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Stock Market Reactions to Sustainability-Linked Debt Announcements

An empirical study of firms listed on major European stock exchanges

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Abstract

This thesis analyses the stock market reaction to announcements of sustainability-linked loans and bonds. Our focus is on the European market, where we examine a sample of announcements from publicly listed firms in 17 European countries. The study covers the period from the introduction of sustainability-linked loans and bonds in Europe, 2017 and 2020, respectively, until the end of 2022. By applying an event study approach, we reveal significant cumulative average abnormal returns of 1.04 % and 1.15 % for sustainability-linked loans and bonds, respectively, indicating that equity holders perceive sustainability-linked debt as value-enhancing.

In addition, we investigate geographical differences in announcement effects within Europe. Notably, the event study results indicate that announcing a sustainability-linked loan leads to significantly better stock market returns in the Nordic region than in the rest of Europe. At the same time, no significant geographical effect is observed for sustainability-linked bonds. These findings remain consistent when controlling for debt and firm-specific characteristics using regression analysis.

Furthermore, we extend our analysis to examine the potential disparities between initial and subsequent announcements of sustainability-linked debt. Contrary to existing literature, our event study reveals significant positive stock market returns for both initial and subsequent sustainability-linked debt announcements.

Contents

Abbreviations

CAR	Cumulative Abnormal Return
CAAR	Cumulative Average Abnormal Return
CBI	Climate Bonds Initiative
COP	Conference of the Parties
ESG	Environmental, Social and Governance
GDP	Gross Domestic Product
ICMA	International Capital Markets Association
IPCC	Intergovernmental Panel on Climate Change
LSTA	Loan Syndications and Trading Association
SDG	Sustainable Development Goals
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
SLB / SLL / SLD	Sustainability-Linked Bond / Loan (Together: Sust.-Linked Debt)
$	US Dollars
bn	Billion
m	Million
tn	Trillion

1.0 Introduction

In recent years, we have witnessed a remarkable shift towards sustainable development and a growing emphasis on environmental and social responsibility. Corporations have realised the need to integrate sustainability into their operations and financing activities as a part of this development. Consequently, there has been a surge of interest from the private sector in sustainable finance over the past decade, driven by a recognition that the benefits of sustainability may significantly outweigh the upfront costs (UN, n.d.). As part of this transformative development, sustainability-linked loans (SLLs) and bonds (SLBs), which incentivise borrowers to achieve predetermined targets linked to the UN's Sustainable Development Goals through financial mechanisms, have emerged as prominent instruments in the sustainable finance market.

Since its inception in 2007 with supranational green bonds, the sustainable finance market has experienced steady growth. However, it was not until the issuance of the first corporate green bond in late 2013 that the sustainable finance market rapidly expanded (CBI, n.d.). The introduction of additional products such as green loans in 2014 and sustainability-linked loans and bonds in 2017 and 2019, respectively, have further contributed to the market's rapid development. As a result, the global sustainable finance market reached a record high of $2.16tn in 2021, with sustainability-linked debt (SLD) accounting for almost 40 % of the market (Refinitiv[1], 2023). Figure 1 shows the annual worldwide announced amount of debt facilities since the introduction of sustainability-linked debt in 2017.

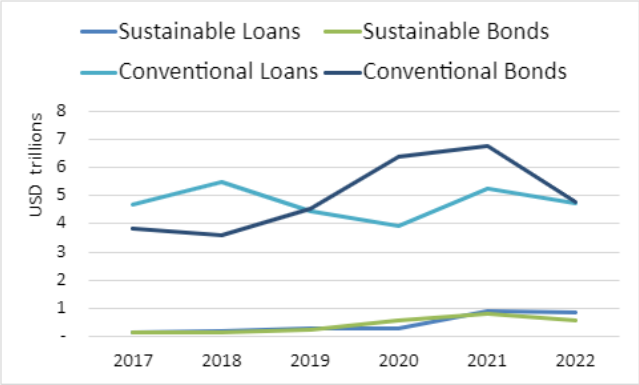

Figure 1: Raised amount of announced sustainable loans and bonds worldwide 2017 - 2022, excluding amount raised for banking & investment services.

Despite the growing importance of sustainability-linked debt, there remains a significant gap in the existing literature regarding the announcement effect of SLD-instruments. While we have found numerous studies that have analysed the broader impact of sustainable finance on firm performance and market behaviour, few have specifically analysed the immediate market reactions surrounding the announcement of SLLs and SLBs. Some literature briefly mentions and analyses the worldwide stock market reaction to SLL-announcements as part of a broader study, with one concentrating on the US stock market exclusively. However, we have not found any literature that analyses the effect of SLB-announcements, nor have we seen any literature solely dedicated to exploring the stock market reaction to sustainability-linked debt announcements.

The lack of existing literature allows us to contribute valuable insights into sustainability-linked bonds and loans, assessing their perceived market value and significance across different geographical regions. Specifically, our research focuses on analysing the announcement effect of these instruments for corporations in 17 European countries, including a subsample from the Nordic countries. To address our research question, we utilise an event study methodology influenced by theories proposed by MacKinlay (1997) and McWilliams & Siegel (1997). Considering the European introduction of SLLs and SLBs in 2017 and 2020, respectively, these years mark the start of our sample periods.

To assess the impact of the different announcements, we analyse the cumulative abnormal return (CAR) of the stock related to the debt announcing firm. By examining stock price reactions, we seek to demonstrate that the announcement of sustainability-linked loans and bonds elicits a more positive response in the stock market than those of their conventional counterparts, thereby incentivising borrowers to commit to sustainability.

For both the full European sample and the Nordic subsample, our analysis reveals positive cumulative average abnormal returns (CAARs) for both SLLs and SLBs, indicating that the market perceives sustainability-linked debt as value-enhancing. In Europe, our results exhibit a significant CAAR of 1.04 % for SLLs and 1.15 % for SLBs[1]. Similarly, for the Nordic countries, we observe a significant CAAR of 1.42 % for SLLs and 1.13 % for SLBs. However, comparing

[1] The Nordic subsample is included in the full European sample, and therefore, the CAARs mentioned for Europe encompass the results for the Nordic region as well.

the announcement effect of SLLs and SLBs to their conventional counterparts, the observed positive difference is only significant for SLBs in both regions.

When comparing the announcement effect of sustainability-linked debt between the two regions, we find a significant premium associated with announcing SLLs in the Nordics. In contrast, the observed premium for SLBs in Europe is found to be insignificant.

We extend our analysis to examine potential disparities between initial and subsequent announcements of sustainability-linked debt. In contrast to comparable studies, such as Flammer (2020), our findings indicate significant stock market reactions for both initial and subsequent announcements. This implies that each SLD-announcement, whether it is a firm's initial or subsequent sustainability-linked debt announcement, is likely to generate a similar stock market reaction.

To enhance the robustness of our event study analysis, we conduct a regression analysis incorporating a broad range of control variables that could potentially impact the stock market reaction to debt announcements, inspired by the research performed by Godlewski et al. (2013) and Glavas (2020). Using the cumulative abnormal returns (CARs) calculated in the event study, we utilise an ordinary least squares (OLS) regression to examine whether the sustainability-linked label affects the stock market's response to a firm’s debt announcement.

The results from the regression analysis validate those of the event study, as they do not show any indication of a significant difference between SLLs and conventional loans. We also observe a significantly stronger positive market reaction in the Nordics compared to Europe, which remains significant only for SLLs. However, contrary to the event study, the regression does not show a significant positive difference between the announcement effects of SLBs and conventional bonds. Additionally, the observed positive market reaction to initial and subsequent SLD-announcements is found to be insignificant in the regression analysis.

To the best of our knowledge, we are the first to analyse the stock market reactions to sustainability-linked debt announcements comprehensively. Prior to our study, no analysis has been conducted on SLB-announcements for any geographical region or worldwide. Further, we are the first to analyse the stock market reactions to SLL-announcements,

specifically in Europe and the Nordics. Our research fills a crucial gap in the literature, shedding light on the investor response to these innovative financing instruments.

The chapters of this thesis are structured as follows: Chapter 2 provides an overview of the sustainable finance market, highlighting development and characteristics, before reviewing relevant literature regarding sustainable finance to establish the theoretical context. Chapter 3 details the data collection process, ensuring transparency and reliability. Chapter 4 presents the methodology and empirical analysis, employing event study and regression analysis to examine the announcement effect. Lastly, Chapter 5 concludes the thesis by summarising the findings, discussing implications, and offering recommendations for future research.

2.0 Background and Literature Review

In this chapter, we will first elaborate on the sustainable finance market. Second, we will discuss existing literature on sustainable finance, with primary focus on literature regarding stock market reaction to announcements of sustainability-linked and green debt.

2.1 Sustainable Finance Market

In December 2015, through their signing of the Paris Agreement (PA), over 190 countries legally committed to the Temperature Goal, aiming to limit the global temperature increase to 1.5 - 2°C above pre-industrial levels (PA, 2015, Article 2a). Being the first time ever a binding agreement was signed in the multilateral climate change process, this marked a historical turning point, uniting almost all nations in combating climate change and adapting to its effects (UNFCCC, n.d.). Only months earlier, the UN General Assembly adopted the 2030 Development Agenda, containing the well-known 17 Sustainable Development Goals (SDGs). Safe to say, the second half of 2015 marked a change of pace in aiming for a sustainable future.

While the commitment to the Temperature Goal and SDGs from almost every country in the world is a crucial first step, the central question of how this can be achieved (or, more precisely: how this can be funded) still needs to be answered. The vast amount necessary, equal to roughly 2.5 % of global GDP (IPCC, 2018, p. 373), calls for way more than the annual $100bn jointly pledged from developed countries in support of climate action in developing countries (COP21, 2015, Decision 5). Consequently, the international finance market plays a crucial role in achieving the Temperature Goal.

The very first sustainable finance instruments were introduced almost a decade before the Paris Agreement with the green bonds issued in 2007 and 2008 by the European Investment Bank and the World Bank, respectively. These issues happened due to a direct request from institutional lenders in Sweden (World Bank, 2019). A few years later, in 2013, Swedish commercial real estate company Vasakronan was the first to ever issue a corporate green bond (Henry, 2021) and in 2014, English supermarket chain Sainsbury's was the first to ever announce a green loan (Boulle, 2014), marking the starting point for a whole new area of green debt instruments.

A green bond is defined as "*any type of bond instrument where the proceeds or an equivalent amount will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects*" (ICMA, 2021, p. 3). Similar to green bonds, green loans are defined as "*any type of loan instruments and/or contingent facilities (such as bonding lines, guarantee lines or letters of credit) made available exclusively to finance, re-finance or guarantee, in whole or in part, new and/or existing eligible Green Projects*'' (LSTA, 2021, p. 2). Both definitions prerequisite that the instrument is in alignment with the four identical core components of the Green Bond Principles[2] and Green Loan Principles[3] , respectively:

1. Use of Proceeds
2. Process for Project Evaluation and Selection
3. Management of Proceeds
4. Reporting

Given that green financing proceeds are bound by their first principle to be utilised for projects with clear environmental benefits, another type of financing instrument, which is the primary interest of this thesis, has emerged: sustainability-linked debt. Contrary to green debt, sustainability-linked debt instruments are agnostic as to loan purposes. The product's availability for any company, no matter their industry, makes these instruments an appealing subject for an event study. Figure 2 shows the annual amount of sustainable debt announced since 2017.

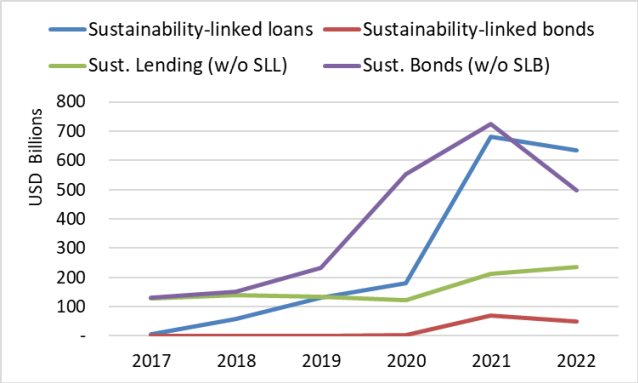

Figure 2: Raised amount of sustainable finance flagged loans and bonds worldwide 2017 - 2022[4], excluding amount raised for banking & investment services[5].

[2] As defined by LSTA (2021, p. 2)
[3] As defined by ICMA (2021, p. 4)
[4] Data retrieved from Refinitiv Eikon Deal Screener
[5] To be further discussed in the Data section

First introduced in 2017, sustainability-linked loans are defined as "*any types of loan instruments and/or contingent facilities (such as bonding lines, guarantee lines or letters of credit) for which the economic characteristics can vary depending on whether the borrower achieves ambitious, material and quantifiable predetermined sustainability performance objectives*" (LSTA, 2023, p. 2). Similarly, sustainability-linked bonds, which was introduced as late as 2019, are defined as "*any type of bond instrument for which the financial and/or structural characteristics can vary depending on whether the issuer achieves predefined Sustainability/ESG objectives*" (ICMA, 2020, p. 2). Similar as for green debt, both definitions prerequisite that the instrument is in alignment with the five identical core components of the Sustainability-Linked Loan Principles[6] and Sustainability-Linked Bond Principles[7], respectively:

1. Selection of Key Performance Indicators (KPIs)
2. Calibration of Sustainability Performance Targets (SPTs)
3. Loan/Bond characteristics
4. Reporting
5. Verification

Sustainability-linked financing usually includes a pricing mechanism that links the margin cost with the borrower's performance on pre-defined ESG-related targets. An example is the $10.1bn Revolving Credit Facility for brewer AB InBev, where the loan pricing mechanism incentivised the borrower to improve its water efficiency, recycle more PET packaging, use more renewable electricity, and reduce its greenhouse gas emissions (ING, 2021). If AB InBev as the borrower of such a sustainability-linked instrument, delivers on the KPIs, they will benefit from a lower cost than initially determined, while a failure to meet the KPIs results in no reduction. In some cases, it may increase from the original level, pending the debt contract terms (BNPP, 2019).

For borrowers of sustainable finance instruments, there are additional transaction costs due to the regulation on the use of proceeds or the monitoring of the KPIs. However, these are often offset with the benefits of the sustainable debt instrument, highlighting the borrower's

[6] As defined by LSTA (2023, p.2)
[7] As defined by ICMA (2020, p. 2)

sustainable assets and/or business. This may, among others, provide the borrower with a positive marketing story and a more diversified investor base (Deschryver & de Mariz, 2020, p. 17). From the lender's perspective, their own ESG commitments and policies will influence their lending decisions. This implies that borrowers willing to commit to sustainability-linked KPIs will benefit not only from reduced margins but also from the increased liquidity available for them to borrow (Strang, n.d.).

According to data retrieved from Refinitiv, Europe and North America have emerged as the largest markets in sustainability-linked finance. Even though the sustainable debt market saw a drop in 2022, as shown in figure 1 and 2, it is predicted to resume its growth in 2023 and onwards (Gardiner & Kendall, 2023). This makes the sustainable finance market a relevant field of study to consider in the future.

2.2 Literature Review

The existing literature on sustainability-linked finance is scarce, and we have only found two research papers that briefly analyses the stock market reaction to sustainability-linked loan announcements as a smaller part of their study, but none that primarily focuses on the stock market announcement effect. The remaining relevant literature is mainly focused on green bonds and the difference in cost of capital comparing an issuance of a green bond to a conventional bond. Therefore, our review will also include existing literature concerning the effect of conventional debt announcements and green bond announcements, which will be connected to our research question.

Fungáčová et al. (2020) compared the effect of syndicated loan and bond announcements on borrowers' stock price and found that debt announcement generates a positive stock market reaction in Europe. They find, however, a significant difference between loan and bond announcements, where the former exerts a stronger positive market reaction than the latter. This is in line with our findings on conventional loans and bonds but the opposite of our results on SLLs and SLBs, where we find that SLBs exert a stronger positive market reaction than SLLs.

Carrizosa & Ghosh (2022) analyse the design of sustainability-linked loan contracts and found a slightly negative stock market reaction to the announcement of sustainability-linked contracts in the US market as a part of their study. Using non-parametric tests, they also find

a more negative stock market reaction for loan contracts with external sustainability agents and auditors, but none of their results is statistically significant. This contrasts our significant findings of a positive relationship between stock market returns and SLL-announcements. However, their approach to analysing the announcement effects from SLLs differs from ours. Where they solely use regression analysis to calculate cumulative average returns, we have applied an event study approach.

Torsteinsen & Englund (2022) examines the explicit use of ESG information in loan contracts worldwide as well as borrowers' incentives to enter SLLs, including shareholders' response to announcements of SLL-announcements between 2017 and 2019 as a part of their study. The findings from their event study indicate a positive market reaction directly connected to the announcement of SLLs, attributing this reaction to the signalling effect of the company's presumed environmental commitment when entering an SLL. The positive stock market reaction in their event study aligns with our findings on SLLs. However, their event study does not consider SLBs, nor is it validated through a regression analysis, in contrast to our event study.

Flammer (2020) and Tang & Zhang (2020) were the first empirical studies on green bond announcements' effects, which emphasised how young the sustainable finance market is and the need for more research on the topic. Both papers study the announcement effect worldwide and find a significant positive stock market reaction. This is relevant for sustainable finance instruments, but they do not consider sustainability-linked instruments specifically, which is the focus of our thesis.

Glavas (2020) studies the effect of green bond announcements in 22 countries worldwide before and after the Paris Agreement. With a sample containing all corporate green bonds issued globally between 2013 and 2018, he shows that the stock price reaction to green bond announcements grew after the Paris Agreement, indicating a shift in the behaviour of investors following the Paris Agreement. As for Flammer (2020) and Tang & Zhang (2020), this is only relevant for the sustainable finance market as a whole, but not for sustainability-linked instruments specifically. Additionally, Glavas (2020) runs a regression analysis to test if the sustainability label of the bond is in charge of the abnormal returns, controlling for other

relevant variables. We have incorporated the same technique in our study and used similar debt- and firm-specific characteristics as control variables.

Similar to Glavas (2020), Pedersen & Thun (2019) performs an event study of 54 green bond announcements in the European stock market from November 2013 to October 2019. Their results indicate a slightly less positive market reaction in Europe than the global average found in other studies. However, they find strong evidence of a more positive market reaction in Northern Europe compared to the rest of Europe, suggesting that Northern Europe is the main driver for the positive stock market reaction in Europe. This is in line with our findings for the Nordic countries regarding SLLs, which indicates a statistically significant more positive stock market reaction for SLL-announcements in the Nordics than in the rest of Europe. However, we cannot make the same conclusion for SLBs. The positive stock market reactions in the Nordics are also supported by the fact that the first quasi-sovereign and commercial green bonds originated in the Nordics.[8]

Regarding research performed on SLBs, we found two articles we wanted to highlight. The first article, Kölbel & Lambillon (2022), estimates yield differentials between SLBs and conventional bonds from the same issuer. They find that issuing an SLB yields an immediate premium compared to a conventional bond, which exceeds the potential penalty a firm can incur if they fail to reach its sustainability performance target. This implies that issuers of SLBs can reap a financial benefit, even if they do not achieve their intended target. This is consistent with findings from Ehlers & Packer (2017) and Hachenberg & Schiereck (2018), which show that green bond issuers borrow at a lower rate than their conventional counterparts. Their findings imply that equity investors perceive both SLBs and Green Bonds as value-enhancing.

Secondly, Broadway (2022) examines the appropriateness of sustainability-linked bonds as trustworthy investments. The emphasis is on the adjustable coupon rate mechanism and whether it aligns with the responsibility of the relevant investor, in this case, a trustee. Although it is not our primary focus, Broadway (2022) argues that SLBs can be viable investment options. The reasoning is that the potential drawbacks caused by the adjustable coupon rate are purely speculative, while the financial advantages of sustainable investments

[8] As discussed in our review of the Sustainable Finance Market

are backed by empirical evidence. A plausible reason for the positive market response to sustainability-linked bond announcements could be associated with the financial benefits of these bonds, which aligns with the results we find for SLBs. For SLLs, however, the results vary with the applied event window.

Du, Harford, and Shin (2022) investigate the economic motivations behind SLL-agreements, revealing no reduction in loan spreads for SLLs or any improvement in borrower ESG performance following the initiation of an SLL. However, they observe that SLL-lenders successfully attract higher deposits after initiation, enabling them to increase their lending. This implies that the primary incentives for engaging in SLL-contracts may reside with the lenders, who appear to reap a majority of the benefits from these agreements. This contrasts our findings which suggest an incentive for borrowers to engage in SLL-contracts. The findings of Du, Harford, and Shin (2022) call into question the purported objectives of SLLs in promoting sustainable practices and can raise concerns of possible greenwashing through too "kind" clauses, which is also mentioned by Carrizosa & Ghosh (2022).

This thesis will complement existing literature on the positive stock market reaction to sustainable debt announcements in general and contribute to the existing literature by providing evidence that sustainability-linked debt announcements, in specific, leads to a positive stock market reaction.

3.0 Data

This chapter will elaborate on the applied collection process, consisting of loan, bond, stock and index data. First, we elaborate on the data set, followed by a description of the financial data included in our regression, ending with descriptive statistics.

3.1 Data Selection

To collect all data regarding loans and bonds, we have used Refinitiv's widely used and recognised Eikon database, which is Bloomberg's most prominent competitor regarding the market share of financial terminals (Martel, 2023). Using Eikon's Deal Screener function, we have collected data on both conventional and sustainability-linked debt facilities, including the name and primary business sector of the issuer/borrower (and their controlling parent), and details such as facility type, principal amount, original currency, and number of years to final maturity, among others.

The Deal Screener in Eikon also contains three key features for our event study. The first feature is the one that includes the announcement date for each loan facility, which is essential for us, as this will constitute the event dates in our analysis for loans. Unfortunately, Eikon does not list an announcement date for most of the bonds in our sample. On the other hand, Eikon lists the bond issuance date, which will be used as the event date in our bond analysis.

The second feature allows us to convert the principal amount of all debt facilities and firm-specific data, such as total assets, to the currency of our choice[9] to facilitate comparisons across Europe.

The third and most crucial feature lets us check whether the debt facility is flagged as sustainability-linked. It is worth mentioning that we have not verified the quality of the sustainability-linked clauses of any of the announced SLD-facilities, as this would require insight into privileged facility agreements between the lenders and issuers/borrowers, nor have we checked for third-party verifications of the sustainability-linked flag. We have merely

[9] US Dollars

scanned all debt announcements in the sample period and checked whether the announced debt facility is flagged as sustainability-linked.

Following Glavas (2020), we classify a debt facility as conventional if it is not flagged as sustainability-linked in Eikon's database, meaning that green loans and bonds may also be classified as conventional in this study. The samples of conventional loans and bonds consist of all announcements made by the same companies that have announced a sustainability-linked counterpart during the sample period. This enables us to control the firm-specific factors that may affect the stock market reaction to debt announcements.

We restrict our universe to 17 of the European country-specific indexes published by Refinitiv[10]. Together, the constituents of these indices construct (in large parts) the widely used Stoxx Europe 600 index[11], which we will use as a proxy for the European market. We have also extracted a subsample consisting of the 4 Nordic[12] country-specific indexes published by Refinitiv, seeing as the Nordic countries are consistently being recognised as global frontrunners when it comes to corporate social responsibility and sustainability (Strand et al., p. 1, 2015).

We further restrict our sample to debt announcements of which we can identify a publicly traded company as either the issuer/borrower or its controlling parent since detailed stock and company information is only available for publicly listed firms. We have, however, chosen to include announcements by fully controlled, non-publicly traded subsidiaries of public companies in our sample and correspond their announcements to their respective parent company's publicly traded stock price. This aligns with methods previously used by Tang & Zhang (2020). An example of such an announcement is the one made by Alumina do Norte do Brasil SA, an aluminium company located in Brazil, which announced an SLL in February 2022. This company is a fully controlled subsidiary of the Norwegian company Norsk Hydro

[10] The 17 countries are: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom.

[11] Two of these countries, Czech Republic (0,1) and Greece (1,3), are not represented in the Stoxx Europe 600 Index, while two other countries, Luxembourg (3,0) and Ireland (6,1), are represented in the index, but not a part of our study (number of respective SLL- and SLB-announcements in parentheses).

[12] Excluding Iceland, as they are not a part of the Refinitiv Europe Index, nor does Refinitiv Eikon publish an Iceland-index.

ASA listed on the Oslo Stock Exchange. Such frequent announcements throughout our dataset indicate that this is a common practice among publicly traded companies across Europe.

Lastly, when multiple tranches of one debt facility are announced by the same company on the same date, we cumulate the principal amount of each tranche together in one single loan/bond announcement. We do this to avoid identical observations in the regression analysis, also done in other studies such as Flammer (2020).

3.1.1 Loans

For SLLs, our initial sample consists of 646 announcements by 415 unique companies, including non-publicly traded companies. Removing any observations with no identified publicly traded borrower or controlling parent, we are left with 624 announcements by 350 publicly traded companies (or their fully controlled subsidiaries). For conventional loans, our sample for the same 350 companies consists of 1268 announcements.

3.1.2 Bonds

For bonds, we have used almost the same method as for the extraction of loans, even though there is one significant difference: Bonds issued by financial institutions are excluded from our initial sample.

Previous studies like Glavas (2020) and Pedersen & Thun (2019) opted to exclude green bonds issued by financial institutions, seeing as they issue green bonds to lend the bond proceeds to their borrowers' green projects. This contrasts with standard corporate green bonds, where the bond proceeds finance the issuers' own projects. Fatica, Panzica & Rancan (2019, p. 11) support this by contending that financial institutions encounter greater challenges in credibly signalling their commitment to environmental action to the market because of the inherent difficulties in tracking the proceeds of green bonds to specific projects.

Reasonably assuming that the above-mentioned logic also applies to SLBs, we have decided to follow this practice in our analysis of bonds. We emphasise that we have not removed any SLL-announcements made by financial institutions in our analysis of loans; given that we have not been able to find any precedent for doing so in our review of relevant literature, we have only removed these observations in our bond analysis.

This means that for SLBs, our initial sample of 98 announcements made by 68 companies (including financial institutions and non-publicly traded companies) is reduced to 68 announcements made by 49 different publicly traded companies (or their fully controlled subsidiaries). In other words, our initial SLB-sample is reduced by roughly 30 % when we remove announcements made by financial institutions and any observations with no identified publicly traded borrower or controlling parent, compared to a reduction of roughly 3.4 % for SLLs. For conventional bonds, our sample for the same 49 companies consists of 56 announcements.

3.1.3 Stock Prices

The primary variable of interest is the adjusted daily total return of all the publicly traded companies in the sample. Through Eikon, we collect the adjusted daily stock price, which, contrary to the simple daily stock price, takes corporate actions such as stock mergers/splits and dividends into account and use this to calculate adjusted daily returns. Announcements where the underlying stock has insufficient or missing data in the estimation and/or event period, are removed from the sample.

In order to reduce the potential of non-synchronous trading, which can lead to the beta-estimate in our sample being biased and inconsistent (Scholes & Williams, 1977, p. 320), we have to account for thin trading. Our event study analysis is based on a Stata module named *eventstudy2*, which follows the trade-to-trade approach suggested by Maynes and Rumsey (1993, p. 148-149) to account for this. Expressively, this method excludes any observations of debt announcements where the underlying stocks have insufficient or zero trading volume during the estimation and/or the event period.

After the above is accounted for, we are left with a final sample of 624 SLL-announcements by 350 publicly traded companies on 429 unique dates and 1266 conventional loan announcements by 273 of the same companies on 792 unique dates. For bonds, we have a final sample of 68 SLB-announcements by 49 publicly traded companies on 54 unique dates and 56 conventional bond announcements by 23 of the same companies on 55 unique dates.

Given that the main objective of this thesis is to examine the stock market reaction to sustainability-linked debt announcements, we find that by including those companies that have only announced sustainability-linked debt during the sample period, we may provide a

comprehensive analysis of the impact of such announcements. Should we, on the other hand, only include companies that have announced both conventional and sustainability-linked debt during the sample period, then our sample size would be significantly reduced. This could affect the statistical power and reliability of our analysis, albeit the control group, being the conventional debt announcements, could be argued to represent a better fit in that case. Further, considering that sustainability-linked debt is an emerging trend, including these companies as a representative sample of the population may offer insights into the behaviour and performance of companies that have embraced sustainability initiatives.

3.1.4 Indices

Data on daily closing prices are collected from Refinitiv Eikon. As for the daily stock return, we use this data to calculate the daily index returns. Although one could argue that each country's leading stock market index should be used as a proxy for the market return, as done in previous studies such as Brounen and Derwall (2010), we have elected to apply the widely used STOXX Europe 600 as our benchmark for Europe. Looking at the fact sheet of this index, a wide range of companies across different sectors, countries and sizes is covered, thus making it a good reflection of the continental market (Stoxx, 2023). Also, comparing our findings to one international benchmark instead of several local ones is preferable from a pure simplicity perspective. Finally, Næs, Skjeltorp and Ødegaard (2008, p. 21) support this by arguing that the global capital market of today calls for the use of an international market index. Therefore, we argue that using an international market index as our proxy for the market is favourable for our analysis. Applying the same logic to the Nordic region subsample, we have used Nordic OMX 40 as a proxy for the Nordic market.

3.1.5 Control Variables

For the regression analysis, we have collected financial data for each company appearing in the sample. We extract the data in USD, as previously done for the loan- and bond-specific data, to facilitate comparisons. First, we retrieve the total reported assets, which we use as an indication of company size. Second, we find the total shareholder's equity, which we use together with the total reported assets to derive the equity-to-assets ratio. Next, we retrieve the interest coverage ratio and the operating margin. Fifth and last, we find the net income, which we use together with the total reported assets to calculate the return on assets (ROA).

Prior research, such as Godlewski et al.'s (2013) examination of sukuk[13] announcements and Tang & Zhang's (2020) analysis of green bond issuances, have used similar data to control for firm-specific characteristics that may influence the stock market response to such announcements. Accordingly, we have selected certain factors from these studies to include in our analysis. The choice of control variables will be explained in greater detail in section 4.2.1.

3.2 Descriptive Statistics

This section provides an overview of the European SLL- and SLB-market. We start by displaying descriptive statistics for our initial sample before the methodology-specific criteria are applied and adjusted for. Next, we provide a table containing loan- and bond-specific details used in our empirical analysis. Lastly, we present the control variables applied in our regression analysis with corresponding, relevant statistics.

3.2.1 Loans and Bonds

The initial sample for loans consists of 646 SLL-announcements, representing all loan announcements flagged as sustainability-linked in the 17 selected countries from 12 April 2017 to 30 December 2022. The average announcement is $1 026m, with an average maturity of 5.35 years.

The initial sample for bonds consists of 69 SLB-announcements, representing all bond announcements flagged as sustainability-linked in the 17 selected countries from 30 October 2020 to 30 December 2022. The average announcement is $631m, with an average maturity of 7.17 years.

Table 1 provides descriptive statistics of the European and Nordic sustainability-linked debt markets.

[13] An Islamic financial certificate, similar to a bond, that complies with Islamic religious (Sharia) law (Investopedia, 2022).

Table 1: Descriptive statistics of the SLL- and SLB-market in Europe

This table provides descriptive statistics for all sustainability-linked loans in column (1) announced in the 17 countries during the sample period from April 2017 to December 2022. Similarly, column (4) provides descriptive statistics for all sustainability-linked bonds announced in the sample period from October 2020 to December 2022. For the Nordic subsamples, the sample period for bonds and loans starts April 2019 and January 2021, respectively, ending in December 2022. Columns (2)-(3) and (5)-(6) provide similar statistics for SLL- and SLB-announcements in the Nordics and the rest of Europe, excluding the Nordics, respectively. *#Sustainability-linked* is the number of SLLs and SLBs announced. *Amount* is the announced total principal amount in $m. *Maturity* is the number of years to maturity of the debt facility at the time of announcement. The sample mean is reported for each characteristic, with the standard deviation reported in parentheses.

	Sustainability-Linked Loans (SLL)			Sustainability-Linked Bonds (SLB)		
	(1) Europe	(2) Nordic	(3) Rest of Europe	(4) Europe	(5) Nordic	(6) Rest of Europe
#Sustainability-linked	646	113	533	69	17	52
Amount	1 025.75	802.09	1 072.95	631.44	231.88	762.06
	(1 493.16)	(1 044.44)	(1 567.31)	(521.99)	(268.95)	(519.61)
Maturity	5.35	5.51	5.32	7.17	5.33	7.77
	(1.77)	(1.57)	(1.80)	(2.96)	(0.99)	(3.15)

In column (2)-(3) and (5)-(6), we separate SLL-announcements originating in the Nordics (2)(5) and the rest of Europe (3)(6). Table 1 shows that roughly 17.5 % of all SLL-announcements in Europe occur in the Nordic region, while the number of SLBs is nearly 25 %. However, the Nordic announcements are considerably smaller for both SLLs and SLBs.

Next, Table 2 presents descriptive statistics for all conventional and sustainability-linked loan announcements used in this study. Announcements made by companies not publicly traded in Europe[14] are now removed from the sample.

[14] In this case, we have deemed an announcement as made by a company non-publicly traded in Europe if we are not able to identify a publicly traded company listed in Refinitiv Europe as either the borrower or controlling parent company. The announcement may still have been made by a publicly traded company (or its controlled subsidiary) whose stock is listed in a smaller European stock exchange or in a stock exchange outside Europe.

Table 2: Descriptive statistics of the conventional and sustainability-linked debt facilities in sample

This table describes the number of observations, the mean (with standard deviation reported in parentheses), median, minimum, and maximum of the announced loans and bonds during the sample periods April 2017 to December 2022 (loans) and October 2020 to December 2022 (bonds). For the Nordic subsamples, the sample period for bonds and loans starts April 2019 and January 2021, respectively, ending in December 2022. *Amount* is stated in $m. *Maturity* is reported in years.

	Europe					Nordics				
Variable	N	Mean	Median	Min.	Max.	N	Mean	Median	Min.	Max.
SLLs										
Amount	624	1 029.33 (1 487.58)	454.32	5.94	12 966.73	110	743.87 (1 040.51)	426.90	24.84	6 000.00
Maturity *	560	5.34 (1.77)	5.00	0.09	15.01	91	5.53 (1.57)	5.00	1.83	10.01
Conv. loans										
Amount	1 266	1 051.96 (2 340.26)	335.53	1.00	38 000.00	140	577.24 (700.33)	306.80	4.30	4 290.09
Maturity *	1 023	5.96 (5.00)	5.00	0.09	35.03	112	4.40 (3.24)	4.21	0.09	19.35
SLBs										
Amount	68	626.02 (521.99)	589.45	31.58	3 308.12	17	231.88 (268.95)	132.71	31.58	1 123.37
Maturity	68	7.20 (2.96)	6.09	3.63	20.29	17	5.33 (0.99)	5.07	4.06	7.98
Conv. bonds										
Amount	56	605.96 (644.08)	498.50	23.16	3 129.80	17	118.79 (108.35)	78.95	23.16	357.00
Maturity *	55	10.14 (17.89)	6.09	1.86	99.99	16	5.37 (2.41)	5.07	1.86	10.15

* Of the announced debt facilities, 64 sustainability-linked loans, 243 conventional loans, and 1 conventional bond had not disclosed the facility's maturity date.

We see here that the firms in the sample announced twice as many conventional loans as SLLs during the sample period, while the number of conventional bonds was slightly lower than the number of SLBs. We also see that the average amount of SLLs and SLBs in the Nordic region was considerably larger than their conventional counterparts. In contrast, the average amount of SLLs and SLBs in Europe was approximately equal to their conventional counterparts.

3.2.2 Control Variables

As mentioned, we will use a wide range of control variables for the regression analysis. Relevant statistics for these variables are presented in Table 3.

The 1 890 loan announcements in Europe during the sample period April 2017 to December 2022 correspond to 1 008 unique firm-year observations. For bonds, the 125 issuances during the sample period October 2020 to December 2022 correspond to 76 unique firm-year observations. The mean value of loan- and bond announcing firms' *Total Assets* is well above the median value, and for loans, it is even more than double of the 3rd quartile value. This indicates that there are a few big firms in the sample that represents a large part of the total assets. The *Interest Coverage Ratio* and the *Operating Margin* display some of the same behaviour, with mean values well above the median values. Also, the 1st quartile values well above zero for the *Interest Coverage Ratio* signals that the companies in the sample are reliable debtors. *ROA* and *Equity-to-Assets* seems to be well-distributed.

In the Nordics, the 310 loan announcements during the sample period April 2019 to December 2022 correspond to 185 unique firm-year observations. For bonds, the 36 issuances the sample period January 2021 to December 2022 correspond to 19 unique firm-year observations. Similar as for the full European sample, we see indications that there are a few big firms within the sample when looking at *Total Assets* and *Interest Coverage Ratio*. However, *Operating Margin* for Nordic loan announcements has a negative mean value, likely driven by the minimum value of -4 400 reported by the commercial airline company Norwegian Air Shuttle ASA in 2017, a well-known restructuring case. Like the full European sample, we observe seemingly well-distributed values for *ROA* and *Equity-to-Assets,* and the 1st quartile values well above zero for the *Interest Coverage Ratio* signals that the companies in the sample are reliable debtors.

Table 3: Descriptive Statistics for Company Characteristics

This table presents descriptive statistics for companies included in the sample during the periods April 2017 to December 2022 (loans) and October 2020 to December 2022 (bonds). For the Nordic subsamples, the sample period for bonds and loans starts April 2019 and January 2021, respectively, ending in December 2022. *Total Assets* is a company's reported total assets presented in $bn. *Equity-to-Asset* equals the shareholder's book value of equity divided by the total assets. *Interest Coverage Ratio* equals the EBIT divided by the interest expense. *Operating Margin* equals the operating income divided by total revenue. *ROA* is the net income divided by the total assets.

Variable	N	Mean	1st Quartile	Median	3rd Quartile	Min.	Max.
Loans, Europe							
Total Assets ($bn)	1 008	79.90	2.91	9.47	32.86	0.07	3 039.19
Equity-to-Assets	1 008	0.34	0.22	0.33	0.46	-0.24	0.93
Interest Coverage Ratio	1 008	17.87	2.89	5.88	12.27	-18.03	2 420.50
Operating Margin	1 008	14.18	4.48	10.09	18.74	-4 400.00	819.96
ROA	1 008	0.04	0.02	0.03	0.05	-0.21	0.38
Loans, Nordics							
Total Assets ($bn)	185	9.17	1.02	3.08	11.45	0.10	118.06
Equity-to-Assets	185	0.40	0.29	0.40	0.49	-0.05	0.78
Interest Coverage Ratio	185	19.48	3.41	9.65	20.39	-14.19	418.00
Operating Margin	185	-8.84	4.74	10.75	21.82	-4 400.00	340.49
ROA	185	0.05	0.02	0.05	0.08	-0.13	0.25
Bonds, Europe							
Total Assets ($bn)	76	24.41	7.94	13.63	34.49	0.50	139.73
Equity-to-Assets	76	0.36	0.25	0.36	0.45	0.02	0.78
Interest Coverage Ratio	76	13.43	4.13	7.32	11.59	-9.24	162.52
Operating Margin	76	10.87	4.53	8.91	17.29	-100.12	57.92
ROA	76	0.04	0.01	0.04	0.06	-0.14	0.25
Bonds, Nordics							
Total Assets ($bn)	19	5.27	1.98	4.39	7.80	0.50	19.17
Equity-to-Assets	19	0.43	0.33	0.42	0.47	0.26	0.78
Interest Coverage Ratio	19	15.59	3.55	7.79	11.54	-1.76	114.48
Operating Margin	19	20.32	6.93	11.35	43.02	-2.84	57.92
ROA	19	0.05	0.02	0.05	0.06	-0.04	0.25

4.0 Empirical Analysis

This chapter will introduce applied methodologies before addressing the research question of the stock market's reaction to sustainable-linked debt announcements. Initially, we will present the event study methodology, followed by a presentation of our results. Second, we will present the regression methodology and proceed to highlight the regression analysis results, which control for both firm and debt-specific characteristics.

4.1 Event Study

This section will provide a concise overview of the event study methodology, where we used a Stata module created by Kaspereit (2019) called *eventstudy2* to perform the actual event study and calculate the test statistic. Subsequently, we will present the findings in the following section.

4.1.1 Methodology

This event study aims to analyse the stock market reaction to sustainability-linked financing, specifically by assessing the abnormal returns linked to the announcements. According to the semi-strong form of the market hypothesis, all new public information should be quickly reflected in the current stock price (Chen, 2022). In event studies, the announcement date holds more significance than the initiation date since it reflects the day new information is disclosed to the market (Flammer, 2020, p. 114). Since the announcement date is the relevant date when new information is conveyed to the market, we have opted to use this in our analysis. Even though there is no firm structure to an event study, there is a general flow that we need to follow.

The first step in performing an event study involves defining the event we want to analyse and determining the event window, i.e., the period during which the firm's stock prices related to the event will be analysed (MacKinlay, 1997, p. 14). It is standard practice to set a broader event window compared to the specific period of interest, as it allows for analysing the periods surrounding the event and capturing any potential insider information. Although there is no set duration for an event window, whether measured in days, weeks, or months, it's advisable to keep it relatively brief, seeing as this helps preventing unrelated or

confounding events from influencing the post-event returns (McWilliams & Siegel, 1997, p. 636). Typically, the period of interest extends beyond the announcement date and includes at least the following day. This allows for the stock price effects of announcements made after the stock market closes on the announcement date to be captured. Moreover, the periods preceding and succeeding the event may also be significant for our analysis (MacKinlay, 1997, p. 15).

A measure of the abnormal return is needed to assess the event's impact, which is the realised ex-post return of a security during the event window minus the security's average return over the same period. The average return refers to the expected return of the firm in the absence of the event (MacKinlay, 1997, p. 15). Specifically, for a given firm (i) and event date (t), the abnormal return can be computed as the difference between the actual ex-post return and the average return:

$$AR_{it} = R_{it} - E(R_{it}|X_t)$$

In this equation, AR_{it}, R_{it}, and $E(R_{it}|X_t)$ represents the abnormal, actual, and normal returns, respectively, for a given time period (t). The variable X_t represents the conditioning information used in the normal return model.

When modelling the average return, two standard options are available: the constant mean return model with a constant value for X_t, or the market model where X_t directly represents the market return (MacKinlay, 1997, p. 15). Before we select the normal performance model, we need to specify the estimation window. It is common to use the period preceding the event window as the estimation window when feasible. In our analysis, we will use daily data and a market model, meaning that the market model parameters can be estimated from data 120 days prior to the event. It is also common practice to exclude the event period from the estimation period to avoid its impact on the parameter estimates of the normal performance model (MacKinlay, 1997, p. 15). For our analysis, we chose an estimation window that concludes 21 days prior to the announcements to prevent overlapping between the estimation window and the event window (Linton, 2019, p. 233).

Once the normal performance model parameters are determined, abnormal returns can be calculated, and a testing framework for the abnormal returns must be designed, considering

factors such as defining the null hypothesis and determining techniques for aggregating individual firm abnormal returns.

As stated above, we will use the market model to estimate normal performance in our analysis. The market model is characterised as a statistical model that establishes a relationship between the return of a given security and the return on the overall market portfolio. This model assumes that assets follow a joint normal distribution (Campbell et al., 1997, p. 155). Thus, for any given security (i), the model can be computed as:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$$

$$E[\epsilon_{it}] = 0 \qquad Var[\epsilon_{it}] = \sigma_{\epsilon_i}^2$$

In this equation, R_{it} and R_{mt} represent the period-t returns on security i and the market portfolio, respectively. ϵ_{it} represents the zero mean disturbance term. α_i, β_i, and $\sigma_{\epsilon_i}^2$ are the parameters of the market model. The market model is preferred over the constant-mean-return model because its potential to provide better results due to removing the portion of the return associated with variation in the market's return, which again leads to a decrease in the variance of the abnormal return. As a result, the reduced variance increases the likelihood of detecting event effects (Campbell et al., 1997, p. 155).

With the selection of our estimation window, event window and use of the market model parameter estimates, it is possible to quantify and examine the abnormal returns. The sample abnormal return is calculated as follows:

$$AR_{it} = R_{it} - \hat{\alpha} - \hat{\beta}_i R_{mt}$$

Next, it is necessary to aggregate the abnormal returns to draw general conclusions regarding the event of interest. This is also known as the cumulative abnormal return and is an essential concept to accommodate a multi-period event window. As shown in the formula below, the aggregation is performed in two dimensions: across time and securities. To start, the initial focus will be on aggregating data over time for a specific security:

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it}$$

Under H_0 it is assumed that the distribution of the cumulative abnormal return is as followed (MacKinlay, 1997, p. 21):

$$CAR_i(t_1, t_2) \sim N\left(0, \sigma_i^2(t_1, t_2)\right)$$

A test of the null hypothesis can be performed by having the null distributions of both the abnormal return and the cumulative abnormal return. However, tests that rely on a single event observation are likely to be useless. A necessary step to take is to aggregate the returns further, leading us to aggregate abnormal returns across multiple observations of the event and within the event window to yield valuable results.

As previously stated, we have selected an estimation window that concludes 21 days prior to the announcement to prevent overlapping between the estimation window and the event window. This is important for the subsequent aggregation process, which assumes no overlapping or clustering. A combination of the non-existing overlapping with the maintained distributional assumptions indicates that the abnormal and cumulative abnormal returns will be independent across securities (MacKinlay, 1997, p. 24). This means that in a sample of N events, we can define the average aggregated returns as:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it}$$

Finally, we can compute the cumulative average abnormal return by using a similar approach as what we used to calculate the cumulative abnormal return for each security i. By aggregating the average abnormal returns over the event window applying this approach, we end up with:

$$CAAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AAR_t$$

To derive statistical inferences from the computed CAARs obtained from the event study, it is essential to test them for significance. These significance tests, commonly used in event studies, can be divided into parametric and non-parametric tests. The main component that differentiates the two types of tests is that parametric tests assume that abnormal returns are independent across securities and follow a normal distribution (MacKinlay, 1997, p. 32),

while non-parametric tests do not have these assumptions. The two types of tests are usually combined with their (non-)parametric equivalents rather than used independently. By incorporating non-parametric tests in combination with a parametric counterpart, one can ensure that the conclusions one draws from parametric tests are reliable (MacKinlay, 1997, 32).

Therefore, we will base our analysis on a parametric test provided by Boehmer, Musumeci and Poulsen, a test of standardised residuals corrected for event-induced changes in volatility. This standardised cross-sectional test is preferred due to its easy implementation. Also, it combines elements of Patell's (1976) standardised-residual methodology as well as the traditional cross-sectional test proposed by Charest (1978) and Penman (1982), and it may even be considered more robust than traditional tests, as it utilises information on variances from both the estimation and event window and factoring in event-triggered volatility (Boehmer et al., 1991, p. 256).

The non-parametric counterpart we chose to include to ensure robustness is the rank test presented by Corrado in 1989. This test exhibits superior properties to previous non-parametric tests, as it does not require symmetrical distribution for the excess returns for proper test specification, which was mandatory in earlier approaches (Corrado, 1989, p. 385-386). Another advantage of this test is that it will be correctly specified regardless of the level of skewness present in the cross-sectional distribution of excess returns (Corrado, 1989, p. 386).

4.1.2 Results

In this section, we will present our results from the event study. We will start by comparing the sustainability-linked debt contracts to their conventional counterparts and see if there is a deviation between sustainable and conventional announcements. Second, we will see if regional differences exist within Europe. Lastly, we will investigate if there is a difference in the market reaction to initial versus subsequent debt announcements.

Stock Market Reaction to SLD-announcements

Table 4 illustrates the cumulative average abnormal returns (CAARs) for European debt announcements, estimated with the market model.

Table 4: Stock Market Reaction to Debt Announcements in Europe

The sample consists of 624 sustainability-linked and 1266 conventional loan announcements from 12.04.2017 to 31.12.2022 as well as 68 sustainability-linked and 56 conventional bond announcements from 30.10.2020 to 31.12.2022. *EV* is the event window. Z_1 is an abbreviation for the test statistic related to the parametric test provided by Boehmer et al. (1991), which is included to assess the presence of event-induced changes in volatility. Z_2 is an abbreviation for the test statistic related to the nonparametric test provided by Corrado (1989), which is included to examine potential heteroscedasticity in the stock market reaction to debt announcements.

	Sustainability-Linked Loans					Conventional Loans				
EV	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]
CAAR	0.44***	0.42***	0.63***	1.04***	2.10***	0.37***	0.39***	0.58***	0.91***	1.98***
t-stat	(8.41)	(7.88)	(9.75)	(12.43)	(16.30)	(10.39)	(11.06)	(13.36)	(16.21)	(22.82)
Z_1	(8.28)	(8.36)	(9.61)	(5.93)	(9.42)	(3.33)	(2.44)	(3.43)	(5.12)	(3.33)
Z_2	(2.21)	(1.30)	(1.62)	(2.39)	(1.92)	(1.45)	(2.13)	(2.61)	(3.33)	(3.56)
Obs.	624	624	624	624	624	1 266	1 266	1 266	1 266	1 266
	Sustainability-Linked Bonds					Conventional Bonds				
EV	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]
CAAR	0.58***	0.53***	0.85***	1.15***	2.54***	0.30*	-0.00	0.24	0.52*	1.37***
t-stat	(3.67)	(3.33)	(4.38)	(4.56)	(6.61)	(1.70)	(-0.01)	(1.11)	(1.86)	(3.24)
Z_1	(3.43)	(3.61)	(3.99)	(4.02)	(7.46)	(1.68)	(0.18)	(1.33)	(2.16)	(3.10)
Z_2	(1.76)	(1.00)	(1.81)	(0.89)	(0.85)	(-0.08)	(-2.63)	(-1.31)	(-1.56)	(-0.67)
Obs.	68	68	68	68	68	56	56	56	56	56

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

An important result is that the CAARs for both types of sustainability-linked debt announcements are significant in our main event window [-2, 2] at the 1 % level. We also see that the positive market reactions to sustainability-linked debt are proven to be significant at the 1 % level using the Boehmer test, indicating that there is a genuine positive market reaction to sustainability-linked debt contracts and not simply a response to changes in the overall market or industry-specific factors. The result of the Corrado rank test[15] backs this indication. However, this does only apply to SLLs and not SLBs.

Continuing to look at the [-2, 2] event window, our results indicate a CAAR of 1.04 % for SLLs and 1.15 % for SLBs. These findings suggest an announcement premium of 0.13 % and

[15] Any lack of significance using the Corrado rank test does not necessarily imply the absence of abnormal returns altogether, it rather suggests that there is no strong evidence of abnormal return rankings that are statistically different from what would be expected by chance.

0.63 %, respectively, when compared to their conventional counterparts. Previous studies like Fungáčová et al. (2020) use a direct comparison like this to report significant premiums for one type of debt in their research on loan and bond announcements by observing that the percentage of positive CARs is over 50 % for loans and less than 50 % for bonds (p. 252). We have, however, implemented a different approach when checking for significant premiums between sustainability-linked debt announcements and their conventional counterparts. Instead of simply making a comparison, we also run a two-sample t-test with two different sample variances. In doing so, we find that the premiums for SLLs are not statistically significant. In contrast, the premiums for SLBs are found to be significant at the 10 % level.

The positive market reaction to sustainability-linked debt contrasts with findings by Carrizosa & Ghosh (2022), who document a slightly negative response to announcements of SLLs in the US market, even though their results are insignificant. However, they used a slightly different approach than us in their analysis, where they opted for solely using regression analysis to calculate their cumulative average returns. Their choice of method and usage of a sample from a different market might explain the differing results. According to Carrizosa & Ghosh (2022, p. 22), the announcement of sustainability-linked loans, which includes borrowers' investments in sustainability and adherence to sustainability-related contract terms, is likely to increase the stock returns related to the debt announcement. Our findings align well with this statement, as we have documented that the stock market views these announcements as value-enhancing.

Table 4 shows that the positive CAARs associated with announcing sustainability-linked debt are significant at the 1 % level for all alternative event windows. Even though we have included the shorter event windows to capture immediate market reactions, we also need to include these longer alternative event windows to capture any potential delayed market reaction and/or any over-/underreaction to the announcements (Krivin et al., 2003, p. 6-7), seeing as the efficient market hypothesis does not necessarily imply that the market reacts to new information instantaneously (Krivin et al., 2003, p. 23). Instead, the market will respond to new information in the shortest time possible, which may differ for announcements.

We also see that debt announcements, in general, yield a positive stock market reaction and are likely perceived as value-enhancing by investors whether the announced debt facility is

sustainability-linked. These results are somewhat consistent with previous studies like Fungáčová et al. (2020), who find that the type of debt does not matter when comparing conventional bonds and loans. However, our results show that the announcement of conventional loans generates a stronger positive market reaction than conventional bonds.

Since we cannot find any relevant research on the announcement effects of sustainability-linked bond issuances, we find it reasonable to compare our results to studies regarding green bonds. As previously stated, Flammer (2020) and Tang & Zhang (2020) were the first empirical studies on green bond announcement effects. Both studies document a positive stock market reaction to the announcements of green bonds. A theory that can support the findings in the mentioned articles, as well as our results for both types of sustainability-linked debt, is that announcements can attract the attention of eco-friendly investors and improve the market visibility of the firm in question. In recent years, sustainable investment options have become increasingly popular, attracting investors concerned about the significant impact of climate change and wanting to align their investment choices with their environmental goals (Reboredo, 2018, p. 38-39). As a result, the increased demand typically leads to an increased stock price. When companies announce sustainable financing, it will be advisable for the firm to highlight their eco-friendly projects. This generates media attention and signals the firm's commitment to ambitious sustainability performance to the market, which most likely will attract an increased number of new investors.

It is worth noting that Tang & Zhang (2020, p. 2) provide an alternative explanation to the positive stock market reaction surrounding sustainable financing, which they refer to as the "fundamental channel". This theory proposes that sustainable financing reduces information asymmetry, as sustainable debt contracts lead firms to commit to sustainable activities. In contrast, conventional debt contracts do not require the firm to disclose the same level of information. This additional information benefits investors, resulting in a positive stock market reaction. Nevertheless, a company that announces a sustainability-linked debt agreement can deviate from its initial investment plans, miss its KPI targets, and potentially incur a higher coupon or interest rate. However, this course of action is not in the best interest of the borrower or investors in a maximised value perspective.

Regional Differences within Europe

In this section, we focus on exploring potential regional differences within Europe. While Pedersen & Thun (2019) have studied geographical differences in green bond announcement effects within Europe, no prior studies are directly comparable to ours. To the best of our knowledge, this paper is the first to investigate the announcement effects of sustainability-linked financing in Europe exclusively, thus also the first to analyse potential geographical differences within Europe. Table 5 illustrates the CAARs for the Nordic region subsample estimated with the market model.

Table 5: Stock Market Reaction to Debt Announcements in the Nordics

The sample consists of 110 sustainability-linked and 140 conventional loan announcements from 17.04.2019 to 31.12.2022 as well as 17 sustainability-linked and 17 conventional bond announcements from 14.01.2021 to 31.12.2022. *EV* is the event window. Z_1 is an abbreviation for the test statistic related to the parametric test provided by Boehmer et al. (1991), which is included to assess the presence of event-induced changes in volatility. Z_2 is an abbreviation for the test statistic related to the nonparametric test provided by Corrado (1989), which is included to examine potential heteroscedasticity in the stock market reaction to debt announcements.

	Sustainability-Linked Loans					Conventional Loans				
EV	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]
CAAR	0.73***	0.63***	0.94***	1.42***	2.85***	0.76***	0.78***	1.14***	1.78***	3.70***
t-stat	(5.95)	(5.08)	(6.22)	(7.26)	(9.61)	(6.80)	(6.93)	(8.31)	(10.02)	(13.56)
Z_1	(5.88)	(6.29)	(6.47)	(2.28)	(3.42)	(2.24)	(1.24)	(1.98)	(2.51)	(2.43)
Z_2	(2.38)	(0.97)	(1.49)	(1.06)	(0.86)	(1.83)	(1.01)	(1.59)	(1.96)	(1.62)
Obs.	110	110	110	110	110	140	140	140	140	140
	Sustainability-Linked Bonds					Conventional Bonds				
EV	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]
CAAR	0.49	0.55	0.87**	1.13**	2.32***	0.22	-0.16	0.07	-0.28	-0.11
t-stat	(1.44)	(1.60)	(2.07)	(2.08)	(2.80)	(0.66)	(-0.46)	(0.17)	(-0.52)	(-0.13)
Z_1	(2.13)	(1.61)	(2.82)	(2.61)	(3.43)	(0.81)	(-0.61)	(0.50)	(-0.24)	(-0.14)
Z_2	(0.18)	(0.58)	(0.23)	(-0.13)	(-0.74)	(-0.99)	(-2.74)	(-1.51)	(-2.56)	(-2.76)
Obs.	17	17	17	17	17	17	17	17	17	17

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results show a positive stock market reaction to SLLs in the Nordics of 1.42 %, significant on the 1 % level in our main event window [-2, 2]. The results also show a positive stock market reaction to SLBs in the Nordics of 1.13 %, significant on the 5 % level. Using the

Boehmer test, these results are proven to be significant at the 5 % level, indicating a genuine market reaction. Similar to the European results, however, the Corrado rank test does not find the results significant, meaning that we cannot observe the presence of abnormal return rankings that deviate from what would be expected under normal market conditions.

In contrast to the European results, we observe a yielded premium of -0.36 % for SLLs announced in the Nordics compared to conventional loans. SLBs, on the other hand, yield a premium of 0.85 % compared to conventional bonds. Similar to the European results, a two-sample t-test indicates that the premiums for SLBs are statistically significant at the 5 % level. In contrast, no significant premiums are found for SLLs at any level of interest.

When comparing the announcement effects of sustainability-linked loans in the Nordic subsample and the entire European sample, the observed CAARs of 1.42 % and 1.04 %, respectively, indicate a premium of 0.38 % for announcements in the Nordic countries. Based on a two-sample t-test, this premium is significant only at the 10 % level. On the other hand, looking at sustainability-linked bonds, the respective observed CAARs of 1.13 % and 1.15 % indicate a disappointing premium of -0.02 %. However, the two-sample t-test reveals no indication of the difference being significant.

The results indicate that investors react more positively to announcements of SLLs in the Nordics than in Europe. However, we find no significant difference in the announcement effects associated with SLBs. In other words, our findings suggest that the Nordic countries influence the positive stock market reaction associated with SLLs in Europe, but this does not apply to SLBs. The significant difference in announcement effects is likely caused by the leading position of the Nordic companies in the global push for sustainability and their environmentally conscious investors, seeing as 12 of the 100 most sustainable companies in the world are located in the Nordics, which contrasts to the Nordic contribution to the worldwide GDP of only 2 percent (Aagaard et al., 2022).

Comparing all event windows with the European results, which showed positive CAARs associated with announcing sustainability-linked debt significant at the 1 % level for all alternative event windows, we see some notable differences for SLBs. The positive CAARs for the event windows [-1, 1] and [-2, 2] are significant at the acceptable 5 % level. In the [-1, 0] and [0, 1] event windows, we see no significant announcement effects at any level.

The market reactions associated with announcing SLLs and SLBs in Europe and the Nordics may vary in different countries. Even though the market for sustainability-linked financing has grown enormously in the past years, it still needs to grow more in order for to conduct a proper analysis of the separate countries within Europe individually. In Europe, we see considerable differences in the number of announced SLD-facilities among the countries. For instance, we only observed 3 SLL-announcements in Poland, while in Denmark, the first SLB-announcement occurred in March 2023, after the end of our sample period. Even in Spain, which reasonably can be assumed to have a considerable economic impact on the overall European debt market, we do not observe any SLB-announcements during the sample period. On the other hand, in France alone, we observe announcements of 105 SLLs and 23 SLBs during the sample period, which may be enough to draw statistical interference. In another large country in terms of economic power, the United Kingdom, we count 102 SLL-announcements but only 3 SLB-announcements in the sample period.

Analysing a small sample size in event studies increases the likelihood that influential outliers impact the results in a greater way than they would in a larger sample (Lichtenberg & Siegel, 1991, cited in McWilliams et al., 1999, p. 352). With the current data available, we deem the subsample for most individual countries too small, especially for SLBs. Therefore, we defer comparing geographical differences on a country level within Europe to further research until the sample sizes become sufficiently large.

Initial versus Subsequent SLD Announcements

This section will examine the stock market response to the initial announcement of SLLs and SLBs across Europe and compare it to subsequent announcements. The results are presented in Table 6. It is essential to note that we have elected to exclude the Nordic region from this analysis as we only observed three subsequent SLB issuances within the region, which we deem too few for performing any reliable analysis.

Table 6: Initial versus Subsequent Sustainability-Linked Debt Announcements

The sample consists of 350 initial and 274 subsequent SLL-announcements from 12.04.2017 to 31.12.2022 as well as 49 initial and 19 subsequent SLB-announcements from 30.10.2020 to 31.12.2022. *EV* is the event window. Z_1 is an abbreviation for the test statistic related to the parametric test provided by Boehmer et al. (1991), which is included to assess the presence of event-induced changes in volatility. Z_2 is an abbreviation for the test statistic related to the nonparametric test provided by Corrado (1989), which is included to examine potential heteroscedasticity in the stock market reaction to SLLs.

	Initial SLLs					Subsequent SLLs				
EV	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]
CAAR	0.43***	0.33***	0.59***	0.99***	2.00***	0.46***	0.53***	0.68***	1.11***	2.22***
t-stat	(6.05)	(4.66)	(6.83)	(8.80)	(11.55)	(5.84)	(6.62)	(6.99)	(8.80)	(11.55)
Z_1	(6.58)	(4.58)	(7.43)	(3.66)	(5.76)	(5.09)	(7.86)	(6.12)	(9.06)	(10.42)
Z_2	(2.11)	(-0.20)	(0.83)	(1.79)	(1.12)	(1.34)	(1.72)	(1.36)	(1.58)	(1.72)
Obs.	350	350	350	350	350	274	274	274	274	274
	Initial SLBs					Subsequent SLBs				
EV	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]	[-1, 0]	[0, 1]	[-1, 1]	[-2, 2]	[-5, 5]
CAAR	0.39**	0.55***	0.75***	1.09***	2.41***	1.08***	0.48	1.11***	1.28***	2.88***
t-stat	(2.07)	(2.91)	(3.25)	(3.67)	(5.25)	(3.58)	(1.58)	(3.01)	(2.68)	(4.00)
Z_1	(2.57)	(3.08)	(3.50)	(3.47)	(6.49)	(2.40)	(1.83)	(2.20)	(2.06)	(3.70)
Z_2	(0.13)	(0.85)	(0.90)	(0.63)	(0.81)	(3.12)	(-0.07)	(1.96)	(0.88)	(0.00)
Obs.	49	49	49	49	49	19	19	19	19	19

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results reveal that initial announcements of both SLLs and SLBs indicate significant positive CAARs in the main event window [-2, 2] of 0.99 % and 1.09 %, respectively. However, for subsequent announcements of both types of SLD, we observe an increase in the CAAR. The increase indicates slight premiums of respectively 0.12 % and 0.19 % in favour of the subsequent announcements, which is found to be insignificant based on a two-sample t-test. The results suggest that both initial and subsequent announcements generate a significant effect on stock market returns, but they cannot be differentiated.

Our results align with the previously mentioned “fundamental channel” theory presented by Tang & Zhang (2020). In accordance with this theory, sustainable financing reduces information asymmetry by requiring firms to commit to sustainable activities, resulting in a positive stock market reaction. This implies that every SLD-announcement, whether first or

subsequent, should generate a similar stock market reaction. This suggests that the "fundamental channel" may influence the observed positive stock market reaction, albeit most likely it is influenced by other factors as well.

In addition, our results regarding initial announcements align with previous studies performed on green bonds (Tang & Zhang, 2020; Flammer, 2021). However, our results deviate from their findings regarding subsequent announcements, as we observe significant results. According to Flammer (2021), the signalling argument suggests that her findings about subsequent green bond issuances align with the notion that initial green bond issuances signal the firm's commitment to sustainability to the stock market, reducing information asymmetry. Consequently, the subsequent green bond issuances do not signal any information not already known from the initial green bond issuances (p. 508). The dissimilarity may be accounted for by the structure of sustainability-linked debt contracts, which include distinct KPIs that may convey a higher or altered level of commitment towards sustainability.

4.2 Regression

This section is included as a robustness check for the event study analysis presented in the previous chapter. We will provide a concise overview of the methodology behind the regression analysis to control for variables that can affect the market's reaction to debt announcements. Subsequently, we will present the findings in the following section.

4.2.1 Methodology

Previous studies examining the relationship between debt announcements and the stock market reaction related to them indicate that various firm and debt facility characteristics can impact the stock market reaction to debt announcements (Godlewski et al., 2013; Glavas, 2020 and Carrizosa & Ghosh, 2022). To ensure the robustness of our event study analysis, we conducted a regression analysis on the CARs related to each announcement to determine whether the sustainability-linked label affects the stock market's response to debt announcements while controlling for other relevant variables.

The first variable we control for is firm size, which has been suggested as a possible factor influencing the market's response to bond issuances (Bradshaw et al., 2006; Glavas, 2020).

One might argue that this also applies to loan announcements, since it is widely known that larger firms tend to be viewed as more attractive to lenders due to their lower risk of default and greater access to capital markets (Cathcart et al., 2020, p. 2). When incorporating company size as a control variable, we follow the methodology of Godlewski et al. (2013) and Glavas (2020) by computing company size as the natural logarithm of total assets.

Next, we include several control variables to address the potential impact of risk-related factors on the stock market's reaction to debt announcements. Specifically, we include the Equity-to-Asset Ratio, the Interest Coverage Ratio, and the Operating Margin, adopting the methodology of Godlewski et al. (2013) and Glavas (2020) once more. Also, a company's financial performance is anticipated to influence the stock market reaction to the debt announcement, so we account for this by utilising the Return on Assets (ROA) as a control variable for financial performance (Godlewski et al., 2013, Glavas, 2020).

Lastly, we lag all the previously mentioned firm-specific control variables using financial data from the fiscal year preceding the announcement date of each announcement, in accordance with Glavas (2020). To ensure the reliability of the data, we base our analysis solely on full-year accounting data, which is deemed the most dependable source, given that it undergoes a comprehensive auditing process.

We enhance our analysis by including additional control variables related to specific debt contract characteristics, as these characteristics may influence the investor's perception of the firm value. Following Godlewski et al. (2013) and Glavas (2020), we include the debt contracts maturity, calculated in years, and debt facility size, which is the natural logarithm of the principal amount announced. To address the inclusion of multiple countries, industries, and years in the sample, we incorporate fixed effects for country, industry, and year. This enables us to test the following OLS regression, inspired by the research of Godlewski et al. (2013) and Glavas (2020):

$$CAR_{ij}(t_1, t_2) = \alpha_i + \beta_{ij} \times Sustainable + Controls_{ij} + \varepsilon_{ij}$$

We utilise an OLS regression to estimate the parameters in the above model, where CAR_{ij} represents the dependent variable in our main event window [-2, 2]. $Sustainable$ is included as a dummy variable taking the value of one if the debt contract is categorised as

sustainability-linked and zero otherwise. $Controls_{ij}$ lists the previously mentioned control variables for firm i at announcement j, and ε_{ij} represents the error term with an expected value of zero and a variance $\sigma^2_{\varepsilon_i}$. Lastly, we apply robust standard errors, to combat the commonly violated assumption of homoscedastic error terms which is assumed by default in the OLS model (MacKinlay, 1997, p. 33).

The focus of interest in the regression analysis is the coefficient β_{ij}. Its significance and positive (or negative) sign would indicate the impact of the sustainability-linked label on the stock market reaction to the debt announcement. A significant coefficient suggests that the announcement of a sustainability-linked debt contract contains valuable information that investors value. Conversely, a non-significant β_{ij} coefficient would suggest that the sustainability-linked label does not contain any additional valuable information for investors. In our study, we report the results of four different regression models, starting with the standard model, then adding country- and year-fixed effects, and finally adding industry-fixed effects. The mentioned models and their details are seen in Tables 7 through 10.

4.2.2 Results

In this section, we will present our results from the regression analysis. We will start by looking at the results from Europe and the Nordics, comparing the sustainability-linked debt contracts to their conventional counterparts after controlling for other relevant variables. We will then proceed to see whether regional differences within Europe exist, looking at the two regions. Lastly, we will analyse whether there is a difference in the market reaction to first versus subsequent debt announcements.

Sustainability-Linked versus Conventional

In Tables 7 and 8, we present the results from the regression analysis for Europe and the Nordic subsample. We use the CAR from the event window [-2, 2] as the dependent variable, being the main variable of interest in the event study and statistically significant for both types of SLD at the 5 % level. As for the independent control variables, we incorporate the bond and firm-specific characteristics previously derived in the methodology section.

Table 7: Regression Results – Sustainability-Linked Debt versus Conventional Debt in Europe

The regression results, calculated with robust standard errors, are displayed below. The sample period is from 12.04.2017 to 31.12.2022 for loan announcements, regression (1)-(3), and from 30.10.2020 to 31.12.2022 for bond announcements, regression (4)-(6). The dependent variable for all regressions is the respective CARs from the main event windows [-2, 2]. The independent variable *Sustainable* is equal to 1 when the debt facility is flagged as sustainability-linked and zero otherwise. Following Glavas (2020), the control variable *Deal Size*, equal to the principal amount of the debt facility on the announcement date, is excluded from regression (1)-(2) and (4)-(5) due to its perceived minimal impact on the stock market reaction to debt announcements. *Size* equals the natural logarithm of total assets. *Equity-to-Assets* equals the shareholder's equity divided by the total assets. *Interest Coverage Ratio* equals the EBIT divided by the interest expense. *Operating Margin* equals the operating income divided by total revenue. *ROA* is the net income divided by the total assets. *Maturity* expresses the debt facility's number of years to maturity on the announcement date. The results incorporating additional fixed effects and time-varying controls are presented in regression (2)-(3) and (5)-(6).

Variable	(1) CAR - Loans	(2) CAR - Loans	(3) CAR - Loans	(4) CAR - Bonds	(5) CAR - Bonds	(6) CAR - Bonds
Sustainable	0.0612	-0.0372	-0.0591	0.681	0.464	0.586
	(0.115)	(0.132)	(0.138)	(0.418)	(0.460)	(0.475)
Size	-0.104***	-0.0190	-0.0675*	0.243*	0.346	0.227
	(0.0362)	(0.0436)	(0.0406)	(0.143)	(0.438)	(0.291)
Equity-to-Assets	-0.291	-0.825*	-0.713	-2.694	-3.655	-4.045
	(0.422)	(0.471)	(0.441)	(2.271)	(3.848)	(3.763)
Interest Coverage Ratio	-0.00142***	-0.00106**	-0.000936*	-0.00438	-0.00422	-0.00400
	(0.000495)	(0.000445)	(0.000487)	(0.00837)	(0.0115)	(0.00913)
Operating Margin	-0.000974	0.000911	-0.000849	-0.00461	0.0321	0.00245
	(0.00127)	(0.00162)	(0.00129)	(0.0156)	(0.0307)	(0.0187)
ROA	0.184	-1.911	-1.363	9.670	-4.303	9.076
	(1.571)	(2.127)	(1.934)	(7.124)	(12.69)	(9.237)
YTM	-0.0243***	-0.0172*	-0.0154	0.0116*	0.0310***	0.0322***
	(0.00916)	(0.00935)	(0.00951)	(0.00636)	(0.00891)	(0.00843)
Deal Size			0.0455			-0.136
			(0.0398)			(0.364)
Constant	3.639***	2.266**	2.748***	-4.496	-7.296	-1.725
	(0.912)	(1.113)	(0.977)	(3.461)	(11.22)	(6.311)
Observations	1 507	1 496	1 481	120	120	119
R-squared	0.014	0.068	0.052	0.084	0.283	0.214
Industry FE	No	Yes	No	No	Yes	No
Year FE	No	Yes	Yes	No	Yes	Yes
Country FE	No	Yes	Yes	No	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Sustainability-Linked Debt versus Conventional Debt in the Nordics

The regression results, calculated with robust standard errors, are displayed below. The sample period is from 17.04.2019 to 31.12.2022 for loan announcements, regression (1)-(3), and from 14.01.2021 to 31.12.2022 for bond announcements, regression (4)-(6). The dependent variable for all regressions is the respective CARs from the main event windows [-2, 2]. The independent variable *Sustainable* is equal to 1 when the debt facility is flagged as sustainability-linked and zero otherwise. Following Glavas (2020), the control variable *Deal Size*, equal to the principal amount of the debt facility on the announcement date, is excluded from regression (1)-(2) and (4)-(5) due to its perceived minimal impact on the stock market reaction to debt announcements. *Size* equals the natural logarithm of total assets. *Equity-to-Assets* equals the shareholder's equity divided by the total assets. *Interest Coverage Ratio* equals the EBIT divided by the interest expense. *Operating Margin* equals the operating income divided by total revenue. *ROA* is the net income divided by the total assets. *Maturity* expresses the debt facility's number of years to maturity on the announcement date. The results incorporating additional fixed effects and time-varying controls are presented in regression (2)-(3) and (5)-(6).

Variables	(1) CAR - Loans	(2) CAR - Loans	(3) CAR - Loans	(4) CAR - Bonds	(5) CAR - Bonds	(6) CAR - Bonds
Sustainable	-0.306	-0.427	-0.519	0.816	-2.058	-2.247
	(0.284)	(0.532)	(0.455)	(0.722)	(2.041)	(1.447)
Size	-0.0891	-0.144	-0.188	-0.292	-0.280	-0.372
	(0.109)	(0.140)	(0.121)	(0.328)	(0.604)	(0.533)
Equity-to-Assets	0.259	-1.056	-0.479	0.162	2.461	1.572
	(1.015)	(1.469)	(1.142)	(2.698)	(9.383)	(4.109)
Interest Coverage Ratio	0.0154	0.0136	0.0154	0.0422	-0.0381	-0.0304
	(0.00982)	(0.00962)	(0.0102)	(0.0357)	(0.0950)	(0.0489)
Operating Margin	-0.00156	-0.000254	0.000318	-0.0267	-0.0251	0.00904
	(0.00358)	(0.00720)	(0.00384)	(0.0217)	(0.200)	(0.0241)
ROA	-4.799	-2.627	-4.223	-17.36	9.898	7.550
	(4.901)	(5.139)	(5.149)	(17.04)	(43.50)	(18.70)
Maturity	-0.0316	-0.0386	-0.0512	-0.0498	0.0563	0.0828
	(0.0374)	(0.0398)	(0.0382)	(0.162)	(0.315)	(0.271)
Deal Size			0.223*			0.207
			(0.132)			(0.555)
Constant	3.686	6.692*	5.199*	7.611	8.371	9.233
	(2.583)	(3.438)	(2.657)	(6.897)	(12.47)	(10.08)
Observations	235	235	230	33	33	32
R-squared	0.040	0.143	0.100	0.246	0.403	0.410
Industry FE	No	Yes	No	No	Yes	No
Year FE	No	Yes	Yes	No	Yes	Yes
Country FE	No	Yes	Yes	No	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

After controlling for our included variables, we find that our variable of interest in this section, *Sustainable*, is insignificant in all the regressions and varies broadly from our event study results. The lack of statistical significance implies insufficient evidence to conclude that the announcement of sustainability-linked debt significantly impacts the CAR using the regression analysis approach. These findings also indicate that the stock market reaction to sustainability-linked debt, on average, does not differ significantly from conventional debt announcements, which is in line with our results from the event study.

These results align with Carrizosa & Ghosh (2022), who found insignificant announcement effects when examining SLLs from the US market. A possible explanation behind their findings is that the potential outcome of borrowers' sustainability investments on firm value could be harmful as lenders and society gain certain advantages. The obligatory evaluation of sustainability performance might also result in over-investment in sustainability, reducing firm value (Aghamolla & An, 2021, cited in Carrizosa & Ghosh, p. 22). This theory can be adapted to our results to the extent that the announcement effect of sustainability-linked debt may lead to a reduction in firm value compared to the effect of their conventional counterpart after accounting for the potential negative impact caused by over-investment in sustainability.

Looking at the significance of the included control variables, we find that our study deviates from the findings in previous studies performed by Godlewski et al. (2013) and Glavas (2020). Godlewski et al. (2013) found none of the included control variables to be statistically significant, while Glavas (2020) found multiple control variables to be significant, but their control variables differ from ours. The comparison of these results faces several challenges for various reasons.

First, there is a limited availability of literature that specifies to what extent the control variables affect the stock market reaction from the announcement of sustainability-linked debt, and the lack of significance indicates that we are not adequately controlling for the correct variables. As a result, it is difficult to compare our findings with the mentioned studies directly. Secondly, disparities in the sample period may further complicate the comparison of results. Our study uses a different sample period from the studies performed by Godlewski et al. (2013) and Glavas (2020), which may be influenced by unique market conditions,

regulatory changes, or any other contextual factors that may influence the stock market reaction in different ways than in other sample periods.

To address any potential omitted variable bias and control for unobserved heterogeneity, we include industry, year, and country-fixed effects in our regression analysis. These effects account for unobserved industry-invariant, time-invariant and country-invariant characteristics that may affect the stock market reaction to announcements of sustainability-linked debt. Some of these characteristics are unobtainable and will lead to biased results when omitted (Baltagi, 2021, p. 6-7). By including these fixed effects, we enhance the robustness of our regression analysis and allow for more reliable estimates. Also, with the inclusion of time-fixed effects, we are less likely to encounter issues with collinearity (Baltagi, 2021, p. 7). However, none of this alters our primary variable of interest, *Sustainable*, which remains insignificant. Multicollinearity is also controlled for in the regression results, which is not considered a problem in our analysis[16].

Regional Differences within Europe

This section will focus on analysing potential regional differences within Europe, controlling for the same variables as previously. We add an interaction term to measure the effect of SLD-announcements in the Nordic countries compared to the rest of Europe, which is indicated by the variable *Nordic*. Table 9 presents the difference between the Nordic countries and the rest of the European countries in our sample in stock market reactions to SLD-announcements.

The main finding here is that the variable *Nordic* is significant at the 1 % level for loan announcements in all regressions after controlling for the other variables. Further, we observe that this is not the case for the bond announcements, where the variable is insignificant. These results indicate that the Nordic region returns a higher CAR than the rest of Europe, which aligns with our event study findings.

[16] See Appendix A for calculation of variance inflation factors for the independent variables included in the regression.

Table 9: Regional differences in announcing Sustainability-Linked and Conventional debt

The regression results, calculated with robust standard errors, are displayed below. The sample period is from 12.04.2017 to 31.12.2022 for loan announcements, regression (1)-(3), and from 30.10.2020 to 31.12.2022 for bond announcements, regression (4)-(6). The independent variable *Sustainable* is equal to 1 when the debt facility is flagged as sustainability-linked and zero otherwise. *Nordic* is an interaction term included to capture the announcement effect of sustainability-linked debt in the Nordic region compared to the rest of Europe. Following Glavas (2020), the control variable *Deal Size*, equal to the principal amount of the debt facility on the announcement date, is excluded from regression (1)-(2) and (4)-(5) due to its perceived minimal impact on the stock market reaction to debt announcements. *Size* equals the natural logarithm of total assets. *Equity-to-Assets* equals the shareholder's equity divided by the total assets. *Interest Coverage Ratio* equals the EBIT divided by the interest expense. *Operating Margin* equals the operating income divided by total revenue. *ROA* is the net income divided by the total assets. *Maturity* expresses the debt facility's number of years to maturity on the announcement date. The results incorporating additional fixed effects and time-varying controls are presented in regression (2)-(3) and (5)-(6).

Variables	(1) CAR - Loans	(2) CAR - Loans	(3) CAR - Loans	(4) CAR - Bonds	(5) CAR - Bonds	(6) CAR - Bonds
Sustainable	0.129	0.0212	-0.0148	0.497	0.476	0.471
	(0.128)	(0.140)	(0.146)	(0.466)	(0.483)	(0.459)
Nordic	0.672***	0.614***	0.621***	-0.240	0.843	-0.809
	(0.189)	(0.187)	(0.189)	(0.920)	(1.158)	(1.119)
Size	-0.0638*	-0.0359	-0.0844**	0.280	0.169	0.201
	(0.0377)	(0.0426)	(0.0394)	(0.213)	(0.348)	(0.282)
Equity-to-Assets	-0.482	-0.663	-0.531	-2.681	-0.976	-1.916
	(0.419)	(0.462)	(0.421)	(2.541)	(3.005)	(2.984)
Interest Coverage Ratio	-0.00112**	-0.000967**	-0.000786	-0.00340	-0.00778	-0.00268
	(0.000509)	(0.000475)	(0.000534)	(0.00824)	(0.0108)	(0.00868)
Operating Margin	-0.000924	0.000817	-0.000782	-0.00268	0.00937	-0.00387
	(0.00125)	(0.00161)	(0.00128)	(0.0167)	(0.0285)	(0.0176)
ROA	-0.135	-1.846	-1.151	8.715	2.065	6.265
	(1.557)	(1.935)	(1.596)	(7.706)	(11.98)	(9.037)
YTM	-0.0214**	-0.0174*	-0.0149	0.0106	0.0245***	0.0145
	(0.00928)	(0.00931)	(0.00949)	(0.00658)	(0.00787)	(0.00920)
Deal Size			0.0513			-0.226
			(0.0385)			(0.313)
Constant	2.610***	1.975*	2.440**	-5.313	-3.135	-1.691
	(0.949)	(1.124)	(0.973)	(4.946)	(8.408)	(5.961)
Observations	1 507	1 507	1 492	120	120	119
R-squared	0.024	0.055	0.041	0.091	0.178	0.123
Industry FE	No	Yes	No	No	Yes	No
Year FE	No	Yes	Yes	No	Yes	Yes
Country FE	No	No	No	No	No	No

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

When controlling for industry and year-fixed effects, we observe a 0.614 % increase in the CAR in the Nordics compared to Europe, which is higher than the observed premium of 0.38 % from our event study. These findings further support the idea that investors in the Nordic region exhibit a more positive reaction to announcements of SLLs than investors in the broader European region. This also strengthens the claim that this differential response is driven by the leading position of Nordic companies regarding the global push for sustainability and their environmentally conscious investors (Aagaard et al., 2022).

Initial versus Subsequent SLD Announcements

This section will focus on measuring the effect of initial and subsequent SLD-announcements in Europe. We add the dummy variables *First* and *Subsequent*, which represent all initial and subsequent announcements of sustainability-linked debt facilities, respectively. As done in the event study, we continue to exclude the Nordic region from this part of the analysis seeing as there are too few subsequent SLB-issuances within the region. The results are presented in Table 10.

Our main finding here is that variable *First* is significant at the 10 % level for bond announcements when incorporating year-fixed effects. This indicates that initial issuances of SLBs experience a significant positive market reaction of 0.77 %. This aligns with our findings from the event study, where we observed a significant positive market reaction to initial issuances of SLBs of 1.09 %. Further, we observe that this is not the case for the other regressions, where all variables of interest are found to be insignificant.

In contrast to our event study results, the regression analysis shows that initial and subsequent announcements of SLLs are not significantly positive. The same applies for subsequent issuances of SLBs, which were found to be significantly positive in the event study. These results indicate no statistically significant market reaction to any SLL-announcements or subsequent SLB-issuances. In other words, when controlling for other variables through regression analysis, the stock market appears to be indifferent to any sustainability-linked debt announcement other than a company's initial sustainability-linked bond issuance.

Table 10: Initial versus Subsequent Sustainability-Linked Debt Announcement

The regression results, calculated with robust standard errors, are displayed below. The sample period is from 12.04.2017 to 31.12.2022 for loan announcements, regression (1)-(3), and from 30.10.2020 to 31.12.2022 for bond announcements, regression (4)-(6). The independent variable *First* is equal to one when the debt facility is the first sustainability-linked facility announced by a company and zero otherwise. *Subsequent* is equal to 1 when the debt facility is a subsequent sustainability-linked facility announced by a company and zero otherwise. Following Glavas (2020), the control variable *Deal Size*, equal to the principal amount of the debt facility on the announcement date, is excluded from regression (1)-(2) and (4)-(5) due to its perceived minimal impact on the stock market reaction to debt announcements. *Size* equals the natural logarithm of total assets. *Equity-to-Assets* equals the shareholder's equity divided by the total assets. *Interest Coverage Ratio* equals the EBIT divided by the interest expense. *Operating Margin* equals the operating income divided by total revenue. *ROA* is the net income divided by the total assets. *Maturity* expresses the debt facility's number of years to maturity on the announcement date. The results incorporating additional fixed effects and time-varying controls are presented in regression (2)-(3) and (5)-(6).

Variable	(1) CAR - Loans	(2) CAR - Loans	(3) CAR - Loans	(4) CAR - Bonds	(5) CAR - Bonds	(6) CAR - Bonds
First	-0.0225	-0.0645	-0.138	0.689	0.465	0.765*
	(0.143)	(0.153)	(0.160)	(0.424)	(0.424)	(0.447)
Subsequent	0.158	-0.0261	-0.0199	0.660	0.187	0.589
	(0.148)	(0.164)	(0.165)	(0.678)	(0.717)	(0.673)
Size	-0.110***	-0.0776*	-0.127***	0.243*	-0.0218	0.248
	(0.0364)	(0.0404)	(0.0381)	(0.142)	(0.182)	(0.232)
Equity-to-Assets	-0.282	-0.466	-0.362	-2.703	-0.343	-2.452
	(0.423)	(0.463)	(0.426)	(2.324)	(2.687)	(2.661)
Interest Coverage Ratio	-0.00140***	-0.00121**	-0.00104**	-0.00439	-0.00857	-0.00499
	(0.000498)	(0.000480)	(0.000503)	(0.00851)	(0.0113)	(0.00873)
Operating Margin	-0.00105	0.00109	-0.000857	-0.00461	0.0105	-0.00812
	(0.00127)	(0.00162)	(0.00131)	(0.0156)	(0.0293)	(0.0166)
ROA	0.128	-1.647	-0.847	9.704	0.195	8.963
	(1.573)	(1.967)	(1.612)	(7.312)	(11.67)	(8.908)
YTM	-0.0232**	-0.0194**	-0.0163*	0.0115*	0.0222***	0.0154*
	(0.00919)	(0.00923)	(0.00945)	(0.00629)	(0.00734)	(0.00852)
Deal Size			0.0571			-0.163
			(0.0389)			(0.307)
Constant	3.756***	3.025***	3.463***	-4.506	1.344	-3.194
	(0.917)	(1.072)	(0.934)	(3.438)	(4.447)	(4.176)
Observations	1 507	1 507	1 492	120	120	119
R-squared	0.014	0.047	0.032	0.084	0.173	0.115
Industry FE	No	Yes	No	No	Yes	No
Year FE	No	Yes	Yes	No	Yes	Yes
Country FE	No	No	No	No	No	No

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The deviating results between the event study and the regression does not necessarily imply that there is no market reaction at all. The lack of significance may be due to random chance or other accounted factors rather than a genuine relationship between the variables included in the regression. Therefore, the results contradict the earlier-mentioned “fundamental channel”-theory by Tang & Zhang (2020), which suggests that sustainable financing reduces information asymmetry through sustainable commitment, resulting in positive stock market responses. However, the regression analysis revealed insignificant coefficients for both initial and subsequent announcements of SLD, indicating no statistically significant difference in market reactions between the two groups. These contrasting results highlight the complexity of understanding the drivers of market reactions to SLD.

5.0 Conclusion

This thesis aimed to analyse the announcement effect of sustainability-linked debt for publicly listed firms in 17 European countries from April 2017 (October 2020 for bonds) throughout 2022, including a subsample for the Nordic region. Using an event study methodology, we sought to determine whether the market perceived sustainability-linked debt as value-enhancing, as this would incentivise borrowers to commit to sustainability. We extended our analysis to see whether there exist any geographical differences in market reactions within Europe and whether there are any disparities between initial and subsequent announcements of sustainability-linked debt. Finally, we included a regression analysis as a robustness check for our event study, controlling for a broad range of variables that could impact the stock market reaction to debt announcements.

The results of our study reveal that sustainability-linked loans and bonds exhibit positive cumulative average abnormal returns (CAARs), indicating that the market perceives sustainability-linked debt as value-enhancing. These findings support the idea that incorporating sustainability into operating and financing activities can result in positive effects for corporations and investors alike. Further, the significant positive CAARs observed in both the Nordic subsample and the entire European sample strengthen the market's acknowledgement of positive value generated by sustainability-linked debt. The study further provides evidence that announcing SLBs may lead to a premium compared to conventional bonds. In contrast, no significant difference is found between the positive market reactions to announcements of SLLs and conventional loans. This indicates that both SLBs and SLLs can contribute to combating climate change while simultaneously benefiting shareholders.

By comparing the announcement effects of sustainability-linked debt announced in the Nordic subsample to that announced in the entire European sample, we find a significant difference between announcements of SLLs in the two regions favouring the Nordics. The observed difference can be attributed to the Nordic companies' leading role in driving the global sustainability agenda, coupled with their environmentally aware investors (Aagaard et al., 2022).

When checking for any differences in market reactions between initial and subsequent announcements of sustainability-linked debt. Contrary to comparable studies conducted on green bond issuances by Flammer (2020) and Tang & Zhang (2020), our study reveals significant stock market reactions to both initial and subsequent announcements. These results emphasise the significance of effectively communicating the sustainability commitments related to announcing sustainability-linked debt. These results correspond with the "fundamental channel" theory presented by Tang & Zhang (2020), which suggests that sustainable financing reduces information symmetry by requiring firms to disclose information on the use of proceeds and environmental activities. As a result, both initial and subsequent sustainability-linked debt announcements are likely to generate a similar stock market reaction.

While our research contributes to understanding the market reactions to sustainability-linked debt, it is essential to acknowledge certain limitations. First, our study focused solely on the European market, and further research is needed to explore the global dynamics and regional variations in market reactions to sustainability-linked instruments. Second, our analysis relied on publicly available data only, which may have limitations in terms of completeness and accuracy. Additionally, future studies may consider utilising more comprehensive datasets, including instrument characteristics such as initial interest/coupon rate and rate adjustment range, and company characteristics such as ESG rating and using an external KPI auditor. Lastly, researchers can also consider incorporating qualitative research methods to gain deeper insights into the perceptions and motivations of market participants.

Being relatively new debt instruments, later studies may reveal other results than ours when more sustainability-linked debt facilities have been announced, and the general knowledge of sustainability-linked debt's potential for positive impact on sustainability has increased. This thesis provides empirical evidence that sustainability-linked bonds and loans generate positive market reactions, indicating their value-enhancing potential on top of benefits such as reduced environmental impact, enhanced reputation, and potentially reduced costs (BNPP, 2019). The research contributes to the growing body of literature on sustainable finance, and the findings support the notion that sustainable finance can drive financial performance and promote sustainable development.

In conclusion, this study enhances the understanding of the key role financial markets possess in addressing climate change. Companies need to reduce their environmental impact to achieve the Temperature Goal and the Sustainable Development Goals. Our findings suggest that sustainability-linked debt can serve as an incentive for companies to lean in on achieving these goals without impacting shareholder value negatively.

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Appendixes

Appendix A: Variance Inflation Factors

Table A: Variance Inflation Factors

The following table displays the results of the variance inflation factors (VIFs) from our regression analysis. We include this as VIF quantifies the presence of multicollinearity within the independent variables of a regression model. Detecting any potential multicollinearity is crucial since it diminishes the statistical significance of the independent variables, although it does not directly impact the explanatory power of the model in question. VIF values above 5 are a cause for concern, as this suggests that the independent variables might be strongly correlated with each other, while values over 10 need to be corrected. As seen from the table, we do not encounter any variables that need correction. There are only 2 variables that indicate somewhat strong multicollinearity.

Variable	VIF - Loans	VIF - Bonds
Sustainable	1.53	1.70
Nordic	1.89	6.84
Size	1.62	3.68
Equity to Asset Ratio	2.05	2.96
Interest Coverage Ratio	1.37	2.88
Operating Margin	1.11	2.90
ROA	2.08	5.89
YTM	1.06	1.11
Deal Size	1.12	3.15

Appendix B: Two-sample T-Test

Appendix X: Two-sample T-test

The following table displays the outcomes of conducting a two-sample t-test on the observed premiums related to announcing sustainability-linked debt, presented as p-values. We conducted a two-sample t-test on the difference between announcement effects of sustainability-linked debt and their conventional counterparts for the full European sample and the Nordic subsample. Next, we conducted a two-sample t-test on the difference between announcing sustainability-linked debt in the Nordics and the rest of Europe. Lastly, the test was conducted on the difference between initial and subsequent announcements in Europe.

Premiums for SLLs	**T-test with equal variance**	**T-test with unequal variance**
Nordic	0.1710	0.1712
Europe	0.2047	0.2019
Nordic compared to Europe	0.0756	0.0765
Initial versus subsequent	0.4808	0.4805
Premiums for SLBs	**T-test with equal variance**	**T-test with unequal variance**
Nordic	0.0209	0.0218
Europe	0.0942	0.0914
Nordic compared to Europe	0.9793	0.9728
Initial versus subsequent	0.7516	0.7734