asymmetries through CSR.

Despite the long history and positive traits of savings banks, Thue (2014) describes that savings banks are now facing pressures threatening their current structure. The connection to the community the banks are known for may be lost on the most local scale due to bank consolidation. The bank structure is converging with that of commercial banks, making them more similar, at the same time as globalization calls for larger international banks (Thue, 2014). However, trends change, and through the savings banks' presence in local communities, and their long history, we can expect that they will survive as long as the financial performance remains sufficient.

2.7 Hypotheses

Following our literature review, we reflect on how we can contribute to the current discussion on sustainable finance. Our aim is to assess whether sustainability-related characteristics of Norwegian banks have an effect on the coupon rate when issuing green and conventional bonds in the primary market. As such, we wish to provide Norwegian banks with a concrete analysis of which characteristics have an effect on their cost of debt.

Following our discussion, the bond coupon rate is determined by a number of factors, including how the issuer is perceived and demand from investors. We observe that issuing green bonds is related to the reduction of information asymmetries, thereby leading to reduced risk for the investor. Furthermore, characteristics such as adopting a sustainability strategy and receiving an ESG rating reflect the perception of the issuer, as well as disclose information on the sustainability focus of the bank. This information is also disclosed through the bank type, as savings and commercial banks differ in their ownership, management and CRM. Thus, we infer that these three characteristics, along with the issuance of green bonds, can help to answer our research question. We therefore define the three following hypotheses:

Hypothesis 1: *Being an early adopter of a sustainability strategy leads to a lower bond coupon rate at issuance*

Hypothesis 2: *Having a better issuer ESG rating leads to a lower bond coupon rate at issuance*

Hypothesis 3: *Savings banks attain a lower bond coupon rate at issuance compared to commercial banks on both green and conventional bonds*

3 Data and methodology

Following the literature review, we now examine the data and methodology for our analysis. We first elaborate on the data retrieval to give an understanding of how the data set is constructed. Then, we present descriptive statistics for the data. Finally, we discuss the various methods used to study the effect of different sustainability-related bank characteristics on the bond coupon rate. The methodology is given in three parts, divided by our three hypotheses, and includes presenting our assumptions and models.

3.1 Data

Our analysis is based on corporate bonds, both green and conventional, from 29 different banks operating in Norway[7]. Of the banks in our sample, 24 are savings banks, while five are commercial banks. Among the commercial banks we find some of the largest Norwegian banks, as well as some Norwegian subsidiaries of Nordic banks.

The bonds and their characteristics are extracted from Bloomberg's fixed income database, all denoted in EUR. We have included the banks' Norwegian subsidiaries, as 30-50 % of banks' house lending is gathered in their so called "Boligkredittforetak" (Bakke et al., 2010; Nordstrøm, 2018). This yields a total of 1,856 bonds issued from February 18th, 2015, until November 10th, 2021, and includes 42 green bonds, after data cleaning[8]. For each bond we have obtained information regarding *currency, maturity, maturity type, coupon, coupon type, amount issued, credit ratings* and *ESG ratings*[9].

We have retrieved some additional data for our hypotheses. First, to determine whether the banks have a sustainability strategy, we have researched them by looking at the banks' websites, annual reports, press releases and Bloomberg. Second, to analyze the effect of an ESG rating we have collected information on ratings from Bloomberg, MSCI, Sustainalytics and CICERO.

[7]See appendix A2 for complete list of banks included in the sample
[8]See appendix A1 for data cleaning
[9]See appendix A3 for explanation of variables

3.2 Descriptive statistics

To better understand the nature of the green and conventional bonds issued by the Norwegian banks in our sample, we present the data our analysis is based on. In Table 3.1, the evolution of green bonds issued by Norwegian banks is reported on a yearly basis.

Table 3.1: Green bonds issued by Norwegian banks

This table reports amount issued in green bonds (denoted in 1000 EUR) over the sampling period from February 2015 to November 2021.

Year	# Green bonds	Amount issued (1000 EUR)
2015	1	116,360
2016	0	0
2017	1	500,000
2018	2	2,000,000
2019	12	4,480,553
2020	10	2,221,879
2021	16	5,881,247
Total	42	15,200,040

We see that the amount of green bonds issued has increased noticeably the past six years, and in 2021 amount to nearly EUR 6 billion for 16 green bonds, compared to a single green bond issued with an amount of EUR 116 million in 2015. In total, approximately EUR 15 billion spread over 42 green bonds has been issued by Norwegian banks since 2015.

Next, in Table 3.2, we present the distribution of green and conventional bonds in our sample by bank type, including summary statistics. This allows us to note the variations in observations and form some expectations for our analysis.

Table 3.2: Summary statistics for bonds issued by Norwegian banks

This table reports number of bonds and issuers for conventional and green bonds, for both savings and commercial banks. It reports the mean of continuous bond characteristics, and the mode of categorical bond characteristics.

	Commercial banks		Savings banks		All banks	
	Conventional	Green	Conventional	Green	Conventional	Green
Summary						
# Bonds	1012	15	802	27	1814	42
# Issuers	5	4	24	10	29	14
Amount issued in 1000 EUR (mean)	236,964	566,370	85,095	248,315	169,820	361,906
Maturity (mean)	6.14	6.11	5.49	5.84	5.85	5.94
Maturity type (mode)	AT MATURITY	AT MATURITY	AT MATURITY	AT MATURITY	AT MATURITY	AT MATURITY
Coupon (mean)	1.75 %	0.71 %	1.39 %	0.68 %	1.59 %	0.69 %
Coupon type (mode)	FIXED	FIXED	FLOATING	FIXED	FLOATING	FIXED
Credit rating						
Ratings (1/0)	0.35	0.73	0.16	0.56	0.27	0.62

Note:
Ratings is a dummy variable equal to 1 if bonds have received ratings from Moody's, S&P and/or Bloomberg

As depicted, Norwegian banks issue a substantial amount of conventional bonds per green bond, with a total of 1,814 conventional vs 42 green bonds. 10 savings banks have issued most of the green bonds in our sample (27), although the five commercial banks have issued the most bonds in total (1,012 conventional and 15 green). Considering savings banks' local and stakeholder commitment, this is as expected, as green bonds can serve as a signaling effect of the commitment to the local community (Flammer, 2021). It should be noted that the commercial banks that are mainly large Nordic banks, could have issued more green bonds through their foreign subsidiaries than those included[10]. This implies that our analysis could have been based on more data, but they are excluded as we wish to analyze from a Norwegian perspective.

The amount issued is on average higher for green compared to conventional bonds, at respectively EUR 361 million and EUR 169 million. This is as expected because green bonds are project specific, presumably making it easier to raise the capital needed. Furthermore, the average maturity for conventional bonds is lower than for green bonds, at approximately 5.85 to 5.94 years, respectively. For commercial banks, however, conventional bonds have a higher maturity, at 6.14 years. This is surprising, as the funds raised in the green bond market are primarily project based and therefore have a more concrete end date. The maturity type is mostly "at maturity". Moreover, it is evident from our data that the bond coupons are on average smaller for green bonds by approximately 1 percentage

[10]See appendix A1 for data cleaning

point compared to conventional bonds, at respectively 0.69 % and 1.59 %, but that the difference is smallest for saving banks where the rates are 0.68 % and 1.39 %, respectively. This could be because investors are willing to sacrifice returns for green bonds, aligned with Zerbib (2019), or it could simply be a result of the difference in sample size for conventional vs green bonds, or any pricing factor. Furthermore, we observe that the coupon type is mostly "fixed". This is interesting, as the most common coupon type in general is "floating" (Kricheff, 2012). Finally, most of the conventional bonds in our sample have not received a rating from either Moody's, S&P or Bloomberg, as the average for ratings is closer to 0 than 1, while more green bonds have received a rating. This is as anticipated as bonds need to be reviewed by a third party to be classified as green.

Finally, we look at the firm level specifics of the banks in terms of having a sustainability strategy. Figure 3.1 and 3.2 display how ESG ratings and sustainability strategies are distributed between the banks in our sample.

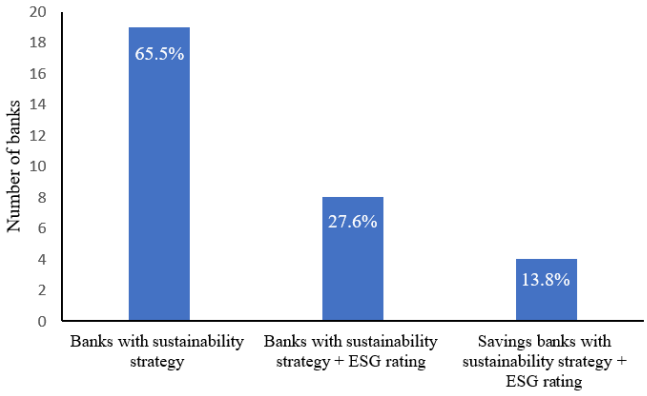

Figure 3.1: Bank characteristics distributed between the banks in our sample

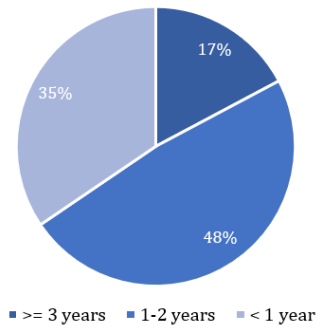

Figure 3.2: Years since implementation of sustainability strategy

Figure 3.1 highlights that 65.5 % of the banks pursue a sustainability strategy, while only 27.6 % of the same banks have received an ESG rating. This could for instance imply that it is harder for the smaller banks to get an ESG rating from the larger rating agencies. Moreover, only four savings banks (13.8 %) both have a sustainability strategy and have received an ESG rating[11]. Furthermore, as can be seen in Figure 3.2, 48 % of the banks have had a sustainability strategy[12] for one to two years. 17 % of the banks have had

[11]ESG rating from Sustainalytics. This will be explained further in the methodology
[12]The sustainability strategy will be explained further in the methodology

a sustainability strategy for more than or equal to three years, while 35 % of the banks recently implemented a sustainability strategy or do not currently have one.

3.3 Methodology

After looking at what our data is based on, and how it is distributed, we now move to the methodology for our thesis. Our analysis is based on cross sectional data, and we therefore make use of the OLS method (Wooldridge, 2013). We are interested in the effect of sustainability-related bank characteristics on the cost of capital for Norwegian banks. As presented in the introduction, there are several ways to study this effect, for instance through spread levels in the secondary market. However, we analyze the primary market to capture how the bond coupon rate is first priced at the time of issuance. Our dependent variable is therefore the *bond coupon rate*.

First, we investigate the direct effect of issuing a green bond on the coupon rate at issuance in the primary market for Norwegian banks. Then, we introduce the bank characteristics we are examining separately to estimate the direct effect of these characteristics on the bond coupon rate. In addition, we add an interaction term for the combination of the characteristic in question with the green label, to examine whether there is a greenium present as per the discussion in the literature review section 2.5. We include control variables and fixed effects to prevent bias in our analyses.

Since we are interested in the effect of bank characteristics on the bond coupon rate, we control for bond characteristics that if excluded would introduce omitted variable bias. We include a vector of control variables consisting of *bond maturity, amount issued*, and *certified*[13]. Furthermore, we have included three fixed effects in our analyses; *coupon type* fixed effects, *year* fixed effects and *currency* fixed effects. This allows us to identify the causal effect of our independent variables of interest holding all other factors fixed (Wooldridge, 2013). We include these specific fixed effects because they are categories by which we can group the bonds in our sample. We could have added fixed effects for *issuer* and *maturity type* as well, however, this introduces multicollinearity to our model[14].

[13]See appendix A3 for variable explanations
[14]See section 5 for robustness analysis

To commence our analysis, we first look at the direct effect of issuing a green bond on the coupon rate for Norwegian banks. This allows us to assess green bonds isolated before adding bank characteristics to our analysis. We estimate the following expression:

$$Coupon_{b,i} = \beta_1 GreenInstrument_b + \beta_2 C_b + \alpha_{ct} + \alpha_y + \alpha_c + \varepsilon \quad (1)$$

Where *GreenInstrument* is a dummy that takes the value 0 if bond b is a conventional bond, and 1 if bond b is a green bond; C is a vector of bond control variables consisting of *maturity, amount issued* and *certified*; α_{ct} are *coupon type* fixed effects; α_y are *year* fixed effects; α_c are *currency* fixed effects; and ε is the error term.

Following our initial regression, we use a matching methodology for the first two hypotheses, examining how the bond coupon rates differ depending on whether the issuer has a sustainability strategy or an ESG rating. We use the matching method because we can define these two bank characteristics as a "treatment", whereby the banks are either treated or not, and create pairs thereafter. Moreover, our sample is unbalanced as the number of treated and non-treated banks differs substantially. Alternatively, if we did not analyze matched pairs, we would assume our OLS estimates to be biased. Additionally, to ensure the robustness of our analysis, we conduct several tests on multicollinearity, endogeneity and homoskedasticity, presented in section 5. We have also clustered all our standard errors at the issuer level due to correlation across the banks in our sample (Thompson, 2011).

Matching is furthermore useful when examining the intrinsic value of a particular financial instrument (Zerbib, 2019). It allows us to distinguish the effect of the one property we are interested in of all characteristics that could explain the bond coupon rate. Hence, only the characteristics in question are considered when matching, and for instance whether the bonds are from the same issuer or not is insignificant. We match by including all variables available known to be related to both the treatment, and the outcome, to satisfy the assumption of ignorable treatment assignment for the matching method (Stuart, 2010). Because both of our treatments are results of unobservable choices from the banks, the matching includes the treatment itself and control variables. These variables are explained in the following when presenting the methodology for each hypothesis.

More specifically for the matching methodology, we have used *nearest neighbor propensity*

score matching (NN-PSM). The matched pairs are created using covariates that are similar, based on the distance between them (Cunningham, 2021). We use two nearest neighbor and thus oversampling, including more information to construct the counterfactual for each bonds. In effect, we find the closest match based on the two nearest neighbors of observations. This results in some increased bias but less variance (Caliendo and Kopeinig, 2008). This implies that the expected value of our estimator is not perfectly equal to the true parameter, but the estimator is however more efficient (Wooldridge, 2013). Then, we use propensity scores to match pairs of bonds. The propensity score is created using an estimated maximum likelihood model for the conditional probability of treatment (Cunningham, 2021). We choose *logit* as our distance because the treatment in question is binary. The matching based on propensity scores, along with the removal of observations that are far from the mean, ensures that our models are more balanced and less biased. Hence, no factors predict the treatment in question, other than the treatment itself.

Following the presentation of the overall methodology, we now discuss the choices we make for each hypothesis.

3.4 Sustainability strategies in Norwegian banks

The aim of our first hypothesis is to test whether having a sustainability strategy in a bank has an effect on the bond coupon rate for the issuer. Considering the correlation between a CSR strategy and competitiveness (Vilanova et al., 2009), we study whether there is an advantage for the banks that are early adopters of a sustainability strategy compared to the ones that recently implemented it[15]. Most of the banks appear to have a sustainability strategy to some extent, based on the information provided on their websites and in reports. However, what defines a sustainability strategy differs among the banks. We therefore create a common understanding of having a sustainability strategy by defining a proxy, which we now explain further.

3.4.1 Sustainability strategy proxy

We have limited a sustainability strategy to the implementation of green products, including green housing loans and deposits, or the issuance of green bonds. Offering green housing

[15]Time of adoption gathered from banks' websites and reports

loans means that a bank will claim a lower interest rate from borrowers on loans, for which the house fulfills some set requirements, for instance having a specific energy label. Furthermore, offering green deposits means that banks give a lower interest rate, in exchange for assuring the customer that the funds are directed towards green purposes[16]. We choose these products in combination with green bonds due to the signaling effects we expect them to have for investors and customers (Flammer, 2021). Moreover, we use green products in addition to green bonds as our proxy because of the smaller savings banks in our sample that have not issued any green bonds, yet their product offering may still reflect a sustainability strategy. Hence, the time of adoption for either of these green products determine the sustainability strategy and, thereby, our proxy variable.

Our proxy variable thus consists of two parts, one categorical and one continuous variable. The first is given by two categories; banks that have incorporated sustainability into their strategy more than, or equal to, 1 year ago, and banks that have incorporated sustainability into their strategy in the last year or not at all. The second part of the proxy is a continuous scale of years since the adoption of a sustainability strategy. This allows us to create matched pairs using the categorical variable and analyze the effect of being an early adopter using the continuous variable.

3.4.2 Nearest neighbor propensity score matching

To analyze the effect of having a sustainability strategy on the bond coupon rate, we create matched bond pairs based on whether the issuing bank has implemented a sustainability strategy or not. The propensity score is thus defined as the conditional probability of a bank having a sustainability strategy. The propensity score model assumes that the treatment in an analysis is randomly assigned (Cunningham, 2021). Because the adoption of a sustainability strategy is decided by the bank itself, the treatment is not random, but rather endogenous. Thus, we expect the implementation to be somewhat correlated with bank characteristics and exogenous factors, such as pressure from society or competitiveness with other banks (Cunningham, 2021). However, we ensure that the pairs are similar, apart from the sustainability strategy, by using control variables when finding the propensity scores, when matching, *and* when regressing the effect of the sustainability strategy on the coupon rate, in line with Angrist and Pischke (2015). Thus, we assume

[16]Information about green housing loans and deposits are found from banks' websites and reports

that the NN-PSM is still applicable to the analysis[17]. We employ bond characteristics as covariates for creating the matched pairs. The covariates include; *maturity, certified, green instrument* and *amount issued*. We control for *coupon type, maturity type*, *currency* and *year of issuance*.

To assess the quality of our created matched pairs, we present summary statistics for the unmatched and matched sample for our first analysis in Table 3.3 below:

Table 3.3: Summary statistics for the created matched pairs in hypothesis 1

The table shows the covariates included in the matching methodology before and after the matching. The covariates are bond characteristics. Continuous variables are measured in means (standard deviation) while categorical variables are measured in number of observations (percentage of sample).

	Unmatched			**Matched**		
Covariates	0, N = 328	1, N = 1,528	p-value	0, N = 328	1, N = 328	p-value
Maturity	5.5 (3.8)	5.9 (4.1)	0.052	5.47 (3.85)	5.19 (1.94)	0.24
Certified	43 (13%)	468 (31%)	<0.001	43 (13%)	116 (35%)	<0.001
GreenInstrument	3 (0.9%)	39 (2.6%)	0.070	3 (0.9%)	11 (3.4%)	0.031
AmountIssued	85,783,422 (166,821,685)	193,139,298 (357,275,564)	<0.001	85,783,422 (166,821,685)	239,379,017 (372,660,867)	<0.001

[2] Welch Two Sample t-test; Pearson's Chi-squared test

We observe that the unmatched sample includes 1,528 bonds from banks with a sustainability strategy, and 328 bonds from banks without such a strategy, while our matched sample consists of 328 bond pairs. Moreover, we note that the differences in means for the covariates for the unmatched sample are statistically significant. We see that the distance between the covariates decreases for *Maturity*, *Certified* and *GreenInstrument* after the matching, indicating a more balanced sample. The p-value has increased for *Maturity*, which implies that the difference in means is no longer statistically significant. Furthermore, the distance for *AmountIssued* increases, but this is acceptable because the other covariates have gotten closer, and because *AmountIssued* has no real impact on any of our analyses[18].

[17] See appendix A5 for distribution of propensity scores
[18] See section 4 for regression outputs

After creating the matched pairs, we estimate the following regression:

$$Coupon_{b,i} = \beta_1 SustainabilityIntro_i + \beta_2 GreenInstrument_b + \beta_3 SustainabilityIntro \times GreenInstrument_{b,i} + \beta_4 C_b + \alpha_{ct} + \alpha_y + \alpha_c + \varepsilon \quad (2)$$

SustainabilityIntro is the years since adoption of a sustainability strategy in bank i; *GreenInstrument* is a dummy that takes the value 0 if bond b is a conventional bond, and 1 if bond b is a green bond; *SustainabilityIntro*× *GreenInstrument* is the interaction term between the introduction of a sustainability strategy and green bonds; C is a vector of bond control variables consisting of *maturity, amount issued*, and *certified*; α_{ct} are *coupon type* fixed effects; α_y are *year* fixed effects; α_c are *currency* fixed effects; and ε is the error term.

3.5 Issuer ESG ratings

The aim of our second hypothesis is to test whether having an issuer ESG rating has an effect on the bond coupon rate for a bank. Considering that ESG ratings give investors more information, we examine whether there is an advantage of being ESG rated. More specifically, we study how a better ESG rating is associated with the bond coupon rate.

Based on the selection of ratings the banks have received, the largest concentration of ESG ratings is given by Sustainalytics, that have rated 10 banks in our sample. Out of these, we find all five commercial banks along with some of the larger savings banks. The ratings are received as a result of firm or investor request and are a paid service for listed companies (Sustainalytics, 2021). Sustainalytics rate companies by determining the size of their unmanaged ESG risk, and the rating is given on an ascending scale from 0-100, whereby a higher score indicates a higher risk. For the banks with a rating from Sustainalytics, the score has been included. We assume that no Norwegian banks at the present time will manage to obtain an ESG score of zero, based on ratings given by Sustainalytics, where the lowest score given to any bank is 4.2 (Sustainalytics, 2021). We therefore define non-rated banks as zero in our sample, which would imply no unmanaged ESG risk related to the bank in question. Even though this will introduce some bias to our estimation, we still find it appropriate, as all the Norwegian banks rated have gotten scores in the lower range of the scale (Sustainalytics, 2021).

As such, we have two parts to our ESG score analysis, denoted by one categorical and one continuous variable. The categorical variable is based on whether a bank has received an ESG rating from Sustainalytics or not. The continuous variable consists of the actual score from Sustainalytics. This allows us to create matched pairs using the categorical variable and analyze the effect of receiving a better score using the continuous variable.

3.5.1 Nearest neighbor propensity scores matching

To analyze the effect of an ESG rating on the bond coupon rate, we create matched bond pairs based on whether the bank has received an ESG score from Sustainalytics or not. We use propensity scores, where the score is defined as the conditional probability that a bank has been rated by Sustainalytics[19]. Again, the model assumes that the treatment in question is randomly assigned, but since Sustainalytics offer a paid service, this is not the case. Thus, we expect the ESG rating to be somewhat correlated with bank characteristics and exogenous factors. Therefore, we again ensure that the pairs are similar apart from the ESG score by using control variables when finding the propensity scores, when matching and when regressing the effect of the ESG score on the coupon rate (Angrist and Pischke, 2015). To create the matched pairs for estimating the effect of the ESG score on the bond coupon rate, we use bond characteristics as covariates for the matching. The covariates include: *maturity, certified, green instrument* and *amount issued*. We control for *coupon type, maturity type, currency* and *year of issuance*.

To assess the quality of our created matched pairs, we present summary statistics for the unmatched and matched sample for our second analysis in Table 3.4 below:

[19]See appendix A5 for distribution of propensity scores

Table 3.4: Summary statistics for the created matched pairs in hypothesis 2

The table shows the covariates included in the matching methodology before and after the matching. The covariates are bond characteristics. Continuous variables are measured in means (standard deviation) while categorical variables are measured in number of observations (percentage of sample)

	Unmatched			**Matched**		
Covariates	0, N = 541	1, N = 1,315	p-value	0, N = 541	1, N = 541	p-value
Maturity	5.1 (2.6)	6.2 (4.5)	<0.001	5.10 (2.62)	5.90 (3.77)	<0.001
Certified	61 (11%)	450 (34%)	<0.001	61 (11%)	229 (42%)	<0.001
GreenInstrument	16 (3.0%)	26 (2.0%)	0.20	16 (3.0%)	6 (1.1%)	0.031
AmountIssued	64,544,301 (120,136,062)	219,266,420 (380,416,812)	<0.001	64,544,301 (120,136,062)	392,529,903 (509,969,707)	<0.001

[2] Welch Two Sample t-test; Pearson's Chi-squared test

We see that the unmatched sample includes 1,315 bonds issued by banks that have received an ESG rating from Sustainalytics, and 541 bonds issued by banks that do not have a rating, while our matched sample consists of 541 bond pairs. Furthermore, we observe again that the differences in means for the covariates for the unmatched sample are statistically significant. We note that the difference for *Maturity* and *Certified* decreases after the matching, indicating a more balanced sample. However, we see that the p-value for *Maturity* and *Certified* implies that the difference in means is still significant. Furthermore, the difference in means increases for *AmountIssued* but we do not consider this to be an issue since it has no significant effect in our analyses and the other covariates have gotten closer. Thus, we consider the matched sample to be balanced enough, taking into account that the difference in the covariates is smaller. Moreover, the statistical significance may be because the number of banks with an ESG rating is considerably smaller than the ones without an ESG rating.

After creating the matched pairs, we estimate the following regression:

$$\begin{aligned} Coupon_{b,i} = \beta_1 Sustainalytics_i + \beta_2 GreenInstrument_b + \\ \beta_3 Sustainalytics \times GreenInstrument_{b,i} + \beta_4 C_b + \alpha_{ct} + \alpha_y + \alpha_c + \varepsilon \end{aligned} \tag{3}$$

Sustainalytics denotes the score given by Sustainalytics for bank i; *GreenInstrument* is a dummy that takes the value 0 if bond b is a conventional bond, and 1 if bond b is a green bond; *Sustainalytics*× *GreenInstrument* is the interaction term between the Sustainalytics score and green bonds; C is a vector of bond control variables consisting of *maturity, amount issued* and *certified*; α_{ct} are *coupon type* fixed effects; α_y are *year* fixed effects; α_c are *currency* fixed effects; and ε is the error term.

3.6 Bond coupon rates in savings vs commercial banks

The aim of our final hypothesis is to test whether bank type has an effect on the bond coupon rate at issuance. Through the differences between savings and commercial banks in terms of ownership structure, management and customer relationships, we investigate whether there is a benefit for savings banks in terms of a lower cost of debt. The OLS regression model is preferred in this case because it contributes to capture unobserved effects that bank type may have on the coupon pricing, without including further information about the bonds (Wooldridge, 2013).

We therefore estimate the following regression:

$$\begin{aligned} Coupon_{b,i} = \beta_1 BankType_i + \beta_2 GreenInstrument_b + \\ \beta_3 BankType \times GreenInstrument_{b,i} + \beta_4 C_b + \alpha_{ct} + \alpha_y + \alpha_c + \varepsilon \end{aligned} \tag{4}$$

BankType is a dummy that takes the value 0 if bank i is a commercial bank, and 1 if bank i is a savings bank; *GreenInstrument* is a dummy that takes the value 0 if bond b is a conventional bond, and 1 if bond b is a green bond; *BankType* × *GreenInstrument* is the interaction term between the bank type and green bond; C is a vector of bond control variables consisting of *maturity, amount issued* and *certified*; α_{ct} are *coupon type* fixed effects; α_y are *year* fixed effects; α_c are *currency* fixed effects and ε is the error term.

4 Analysis

We continue our thesis by applying the methodology to our data. In this section, we therefore present and discuss the results of our analyses. Based on the validity of our models, we assume that we can interpret our results causally[20]. The section is divided into four parts, divided by the initial analysis and our three hypothesis.

4.1 Green bonds

To commence our analysis, we regress green bonds on the coupon rate. This indicates whether a green bond is issued at a greenium, all else equal. The regression output is presented in Table 4.1. We analyze model (3) as this is the most reliable.

[20]See section 5 for the discussion on the robustness of our models

Table 4.1: Regression of green bonds on the bond coupon rate

This table reports the estimates for the green bonds on the bond coupon rate. The main variable of interest is defined as *GreenInstrument*. Model (1) captures the effect of the green bond label on bond coupon rate, model (2) adds controls for bond characteristics, while model (3) additionally includes fixed effects. Clustered standard errors are reported in parentheses.

	Dependent variable:		
	Coupon		
	(1)	(2)	(3)
GreenInstrument	−0.009***	−0.006***	−0.003**
	(0.002)	(0.001)	(0.002)
Maturity		0.001***	0.001***
		(0.0002)	(0.0001)
AmountIssued		−0.000***	−0.000***
		(0.000)	(0.000)
Certified		−0.006***	−0.006***
		(0.002)	(0.001)
Constant	0.016***	0.015***	0.007
	(0.002)	(0.002)	(0.005)
Coupon Type Fixed Effect	No	No	Yes
Year Fixed Effects	No	No	Yes
Currency Fixed Effects	No	No	Yes
Observations	1,856	1,856	1,856
R^2	0.013	0.094	0.350
Adjusted R^2	0.013	0.092	0.342
Residual Std. Error	0.012	0.011	0.009
	(df = 1854)	(df = 1851)	(df = 1835)
F Statistic	24.573***	47.920***	49.308***
	(df = 1; 1854)	(df = 4; 1851)	(df = 20; 1835)
Note:			*p<0.1; **p<0.05; ***p<0.01

We note that the coefficient for *GreenInstrument* is statistically significant at the 5 % level. We observe that when we add control variables and fixed effects, the coefficient decreases from -0.009 to -0.003. This implies that some omitted variable bias is excluded when controlling for more factors. Specifically, for a green bond, the coupon rate will be approximately 30 bps lower on average than for a conventional bond, all else equal.

Our findings are in line with the results of Baker et al. (2018), indicating that green bonds are priced at a lower coupon rate at issuance than conventional bonds. The lower rate indicates that investors are willing to sacrifice returns when investing in green bonds, and that banks are rewarded with a lower cost of debt (Flammer, 2021). However, our greenium of 30 bps is substantially higher than that of Baker et al. (2018), who found a greenium of 6 bps when examining 2,083 green U.S. municipal bonds and 19 green U.S.

corporate bonds issued between 2010 and 2016. The deviation in results can be justified by the difference in number of green bonds in our samples. In addition, the country and issuer type differs, making it reasonable to assume that there should be a pricing difference in the two analyses. Our results also deviate from Fatica et al. (2021), who could not find *any* pricing differences between green and conventional bonds issued by financial institutions. Consequently, we believe there is still omitted variable bias present in our analysis. Thus, it is of interest to look further into bank characteristics that potentially have an effect on the bond coupon rate, and as such reduce the omitted variable bias.

4.2 Sustainability strategies in Norwegian banks

After our initial regression, we assess the potential effect of having a sustainability strategy on the bond coupon rate. We study whether there is an early mover advantage of implementing a sustainability strategy and examine the interaction of such a strategy with the issuance of green bonds. The regression output is presented in Table 4.2. We analyze model (6) as this is the most reliable.

Table 4.2: Regression of a sustainability strategy on the bond coupon rate

This table reports both the unmatched (model (1) to (3)) and the matched (model (4) to (6)) estimates for a sustainability strategy on the bond coupon rate. Our independent variables of interest are defined as *SustainabilityIntro*, *GreenInstrument* and the interaction term *SustainabilityIntro*× *GreenInstrument* is given by *Interaction*. Clustered standard errors are reported in parentheses.

	Dependent variable:					
	Coupon					
	(1)	(2)	(3)	(4)	(5)	(6)
Interaction	0.0001	−0.0001	0.0001	−0.001***	−0.001**	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0002)
SustainabilityIntro	0.0003**	0.001***	0.0004***	0.002***	0.002***	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GreenInstrument	−0.009***	−0.006***	−0.003**	−0.011***	−0.008***	0.003
	(0.003)	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)
Maturity		0.001***	0.001***		0.001***	0.001***
		(0.0002)	(0.0002)		(0.001)	(0.001)
AmountIssued		−0.000***	−0.000***		−0.000	−0.000
		(0.000)	(0.000)		(0.000)	(0.000)
Certified		−0.007***	−0.006***		−0.009***	−0.009***
		(0.003)	(0.003)		(0.005)	(0.004)
Constant	0.015***	0.014***	0.006***	0.015***	0.011***	0.006**
	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)
Coupon Type Fixed Effects	No	No	Yes	No	No	Yes
Year Fixed Effects	No	No	Yes	No	No	Yes
Currency Fixed Effects	No	No	Yes	No	No	Yes
Observations	1,856	1,856	1,856	656	656	656
R^2	0.016	0.103	0.352	0.085	0.194	0.478
Adjusted R^2	0.014	0.100	0.344	0.080	0.186	0.459
Residual Std. Error	0.012	0.011	0.009	0.012	0.011	0.009
	(df = 1852)	(df = 1849)	(df = 1833)	(df = 652)	(df = 649)	(df = 633)
F Statistic	9.754***	35.364***	45.311***	20.109***	25.986***	26.299***
	(df = 3; 1852)	(df = 6; 1849)	(df = 22; 1833)	(df = 3; 652)	(df = 6; 649)	(df = 22; 633)
Note:						*p<0.1; **p<0.05; ***p<0.01

We observe that the coefficient for *SustainabilityIntro* is statistically significant at the 5 % level. This indicates that for an additional year since a bank has adopted a sustainability strategy, the coupon rate for a conventional bond is approximately 10 bps higher on

average, all else equal. The coefficient for *GreenInstrument* is not statistically significant. This indicates that the coupon rate for green bonds is not statistically different from the coupon rate for conventional bonds, when issued by banks that do not have a sustainability strategy. The interaction term is not statistically significant either. This implies that the coupon rates of green bonds issued by banks with a sustainability strategy are not statistically different from those of green bonds issued by banks without a sustainability strategy, or conventional bonds of banks that do have a sustainability strategy. However, when looking at regression (5), the matched sample excluding fixed effects, those coefficients *are* statistically significant. We therefore explore which fixed effects impact our results[21]. We observe that when we include year fixed effects, the significance level for our coefficients do not change. However, when including *coupon type* and *currency* fixed effects, the coefficients for *GreenInstrument* and the interaction term lose their statistical significance.

Counterintuitive to our hypothesis, the results show that banks pay a higher coupon rate for each additional year since the implementation of a sustainability strategy. We therefore infer that banks do not benefit from being early adopters of a sustainability strategy, at least not in the bond market. Our results can be explained by the fact that not all investors are willing to sacrifice returns for sustainable investment products (Gutsche and Ziegler, 2019). Another explanation can be the industry of choice in our analysis. Investors may prefer to invest in corporations with concrete impact on the environment when greening their portfolios, while banks mostly have an indirect impact through financing. Thus, investors may not be able to identify a direct link between banks and specific green investment projects (Fatica et al., 2021). It is therefore interesting that the coefficients for *GreenInstrument* and the interaction term are not statistically significant, considering that green bonds are project specific and provide investors with information about the concrete impact of the funds. Thus, it is evident that the isolated effects of issuing green bonds, as seen in the initial analysis, and having a sustainability strategy are significant. However, together they do not give an advantage to the bank as a green bond issuer.

Furthermore, we consider the implementation of a sustainability strategy through introducing green products to be associated with disclosure, and thus contribute to the reduction of information asymmetries between a bank and its investors. As a result

[21] Illustrated in Table A6.1 in the Appendix

of the improved transparency for stakeholders, in line with Vilanova et al. (2009), we expect the banks to pay lower bond coupon rates. However, since this is not the case, we question the strength of our defined proxy. A concern is that it is based on large variations in conditions and use of proceeds. This is as a result of the different product types and different banks, and thus their underlying strategies and frameworks. For instance, though green housing loans appear to be a benefit, "good" bank customers can obtain these interest rates without borrowing through green terms. Moreover, capital raised through green bonds can for instance be used to finance a pool of green housing loans, and not necessarily specific green projects. Nevertheless, even though the green products serve as a proxy for a sustainability strategy in our analysis, offering them do not eliminate the risk of the bank practicing greenwashing.

In sum, our findings show a statistically significant effect of an additional year since implementing a sustainability strategy on the coupon rate for conventional bonds. We see a *higher* bond coupon rate at issuance, and as such do not find an advantage for banks that are early adopters of a sustainability strategy. We therefore reject our first hypothesis.

4.3 Issuer ESG ratings

To continue our analysis, we examine the potential effect of receiving an ESG rating on the bond coupon rate. We assess whether there is a benefit of receiving a better ESG score and investigate the interaction of such a score with the issuance of green bonds. The regression output is presented in Table 4.3. We analyze model (6) as this is the most reliable.

Table 4.3: Regression of an ESG score on the bond coupon rate

This table reports both the unmatched (model (1) to (3)) and the matched (model (4) to (6)) estimates for an ESG score on the bond coupon rate. Our independent variables of interest are given as *Sustainalytics*, *GreenInstrument* and the interaction term *Sustainalytics*× *GreenInstrument* is given by *Interaction*. Clustered standard errors are reported in parentheses.

	Dependent variable:					
	Coupon					
	(1)	(2)	(3)	(4)	(5)	(6)
Interaction	−0.0003***	−0.0002**	−0.0001	−0.0003***	−0.0001	0.0001
	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Sustainalytics	0.0001***	0.0002***	0.0002***	0.0001***	0.0003***	0.0002***
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.00004)
GreenInstrument	−0.005***	−0.003**	−0.001	−0.005***	−0.003**	−0.0004
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
Maturity		0.001***	0.001***		0.001***	0.001***
		(0.0003)	(0.0002)		(0.0003)	(0.0002)
AmountIssued		−0.000***	−0.000***		−0.000***	−0.000***
		(0.000)	(0.000)		(0.000)	(0.000)
Certified		−0.007***	−0.006***		−0.007***	−0.005***
		(0.003)	(0.002)		(0.003)	(0.002)
Constant	0.014***	0.012***	0.001	0.014***	0.012***	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Coupon Type Fixed Effects	No	No	Yes	No	No	Yes
Year Fixed Effects	No	No	Yes	No	No	Yes
Currency Fixed Effects	No	No	Yes	No	No	Yes
Observations	1,856	1,856	1,856	1,082	1,082	1,082
R^2	0.029	0.124	0.374	0.029	0.157	0.496
Adjusted R^2	0.027	0.121	0.366	0.027	0.152	0.486
Residual Std. Error	0.011	0.011	0.009	0.011	0.011	0.008
	(df = 1852)	(df = 1849)	(df = 1833)	(df = 1078)	(df = 1075)	(df = 1059)
F Statistic	18.159***	43.701***	49.750***	10.809***	33.290***	47.430***
	(df = 3; 1852)	(df = 6; 1849)	(df = 22; 1833)	(df = 3; 1078)	(df = 6; 1075)	(df = 22; 1059)

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

We note that the coefficient for *Sustainalytics* is statistically significant at the 1 % level. This implies that for a one point increase in the ESG score given by Sustainalytics, the coupon rate for a conventional bond is approximatly 2 bps higher on average, all else equal.

We see again that whether the bond is green does not have a statistically significant effect on the coupon rate, and neither does the interaction term. This implies that the coupon rate for green bonds is not statistically different from the coupon rate for conventional bonds, when issued by banks that are not rated by Sustainalytics. Furthermore, the coupon rates of green bonds issued by banks with a Sustainalytics rating are not statistically different from those of green bonds issued by banks without a Sustainalytics rating, or conventional bonds of banks that have a Sustainalytics rating. From model (4) we see that all coefficients are statistically significant, but that when adding controls and fixed effects, the coefficients for *GreeenInstrument* and the interaction term lose their statistical significance. We examine which fixed effects impact our results[22], and note that when adding *coupon type* fixed effects, the coefficient for *GreenInstrument* is no longer significant.

Because Sustainalytics' ESG score is a measure of risk, each extra point denotes a higher risk associated with the bank in question. Thus, we can infer that if a bank has a higher ESG score, i.e., is measured to a higher risk, the coupon rate for a conventional bond is on average higher. This is as anticipated, because investors expect a higher reward for more risk. Our findings are in line with Scholtens and van't Klooster (2019) who provide evidence that better ESG ratings of banks are associated with lower default risk. For our analysis, this equals to a lower ESG score.

Our results can be explained by the correlation between credit ratings, CSR and information disclosure (Attig et al., 2014; Cornett et al., 2016; Cui et al., 2018a). We infer that high CSR firms attract both impact investors and media interest, which in turn increases the demand for information. As credit and ESG ratings reflect the quality of information disclosure, information asymmetries are reduced and consequently investors can be willing to accept a lower bond coupon rate for better rated banks. This is also supported by the improved issuer perception, as discussed in section 2.7. Because we find significant effects of ESG scores on the coupon rate for conventional bonds, we perceive that the scores do in fact reduce information asymmetries. Since green bonds are project specific, and thus provide investors with more information, we expect that an ESG score on top of that contributes to the reduction of information asymmetries. However, we see that, similar to our first analysis, this is not the case. We therefore infer that there is no additional

[22]Illustrated in Table A7.1 in the appendix

advantage of issuing green bonds for an ESG rated bank.

In addition to the ESG scores, the investment product in question must also be considered in dermining the bond coupon rate. Effectually, banks only benefit from lower ESG scores from Sustainalytics when issuing conventional bonds. For the banks in our sample, however, this is not necessarily a concern, as the majority of the bonds they issue are at present conventional. This suggests that the most important aspect is not that the bond in question is labeled green, but rather what signaling effect the ESG rating represents. This signaling effect would be stronger if we had seen a significant effect of the combination of an ESG score and a green label, as per Flammer (2021).

However, the rated banks are mostly larger commercial and savings banks. Aligned with Hau et al. (2013), we therefore expect a rating bias to be present in our sample, as rating agencies tend to assign more favorable ratings to larger banks. Furthermore, we define the non-rated banks to have a Sustainalytics' score of 0. This indicates no unmanaged ESG risk related to the bank. As such, the sample is presumably tilted towards an unusual number of low-risk banks.

Overall, we find a slightly higher coupon rate for banks with a higher ESG score from Sustainalytics. Hence, a good ESG rating, meaning a low Sustainalytics' score, is beneficial for banks as bond issuers. First, it indicates that a sustainable focus is related to lower risk. Secondly, it can be an indication that investors are willing to offer returns as a result of reduced information asymmetries. As such, banks can reduce their cost of debt and benefit from having a sustainable focus. We therefore confirm our hypothesis that having a better ESG rating leads to a lower bond coupon rate, although only for conventional bonds.

4.4 Coupon rates in savings vs commercial banks

To conclude our analysis, we assess the potential effect of being a savings or commercial bank on the bond coupon rate. We examine whether there is an advantage of being a savings bank and investigate the interaction of the bank type with the issuance of green bonds. The regression output is presented in Table 4.4. We analyze model (3) as this is the most reliable.

Table 4.4: Regression of bank type on the bond coupon rate

The table reports the estimates for bank type on the bond coupon rate. Our independent variables of interest are given as *BankType*, *GreenInstrument* and the interaction term (*BankType*× *GreenInstrument*) is given by *Interaction*. Clustered standard errors are reported in parentheses.

	Dependent variable:		
	Coupon		
	(1)	(2)	(3)
Interaction	0.003	0.003	0.001
	(0.005)	(0.004)	(0.003)
BankType	−0.004***	−0.005***	−0.006***
	(0.003)	(0.003)	(0.003)
GreenInstrument	−0.010***	−0.006***	−0.002
	(0.005)	(0.002)	(0.002)
Maturity		0.001***	0.001***
		(0.0003)	(0.0002)
AmountIssued		−0.000***	−0.000***
		(0.000)	(0.000)
Certified		−0.007***	−0.007***
		(0.003)	(0.002)
Constant	0.017***	0.018***	0.008***
	(0.003)	(0.003)	(0.002)
Coupon Type Fixed Effects	No	No	Yes
Year Fixed Effects	No	No	Yes
Currency Fixed Effects	No	No	Yes
Observations	1,856	1,856	1,856
R^2	0.036	0.138	0.384
Adjusted R^2	0.034	0.135	0.377
Residual Std. Error	0.011	0.011	0.009
	(df = 1852)	(df = 1849)	(df = 1833)
F Statistic	22.874***	49.255***	51.964***
	(df = 3; 1852)	(df = 6; 1849)	(df = 22; 1833)
Note:			*p<0.1; **p<0.05; ***p<0.01

We observe that the coefficient for *BankType* is statistically significant at the 1 % level. This indicates that the bond coupon rate will approximately be 60 bps lower on average for a conventional bond issued by a savings bank compared to a conventional bond issued by a commercial bank, all else equal. Again, the coefficients for *GreenInstrument* and the interaction term are not statistically significant. This implies that the coupon rate for green bonds is not statistically different from the coupon rate for conventional bonds when issued by a commercial bank. Furthermore, the coupon rate for a green bond issued by a savings bank is not statistically different from the coupon rate of a green bond issued by a commercial bank, or from the coupon rate for a conventional bond issued by a commercial bank. We note that the coefficient for *GreenInstrument* is statistically significant before adding bond fixed effects to our regression analysis. Again, the coefficient loses its statistical significance when we add *coupon type* fixed effects[23].

Our results indicate that savings banks are rewarded with a lower cost of debt when issuing conventional bonds. This can be explained by the ownership structure in savings banks and how it is related to financial performance. Good performance is associated with lower risk, which in turn implies that investors should be willing to accept a lower bond coupon rate. As such, our results are in line with the findings of Bøhren and Josefsen (2007) who denote that savings banks, because they are governed by their stakeholders, often outperform commercial banks. In our analysis, this is reflected in the lower coupon rate for conventional bonds.

Furthermore, the owners of savings banks determine how profit is used on the local communities of the banks. As the profits are typically aimed at other aspects of ESG than the environment, such as children's choirs and school bands, we infer that these characteristics are the savings banks' strength. Additionally, how the savings banks contribute to their local communities is integrated in their strategies, highlighting their purpose to create long-term value on the community level. This is further emphasized by the non-significant coefficient for the interaction term in our model. Moreover, this serves as a credible signal, per Flammer (2021), and is reflected in a lower coupon rate for conventional bonds.

Moreover, our findings are aligned with the research of Elyasiani and Goldberg (2004),

[23]Illustrated in Table A8.1 in the appendix

Udell (2008) and Krasnikov et al. (2009). They find that certain characteristics, such as CRM and relationship banking, have a positive impact on financial performance in smaller banks. Thus, the lower coupon rate on conventional bonds for savings banks can be further explained by their genuine focus on CRM. This strengthens the argument that the bank type has a greater impact on the coupon rate than bond characteristics, such as a green label. On the other hand, our findings are not consistent with Cornett et al. (2016) whose results indicate that bigger banks engage in responsible activities to a higher degree than smaller banks and are rewarded by increased financial performance. Hence, we question whether the different types of responsible activities pursued by the banks can be an explanatory factor, whereby the responsible acitivites for Norwegian savings banks are community oriented, as documented by their lower coupon rate.

Furthermore, because savings banks are stakeholder oriented, their managers are more willing to voluntarily disclose information about the banks' operations than managers of commercial banks (Cui et al., 2018a). Our results are therefore as expected, because this type of voluntary disclosure is associated with lower cost of debt (Healy and Palepu, 2001). By disclosing their stakeholder oriented activities, such as how profits are distributed to contribute to local value creation, we infer that managers of savings banks facilitate for reduced information asymmetries. Consequently, this will allow them to attract more investors, increasing their sustainability-oriented investor base.

In sum, it is beneficial to have the qualities associated with a typical Norwegian savings bank. We find a statistically significant greenium given to savings banks when issuing conventional bonds, which can be explained by the bank's management, ownership structure and CRM. As such, we confirm our hypothesis that savings banks pay *lower* bond coupon rates than commercial banks, although only for conventional bonds.

5 Robustness

After presenting our results, we investigate the robustness of our models. We do this to test the assumptions for OLS, and hence determine if the results from our regressions can be interpreted causally. We assume that the normality assumption is fulfilled because of our sample size. We therefore first investigate whether we have problems with multicollinearity in our analyses. Second, we discuss possible endogeneity, before we finally address homoskedasticity.

5.1 Multicollinearity

We test for multicollinearity to determine if there is a linear relationship between the independent variables in our analyses. To detect any correlation among the variables, we conduct *variation inflation factor* (VIF) tests[24]. We find that if we had included both *maturity type* and *maturity* in our analyses, the VIF would increase to such a degree that multicollinearity would be present in our analyses. To solve this issue, we removed *maturity type* from our regressions. Because we would only include both variables as control variables, we find this does not decrease the quality of our analysis.

Furthermore, we examine the categorical variables used in our analyses, because the choice of reference category for a set of dummy variables may affect the degree of multicollinearity in the data (Wissmann and Toutenburg, 2007). We note that none of our categorical variables display multicollinearity values and can therefore infer that the reference categories contain enough observations to balance the analyses.

[24]We have used $GVIF^{(1/(2*Df))}$, where Df is the number of coefficients in the sample. We do this to make the VIFs comparable across dimensions and to reduce them to a linear measure

Table 5.1 shows the degree of collinearity between the independent and control variables for each of our models, represented by the VIF:

Table 5.1: VIF test for multicollinearity

M denotes the matched pair models for the first and second analysis

Model	0	1	1M	2	2M	3
SustainabilityIntro		1.247	2.258			
SustainabilityIntro:GreenInstrument		1.926	1.763			
Sustainalytics				1.296	2.181	
Sustainalytics:GreenInstrument				1.586	1.178	
BankType						1.390
BankType:GreenInstrument						1.693
GreenInstrument	1.037	1.934	1.754	1.610	1.209	1.698
Maturity	1.179	1.974	1.205	1.180	1.162	1.182
AmountIssued	1.186	1.193	1.901	1.192	1.437	1.205
Certified	1.282	1.300	1.611	1.284	1.378	1.286
CouponType	1.054	1.057	1.145	1.058	1.212	1.056
Year	1.024	1.027	1.036	1.025	1.030	1.027
Currency	1.065	1.087	1.372	1.096	1.241	1.109

Note:
Values > 10 indicate multicollinearity

5.2 Endogeneity

The assignment of treatment for banks regarding a sustainability strategy and ESG rating is not random. Both the implementation of a sustainability strategy and having an ESG rating stems from management and/or investors. Where and how these decisions take place is unobservable, and we thus have a sample selection bias and omitted variable bias (Heckman, 1979). To reduce the bias in our models, we introduce control variables and analyze our independent variables using propensity score matching. By doing this, we consider endogeneity to be solved.

5.3 Homoskedasticity

We assume that since we are only using linear models, it is sufficient to determine whether we have heteroskedasticity in our analyses through using Breusch-Pagan tests (Breusch and Pagan, 1979). Our results show that we have heteroskedasticity in all our analyses[25].

[25]The Breusch-Pagan tests all have a low p-value and the null hypothesis for homoskedasticity is therefore rejected

However, our regressions can still be interpreted causally, but we do not know how precise our estimators are. The heteroskedasticity could stem from the fact that many bonds are issued by the same bank. To deal with this in our models, we cluster our standard errors on issuer-level.

We therefore conclude that our results can be interpreted causally, based on the conducted robustness tests.

6 Conclusion

We find evidence that sustainability has a causal effect on the coupon rate for conventional bonds issued by Norwegian banks. This evidence is documented using standard and matched pairs OLS, controlling for bond characteristics and adding fixed effects. Our findings are in line with our second and third hypotheses, implying that banks with better ESG ratings and savings banks characteristics pay a *lower* coupon rate when issuing conventional bonds. However, our results are not consistent with our first hypothesis, implying that banks that are early adopters of sustainability strategies pay a *higher* coupon rate when issuing conventional bonds. Overall, we see that the combination of these sustainability-related characteristics with the issuance of green bonds is insignificant. This indicates that banks should direct their focus towards these characteristics to benefit from a lower cost of debt when contributing to the green transition.

7 Proposed avenues for further research

Our quantitative analysis of the primary market isolated is not adequate to conclude on investors' preferences. To study green bonds and the bond market for Norwegian banks further, it would therefore be interesting to examine these investor preferences on a larger scale. One way to do this would be to look at the oversubscription of green bonds compared to conventional bonds at issuance. As discussed in the literature review, more investor interest can contribute to lower the bond coupon rate. In 2018, the Climate Bonds Initiative (2019) reported that 72 % of green bonds issued that year achieved a higher oversubscription than their equivalent conventional bonds after only one day. As such, it would be of interest to look further into to what extent investors are demanding green bonds from banks.

Another avenue for further research would be to look at green loans offered by the banks. Many Norwegian banks have already implemented green loans, for houses and cars, into their product offering and thus provide lower interest rates to loans where the products meet specific requirements. One could therefore examine whether offering these types of loans improve customer relationships and create long-term value for the bank. In addition, one could measure the marketing effect of offering these loans. Finally, one could determine whether there are any financial benefits.

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Appendix

A1 Data cleaning

For each bond we obtain issuer, coupon, coupon type, issue date, maturity date, maturity type, BBG composite, currency, ESG rating, Moody's rating, S&P rating, green instrument, and amount issued from the fixed income database in Bloomberg. BBG composite and ESG rating are ratings given by Bloomberg for bonds, and green instrument denotes which bonds Bloomberg has defined as green. All bond prices are denominated in EUR, but we have included information about the currency in which the bonds were issued. We download data for the period 17/02/2015 – 10/11/2021 and include all banks denoted in appendix section A2. The time period is selected based on the availability of data in Bloomberg.

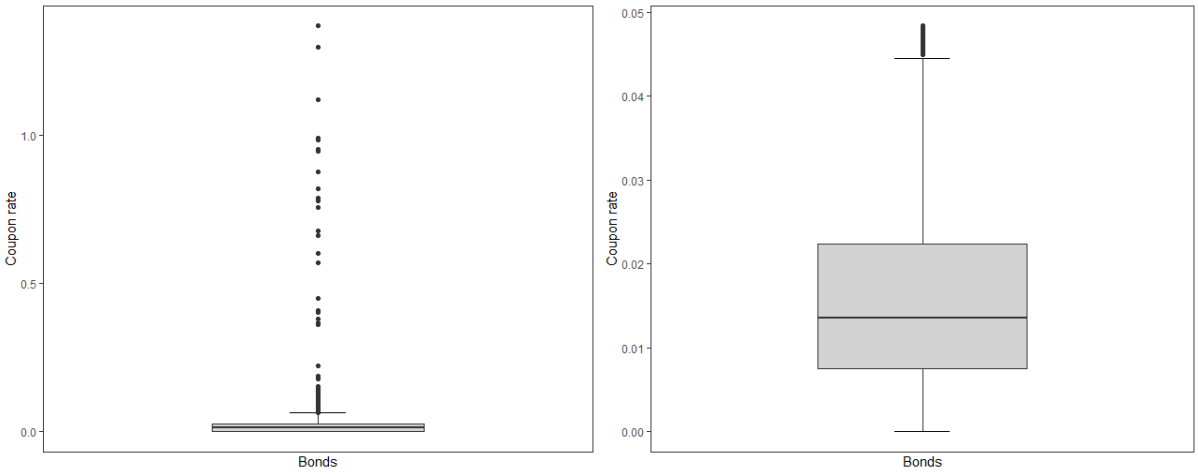
All foreign subsidiaries are removed from the sample, while the Norwegian subsidiaries are classified according to their bank. Maturity is defined as the difference between the maturity date and the issue date. All bonds issued in currencies other than USD, EUR, SEK, NOK, GBP, and DKK are removed for simplicity. To test our hypothesis on whether there is a difference in the bond coupon rate as a result of bank type, the banks are denoted as savings bank or commercial bank.

Bonds may receive both ratings and certifications. We determine a bond to be certified based on ratings given by Moody's, S&P and Bloomberg. A bond is in our sample thus denoted as *certified* if it has received a rating by one or more of the beforementioned agencies. To reflect this classification, we define a dummy in our sample. Whether a bond is certified is independent from the bond being classified as green and is only a tool for providing more information on the bond.

Furthermore, we remove observations in our sample that clearly differ from the rest of the bonds. First, we remove bonds with negative or large coupon rates. Second, we remove perpetual bonds. Last, we remove bonds that are classified as zero-coupon bonds because their coupon rate will not be affected by the variables we are testing. Moreover, zero-coupon bonds are common internationally but less so in Norway (Norges Bank, 2018).

The following boxplots display the distribution of observations before and after removing

the most significant outliers.



(a) Before **(b)** After

Figure A1.1: Boxplots before and after removing outliers

A2 Banks included in the sample

Banks are selected based on bank type, location, size and availability in Bloomberg.

Danske Bank	SB1 Gudbrandsdal	SB1 Søre Sunnmøre
DNB	SB1 Hallingdal Valdres	SB1 Sørøst-Norge
Fana Sparebank	SB1 Helgeland	SB1 Østfold & Akershus
Handelsbanken	SB1 Lom og Skjåk	SB1 Østlandet
Haugesund Sparebank	SB1 Modum	Sparebanken Møre
Hegra Sparebank	SB1 Nordmøre	Sparebanken Sogn og Fjordane
Jæren Sparebank	SB1 Nord-Norge	Sparebanken Sør
Nordea	SB1 Ringerike Hadeland	Sparebanken Vest
Sandnes Sparebank	SB1 SMN	Østre Agder Sparebank
Sbanken	SB1 SR-Bank	

A3 Variable explanation

Issuer: Bank identifier

BankType: Dummy where 1 = savings bank and 0 = commercial bank

CouponType: Coupon type as given by Bloomberg

Coupon: Bond coupon rate given by Bloomberg

IssueDate: Date of bond issuance

MaturityDate: Date of bond maturity

Maturity: MaturityDate – IssueDate

MaturityType: Maturity type as given by Bloomberg

Certified: Dummy where 1 = bond has received rating from Moody's, S&P and/or Bloomberg, and 0 = no rating

Sustainalytics: ESG score given by Sustainalytics

Currency: Original issuance currency

GreenInstrument: Dummy where 1 = green bond and 0 = conventional bond

AmountIssued: Bond issue amount, denoted in EUR

SustainabilityIntro: Proxy variable for year since adoption of sustainability strategy

A4 Correlation matrix

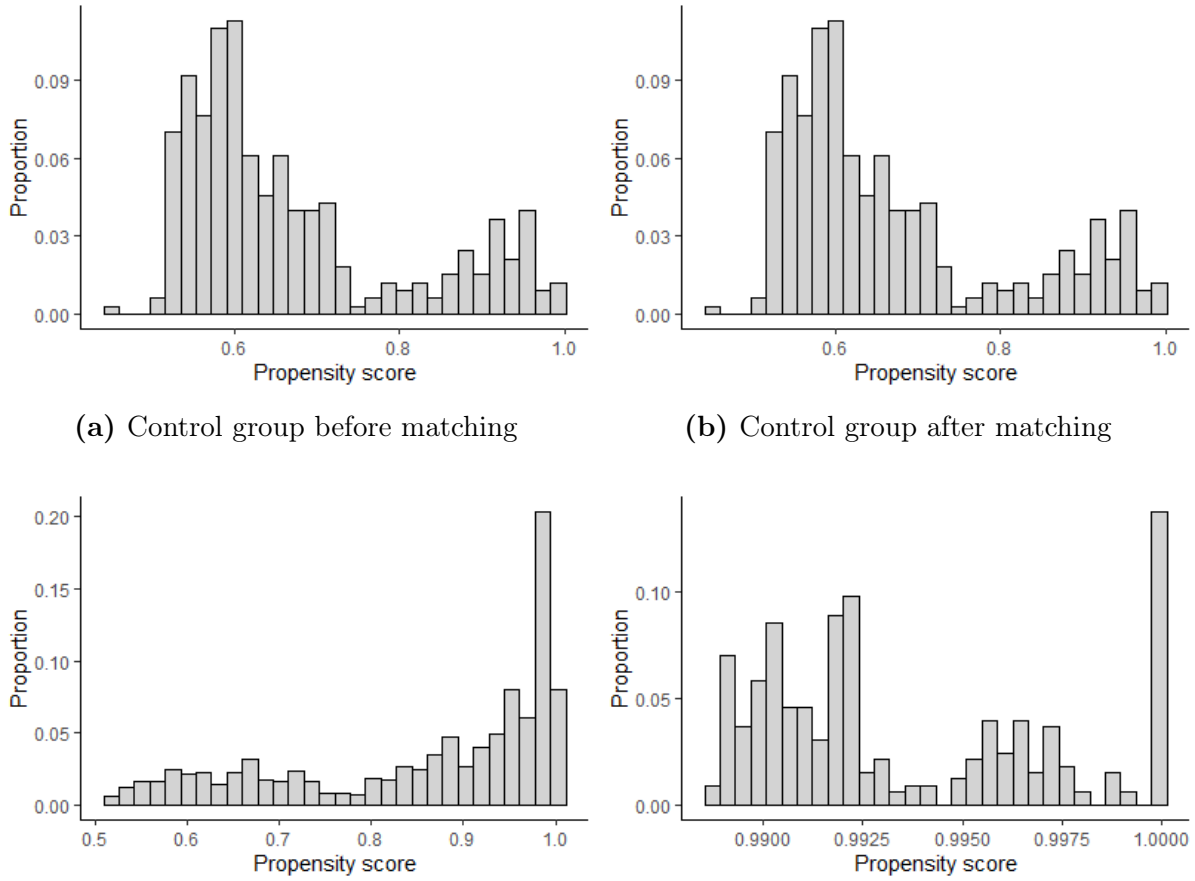
Table A4.1: Correlation matrix: all variables

The table presents the correlation matrix for all dependent, independent and control variables.

	Coupon	Green	SustIntro	Sustainalytics	BankType	Maturity	Amount	Certified
Coupon	1.0000000							
Green	-0.1143716	1.0000000						
SustIntro	0.0466743	0.0259706	1.0000000					
Sustainalytics	0.1246623	-0.0443112	0.3602300	1.0000000				
BankType	-0.1557579	0.0600503	-0.6470157	-0.7783843	1.0000000			
Maturity	0.1135734	0.0030874	0.2057646	0.0353584	-0.0783727	1.0000000		
Amount	-0.1890827	0.0855126	0.1747547	0.1891106	-0.2252557	-0.0707945	1.0000000	
Certified	-0.2073506	0.1170908	0.2896551	0.1700350	-0.2068248	0.3544510	0.4085204	1.0000000

A5 Nearest neighbor propensity score matching

Propensity score distribution before and after matching H1



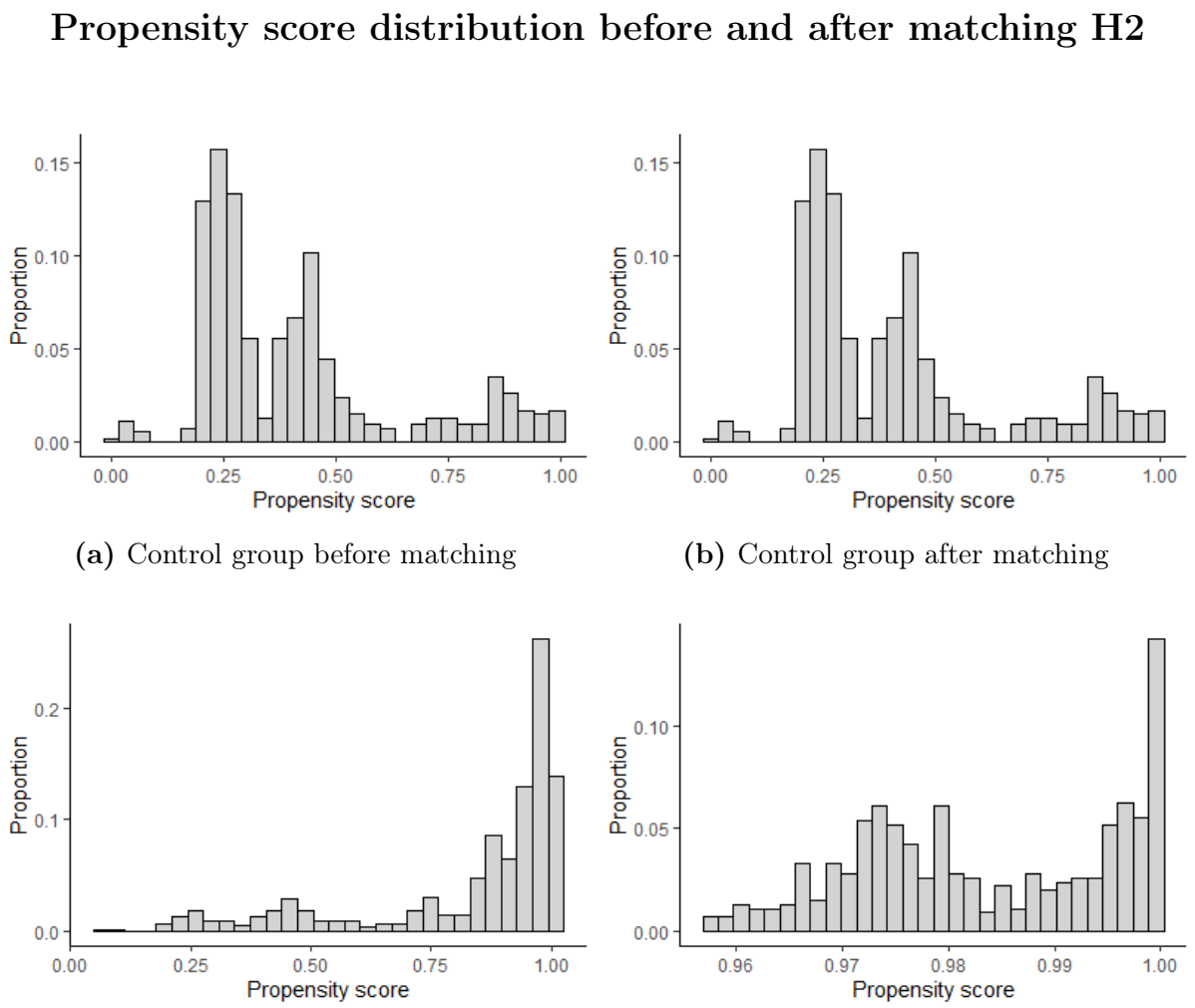
(a) Control group before matching

(b) Control group after matching

(c) Treatment group before matching

(d) Treatment group after matching

Figure A5.1: Histograms for matched and unmatched samples for estimating the effect of a sustainability strategy on bond coupon rates



(a) Control group before matching

(b) Control group after matching

(c) Treatment group before matching

(d) Treatment group after matching

Figure A5.2: Histograms for matched and unmatched samples for estimating the effect of ESG ratings on bond coupon rates

A6 Sustainability strategy

Table A6.1: Fixed effects on matched pairs H1

	Dependent variable:		
	Coupon		
	(1)	(2)	(3)
Interaction	0.00004	−0.002***	−0.001*
	(0.001)	(0.001)	(0.002)
SustainabilityIntro	0.002***	0.002***	0.001*
	(0.001)	(0.001)	(0.002)
GreenInstrument	−0.004	−0.006***	−0.005
	(0.006)	(0.001)	(0.007)
Maturity	0.001***	0.001***	0.001***
	(0.001)	(0.001)	(0.0004)
AmountIssued	−0.000	0.000	−0.000
	(0.000)	(0.000)	(0.000)
Certified	−0.010***	−0.009***	−0.009***
	(0.003)	(0.004)	(0.006)
Constant	0.017***	0.012***	−0.00001
	(0.002)	(0.001)	(0.002)
Coupon type	Yes	No	No
Year	No	Yes	No
Currency	No	No	Yes
Observations	656	656	656
R^2	0.379	0.205	0.274
Adjusted R^2	0.368	0.191	0.262
Residual Std. Error	0.010 (df = 644)	0.011 (df = 643)	0.010 (df = 644)
F Statistic	35.710*** (df = 11; 644)	13.853*** (df = 12; 643)	22.142*** (df = 11; 644)

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

A7 ESG rating

Table A7.1: Fixed effects on matched pairs H2

	Dependent variable:		
	Coupon		
	(1)	(2)	(3)
Interaction	−0.0001	−0.0002**	0.0001
	(0.0001)	(0.0001)	(0.0001)
Sustainalytics	0.0003***	0.0003***	0.0002***
	(0.0002)	(0.0002)	(0.0001)
GreenInstrument	−0.0001	−0.002*	−0.005***
	(0.002)	(0.002)	(0.002)
Maturity	0.001***	0.001***	0.001***
	(0.0003)	(0.0003)	(0.0003)
AmountIssued	−0.000***	−0.000***	−0.000**
	(0.000)	(0.000)	(0.000)
Certified	−0.007***	−0.007***	−0.005***
	(0.003)	(0.003)	(0.003)
Constant	0.017***	0.013***	−0.003
	(0.002)	(0.002)	(0.002)
Coupon type	Yes	No	No
Year	No	Yes	No
Currency	No	No	Yes
Observations	1,082	1,082	1,082
R^2	0.286	0.178	0.346
Adjusted R^2	0.279	0.169	0.340
Residual Std. Error	0.010 (df = 1070)	0.010 (df = 1069)	0.009 (df = 1070)
F Statistic	38.952*** (df = 11; 1070)	19.289*** (df = 12; 1069)	51.530*** (df = 11; 1070)

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

A8 Savings vs commercial banks

Table A8.1: Fixed effects H3

	Dependent variable:		
	Coupon		
	(1)	(2)	(3)
Interaction	0.001	0.003	0.002
	(0.006)	(0.003)	(0.003)
BankType	−0.005***	−0.005***	−0.006***
	(0.003)	(0.003)	(0.003)
GreenInstrument	−0.003	−0.007***	−0.005***
	(0.005)	(0.002)	(0.002)
Maturity	0.0004***	0.001***	0.001***
	(0.0003)	(0.0003)	(0.0002)
AmountIssued	−0.000***	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)
Certified	−0.008***	−0.007***	−0.006***
	(0.002)	(0.002)	(0.002)
Constant	0.022***	0.017***	0.004
	(0.003)	(0.004)	(0.001)
Coupon type	Yes	No	No
Year	No	Yes	No
Currency	No	No	Yes
Observations	1,856	1,856	1,856
R^2	0.250	0.142	0.259
Adjusted R^2	0.245	0.136	0.255
Residual Std. Error	0.010 (df = 1844)	0.011 (df = 1843)	0.010 (df = 1844)
F Statistic	55.863*** (df = 11; 1844)	25.408*** (df = 12; 1843)	58.714*** (df = 11; 1844)
Note:			*p<0.1; **p<0.05; ***p<0.01