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Voluntary Information Disclosure through Green Bonds

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Abstract

This thesis investigates the effect of corporate environmental disclosure and its implications for green bond issuers, focusing on these bonds and the firms issuing them in relation to the 2020 EU Taxonomy regulations. By investigating a sample of European corporate green bonds and the firms issuing them, this study performs an event study into the announcement and implementation of the EU Taxonomy regulations. The abnormal return on the green bonds and the stock prices of the issuers are analyzed to investigate if the increased regulatory sustainable transparency altered investors' valuation of green bonds and the firms issuing them. Additionally, this study investigates if these effects are greater for firms issuing quantitatively more green bonds and for green bonds with more communicated use of proceeds. The results indicate that there is a positive market reaction for firms issuing green bonds in the short-term and a long-term positive market reaction for green bonds to the announcement and implementation of the EU Taxonomy. Additionally, firms that quantitatively issue more green bonds seem to be more sensitive to the change by showing significant positive abnormal returns. Next to this, green bonds with more use of proceeds experience higher abnormal returns than bonds with less use of proceeds. The findings indicate a positive link between voluntary sustainable information disclosure through green bonds as a financial instrument and investor valuation. Furthermore, the findings suggest that firms that have already disclosed sustainable information by issuing green bonds experience positive market reactions at the firm and bond levels. To examine if the EU Taxonomy played a crucial role in shifting the investor's interest in sustainable information disclosure, future research should investigate investors' valuation of information disclosure in more depth so policymakers can adjust their policies effectively. That way, Europe can transition smoothly toward a green and sustainable economy.

Keywords: Green Bonds, EU Taxonomy, Sustainable Disclosure, Sustainable Investments

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1. Introduction

European policymakers have implemented the new 2020 EU Taxonomy regulations to seek a greener European economy. The EU taxonomy allows financial and non-financial companies to share a common definition of economic activities that can be considered environmentally sustainable. The goal of this common definition is to assist investors and companies in identifying sustainable practices more efficiently. In addition, this common definition helps promote sustainable investment within the European Union, which smoothens the transition to a green European economy (*EU Taxonomy For Sustainable Activities*, z.d.). From July 2020, European companies must transparently report to what extent their investment activities comply with the EU Taxonomy. Additionally, the Taxonomy can decrease uncertainty in investment decisions, which increases market efficiency and reduces the firm's average cost of capital (Lucarelli et al., 2020). These regulations are thus aimed to guide investment towards a greener EU and ultimately to contribute to the European climate goals.

On the financial markets, the shift to investing with green intention has become visible as well, as can be seen in the increase in the number of issuances of green bonds (*Green Bonds,* 2023). In the last decade, corporate green bonds have become more popular. A (corporate) green bond represents the determination of the issuer to invest in climate-friendly projects like the energy transition. The difference with an ordinary bond is that the funds raised should flow to a green cause and that a green bond specifically mentions the use of proceeds where these funds flow (OECD, 2023). At first, these bonds seem to signal a positive intention for the issuer regarding the environmental performance of the issuer. However, that is not always the case. Recent literature shows that green bonds are not only used to signal an issuer's determination to become greener but also to appear green. In other words, these bonds can be used to greenwash (She et al., 2023). For investors in this sustainable field of finance, certainty about the actual purpose of green bonds (signaling or greenwashing) can positively

affect sustainable investors' position towards this finance tool. Issuers can reduce this uncertainty about the true purpose of these green bonds by certifying the green bond via an objective third party such as Climate Bond Initiative (*Climate Bonds Certification,* 2024). The bond has to undergo a third-party verification, making the bond's financing process more expensive. Although the costs of this process can be high, it can be important in the signaling process for investors because they usually lack information about an issuer's environmental commitment (Lyon & Maxwell, 2011; Lyon & Montgomery, 2015). In addition to this, previous research shows evidence for this signaling argument, namely that certified green bond issuance leads to an increase in the environmental performance of the issuer, as well as a reduction of the CO2 emission relative to its revenue (Flammer 2020). These findings are also not in favor of the greenwashing argument because greenwashing would imply that post-issuance of green bonds, green performance would not improve. Additional research not in favor of the greenwashing argument finds that the issuance of green bonds positively impacts the number of green patent applications (Xian-Wang et al., 2023). Conclusively, green bonds are used by firms to signal their green intentions voluntarily.

Now that from 2020, the EU Taxonomy has been implemented, all firms have to disclose information about their sustainable practices, making it slightly easier for sustainable investors to determine how much a company aligned its expenditure with the taxonomy. This shift in the regulatory landscape has thus increased the information available to the market, which might have emphasized sustainable information usage more by investors in general. Additional disclosure by firms issuing green bonds might be revalued by investors as well due to the new regulations. Issuing green bonds is a voluntary process and thus can be seen as extra transparency about the firms' practices. Firms issuing green bonds are obligated to communicate the use of proceeds, but more comprehensive and granular communication

about the use of proceeds is optional. This extra communication can be seen as more voluntary transparency as well. More information about the use of proceeds from a green bond can make the green bond more appealing to investors than competitors that disclose less information about this matter because investors want to make decisions on an informed basis (Fung, 2014). The EU Taxonomy increased the amount of information available for these investors, which might have changed the way investors make their decisions and regard green bonds as an investment opportunity

Although every European firm issuing a green bond has to disclose green bond uses of proceeds, there is no literature investigating whether the amount of use of proceeds influences the financial returns on investments in these green bonds or in firms who issue them. Furthermore, there is no literature investigating if the implementation of the EU Taxonomy regulations, made companies and firms issuing green bonds more attractive for investors to invest in. In other words, has the EU Taxonomy acted as a catalyst for investors to pay more attention to firms' sustainable practices? Moreover, is this translated into positive abnormal returns on firms issuing green bonds and the green bonds themselves?

In this thesis, I will perform two event studies to analyze the abnormal returns on green bonds and on the stocks of firms that issued green bonds. I will investigate a sample of European firms that issued green bonds from 2013 to 2020 by performing an event study, looking at the abnormal returns of the firms' stock issuing green bonds and on the bonds shortly before and after the implementation of the EU taxonomy, to see whether the market reacts to the EU taxonomy. The sample is analyzed at the bond and firm levels to see whether investors react to voluntary sustainable disclosure, represented by green bonds, after changes in the regulatory landscape.

The first expectation for this research is that green bonds will experience positive abnormal returns during the announcement and implementation of the EU Taxonomy regulations, as the regulations demand sustainable information disclosure, investors are attracted to green bonds because they value environmental information (Fung 2014; MacAskill et al. 2021). Furthermore, I expect firms issuing green bonds to experience positive abnormal returns as well supported by research that links voluntary disclosure to improved environmental and economic performance (Al-Tuwaijri et al. 2004; Baulkaran 2019; Zhang et al. 2021). I expect this to be recognized and valued by investors. Additionally, I expect that firms issuing more green bonds quantitatively, experience higher abnormal returns than firms issuing fewer green bonds. This expectation is based on the relationship between voluntary disclosure and environmental performance (Clarkson et al. 2008; Giannarakis et al. 2017). Moreover, issuing green bonds is a voluntary process that, according to Flammer (2020), improves environmental performance. Lastly, reasoning similarly to firms issuing more green bonds, I expect green bonds with more detailed use of proceeds information to outperform green bonds with less communicated use of proceeds. Again, this expectation is based on the relationship between voluntary disclosure and environmental performance. Conclusively, this thesis argues that increased sustainable disclosure demanded by the EU Taxonomy enhanced the value of green bonds and firms issuing them.

The findings indicate that the EU Taxonomy boosted investors' confidence in green bonds and firms issuing green bonds. These improvements are more pronounced for firms issuing more green bonds and for green bonds with more granular communicated use of proceeds. This positive market reaction suggests that the regulatory changes enhanced investors' valuation of voluntary sustainable information disclosure, which should be further examined in future studies.

2. Literature Review

In this section, I aim to clarify the existing literature on green bonds, their financial performance, green bond issuers' financial and environmental performance, and what key factors determine these performances. Furthermore, I present literature about information disclosure and (sustainable) investors' preferences. Afterward, I developed the hypotheses for this research based on the existing literature.

2.1 Pricing and Market Reaction

Research has been done into the pricing effects of certified and non-certified green bonds. A study into the volatility of green bonds shed light on the difference in nature of these price fluctuations over time between 'labeled'-(certified) and 'unlabeled' (uncertified) green bonds. Namely, the volatility in the returns of certified green bonds persists over a longer period than the volatility in returns of the non-certified alternative (Pham 2016). In addition to these volatility characteristics, green bonds are traded at a premium relative to comparable corporate bonds (Zerbib 2019). This implies that investors are willing to pay relatively more for green bonds than other similar bonds. This might be explained by the following research by Baulkuran (2019), who found a positive market reaction to corporate green bond issuance. Baulkaran (2019) notably found that green bond announcements generate positive cumulative abnormal returns because investors see these activities as value-enhancing or as a proper form of risk mitigation. These findings all show that investors use green bonds to balance the risk within their portfolios or to incorporate green activities within them for which they are willing to pay a premium. Balancing climate risk within investors' portfolios does not only occur in the bond market but also on the stock market. Namely, there is evidence of a positive transition risk premium, which is significantly lower for emission-intensive companies that engage in green innovation. This indicates that investors care about whether companies are 'fit' for the green transition (Boermans et al., 2024). In addition, the stock market reacts

positively to the first issuance of a corporate green bond as Flammer (2020) concluded with an event study into the first issuance of a green bond. Furthermore, institutional investors seem to divest carbon-intensive stocks, leading to widespread carbon-premium and higher stock returns for companies with higher carbon emissions in all sectors over three continents: Asia, Europe, and North America (Bolton & Kacperczyk, 2021). The divestment by institutional investors could be explained in two ways: on the one hand, as climate risk mitigation and, on the other hand, from a sustainable point of view. This again highlights that investors have sustainable preferences and use green(er) investments to mitigate risk within their investment portfolios. Applying these outcomes to green bonds again, there is an academic debate about the green premium for green bonds, which, as mentioned before, actually exists. Because the literature varies on this matter, it is interesting to look into a literature review in which multiple papers have been analyzed. The findings confirm a consensus on the existence of a green premium within 56% of primary and 70% of secondary market studies (MacAskill et al. 2021). The authors underline the importance of understanding noneconomic factors like environmental performance in bond pricing. This means that investors do not only look for financial return but also have environmental preferences when allocating their resources.

2.2 Green Bonds and Environmental Performance

Having established that investors do not only care about financial performance but rather have environmental preferences and use green investments to mitigate risk within their portfolios, it might be interesting to investigate if green bonds are environmentally improving. In other words, how green are green bonds? There is various academic literature that sheds light on this question. As mentioned before, green bonds are tools that can be used to signal green determination by the issuer, but can also be used by the issuer to act like the firm wants to become more environmentally friendly, while the issuer will not improve its

environmental performance (She et al., 2023). For investors lacking substantial information about the issuer, the probability of greenwashing might prevent them from investing in a green bond. In her paper Corporate Green Bonds, Flammer establishes that certified green bonds increase the issuer's ESG score and reduce the CO_2 emission divided by the total revenue of the issuer (Flammer, 2020). The bonds are used to signal a real commitment to improving the issuers' environmental performance rather than greenwashing.

This research also finds that certification of the green bond by a third party is the most important signaling factor. Furthermore, there is evidence that investments in green projects improve environmental performance by reducing CO_2 emissions in the short- and long-run (Li et al., 2021). Lastly, research shows that green investment has a significant and positive correlation with financial performance; that is, increasing green investment helps improve financial performance and green investment helps reduce environmental violations and promote environmental performance, and environmental performance can strengthen the impact of green investment in improving the long-term performance of firms (Chen & Ma, 2021).

2.3 The EU Taxonomy, Disclosure and Performance

When the EU Taxonomy policy was implemented in 2020, disclosure about sustainable activities became mandatory for financial and non-financial corporations. The EU Taxonomy aims to create a unified classification system to determine whether economic activities can be considered environmentally sustainable. An economic activity can be considered as 'EU Taxonomy aligned' when (i) it contributes substantially to at least one of the six environmental objectives, (ii) it does not significantly harm any other environmental objectives, and (iii) it complies with minimal social safeguards. The environmental objectives formulated in the EU Taxonomy are 1) Climate change mitigation, (2) climate change adaptation, (3) sustainable use and protection of water and marine resources, (4) transition to

a circular economy, (5) pollution prevention and control, and (6) protection and restoration of biodiversity and ecosystems (Lucarelli et al., 2020).

There is various literature linking sustainable disclosure with financial and environmental performance. According to Fung (2014), the demand and need for adequate transparency, disclosure, and suitable corporate financial reporting is essential to investors who can make better decisions on a more timely and informed basis. This transparency can play an essential role in sustainable investors choosing to allocate their resources to the bond or not. Concerning the voluntary disclosure of practices and environmental performance, there is evidence of a positive relationship. A sample of 191 firms from the five most polluting industries in the US was used to find a positive association between environmental performance and the level of discretionary environmental disclosures (Clarkson et al., 2008). This is further backed by research into the S&P 500 firms, where a positive relationship between disclosure and environmental performance was established (Giannarakis et al., 2017). This could be interpreted as voluntary disclosure as a form of signaling green performance. Additionally, Al-Tuwaijri et al. (2004) did research into environmental disclosure and environmental and economic performance. The results suggest that "good" environmental performance is significantly associated with "good" economic performance and with more extensive quantifiable environmental disclosures of specific pollution measures and occurrences. This implies that minimizing or leaving a positive impact on the environment is associated with financial success at the firm level. What can be concluded from this literature is that disclosure improves the environmental performance of firms and even leads to better economic performance. A note has to be made that simply disclosing does not directly improve environmental performance but stimulates the company to enhance it. Additionally, investors value information that helps them to make investment decisions.

2.4 Regulation and Green Investments

While there is not much literature covering the effect of the EU Taxonomy regulations on the green bond or stock market, a paper investigating a similar regulatory change is written by Zhang et al. (2021). Zhang et al. (2021) did research into the effect of the announcement of China's "Guidelines for Establishing the Green Financial System" on good-scoring ESG stocks and bad-scoring ones. The implemented regulations aimed to outline a comprehensive framework to promote green finance and integrate sustainability into the country's financial sector. Furthermore, these measurements stimulated the development of green bonds, green insurance, and green credits, as well as the establishment of green equity indices and green development funds. Lastly, the regulations improved the disclosure of environmental performance by corporations. They found that good-scoring ESG portfolios experience positive abnormal returns. This implies that the regulations that stimulated green investments caused abnormal returns on green investments.

2.5 Gap in the Existing Literature

In the currently existing literature, there is no absolute or general consensus about the financial performance of firms issuing green bonds. There is more consensus on whether green bonds are used to greenwash or signal, namely that they are not used to greenwash (Flammer, 2020). In addition, a consensus exists about a green premium, showing that investors care about returns, have environmental preferences, and use green bonds to mitigate risks within their investment portfolios (MacAskill et al. 2021). Additionally, the first issuance of a green bond has positive stock market effects (Flammer, 2020). Furthermore, disclosure of information is valued by investors and leads to better environmental and even economic performance (Al-Tuwaijri et al.,2004).

While much research is done into the disclosure of information on green bonds, the effect of the changes in the regulatory landscape in Europe on green bond performance and issuers needs further analysis. The link between sustainable information disclosure and green bonds has yet to be made. It is interesting to investigate the effects of these regulatory changes by analyzing how investors value additional voluntary disclosed sustainable information. Green bond issuers voluntarily issue green bonds to signal their green intentions (Flammer, 2020). This voluntary signal might attract sustainable investors who seek voluntarily provided information when determining where to invest. Therefore, an event study into the effect of new EU Taxonomy regulations on abnormal returns on corporate green bonds and on the stocks of firms issuing them in the period before and after the implementation of the 2020 EU Taxonomy can shed light on the question of whether the EU Taxonomy regulations made investors value this information more than before, leading to higher abnormal returns on these bonds. Furthermore, green bonds with more use of proceeds might also experience higher abnormal returns than bonds with less use of proceeds due to the EU Taxonomy regulations because even more information is provided voluntarily. Therefore, it is interesting to investigate if investors value this additional information after the implementation of these regulations. In other words, are green bonds valued by investors more because of the voluntary nature of information disclosure and the emphasis on information disclosure due to the EU Taxonomy? And will additional disclosure by communication of more use of proceeds lead to even higher abnormal returns in the period before and after the implementation of the new EU Taxonomy regulations? Finally, it is interesting to investigate whether signaling quantitatively more (by issuing more green bonds) is valued higher by investors, leading to higher abnormal returns on the firms' stocks compared to firms issuing fewer green bonds.

2.6 Hypotheses Development and Economic Expectations

This thesis consists of an event study regarding the announcement and implementation of the new EU Taxonomy regulations. The first two hypotheses of this thesis are: *"The green bonds experience positive abnormal returns during the event window of the EU Taxonomy announcement and implementation."* and *"The firms that issued green bonds experience positive abnormal returns during the event window of the EU Taxonomy announcement and implementation."* This is because the EU Taxonomy demands firms to disclose information about sustainable practices, and investors want to make investments on a more informed basis (Fung 2014). Therefore, I expect the returns of green bonds to increase after the EU Taxonomy because investors are willing to pay for this voluntarily provided extra information. This is further backed by the fact that sustainable investors do not only look for financial return but also have environmental preferences when allocating their resources (MacAskill et al. 2021). Additionally, the relationship between disclosure and environmental and economic performance, concluded by Al-Tuwaijri et al. (2004), leads to the expectation that this also holds at the firm level. Additionally, the value-enhancing aspect of the issuance of green bonds, as concluded by Baulkaran (2019), leads to the expectation that the firms' stocks that issue these bonds experience positive abnormal returns. Lastly and most dominantly, the similar nature of the research of Zhang et al. (2021) leads to the expectation that regulation promoting sustainable investments, which is the EU Taxonomy, leads to positive abnormal returns on green bonds and stocks.

The third hypothesis: *"Green bonds with an increased granularity of communicated use of proceeds experience higher abnormal returns during the event window of the EU Taxonomy announcement and implementation than green bonds with less use of proceeds."* I expect that more granular information about the use of proceeds will positively affect the bonds'

performance. I expect this because of the positive relationship between voluntary disclosure and environmental performance (Clarkson et al., 2008). This is further backed by research into the S&P 500 firms, where a positive relationship between disclosure and environmental performance was established (Giannarakis et al., 2017). Due to these previous research results, I expect sustainable investors to see this voluntarily provided information as value-enhancing, increasing the demand for these and improving the returns on these green bonds as sustainable investors do not only look for financial return but also have environmental preferences when allocating their resources (MacAskill et al. 2021). I have similar expectations regarding the fourth hypothesis: *"Stocks of firms that issue more green bonds experience higher abnormal returns during the event window of the EU Taxonomy announcement and implementation than firms issuing less green bonds."* This expectation is also linked to the environmental performance and information disclosure arguments presented in the second hypothesis. Conclusively, more voluntary information is valued higher because signaling via voluntary sustainable disclosure is valued higher by investors due to the EU Taxonomy regulations.

3. Methodology

This section will provide a more detailed picture of this thesis's methodology, identification strategy, data selection, and extraction, as well as why I use this data.

3.1 Dataset and Selection

For this research, a data set, consisting of corporate green bonds issued in Europe from May 2013 till May 2020 was selected. These bonds were live during the event window. This interval is selected because benchmark returns on the bonds and stocks have to be calculated before the event dates. This is called the estimation period (Lamdin, 2001). The 134 green bonds in the sample were issued by 84 different companies. The stock prices of these companies were retrieved using Refinitiv Eikon. This process has also been done for each of the issued green bonds to calculate the return on these stocks and bonds; more on this in chapter 3.3.1. After the bonds had been retrieved, the data of the daily stock and bond prices had to be modified because of missing data points. For each missing point, the assumption is made that the value is equal to the average of the missing trading days. A note has to be made that only the bonds and stocks that had enough data available in Refinitiv Eikon for the event study have been used in this research.

Due to the small size of the two samples and the fact that the use of green bonds as a financial instrument has started to grow recently, there is limited data available. Therefore, there only could be made two groups for the quantitative issuance of green bond analysis as well as for the use of proceeds analysis. For the quantitative issuance of green bonds, 37 companies issuing one green bond are compared with 47 companies issuing more than one bond. For the use of proceeds analysis, 112 bonds with two or fewer uses of proceeds are compared to 22

bonds with more than two uses of proceeds. There were no bonds with one use of proceeds and only one bond with four uses of proceeds. No bond exceeds four uses of proceeds.

The dataset was selected because I want to measure market reaction at the green bond and the firm level on the announcement and implementation of the EU Taxonomy regulations. In addition, firms issuing green bonds disclose sustainable information voluntarily, which might affect the returns on the stock prices. Because disclosure leads to better environmental performance, according to Al-Tuwaijri et al. (2004), and investors see the issuing of green bonds as value-enhancing and as proper risk mitigation, according to Baulkaran (2019), it is interesting to investigate if the issuance of green bonds leads to abnormal returns during the event window.

3.2 Data Characteristics

Table 1 in the appendix gives a clear description of the growth in the amounts of issued green bonds in the period from May 2013 to May 2020. A note has to be made that for 2013, only the bonds issued after May are taken into account, and for 2020, the bonds issued until May have been used for this table. As shown in Table 2 in the appendix, 236 green bonds were issued in Europe between May 2013 and May 2020. Most of them have been issued in Scandinavia and Western Europe, with Sweden leading in Europe with the issuance of 75 different green bonds. Table 3 reports the green bonds issued per business sector between May 2013 and May 2020. By far, most bonds have been issued in the Real Estate, Banking & Investment Services, and Utilities sector.

3.3 Selection of Events

The events selected for this study are the announcement and implementation of the 2020 EU Taxonomy regulations (22-06-2020;12-07-2020). As mentioned, the EU taxonomy allows financial and non-financial companies to share a common definition of economic activities that can be considered environmentally sustainable. The goal of this common definition is to assist investors and companies in identifying sustainable practices more easily (*EU Taxonomy For Sustainable Activities*, z.d.). This event changed how information is provided to investors; namely, it is no longer provided voluntarily. Although investors already want to make investment decisions on an informed basis (Fung, 2014), The EU Taxonomy regulation might have put more emphasis on sustainable information disclosure. Green bonds are a tool that can be used to signal environmental performance (Flammer, 2020). This financing tool represents sustainable commitment and transparency, which can be of even more importance for investors in the new regulatory landscape. Therefore, the event study will investigate if green bonds experience positive abnormal returns due to the voluntary information disclosure they represent. Furthermore, this is also investigated at the stock level because investors react positively to the first issuance of green bond announcements (Flammer, 2020). This shows that issuing green bonds also affects stock performance.

The regulation's announcement is selected as an event because it captures the new information provided to the market (Flammer, 2020). As information forms the basis for the expected market reaction, it is important to analyze the market reaction to this information. As the regulatory implications become clearer, it is interesting to investigate the actual implementation effects because this gives the market more time to adapt to the announcement of the regulations and, thus, the new information.

Conclusively, this study covers four event studies. Two studies analyze the market reaction to the announcement of the regulatory changes (22-06-2020) at the bond and the stock level. The other two analyze the market reaction to the implementation of the EU Taxonomy (12-07-2020) at the bonds and the stock level. To investigate if the regulatory changes affected how the market values sustainable information disclosure, represented by the green bond.

3.3.1 Event Study Methodology

Firstly, I analyze the short-term reaction of green bond performance to the announcement of the EU Taxonomy. For this study, I will perform two event studies since the Taxonomy Regulation was published in the Official Journal of the European Union on 22 June 2020 and entered into force on 12 July 2020 (EU Taxonomy for Sustainable Activities, n.d.). Therefore, I will set the 22nd of June as day 0 in the first analysis and the 12th of July as day 0 in the second analysis. I keep the possibility into account that the public knows some information about the announcement five trading days before the announcement and account for the lagged response to the announcement ten days [-5;10] (Krueger 2015). Furthermore, I use the same time frames in the runup to the announcement and after the announcement as Flammer did, [-20;-11] and [-10;-6] prior and [11;20] and [21;60] after the event (Flammer 2020). I do the same for analyzing the implementation date, only setting the 12th of July as day 0 in this event study. These timeframes are selected to see whether reactions to the event have short-term reactions or if they persist over a longer period.

When performing the event study I am interested in the abnormal daily returns of the bonds (AR). I will compute these using the Capital Asset Pricing Model (CAPM). The Capital Asset Pricing Model was developed by Sharpe (1964) and Lintner (1965) as a framework for estimating expected returns based on the collective behavior of the overall market. This gives

me the following expression:

$$E(Rit) \; = \; \alpha i \; + \; \beta i \; * \; Rmt \; + \; \varepsilon it \; (1)$$

Where E(Rit) is the return on the bond of company i on day t, Rmt is the daily market return, and εit is the residual. Note has to be made that for the market return, the STOXX Europe 50 is used as the benchmark for European bonds. The estimations of the E(Rit) are done in the event window similar to Flammer (2020), namely [-220;-21]. The estimated return on the bond of issuer i on day t is as follows:

$$Rit \; = \; \alpha i \; + \; \beta i \; * \; Rmt \; (2)$$

For computing the AR:

$$ARi \; = \; E(Rit) \; - \; Rit \; (3)$$

Finally, I compute the cumulative abnormal returns (CAR) for the event windows stated above ([−20, −11], [−10, −6],[-5;10], [11, 20], and [21, 60]) from these daily abnormal returns.

This calculation of the abnormal returns will be done for each green bond and each firm issuing green bonds in the sample—that way, the effect of the event on the stock and bond performance can be investigated. The firms are categorized into two groups based on the amount of green bonds they have issued. A similar process is done for the bonds, but then they are categorized based on the amount of use of proceeds.

3.3.2 Statistical Tests

After the CAARs have been computed for the different windows and groups, the results have to be tested on statistical significance. T-tests will test if the established CAARs are statistically significantly different from zero. Hence the hypotheses:

$$H0: \mu = 0 \; ; \; Ha: \mu \neq 0 \; (4)$$

When the T-value found is greater than the T-critical, H0 can be rejected, and the effect is statistically significantly different from zero.

The CAARs that have been computed for the separate groups based on the number of bonds issued by each firm and based on the amount of use of proceeds at the bond level are first tested with expression (4). Afterward, the CAARs are compared with each other to see if the difference measured in CAARs is statistically significant. Hence the hypotheses:

$$H0: \mu 1 = \mu 2 \; ; \; Ha: \mu 1 \neq \mu 2 \; (5)$$

When the P-value exceeds the 5% significance level, H0 cannot be rejected, and the difference between the CAARs cannot be determined as statistically significant.

4. Results

In this section, I summarize outcomes from the event study analysis, which has been discussed in the previous section.

4.1 Average Abnormal Returns

As mentioned, the abnormal returns on the stocks and the bonds have been computed for this analysis. Graph 1 in the appendix reports the average abnormal returns in percentages (AAR%) on the 134 green bonds used for this study, with the event dates highlighted in red. The trendline decreases over time but remains above 0%. What stands out is that the bonds for both events experienced negative AARs. Graph 2 in the appendix reports the AARs on the 84 firms that issued a green bond. Similar to the outcomes of the green bonds, the trendline shows a decrease in AAR over time but remains above 0%. The announcement date is negative, while the implementation date has a slightly positive AAR. Furthermore, the returns on the stocks are more volatile than the returns on the bonds. This is not remarkable because returns on stocks are more volatile relative to bonds (Ibbotson & Sinquefield, 1976).

4.2 Green Bond and Stock Performance

To test the first hypothesis of this thesis, the CAAR results at the bond- and the stock level of the announcement of the EU Taxonomy regulations have to be analyzed. These results are reported in Table 4, presented below. In line with the expectations, statistically significant positive CAARs could be established for the green bonds issued between 2013 and 2020 that were live during the event date. The green bonds show outperformance in the period leading up to and after the announcement of the EU Taxonomy regulations. This outperformance increases in the longer term after the announcement of the regulations, with an outperformance of 1.775% in the [21;60] window. Therefore the market reacts positively to green bonds as an instrument shortly before the announcement. This higher valuation by

investors of green bonds seems to persist in the long term. This long-term high valuation of green bonds indicates that the EU Taxonomy has boosted investor confidence or preference for this financial instrument.

For the firms issuing green bonds on the days [-20;-11] and [-5;10], the CAARs appear significant and positive. Therefore, there seems to be a positive market reaction to firms that have issued at least one green bond before and shortly after the EU Taxonomy announcement. Firms that have issued these bonds are thus valued higher because investors might value firms that use green bonds higher because of the emphasis the EU Taxonomy places on sustainable information. However, this higher valuation does not seem to persist over a longer period and is only significant at a 5% level. This could be explained due to the nature of a green bond. A green bond signals environmental performance improvement, according to Flammer (2020), but does not have to mean that the firm is green or sustainable. Hence the higher valuation does not persist over a longer period.

Table 4: CAAR Announcement Results of Bond- and Stock-level with T-statistics

In this table, I report the results for the CAAR (%) values at the Bond-level and at the Stock-level in column (1) and (2). I indicate these values for 5 different windows ([−20, −11], [−10, −6],[-5;10], [11, 20], and [21, 60]). I present the T-statistics below the CAAR and denote significance levels by ***, ** and *, indicating parameter estimates significantly different from zero at 1%, 5% and 10% levels, respectively.

	(1) Bond-level	(2) Firm-level
[−20, −11]	1,39313 (6,154417 ***)	2,840825261 (2,58328 **)
[−10, −6]	0,436477 (4,589775 ***)	0,140963212 (0,15989)
[-5;10]	0,938166 (3,926657 ***)	1,646626269 (2,001248 **)
[11, 20]	0,694052 (9,950461 ***)	0,791763487 (1,503545)
[21, 60]	1,775007 (7,73423 ***)	2,391980267 (1,654219)
N-Bond-level: 134		
N-Stock-level: 84		

Fairly similar results could be obtained from the event study on the analysis of the implementation of the EU Taxonomy regulations. Table 5 reports CAARs on the green bonds and stock of firms who issued green bonds. From the bond-level analysis, all the CAARs are positive and follow a similar development to the announcement analysis. All the periods seem statistically significant except for the period 10 to 6 days before the event. This is interesting because the CAAR of this period is by far the smallest at 0.02%. Due to these similar results to the announcement, the implications are also similar. There is a long-term high valuation of green bonds, which indicates the EU Taxonomy has boosted investor confidence or preference for this financial instrument. For the firms who issued a green bond, the stocks experienced a positive CAAR of roughly 1.6% during the days [-10;-6] and [11;20]. The positive long-term CAAR of [21;60] is slightly insignificant, while the negative CAARs of the days [-20;-11] and [-5;10] are very insignificant. Therefore, there seems to be a positive market reaction similar to the announcement of the EU Taxonomy, which has similar implications.

Table 5: CAAR Implementation Results of Bond- and Stock-level with T-statistics

In this table, I report the results for the CAAR (%) values at the Bond-level and at the Stock-level in column (1) and (2). I indicate these values for 5 different windows ([−20, −11], [−10, −6],[-5;10], [11, 20], and [21, 60]). I present the T-statistics below the CAAR and denote significance levels by ***, ** and *, indicating parameter estimates significantly different from zero at 1%, 5% and 10% levels, respectively.

	(1) Bond-level	(2) Firm-level
[−20, −11]	0,805004	-0,37257
	(2,520499 **)	(-0,60451)
[−10, −6]	0,015757	1,628287
	(0,153846)	(4,486569***)
[-5;10]	0,913608	-0,0778
	(10,53359***)	(-0,11074)
[11, 20]	0,236568	1,621189
	(3,072467***)	(2,403003**)
[21, 60]	1,36148	2,085524
	(3,087616***)	(1,469962)
N-Bond-level: 134		
N-Stock-level: 84		

4.3 Use of Proceeds

To test whether more granular communication about green bonds' uses of proceeds leads to more outperformance than green bonds with less use of proceeds, the CAARs of green bonds with two or fewer uses of proceeds and green bonds with more than two uses of proceeds have been analyzed and compared. Table 6 below reports the CAARs of these two different groups and the P-value of the comparison between the found differences. The results show statistically significant positive CAARs for both groups' windows. What can be seen as well is that the green bonds with more use of proceeds communication show more outperformance than the green bonds with two or less use of proceeds. This aligns with the expectation that more information leads to more outperformance. However, the P-values indicate that the difference between these CAARs per window could not be statistically significant as they are all above 0.1. In other words, both groups experience positive abnormal returns, but the difference between these groups is not statistically significant.

Table 6: CAAR Announcement Results for Green Bonds with Different Amounts of Use of Proceeds

In this table, I report the results for the CAAR (%) values, for green bonds with different amount of use of proceeds, issued between 2013 and 2018 in column (1), (2). Column (3) indicates the P-value of the comparison between the found CAAR in (1) and (2). I indicate these values for 5 different windows ([−20, −11], [−10, −6],[-5;10], [11, 20], and [21, 60]). I present the T-statistics below the CAAR and denote significance levels by ***, ** and *, indicating parameter estimates significantly different from zero at 1%, 5% and 10% levels, respectively.

	(1) Green Bonds With 2 or Less Use of Proceeds	(2) Green Bonds With More Than 2 Use of Proceeds	(3) P-Value CAAR (1):(2)
[−20, −11]	1,201199 (4,53417 ***)	1,766731 (6,242396 ***)	0,46656124
[−10, −6]	0,616241 (5,682659 ***)	0,621013 (3,557176 ***)	0,39179772
[-5;10]	0,903812 (3,178483 ***)	0,911892 (5,630181 ***)	0,96134756
[11, 20]	0,51359 (6,744452 ***)	0,853667 (4,913518 ***)	0,31228603
[21, 60]	1,127584 (4,326995 ***)	2,360568 (5,489633 ***)	0,25968223

N- 2 or Less Use of Proceeds: 112
N- 2+ Use of proceeds: 22

Similar results regarding the CAARs could be established for the implementation of the EU Taxonomy regulations. With high significant positive CAARs (except for the days [-10;-6] for green bonds with more than two use of proceeds), it is again highlighted that there is a long-term persisting positive market reaction to the EU Taxonomy regarding green bonds, showing investors high valuation of this financing instrument. Additionally, the difference between the CAARs of green bonds with less than two and green bonds with more than two use of proceeds is statistically significant from 5 days prior to the event until 20 days past the implementation. The green bonds with more use of proceeds experience higher abnormal returns than bonds with less use of proceeds, implying that the market reaction is more positive for bonds with more use of proceeds disclosure. This is in line with the expectation that additional use of proceeds information is valued higher as well. The market thus reacts more positively to additional information disclosure through the use of proceeds.

Table 7: CAAR Implementation Results for Green Bonds with Different Amounts of

Use of Proceeds

In this table, I report the results for the CAAR (%) values, for green bonds with different amount of use of proceeds, issued between 2013 and 2018 in column (1), (2). Column (3) indicates the P-value of the comparison between the found CAAR in (1) and (2). I indicate these values for 5 different windows ([−20, −11], [−10, −6], [-5;10], [11, 20], and [21, 60]). I present the T-statistics below the CAAR and denote significance levels by ***, ** and *, indicating parameter estimates significantly different from zero at 1%, 5% and 10% levels, respectively.

	(1) Green Bonds With 2 or Less Use of Proceeds	(2) Green Bonds With More Than 2 Use of Proceeds	(3) P-Value CAAR (1):(2)
[−20, −11]	1,071468 (2,809753***)	0,612902 (4,363252***)	0,790927
[−10, −6]	0,427286 (3,5028***)	-0,01308 (-0,20149)	0,901234
[-5;10]	0,633817 (7,270951***)	1,45428 (5,53401***)	0,005305***
[11, 20]	0,504605 (5,751205***)	0,566986 (4,580442***)	0,056877**
[21, 60]	1,496858 (2,849682***)	1,096724 (4,08729***)	0,791287

N- 2 or Less Use of Proceeds: 112
N- 2+ Use of proceeds: 22

4.4 Quantitative Green Bonds Issued

To test whether firms issuing more green bonds experience higher abnormal returns than firms issuing fewer green bonds in the event window of the EU Taxonomy regulations announcement, firms issuing one green bond between 2013 and 2020 and firms issuing more than one green bond between 2013 and 2020 have been analyzed. The results of this analysis can be seen in Table 6 below, which reports the CAARs on the stocks of companies that have issued two or fewer green bonds and companies that issued more than two. Furthermore, the P-values of the comparison between these found CAARs. In line with the hypothesis, both groups experience positive abnormal returns in all the windows; however, these are not significant except for firms issuing more than two bonds in the windows [-20;-11] and [-5;10] (at 10%). Firms with more green bonds seem to be more sensitive to the EU Taxonomy announcement, implying that investors value these firms who had more green assets perform better around the events. Contrary to the expectation, the CAARs are higher for the firms

issuing fewer green bonds (except for the window [-20;-11]); however, these differences between the CAARs are not statistically significant, as could be seen in the column for the P-values, which all exceed 0.1.

Table 8: CAAR Announcement Results for Firms Issuing Different Amounts of Green Bonds

In this table, I report the results for the CAAR (%) values, for firms issuing different amounts of green bonds, between 2013 and 2018 in column (1), (2). Column (3) indicates the P-value of the comparison between the found CAAR in (1) and (2). I indicate these values for 5 different windows ([−20, −11], [−10, −6],[-5;10], [11, 20], and [21, 60]). I present the T-statistics below the CAAR and denote significance levels by ***, ** and *, indicating parameter estimates significantly different from zero at 1%, 5% and 10% levels, respectively.

	(1) Firms Issuing 1 Green Bond	(2) Firms Issuing 2+ Green Bonds	(3) P-Value CAAR (1):(2)
[−20, −11]	2,606694851 (1,571927)	3,025140691 (2,037709 **)	0,851497
[−10, −6]	1,183947587 (1,016308)	0,362443597 (0,67807)	0,493843
[-5;10]	1,710790048 (1,110361)	1,596114358 (1,880388 **)	0,945336
[11, 20]	1,406751026 (1,628002)	0,307624361 (0,473174)	0,302944
[21, 60]	3,381346941 (1,310625)	1,61311714 (0,998133)	0,547012

N- 1 Green bond: 37
N- 2+ Green Bonds: 47

Comparing these results to the implementation, different results have been obtained. Firms that have issued one green bond experience a significant positive CAAR of 2.4% 11 to 20 days after the implementation. Additionally, all the CAARs for firms issuing one green bond are positive but are not statistically significant. Firms issuing two or more green bonds seem to have statistically significant CAARs 10 to 6 days before the EU Taxonomy implementation. Contrary to expectations, the firms issuing more green bonds experience negative CAARs in the rest of the event windows; however, none of these are significant; therefore, the positive P-values comparing the CAARs do not have implications either.

Table 9: CAAR Implementation Results for Firms Issuing Different Amounts of Green Bonds

In this table, I report the results for the CAAR (%) values, for firms issuing different amounts of green bonds, between 2013 and 2018 in column (1), (2). Column (3) indicates the P-value of the comparison between the found CAAR in (1) and (2). I indicate these values for 5 different windows ([−20, −11], [−10, −6],[-5;10], [11, 20], and [21, 60]). I present the T-statistics below the CAAR and denote significance levels by ***, ** and *, indicating parameter estimates significantly different from zero at 1%, 5% and 10% levels, respectively.

	(1) Firms Issuing 1 Green Bond	(2) Firms Issuing 2+ Green Bonds	(3) P-Value CAAR (1):(2)
[−20, −11]	0,523635 (0,495137)	-1,23605 (-1,50571)	0,239871
[−10, −6]	0,69918 (1,2277)	2,179952 (4,618243***)	0,075733*
[-5;10]	1,427171 (1,188703)	-1,32824 (-1,57837)	0,094127*
[11, 20]	2,403146 (2,187508**)	-0,86138 (-1,08196)	0,033334**
[21, 60]	1,48987 (0,597518)	1,152418 (0,708903)	0,918615

N- 1 Green bond: 37
N- 2+ Green Bonds: 47

5. Discussion and Limitations

This research aimed to investigate the effect of corporate environmental disclosure and its implications for green bond issuers, focusing on these bonds and the firms issuing them in relation to the 2020 EU Taxonomy regulations by performing an event study into the announcement and implementation of these regulations. The results indicate a positive market reaction to the implementation and the announcement at the bond level, which persists in the long term. A positive market reaction for both events is also established at the stock level; however, these positive abnormal returns are short-lived. Furthermore, stocks of firms that issued more green bonds are more sensitive to the events than those that issued less green bonds, as significant positive CAARs are established for these firms. Regarding the implementation of the EU Taxonomy, significantly higher abnormal returns are found for green bonds with more use of proceeds communication than green bonds with less.

5.1 Implications

These findings support the hypotheses that green bonds experience positive abnormal returns during the event window of the EU Taxonomy announcement and implementation and that firms that issued green bonds experience positive abnormal returns during the event window of the EU Taxonomy announcement and implementation. These findings are similar to those of Zhang et al. (2021), who found that regulation promoting sustainable investments leads to positive abnormal returns on green bonds and stocks.

Evidence for the hypothesis that more use of proceeds communication leads to higher abnormal returns could only be found when investigating the implementation of the EU Taxonomy. Although the differences between the CAARs of the announcement were insignificant, the CAARs were higher for bonds with more use of proceeds for each of the windows. The lack of significance in the findings might be due to the small sample size of the

green bonds with more than two uses of proceeds (n=22). Therefore, the results align with the hypothesis that sustainable investors not only look for financial return but also have environmental preferences when allocating their resources (MacAskill et al., 2021). Moreover, there is a positive relationship between voluntary disclosure and environmental performance (Clarkson et al., 2008). More use of proceeds communication is thus seen as more value-enhancing due to the relationship with better environmental performance.

Lastly, this research failed to find higher abnormal returns on the stocks of firms issuing more than one green bond compared to firms issuing one green bond. However, it stands out that significant positive abnormal returns can be found for firms issuing more than one green bond, indicating that these firms are more sensitive to the event. This is in line with the value-enhancing aspect of the issuance of green bonds, as concluded by Baulkaran (2019). Therefore, these results indicate that issuing more green bonds is valued more than just one.

These findings suggest that the EU Taxonomy regulations influenced the way investors use and value sustainable information disclosure through green bonds in their decision-making process. Confidence towards green bonds as a financial instrument can be concluded from their long-lasting abnormal returns. An explanation for this confidence towards green bonds and green bond issuers could be found in research by Luca and Monasterolo (2024). This research states that after the Paris Agreement, there is a lack of a clear definition of what economic activities can be considered green and which are not. Using the EU Taxonomy (combined with Climate Policy Relevant Sectors (CPRS)), investors seem to hedge for climate risk within their portfolios (Luca & Monasterolo, 2024). Therefore, the announcement and implementation of the EU Taxonomy might have caused investors to use green bonds and stocks of green bond issuers to hedge for climate risks leading to positive abnormal returns as green bonds are used by investors to mitigate risks within their portfolios

(Baulkaran, 2019). This is a positive sign for policymakers because the funds raised with these green bonds specifically flow towards green projects and, according to Flammer (2020), improve a firm's environmental performance. These green projects contribute to the objectives of the EU Taxonomy. Therefore, policymakers should continue to develop regulations that support green investments as they seem to work. Additionally, investors value voluntarily disclosed information positively, which can be used in corporate strategy. Firms can adopt the issuance of green bonds in their financing strategy as investors see them as value-enhancing, according to Baulkaran (2019). When doing so, firms should put the emphasis on signaling with more green bonds and more granular use of proceeds communication. This is because investors want to make investment decisions on an informed basis (Fung, 2014), and the results indicate that the EU Taxonomy has made sustainable information disclosure even more important. Next to this, green bonds improve a firm's environmental performance, which investors value positively (Flammer, 2020).

Additionally, the outperformance of green bonds and firms issuing them should attract not only sustainable investors but also investors who are not sustainability-orientated when investing. This favors the regulations because this shifts the transition to a greener European economy.

5.2 Limitations and Further Research

One limitation of this study is that it could not find significant differences between the announcement CAARs on bonds with more use of proceed communication compared to bonds with less. This is most likely because of the small amount of green bonds with more than two use of proceeds (n=22). Additionally, there is limited data available due to the lack of green bond issuances in Europe before the EU taxonomy announcement and implementation. Further research should investigate the possibility of a larger data sample by exploring whether the data of more corporate green bonds can be found in different

databases. Another possibility is to examine not only corporate green bonds but also green bonds whose issuers are not active on the stock market. This way, the use of proceeds analysis can be done with a larger sample, which can shed more light on whether green bonds with more use of proceeds experience superior performance to ones with less use of proceeds around the EU Taxonomy announcement and implementation. The increase in the sample size makes it possible to compare the performance of green bonds and their issuers more easily. By investigating if country, region, or industry characteristics alter the performance of the bond or firm, a clearer image could be made of where or in which industry, signaling with green bonds, is valued higher. When investigating if industry affects the performance of these bonds, the use of proceeds might also play a role. The use of proceeds can be very sector-specific, which might affect the investors' valuation of this use of proceeds communication. This role should be further examined to create a better understanding of the valuation of the use of proceeds communication.

From a methodological point of view, an increase in the available data makes it possible to perform a difference-in-difference analysis comparing Europe pre and post-treatment. It is interesting to analyze if the EU Taxonomy regulations affected the environmental and financial performance of green bond issuers and what the main variables are that influence these changes. This approach can determine if the regulations effectively stimulate the European economy's green transition. Furthermore, this research only investigates green bonds and firms issuing them. Multiple other sustainable financial instruments can be used to improve environmental performance or can be used to signal a company's commitment to sustainability. Sustainability Linked Bonds (SLB) are an example of financial instruments that can be used for these goals (Kölbel & Lambillon, 2022). It is interesting to investigate if the EU Taxonomy triggered a market reaction for firms using these types of sustainable

financial instruments. If so, the argument that the EU Taxonomy triggered a positive valuation of using these sustainable instruments might be due to the emphasis these regulations put on sustainable information disclosure.

Next, further research should investigate more specifically what moves the investors to value these green assets and firms to issue them around the EU Taxonomy. This could be done by creating a survey in which the motivation and the information perception of the investors and issuers are questioned. Using this data, together with the market reaction results of the research, a clearer image could be depicted of what moves an investor in his choices and to what factors these findings can be contributed to. This could be done by using a regression analysis to compare the results of Europe (a region with the EU Taxonomy) with those of an area that does not have these regulations. For example, the use of sustainable information in investment decision-making by the treatment group (Europe) is compared with the group that has not been treated (another region). This way, the effects of the EU Taxonomy on sustainable information disclosure can be analyzed from an investor's point of view.

6. Conclusion

This thesis aimed to investigate the effect of corporate environmental disclosure and its implications for green bond issuers. It focused on these bonds and the firms issuing them in relation to the 2020 EU Taxonomy regulations by performing an event study into the announcement and implementation of these regulations.

The findings indicate a long-lasting positive market reaction for green bonds to the announcement and the implementation of the EU Taxonomy, suggesting that the EU Taxonomy boosted investors' confidence towards green bonds. This is a positive sign for the regulatory change as it seems to have positively changed investors' valuation of this sustainable investment tool. At the firm level, the findings also indicate a positive market reaction for firms issuing green bonds. This market reaction is short-lived but could also be determined for firms that issued more than one green bond, indicating that firms with more green bonds are more sensitive to the EU Taxonomy. This thesis also examines the role of the use of proceeds communication. Despite the small sample size, the results show higher CAARs for green bonds with more use of proceeds. This indicates that the EU Taxonomy implementation made investors value this extra information higher than green bonds with less information. Overall, the findings imply that the EU taxonomy changed the way sustainable information disclosure, through green bonds and green bonds' use of proceeds, is valued by investors.

Further research should investigate this sustainable information disclosure valuation in more depth and investigate if the EU Taxonomy caused a change in (sustainable) investors' behavior. This could be done via a control and treatment analysis, comparing a region that does not have the EU Taxonomy regulations (or similar regulations) at that time. This way, a

causality between the EU taxonomy and the valuation of sustainable information disclosure could be investigated. Additionally, further research should explore the market reactions to other sustainable financing instruments to enlarge the sample size and examine if this positive market reaction only exists on green bonds and firms issuing them.

Conclusively, this thesis found a positive market reaction to green bonds and firms issuing them to the EU Taxonomy. The results suggest a positive link between extra-sustainable information disclosure and investors' confidence and valuation. This is a positive sign for policymakers, but more knowledge about what causes this valuation is needed to optimize European policy to stimulate the promotion of sustainable investments. When optimized, frameworks like the EU Taxonomy can play a crucial role in smoothly transitioning to a green European economy.

7. Appendix

Table 1: Green Bonds Issued for Year (2013-2020)

In this table, I report the amount of green bonds issued (2) for each year (1), between May 2013 and May 2020, that have been used for the bond- or stock-level analysis of this research. (*half year is reported due to data selection)

(1) Year	(2) Amount of Green Bonds
2013*	1
2014	9
2015	11
2016	13
2017	38
2018	41
2019	88
2020*	34
Total	236

Table 2: Green Bonds Issued for Each European Country (2013-2020)

In this table, I report the amount of green bonds issued (2) for each European country (1), between May 2013 and May 2020, that have been used for the bond- or stock-level analysis of this research.

(1) Country	(2) Amount of Green Bonds
Sweden	75
France	48
Norway	17
Germany	16
Italy	14
Netherlands	13
United Kingdom	12
Finland	8
Switzerland	7
Austria	5
Spain	5
Czech Republic	4
Belgium	3
Portugal	3
Denmark	2
Turkey	2
Luxembourg	1
Total	236

**Table 3: Green Bonds Issued for Each Business Sector (2013-2020)**

In this table, I report the amount of green bonds issued (2) for each Thomson Reuters Business Classification business sector (1), between May 2013 and May 2020, that have been used for the bond- or stock-level analysis of this research.

(1) **Thomson Reuters Business Classification business sector**	(2) **Amount of Green Bonds**
Real Estate	93
Banking & Investment Services	51
Utilities	49
Applied Resources	8
Industrial Goods	6
Renewable Energy	5
Telecommunications Services	5
Insurance	4
Industrial & Commercial Services	3
Transportation	3
Chemicals	2
Food & Beverages	2
Technology Equipment	2
Cyclical Consumer Products	1
Food & Drug Retailing	1
Total	236

Graph 1: Average Abnormal Return (%) on Green Bonds
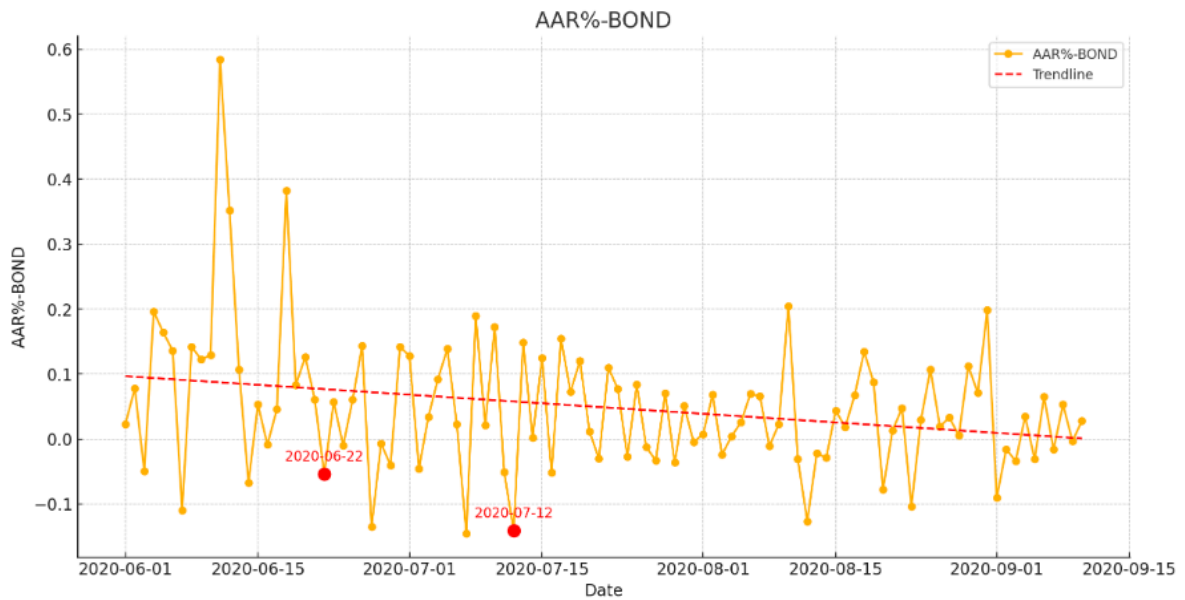
Graph 2: Average Abnormal Return (%) on Stocks of Firms Issuing Green Bonds
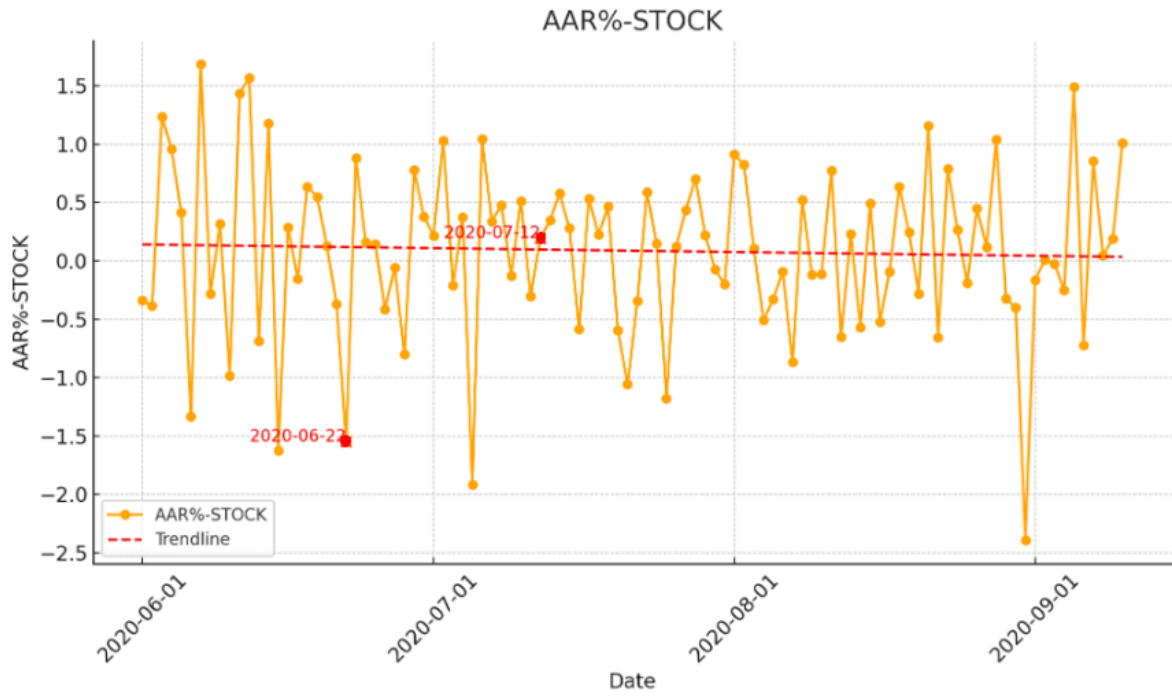
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