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Shareholder Wealth: An Event Study of Green and Non-Green Bond Issuance in Scandinavia

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Abstract

The green bond market has grown immensely since 2013 and is projected to continue on this growth path in the future. There is no consensus surrounding the effect of green bonds on the issuing firms share price. The purpose of this study is to analyze and compare the effect the announcement of the issuement of green bonds and conventional bonds have on the issuing firm's share price in Scandinavia. An event study was conducted and we analyzed the cumulative abnormal returns (CARs) of both green and non-green bond issues using the capital asset pricing model (CAPM) in three different event windows.

We found positive CARs for both first-time and subsequent issuers of green bonds, with statistical significant positive CARs for subsequent issuers in one of the analyzed event windows. The results also indicate that negative CARs are associated with the issuement of conventional bonds, albeit not statistically significant. This points to the conclusion that the Scandinavian equity market reacts positively to the issuement of green bonds compared to the established negative view of conventional debt.

Keywords: Green bonds, Conventional bonds, Event study, Cumulative Abnormal Return, Capital Asset Pricing Model

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1 Introduction

Over the last decade, awareness of the climate issues our planet faces has increased substantially. This has in turn affected corporate and government policy. The term ESG, environmental, social and governance, and its importance for future investing was first expressed in a 2004 study facilitated by Ivo Knoepfel aptly named “Who cares wins” (Knoepfel, 2004). Since 2013 - 2014 ESG investing has expanded greatly due to published studies finding a significant correlation between good financial results and corporations performance in the sustainability area (Kell, 2018). Our study will examine the environmental aspect of ESG, specifically green bonds and how the stock market reacts to new issuements of green bonds compared to conventional bonds. The definition of a green bond has been under debate, but a general consensus is the definition developed by the International Capital Markets Association (ICMA), and is expressed in their framework for the issuement of green bonds: Green Bond Principles. The determinants of a green bond is mostly based on the use of proceeds (International Capital Markets Association, 2018). We will further discuss green bonds, the green bond market, the issuers of green bonds and how it differs from conventional bonds in chapter 3.

The green bond market is relatively new to the financial sector but has gained increased attention over the past decade, however the effects and consequences of its existence and trading is not entirely clear. We believe that it is interesting to analyze if the announcement of a green bond has any effect on the stock price of the issuing firms in question. The purpose of this research is to analyze the previously mentioned effect on publicly listed firms in Scandinavia and compare if there is any difference from the announcement of conventional bonds.

From our research we found that the announcement of conventional bonds has a deteriorating effect on the stock price in Scandinavia in the three analyzed event

windows. The day prior to the day after announcement, 5 days prior to 5 days past the announcement date and 20 days prior to 20 days past the announcement date. On the other hand, our research provided a result that green bonds announcements have a positive effect on the stock price, although inconsistent, compared to the announcement of conventional bonds. For first time issuers of green bonds it initially resulted in a positive effect on the stock price within the narrow event window. The second event window [-5, 5] exhibits slightly negative CARs, similar to conventional bond issues. However, in the broader event window, it changes and shows an increasing effect on the stock price. Apart from the announcement for first time issuers, the announcement of subsequent issues shows a positive effect on the stock price within all three analyzed event windows. Specifically, in the shortest window of [-1, 1], we found statistically significant positive CARs at 5% significance level. However, even though we were able to come to these conclusions regarding subsequent issuers in the shortest time frame, we could not prove statistical significance for any of the other analyzed event windows and bond issues.

Henceforth, the remainder of this paper is structured as follows: Chapter 2 presents previous research done on the topic as well as how we differentiate. Chapter 3 discusses our research framework, provides information on essential elements for the study and hypothesis development. Chapter 4 and 5 explains the methodology foundation of the event study, as well as a discussion about our data set. Finally, chapter 6 provides the result of the event study and empirically investigates the hypotheses, while chapter 7 concludes the paper.

2 Previous Research

Financial markets have a tendency to be highly reactive to all kinds of announcements, press releases and news (Lebelle, Jarjir & Sassi, 2020). The corporate bond market has developed significantly over the years and previous researchers have looked at how the equity market reacts to announcements of the issuing of different kinds of fixed income instruments. For example, Dann and Mickelson (1984) analyzes convertible bonds on the US market. They look at 132 announcements of debt issues made during the time period of 1970 - 1979 from 124 different corporations and find that shareholders earn significant negative abnormal returns. An explanation behind the negative abnormal returns may be that when corporations increase their debt more of the cash flow goes to the debt holders in the form of interest payments and amortization as opposed to the shareholders leading to lower stock prices. A more recent study conducted within the scope of our research paper, namely the Nordic region, is Hemmingson and Ydenius (2017). They analyze the announcement effect of convertible bonds issuance using an event study on 53 observations. Their results are largely in line with Dann and Mickelson (1984). Hemmingson and Ydenius find a negative significant announcement effect on the issuing firm's cumulative abnormal returns. The effect debt issuance has on the issuing firms shareholder value differs between markets around the globe. Sze and Abdullah (2013) focuses on bonds issues from 100 different Malaysian firms and finds positive cumulative abnormal returns, indicating that the equity market elucidates debt issuing as an advantageous factor for the issuing firm. Sze and Abdullah also conduct a cross-sectional regression analysis that shows an insignificant relation of firm profitability, growth opportunities, asset tangibility, size and managerial ownership with cumulative abnormal returns. This result indicates that there is a signaling effect of bond issuance announcements.

With this in mind the effect the issuance of conventional bonds have on the firm's equity value is somewhat divided, at least previous research points to different effects between regional markets.

Previous research on green bonds and how the announcement of the issuance of green bonds affect the issuing firms equity price is divided. Lebelle, Jarjir and Sassi (2020) uses an international sample of 475 corporate green bond issuances from 145 unique firms during the time period 2009 to 2018. The methodology of their research is an event study using the capital asset pricing model (CAPM), Fama and French 3-Factor Model and Carhart 4-Factor model. They find insignificant negative cumulative abnormal returns for the event window of 20 days before announcement to 20 days after announcement. When they zoomed in closer to the announcement date, specifically the day of announcement and the day after they found significant negative cumulative abnormal returns. The differing results between the model being used to estimate CARs is marginal. The results presented provide evidence that the equity markets react similar for green bond and conventional issuances.

However, Tang and Zhang (2020) find completely different results. Their dataset is also international and consists of 241 green bonds issued by 141 unique publicly traded firms during the time period 2nd quarter 2007 to 4th quarter 2017. They analyze an event window of 10 days before to 10 days after announcement date and 5 days before to 10 days after announcement date using the CAPM, Fama and French 3-Factor Model and Fama and French 5-factor Model. Tang and Zhang find significant positive cumulative abnormal returns for all models being used and event windows. They attribute the positive CARs to the “green label” effect indicating that the firm’s green projects have an environmental impact. A similar result has been shown by Klassen and McLaughlin (1996), in which they show that firms receiving environmental awards also demonstrate significant positive CARs.

This result found by Tang and Zhang (2020) goes against the results found by Lebelle, Jarjir and Sassi (2020). The different results may be attributed to choice of event window, the sample of corporate green bonds, and firms being analyzed and time period. Tang and Zhang use a shorter time frame while Lebelle, Jarjir and Sassi use both a shorter and larger time frame. The effect subsequent issues of green bonds have on the firm's stock price is shown to be less than for first-time issuers (Tang & Zhang, 2020). The larger sample size for Lebelle, Jarjir and Sassi (2020) is mostly subsequent issues and therefore a larger proportion of the sample being analyzed are not first-time issuers. Consequently the "green label" effect is subject to diminishing returns and negative CARs can be observed in the short term.

This study presents new data as compared to previous studies. The previous literature on the effects of green bonds issuance on the issuing firms share price have datasets that range up to the year of 2018. With a constantly growing market, new- and subsequent issuers announced a significant amount of green bonds during 2019 and early 2020. We present new data and analyze it in a market that is more mature. In addition to this we isolate our study to Scandinavia. There have been results indicating that the effect differs between regional markets and by limiting our dataset to Scandinavia we observe the isolated effect. On top of this, we compile a similar dataset of conventional bonds with similar origin as the green bonds to compare the effect that green bonds and conventional bonds have on the share price. By similar origin, we imply that the bonds are being issued by mostly the same firm, if that is not possible we included firms in the same or similar sector.

3 Research Framework

This chapter lays the foundation and covers important topics to understand and properly conduct our research. The first subchapter covers conventional bonds and different types of bonds. The following part discusses green bonds, the green bond market globally and in Scandinavia, and lastly the benefits and costs of issuing green bonds. In the last part we construct three hypotheses that we aim to answer in this paper.

3.1 Conventional Bonds

A bond is an interest-bearing debt instrument in which an investor loans to either a firm or government where the return of the instrument is proportionate to an interest rate. Bonds can be issued by governments, municipalities and corporations to fund their projects and investments. Bonds differ from conventional loans in that they are traded on an exchange or an over the counter (OTC) market (Byström, 2014). There exists a number of different fixed income instruments. One example that is present in our dataset is hybrid bonds. Hybrid bonds are securities that combine the characteristics of both debt and equity, and are typically structured with either very long maturity or perpetual with deferrable coupon payment, similar to dividends from stocks (Nordea, 2020). There have been occurrences of green hybrid bonds, for example Telia became the first Swedish corporation to issue a green hybrid bond in 2020 (Telia, 2020). It is included in our dataset. Another type of bond is a convertible bond. It gives the bondholder an option to convert the bond into a specific number of shares in the issuing firm (Batten, Khaw & Young, 2018). The green version of a convertible bond exists, but is not present in our dataset.

3.2 Green Bonds and the Green Bond Market

3.2.1 Green Bonds

Climate awareness amongst the general population has increased substantially. In 2015 the Paris Agreement was signed to fight climate change and the financial markets responded by increasing attention to Socially Responsible Investments (SRI) and ESG-investing. There is also an increased desire amongst corporations to be “green” or at least be perceived as “green”. Green bonds are similar to conventional fixed income securities in the sense that they are issued by corporations, municipalities and governments to raise capital for financing investments and projects. They differ in the use of proceeds. ICMA defines a green bond as follows:“Green Bonds are any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects and which are aligned with the four core components of the GBP (International Capital Markets Association, 2018). The capital raised by green bonds are intended to be environmentally beneficial, e.g. reducing emissions, preventing pollution, or building wind- or solar parks (Tang & Zhang, 2020).

As previously mentioned there is no universally agreed upon conditions that awards a bond a “green” label and the terms for issuing green bonds are mostly voluntary standards (Flood, 2017). Green bonds face a major risk with greenwashing, i.e. “the superficial or insincere display of concern for the environment” (Talbot, 2017). Talbot (2017) argues that more transparency regarding use of proceeds is necessary for the green bond market to reach its full potential and meet the high investor demand for environmentally beneficial debt instruments. Our dataset of green bonds is collected from Bloomberg and the green bond label is given to debt instruments on Bloomberg by complying with the Green Bond Principles framework developed by the International

Capital Market Association (Bloomberg, 2020). We will further discuss the dataset in chapter 5.

The Green Bond Principles have four core components: Use of proceeds, process for project evaluation and selection, management of proceeds, and reporting. The use of proceeds is a cornerstone of a green bond and ICMA specifies that all projects should have a clear environmental benefit. The second component states that the issuer of green bonds should communicate to investors the environmental objective, the process by how the issuer determines the projects fit in the green projects categories, and the associated risks involved. The remaining two components specify guidelines for how the net proceeds shall be managed and that satisfactory reporting by the issuer is conducted (International Capital Markets Association, 2018).

There are a number of issuers of green bonds. Initially, supranational organizations and government-related entities such as municipalities were dominant players on the market. However, in the last years corporations have increased their presence. From our sample of publicly listed firms the majority of them are active within the real estate business. Other sectors include banking, renewable energy and power, industrial and manufacturing, investment company, and construction.

3.2.2 Evolution of the Green Bond Market

The history of green bonds is, relatively speaking, a short one. Green bonds are still a very new fixed income instrument. The first green bond was issued in 2007 by the EIB, European Investment Bank, and was at the time of issuement called a “climate awareness bond” (Climate Bonds Initiative, 2020). The following year in 2008, the World Bank issued the world's first bond awarded with the green label. It also helped form the basis for the aforementioned Green Bond Principles developed by the International Capital Markets Association (The World Bank, 2019). In 2019 the market value for green bond and green loan issuance increased by 51% compared to 2018, with the total

outstanding amount reaching roughly USD 257,7bn worldwide (Climate Bonds Initiative, 2020). The green bond market has seen substantial growth every year since 2014 and, as can be seen by Figure 1, Europe has been the leading driver behind it.

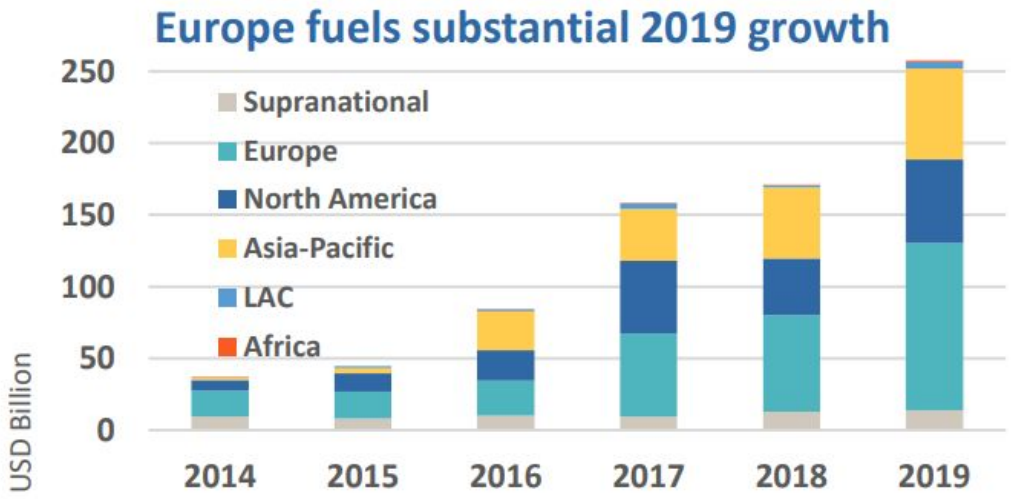

Figure 1. (adapted from Climate Bonds Initiative, 2020) Green bond market growth separated by region

As Figure 1 (adapted from Climate Bonds Initiative, 2020) shows, the green bond market has more than quadrupled since 2014 when the ICMA launched its blueprint for green bond issuance, the green bond principles. According to Danske Bank, the green bond market expects to continue on this growth path. Danske Bank's expectation for the future indicates a total of USD 350bn of green bonds to be issued during the year of 2020, which would be a growth of 33% from 2019. This leads to a significant hallmark of the green bond market with total issuance being worth USD 1 trillion after the summer of 2020 (Danske Bank, 2020).

3.2.3 Scandinavia and Green Bonds

The first green bond issued in Scandinavia and in Swedish Krona (SEK) occurred in 2013 by the non-publicly listed real estate firm Vasakronan (Davidsson, 2020). Since then they are a frequent issuer of green bonds. The green bond market has evolved

immensely in the nordic region, specifically Sweden. Sweden is a leading actor on the green bond market. In a 2019 report by Climate Bonds Initiative, Sweden is ranked number 7 in the world by green bond issuance 2019, after the likes of USA, China, France and Germany (Climates Bonds Initiative, 2020). It is not only corporations that can issue green bonds. Supranational institutions, municipalities and countries can issue green and non-green bonds as well. For example, the Swedish government, through its debt office Riksgälden, is planning to issue its first green bond during the year of 2020 and the proceeds are to be used to finance expenditure related to sustainable investments and projects (Riksgälden, 2019).

Furthermore, we will present statistics of the green bond market from our dataset of publicly listed firms.

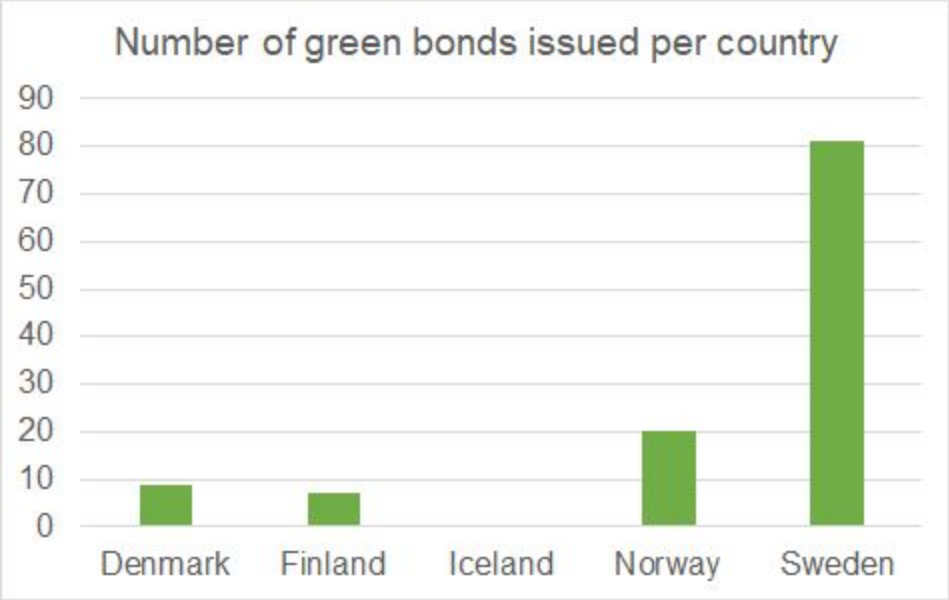

Figure 2. Number of issued green bonds from publicly listed firms per country

Figure 2 shows the geographical allocation of green bonds from publicly listed firms in Scandinavia based on our dataset. From this, we can conclude that Sweden is dominant in this aspect with 81 issued green bonds, afterward comes Norway in second with 20 issued green bonds as well as Denmark, Finland and Iceland with merely 9, 7 and 0 issued green bonds respectively.

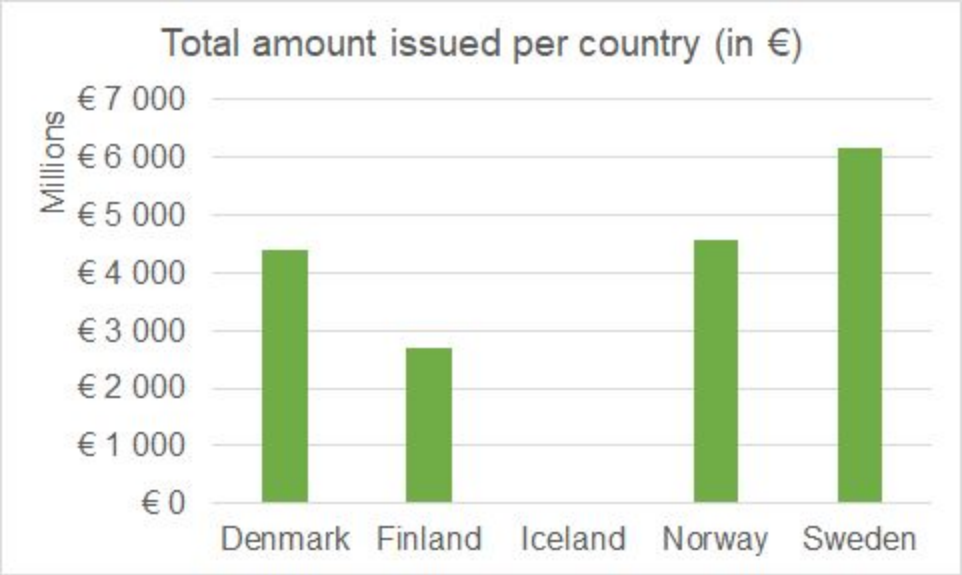

Figure 3. Total amount in Euro issued from publicly listed firms per country

If we instead compare the countries by the total amount issued, another story can be observed. Numerous of the green bonds from our dataset are not issued in Euros, to compare them we computed the amount issued in the respective currency into Euro using the exchange rate at the issue date of the bond. As we can see from Figure 3, the amount issued per country is more similar than the amount of bonds issued per country.

3.2.4 Benefits of Issuing Green Bonds

In contrast to conventional bonds, a green bond creates a new addition to the bond market which creates an optional investment decision for entities who value both ethical and green business operations. Through this, an issuing firm of green bonds is able to reach out to an alternative customer base which conventional bonds are not able to and possibly meet a demand, which previously have not been met. In addition to diversifying their investor base, issuers of green bonds highlight their green assets and the environmentally beneficial part of their business model (Climate Bonds Initiative, 2020). Green bond issuance also sends a pro-active signal to stakeholders and leads to a positive marketing story. It gives corporations the opportunity to increase their brand value by indicating that they are sustainable, forward thinking, and innovative (As You

Sow, 2020). Kanamura (2020) analyzed the performance of green bonds compared to conventional bonds and found that the investment performance of green bonds is greater than conventional bonds, but that the outperformance is declining over time (Kanamura, 2020). This result points to green bonds being a favourable fixed income instrument for issuers to adopt.

3.2.5 Costs of Issuing Green Bonds

Though green bonds seem to be very effective, forward thinking comes with several benefits, exposure and profits. However there are costs attached that are easily overlooked if one is not particularly invested in the process. Even though some of the costs are equivalent to the issuance of conventional bonds, there are some that are different for an issuer's standpoint.

In a consultation report on the behalf of the Federal Ministry for Economic Cooperation and Development, Skandinaviska Enskilda Banken (SEB) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) conduct a thorough analysis of the benefits as well as the costs of green bonds (2018). Although there is no globally agreed upon certifications and frameworks, there still are some requirements for firms issuing green bonds. To be able to issue green bonds, a firm must first and foremost construct a framework, which could be likened to the foundation of the proceeds around the green bonds and to what investments the funds will be used for and what areas the firm takes a standpoint against. Furthermore, additional costs to this include fees paid for third party certification, verification and labeling, as well as a variable cost in the form of continuous monitoring and reporting of the green bond and its related principles.

Finally, there is a great risk if a firm were to act controversial and challenge their green framework credentials or dissatisfy their stakeholders expectations. By doing this, the issuing firm would damage their reputation and lose trust from their stakeholders which could have a critical effect on the business.

3.3 Hypotheses

As mentioned earlier, environmental issues and green investing have gained a large traction over the last decade and continue to increase in the spotlight of media for each passing year. There exist conflicting views on how the equity market reacts to the announcement of green bonds. The positive view on green bond issuance is that the announcement suggests a positive development of the issuing firm's business model that is more in line with the expansionary regulatory climate- and environmental policy (Tang & Zhang, 2020). This business model would also be less susceptible to climate risks and at the same time gain more traction from the growing sustainable investment community. The other view takes a more pessimistic approach. An activity with a focus on sustainability may lead to uncertainty regarding how the new environmentally focused part of the business model would affect the profitability of the firm's ongoing operations (Lebelle, Jarjir & Sassi, 2020). Since there is no consensus regarding the shareholder effect, our hypotheses follows as such:

Hypothesis 1. We believe that the announcement of green bonds will have an effect on the stock price of the issuing firm.
Hypothesis 2. Secondly, the announcement of green bonds will have a different effect compared to conventional bonds.
Hypothesis 3. Finally, we believe that a first time announcement will have a different effect in contrast with subsequent issuance of green bonds.

We believe that answering these hypotheses will aid to give a deeper understanding and larger perspective on the effects of green bonds issuance for the stakeholders. Since there exists conflicting evidence on the effects, these will also help, if proven statistically significant, come to a more general answer for the effect of green bond issuance and how it differentiates from conventional bond issuance.

4 Methodology

Within this chapter we present our choice of method and how we conducted the research. Furthermore, we explain the models we used in order to analyze and empirically investigate the hypothesis as well as analyze the statistical significance.

4.1 Event study, CAPM and Cumulative Abnormal Returns

Our study is aimed at measuring the effect of the announcement of the issuement of both green and conventional bonds on the issuing firm's share price. A rigorous and thorough methodology is to conduct an event study. Given the efficient market hypothesis the impact an economic event has on the price of a security should be observed in a relatively short time frame. Event studies have plenty of uses, for example, they have been used to measure the effect of both firm specific events and economic events, e.g. mergers and acquisitions, announcement of macroeconomic variables such as the trade deficit and lastly issuement of new equity and debt (MacKinlay, 1997). As previously mentioned we will study the latter.

When conducting an event study it is important to specify the event window, meaning the time frame of interest. MacKinlay (1997) mentions that it is customary to define the event window as larger than the specific period of interest. For us this implies that our event window should be greater than just the day of the announcement of new debt. Specifically, we will analyze three separate time frames. In line with Lebelle, Jarjir and Sassi (2020) our event windows are [-20, 20], [-5, 5] and [-1, 1]. The reasoning behind the interval 20 days prior to the announcement and 20 days after is to analyze a more zoomed-out view and to capture any event-related pricing information being leaked to the market. To observe a medium time frame we also consider 5 days before the announcement date and 5 days after. To observe an even further zoomed-in view we consider the day before the announcement and the day after.

To successfully appraise the impact of issuing green- and conventional bonds we measure the abnormal returns during the event windows. The abnormal return is defined as the realized return of firm *i* at time *t* minus the expected return of firm *i* at time *t* (MacKinlay, 1997). Expressed mathematically as:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}|X_t) \quad (1)$$

where AR_{it} is the abnormal return, R_{it} the realized (or actual) return and $E(R_{it}|X_t)$ the expected return. X_t is the conditioning information and in our case the return of the market.

To study the effect of bond announcement we calculate daily cumulative abnormal return (CARs). CAR is equal to the sum of the abnormal returns, which is, as previously mentioned, defined as the difference between the actual returns and the expected returns. We started by estimating the expected returns using the Capital Asset Pricing Model, or CAPM. Specifically we estimated the parameters α_i and β_i of the market model for each firm and announcement date pair during 250 trading days, starting 300 days prior to the announcement date and ending 50 days before, in line with Tang & Zhang (2020) and Lebelle, Sassi & Jarjir (2020). We estimated the following regression:

$$R_{i,t} = \alpha_i + \beta_i \times R_{m,t} + \varepsilon_{i,t} \quad (2)$$
$$E[\varepsilon_{i,t}] = 0 \qquad var(\varepsilon_{i,t}) = \sigma^2_{\varepsilon_i}$$

where $R_{i,t}$ is the realized (actual) daily return of firm *i* at time *t*. $R_{m,t}$ is the daily market return of the specific country at time *t*, we use the stock index in the country of which the issuing firms share is listed. For example if the issuing firm's share is listed in Sweden we use the country-specific leading stock index OMXS30 or if the share is listed in Finland we use OMXH25 etc. $\varepsilon_{i,t}$ is the residual term with expected value of 0 and variance of $\sigma^2_{\varepsilon_i}$.

We then use the estimated parameters to calculate the expected returns of the stock *i* for each day *t* belonging to the three event windows:

$$\hat{R}_{i,t} = \alpha_i + \beta_i \times \hat{R}_{m,t} \quad (3)$$

Then to calculate the abnormal return for each firm *i* and day *t* belonging to the event windows we subtract the expected return from the actual return as follows:

$$AR_{i,t} = R_{i,t} - \hat{R}_{i,t} \quad (4)$$

In order to create a more diverse study we will separate the analysis of green bonds issuance into two parts, we will split our observations into first-time issuers and subsequent issuers of green bonds.

4.2 Statistical test

To test the statistical significance of our results we test the following hypothesis:

$$H_0 : \overline{CAR} = 0$$
$$H_1 : \overline{CAR} \neq 0$$

where $\overline{CAR}$ is the average CAR of all the firms being analyzed. In written words, we test the null hypothesis that the average CARs amongst the three groups is equal to zero with the alternative hypothesis that the average CARs is different from zero. The average CARs, denoted as $\overline{CAR}$, is computed by calculating the average abnormal return for each time period *t*, denoted as $\overline{AR}$, and summarizing them as follows:

$$\overline{AR_t} = \frac{1}{N} \sum_{i=1}^{N} AR_{i,t} \tag{5}$$

$$\overline{CAR}\,(t_1,\ t_2) = \sum_{t=t_1}^{t_2} \overline{AR}_t \tag{6}$$

To test the null hypothesis that the average cumulative abnormal returns are zero, because the population variance $\sigma^2_{\varepsilon_i}$ is unknown, an estimator must be used to compute the variance of the abnormal returns. $\sigma^2_{\varepsilon_i}$ is mathematically defined as:

$$\sigma^2_{\varepsilon_i} = \frac{1}{L_1 - 2} \sum_{t=T_0+1}^{T_1} (R_{i,t} - \alpha_i - \beta_i \times R_{m,t})^2 \tag{7}$$

where L_1 is the estimation window, T_0 the starting day of the estimation window, T_1 the final day of the estimation window, α_i and β_i the estimated parameters for firm *i* estimated according to the CAPM-model earlier. From this we can compute the variance of CAR_i:

$$\sigma^2_i(t_1,\ t_2) = (t_2 - t_1 + 1) \times \sigma^2_{\varepsilon_i} \tag{8}$$

To receive the variance of $\overline{CAR}$ we need to make further adjustments:

$$var(\overline{CAR}(t_1,\ t_2)) = \frac{1}{N^2} \sum_{i=1}^{N} \sigma^2_i(t_1,\ t_2) \tag{9}$$

From this we can test the null hypothesis that the average cumulative abnormal returns are equal to zero. H_0 can be tested using the following equation:

$$\theta = \frac{\overline{CAR}(t_1, t_2)}{var(\overline{CAR}(t_1, t_2))^{1/2}} \sim N(0, 1) \quad (10)$$

As mentioned in equation (10) the computed theta (θ) is approximately standard normally distributed with an expected value of zero and constant variance of one. This equation and the steps taken from equation (5) to (10) is described in the paper "Event Studies in Economics and Finance" by A. Craig MacKinlay 1997 (MacKinlay, 1997). This paper has acted as a guidebook to our methodology during our research in this topic.

5 Data

This chapter covers the dataset we used in our analysis. It begins with a discussion of the data and our selection process. Next we discuss the similarities and differences between the green and conventional bonds.

5.1 Discussion of the dataset

Throughout our research and gathering of the dataset we used Bloomberg as our main source of information for the announcement dates for both green- and conventional bonds. However, during this process, we have simultaneously conducted sample tests of the gathered information and compared it with alternative sources such as official press releases by the issuing firm in order to have the correct announcement date.

Furthermore, we have only accounted for green bonds issued by publicly listed Scandinavian corporations in accordance with the reasoning presented earlier. Additionally, we have paid certain attention to if the firms in question are first time issuers of green bonds in order to see if there are any discrepancies compared to subsequent issues. As mentioned, we looked for conventional bond issues from the same (or similar) firm's that issue green bonds. Where that was not possible, we looked for conventional bond issues from similar corporations in the same sector.

The data for the stock price and the respective indices are collected from Datastream.

5.2 Descriptive statistics: similarities and differences

Table 1. Descriptive statistics of green and conventional bonds

Panel A: Green bonds				
	Mean	**Median**	**Std.**	**N**
Coupon (%)	2.07	1.503	2.05	117
Maturity (years)	22.88	5	130.82	115
(Maturity) (years)	5.07	5	2.36	112
Outstanding amount (milon €)	149.35	50.05	217.45	117
Final dataset (analysis) (First time)				33
Final dataset (analysis) (Subsequent)				56
Panel B: Conventional bonds				
	Mean	**Median**	**Std.**	**N**
Coupon (%)	2.48	2.125	1.91	116
Maturity (years)	22.35	5	130.67	116
(Maturity) (years)	5.04	5	3.12	113
Outstanding amount (milon €)	230.22	61.67	331.59	116
Final dataset (analysis)				101

This table reports a summary of the descriptive characteristics of the different types of bonds. Within panel A and B we have excluded unlimited maturity dates under the topic “Maturity” as well as extreme values under “(Maturity)” (+25 years).

From this summary we are able to analyze the differences in characteristics between the green and conventional bonds. During the construction of the table we excluded hybrid bonds which had unlimited maturity from the first row Maturity. In addition to the exclusion of bonds with unlimited maturity, we excluded bonds that have a maturity of 25 years or longer from the row (Maturity), hence the differences in values within both panels. The reason for the exclusion of bonds with abnormally long maturity is to not skew the results because of very few extreme observations.

Initially, we can see that the different types of bonds share a striking similarity in many of the characteristics. The coupon varies slightly between green and conventional bonds with the latter having a higher mean and median coupon as well as lower standard deviation, which leads to the conclusion that conventional bonds generally lie on a higher coupon level and have lower variation.

Furthermore, the maturity, excluding hybrid bonds, are roughly similar with just small variations. Both conventional and green bonds have a median maturity of 5 years and a mean that is very similar. The standard deviation of the maturity for conventional bonds is slightly higher than for green.

Where the bonds differ is the outstanding amount. The mean outstanding amount for conventional bonds is roughly €100 millions larger than for green bonds. This may be attributed to the strict regulation regarding reporting of the use of proceeds for the green bonds. Issuers of green bonds may be reluctant to issue large amounts since the use of proceeds from the bonds has to be implemented into their green- and environmental projects.

In conclusion, since there are not any greater differences between the characteristics of the different bonds, except for the outstanding amount, the characteristics of the bonds should not have a vital impact on how it affects the stock price.

6 Results

In this chapter we present and discuss the result of our study. In the first part we present and discuss the result and the statistical significance. Following this, we formulate an answer to our three constructed hypotheses. Next we mention delimitations, factors that could have affected the outcome of our research and finally improvements for future research.

6.1 Stock market reaction to announcement of green and conventional bonds

Table 2. Accumulation of the average CARs[-1, 1].

CARs [-1, 1]						
	First-Time Issues		Subsequent Issues		Conventional Issues	
Event Day	AR	CAR	AR	CAR	AR	CAR
-1	-0,0016	-0,0016	0,0014	0,0014	0,0022	0,0022
0	-0,0007	-0,0024	0,0019	0,0033	-0,0037	-0,0015
1	0,0035	**0,0011**	0,0026	**0,0060**	-0,0006	**-0,0021**

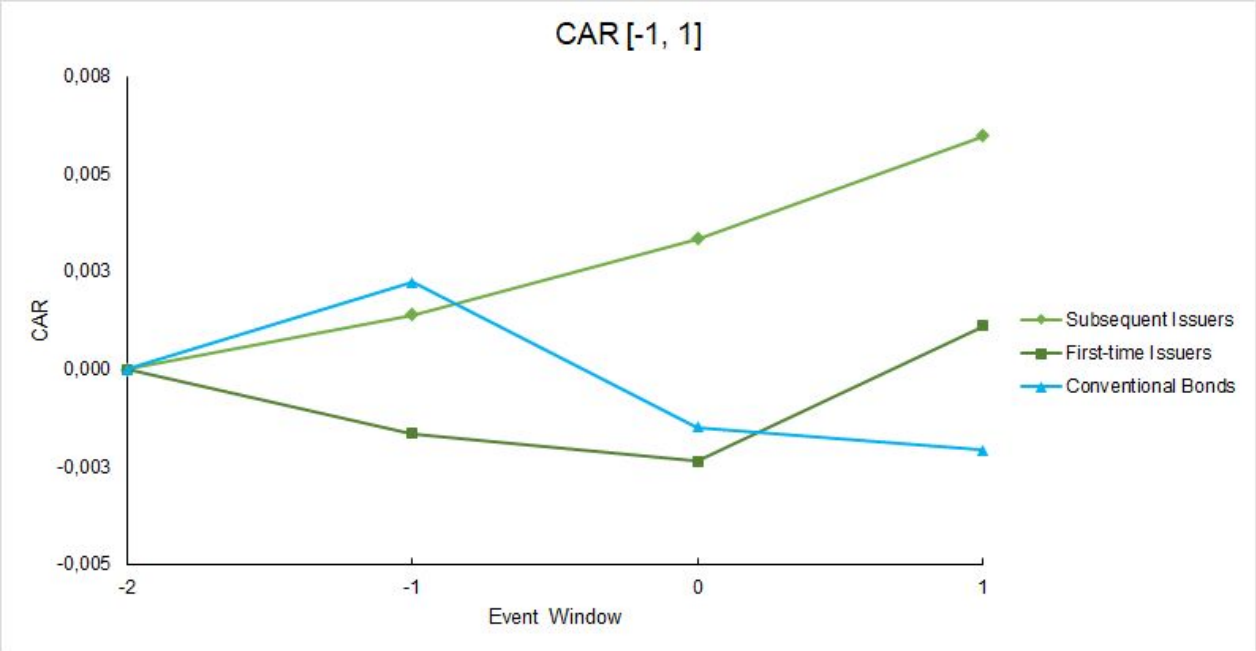

Figure 4. Accumulation of the average CARs[-1, 1].

Table 3. Accumulation of the average CARs[-5, 5].

CARs [-5, 5]						
	First-Time Issues		Subsequent Issues		Conventional Issues	
Event Day	AR	CAR	AR	CAR	AR	CAR
-5	-0,0034	-0,0034	-0,0004	-0,0004	0,0007	0,0007
-4	-0,0004	-0,0038	-0,0006	-0,0010	0,0033	0,0041
-3	-0,0024	-0,0063	0,0018	0,0008	-0,0025	0,0016
-2	0,0033	-0,0030	-0,0003	0,0005	-0,0020	-0,0005
-1	-0,0016	-0,0046	0,0014	0,0019	0,0022	0,0018
0	-0,0007	-0,0054	0,0019	0,0038	-0,0037	-0,0019
1	0,0035	-0,0019	0,0026	0,0065	-0,0006	-0,0025
2	0,0005	-0,0014	-0,0012	0,0053	-0,0013	-0,0038
3	0,0004	-0,0010	-0,0026	0,0026	0,0024	-0,0015
4	0,0006	-0,0005	-0,0010	0,0017	-0,0014	-0,0029
5	-0,0029	**-0,0033**	0,0001	**0,0018**	-0,0013	**-0,0041**

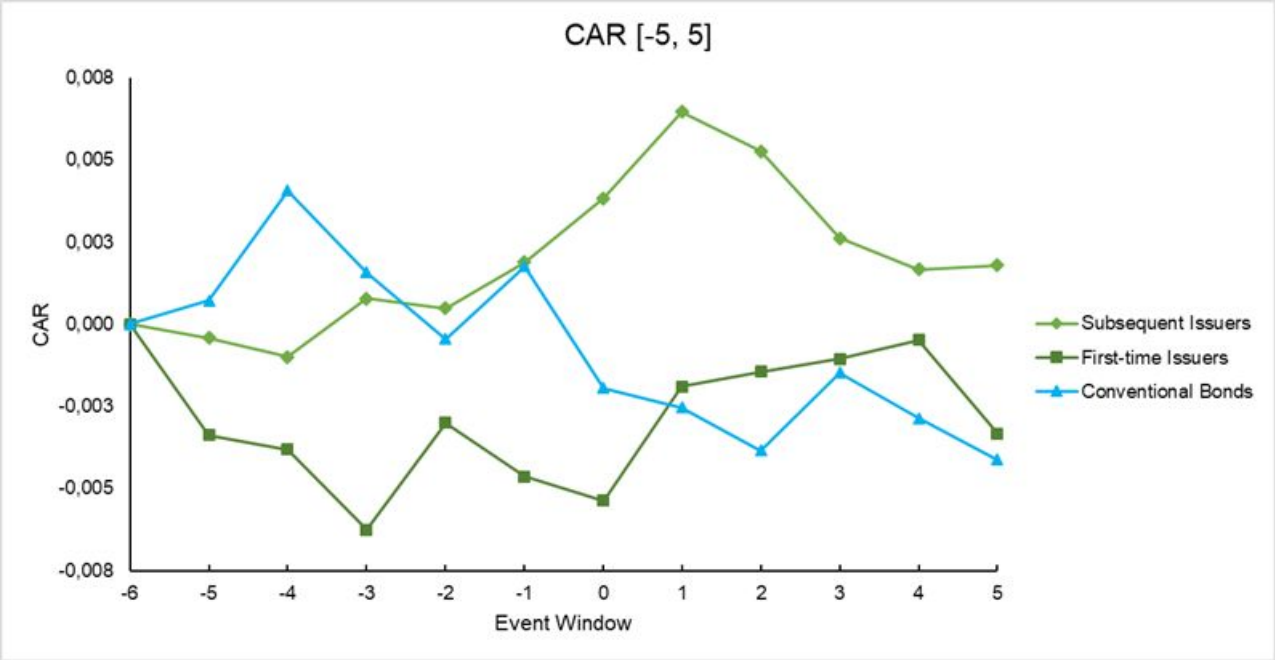

Figure 5. Accumulation of the average CARs[-5, 5].

Table 4. Accumulation of the average CARs[-20, 20].

	CARs [-20, 20]					
	First-Time Issues		Subsequent Issues		Conventional Issues	
Event Day	AR	CAR	AR	CAR	AR	CAR
-20	0,0040	0,0040	0,0002	0,0002	0,0012	0,0012
-19	-0,0015	0,0025	-0,0007	-0,0005	0,0033	0,0045
-18	0,0017	0,0042	-0,0014	-0,0019	-0,0024	0,0022
-17	0,0001	0,0043	-0,0015	-0,0034	-0,0013	0,0008
-16	-0,0016	0,0027	0,0023	-0,0011	-0,0008	0,0000
-15	-0,0007	0,0020	0,0020	0,0010	0,0002	0,0002
-14	-0,0034	-0,0014	-0,0039	-0,0030	0,0015	0,0018
-13	-0,0023	-0,0037	-0,0002	-0,0032	-0,0002	0,0016
-12	0,0023	-0,0014	0,0002	-0,0030	-0,0016	0,0000
-11	0,0003	-0,0011	0,0004	-0,0026	0,0001	0,0002
-10	-0,0014	-0,0025	-0,0026	-0,0053	0,0018	0,0019
-9	-0,0008	-0,0032	0,0020	-0,0032	-0,0012	0,0008
-8	0,0036	0,0003	0,0005	-0,0027	0,0008	0,0016
-7	-0,0017	-0,0014	0,0013	-0,0014	0,0003	0,0019
-6	0,0027	0,0013	-0,0005	-0,0019	0,0027	0,0046
-5	-0,0034	-0,0021	-0,0004	-0,0023	0,0007	0,0053
-4	-0,0004	-0,0025	-0,0006	-0,0029	0,0033	0,0086
-3	-0,0024	-0,0050	0,0018	-0,0011	-0,0025	0,0061
-2	0,0033	-0,0017	-0,0003	-0,0014	-0,0020	0,0041
-1	-0,0016	-0,0033	0,0014	0,0000	0,0022	0,0063
0	-0,0007	-0,0041	0,0019	0,0020	-0,0037	0,0026
1	0,0035	-0,0006	0,0026	0,0046	-0,0006	0,0020
2	0,0005	-0,0001	-0,0012	0,0034	-0,0013	0,0007
3	0,0004	0,0003	-0,0026	0,0008	0,0024	0,0031
4	0,0006	0,0008	-0,0010	-0,0002	-0,0014	0,0017
5	-0,0029	-0,0020	0,0001	-0,0001	-0,0013	0,0004
6	0,0015	-0,0005	0,0004	0,0003	0,0001	0,0005
7	0,0049	0,0044	-0,0001	0,0002	-0,0019	-0,0014
8	-0,0033	0,0012	-0,0003	-0,0001	0,0036	0,0022
9	0,0002	0,0013	0,0002	0,0001	-0,0014	0,0008
10	0,0019	0,0033	0,0018	0,0019	-0,0010	-0,0002
11	-0,0033	0,0000	0,0033	0,0052	0,0010	0,0008
12	0,0007	0,0007	0,0023	0,0075	0,0017	0,0025
13	0,0039	0,0046	0,0007	0,0082	-0,0022	0,0003
14	-0,0026	0,0020	0,0015	0,0097	0,0025	0,0028
15	-0,0019	0,0001	0,0005	0,0102	-0,0028	0,0000
16	0,0019	0,0020	0,0027	0,0129	-0,0011	-0,0011
17	-0,0012	0,0008	-0,0008	0,0121	0,0015	0,0004
18	-0,0029	-0,0021	-0,0030	0,0091	-0,0036	-0,0032
19	0,0023	0,0002	-0,0013	0,0077	-0,0002	-0,0034
20	0,0001	**0,0003**	0,0025	**0,0103**	0,0011	**-0,0023**

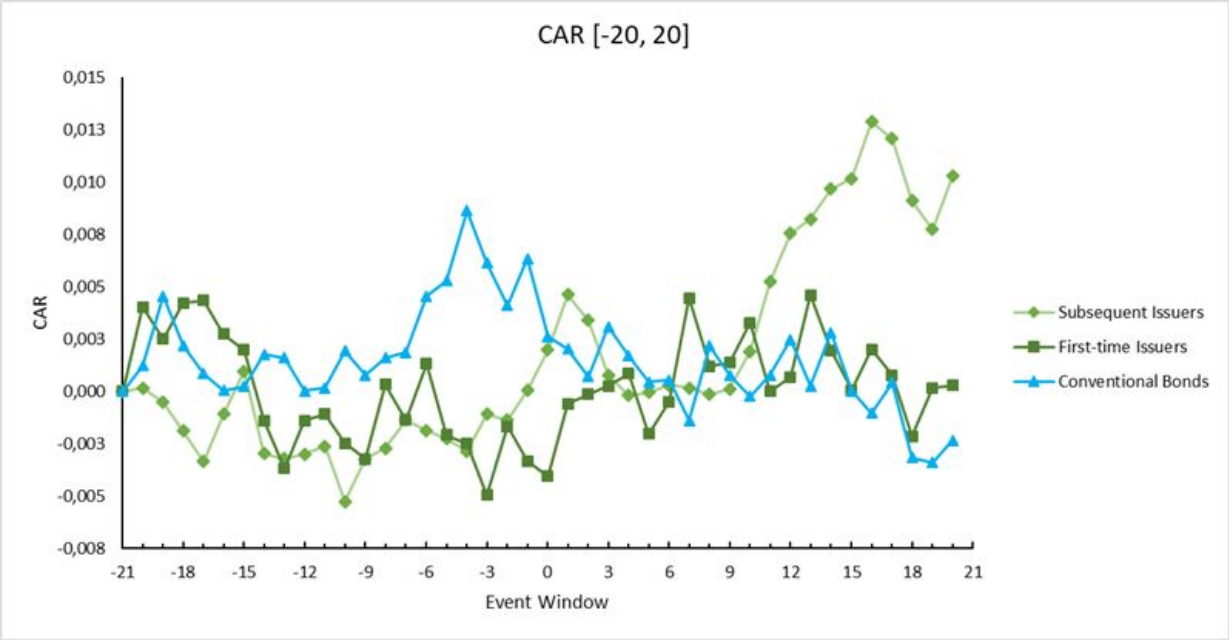

Figure 6. Accumulation of the average CARs[-20, 20].

From Table 2, 3 & 4 and Figure 4, 5 & 6 we can conclude that the stock market reacts positively for subsequent issuers in all analyzed event windows. Specifically we can observe positive reactions on the days surrounding the announcement date. For first-time issuers positive abnormal returns can be observed during the time window 0 to 4. The trend exhibited beforehand can arguably be attributed to a random walk but in the short window of 1-2 days around the announcement date a positive reaction from the equity market can be observed. This positive result may be attributed to the “green label” effect presented by Tang & Zhang (2020). After the positive reaction the stock's abnormal return starts exhibiting a downward sloping trend. As previously mentioned there is a consensus regarding the negative effect issuance of debt has on the firm’s share price. We found similar results as Eckbo (1986). Eckbo (1986) analyzed the effect issuance of conventional bonds has on the firm’s stock price and found that it is slightly negative in the short window. As can be observed from the above figures and tables we found equivalent results of slightly negative CARs for conventional bond issues. We can deduce that the average CARs is, although negative at times, higher for both first-time

and subsequent issuers compared to conventional issues. Following this, issuing green bonds is more beneficial in respect to the change in share price compared to conventional bond issues.

Table 5. Stock market reaction to bond issuement

Panel A: Green Bonds						
	First-Time Issues			Subsequent Issues		
	(1)	(2)	(3)	(4)	(5)	(6)
Event window	[-1, 1]	[-5, 5]	[-20, 20]	[-1, 1]	[-5, 5]	[-20, 20]
CAPM_CAR (%)	0.110	-0.333	0.028	0.597**	0.180	1.027
Z-statistic (θ)	0.24783	-0.39262	0.01712	1.85851**	0.29230	0.86405
Observations	33	33	33	56	56	56

Panel B: Conventional Bonds			
	Conventional Issues		
	(1)	(2)	(3)
Event window	[-1, 1]	[-5, 5]	[-20, 20]
CAPM_CAR (%)	-0.208	-0.412	-0.234
Z-statistic (θ)	-0.77779	-0.80432	-0.23681
Observations	101	101	101

The tests significance level is indicated by *** P < 0.01, ** P < 0.05, * P < 0.1

From Table 5 we are able to analyze the average cumulative abnormal return for the green bonds, both first time issuers and subsequent issuers, as well as the conventional bonds. Initially, in order to not have a misleading and instead a correct analysis we had to exclude some of the observations from the data set. These exclusions were necessary to be able to estimate the alpha and beta value correctly. The excluded observations are represented by bonds that were released from the same firm on the same date, this was done in order to avoid double counting the effect of the announcement. Furthermore, because we estimate alpha and beta using a window starting from 300 trading days before the announcement to 50 days before, we also excluded bonds issued from firms which have not been publicly listed for the appropriate amount of time.

What we mainly can see from Table 5 is how the announcement of a bond issuance has affected the stock price of the firms. The analysis shows three different event windows where one analyzes 1 day prior to 1 day past the announcement date, the other

analyzes 5 days prior to 5 days past, while the third analyzes 20 days prior to 20 days after, which creates three event windows of 3, 11 and 41 days respectively. From this, we are able to see that the announcement of conventional bonds has a negative effect on the stock price in each and every event window, where it decreases by 0.208% within the 3 day event window, 0.412% over the 11 day event window, and 0.234% over the 41 day event window.

Apart from conventional bonds, green bonds have a rather positive effect, except for the 11 day event window for first time issuers. However, within the 3 day and 41 day event window for first time issuers we can see an increase in the stock price of 0.110% and 0.028% respectively. On the other hand, for the subsequent issuers of green bonds we found an increase in the stock price within all event windows. The 3 day event window had an increase of 0.597%, while the 11 day event window and the 41 day event window increased the stock price with 0.180% and 1.027% respectively. According to this, we see that first time green bonds yield a negative negative effect on the stock price in the 11 day event window, however, both prior and past this event window, it gives a positive effect. Furthermore, as more green bonds are issued from the same firm it has a positive effect while conventional bonds solely have a negative effect on the stock price. This may be attributed to a decline in the uncertainty of how the green bond affects the profitability of the firm's main operations. When a firm issues their first green bond shareholders and the market are unsure of the magnitude of the new environmentally friendly project. When the firm manages to uphold similar profitability as prior to the green bond issuement, or that the proceeds from the green bonds are generating significant revenue, the market reacts positively to subsequent issues.

This leads to the question of why the effect of a first time announcement is negative within the 11 day event window. As mentioned in the introductory chapter, the green bonds market is relatively new and thereby the functionality of the green bonds is not studied well enough in order to be able to draw final conclusions. The lack of knowledge

of green bonds might create concern amongst stakeholders and could thereby be an explanation for the negative effect for first time issuers within the short event window of 11 days.

Even though we are able to see an effect of announcement from both conventional and green bonds, we were not able to statistically prove the majority of the estimated effects. However, for subsequent announcements within the 3 day event window, we were able to prove the effect with a statistical significance of 5%. In other words, we are not able to statistically prove most of the above mentioned effects are the actual effects of green and non-green bond announcements in Scandinavia based on our sample. We found similar results as Tang and Zhang (2020), they found positive CARs for both first-time and subsequent issuers of green bonds with statistical significant results for first-time issuers in the event windows [-10, 10] and [-5, 10]. Interestingly, our results are different from Lebelle, Jarjir and Sassi (2020). Lebelle, Jarjir and Sassi (2020) did not separate their analysis into first-time and subsequent issuers, they bundled them together and found statistical significant negative CARs in a longer event window of [-20, 20] as well as shorter time frames of [-1, 1] and [0, 1]. The reasoning behind our differing results may be attributed to the separation of first-time and subsequent issuers and that we analyze an isolated regional effect. As previously mentioned the effect differs between regional markets and our findings of positive effects may not be observed globally.

6.2 Answers to our hypotheses

From the information provided in the previous section we are able to conclude answers for our hypotheses. Regarding our first hypothesis we expected a green bond announcement to have an effect on the stock price. With our second hypothesis we expected that the effect of announcement of green bonds will be different from conventional bonds, and lastly, for our third hypothesis we expected that the effect of first time issuance of green bonds will be different from subsequent issues.

As mentioned in the previous section, the announcement of green bonds have a positive effect for subsequent issuers in all analyzed event windows. For first-time issuers we found slightly positive CARs in the event windows [-1, 1] and [-20, 20] and negative in [-5, 5]. We can conclude that green bond announcements have a positive effect and that it differs between first-time and subsequent issuers. Furthermore, we can also conclude that the effect announcements have on the stock price differentiate between green bonds and conventional bonds.

Even though the results of our analysis enables us to answer the hypotheses, we are only able to statistically prove the effect for subsequent issuers in the short event window of [-1, 1]. This means that we can answer our first hypothesis with statistical significance. Subsequent issues of green bonds have a positive effect on the issuing firms share price in the short run. We are unable to find statistically significant results for conventional bond issues and first-time issuers of green bonds. Since we are only able to statistically prove it for one of our analyzed event windows, we cannot statistically prove our hypotheses in longer time frames for subsequent issuers. On top of this, we cannot say with statistical significance that the effect differs between conventional and green bond issuement and that it differs between first-time and subsequent issues.

6.3 Delimitation

As previously mentioned we analyzed the Nordic region, specifically Scandinavia. These countries are somewhat similar to each other in regards to culture, ethics and operations of the financial market. The decision to study multiple countries instead of just one is based on the problem of having abnormal investment decisions of a single country following a particular trend, which could cause biases and an incorrect view of the analyzed effects. In order to answer our hypotheses, the effect green bond announcements have on the market price of the issuing firm’s share we have excluded green bond announcements from firms that are not publicly listed in either of the Scandinavian countries stock exchange. This led to a lot of observations being dropped

due to the firm not being publicly traded. As previously mentioned, the effect is isolated within the Nordic region and the effects presented are not representable for different regional markets and the green- and conventional bond market as a whole. In addition to this our chosen event windows may also present different results compared to a more zoomed-in event window of [0, 1] or [0, 2] but we chose our event windows to capture the fact that rumors and information leakage affect the share price prior to the announcement day.

6.4 Factors that could have affected the research and improvements for future research

What we mainly found to be problematic with our research and the outcome is the magnitude of the data set. In accordance with the previously mentioned information, green bonds have not been traded for an especially long time and therefore there are a limited amount of green bonds, specifically in Scandinavia. In addition to this we solely analyze publicly listed firms which furthermore limits our dataset. A larger dataset of both first-time and subsequent issues would have been preferable. This smaller dataset is a contributing factor to our results only being statistically significant for subsequent issuers at a 5% level.

Since the green bond market is still a fairly new and emerging market, the amount of issued green bonds are limited, especially with our narrow perspective of only green bonds in Scandinavia. This results in a difficulty being able to analyze and statistically prove the effects the announcement has on our dataset. Furthermore, without a large enough data sample the result could be misleading since it creates an uncertainty if the effect is a special occurrence or if it gives a valid representation, and therefore it might be controversial to draw a final conclusion. Mainly, what would improve the significance of the research is a larger data set. However, since there is a limitation in issued green bonds from publicly listed firms in Scandinavia, this would be hard to improve at the current time. Another improvement that could be made is to include another shorter

event window. If the efficient market hypothesis holds true, the information disclosed at the announcement date should be priced into the share instantly. It would be interesting to analyze a larger dataset in Scandinavia, capture the isolated regional effect, and include an event window of [0, 1] or [0, 2] and compare it to a broader event window. Another addition that would improve the research is to use an additional model on top of CAPM to calculate the abnormal returns. For increased robustness multi-factor models such as Fama and French 3-factor (Fama and French, 1993), Fama and French 5-factor (Fama and French, 2015) and Carhart 4-factor (Carhart, 1997) can be used.

7 Conclusion

In conclusion, the average CARs for first-time issuers of green bonds showed positive results in the event windows [-1, 1] and [-20, 20], while slight negative CARs can be observed in [-5, 5]. For subsequent green bond issuers, the average CARs are positive in all three of the considered event windows, with statistically significant positive CARs of 0.597% at a 5% significance level in the 3-day event window. Conventional bond issues exhibit negative average CARs of similar sizes in event windows [-1, 1], [-5, 5] and [-20, 20]. The findings of the research were unanimous with our hypotheses, however, we are only able to reach a meaningful and statistical significant conclusion regarding the first of our three hypotheses. Subsequent issues of green bonds have a significant positive effect on the issuing firm's share price. We can draw conclusions regarding the other two hypotheses. Specifically that the issuance of green bonds is more positive compared to conventional bonds and that the effect is more positive for subsequent issuers compared to first-time issuers. Future researchers within this topic should consider a larger dataset to present regional effects of green bond issuance. Since there does not exist a sufficient dataset of green bonds issued from publicly listed firms in Scandinavia at the time of our study, further time should be allowed for the green bond market to grow and more bonds to be issued.

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