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Capital funding in an environmentally aware market

A comparative study of Sustainability Linked Loans and
Green Bonds

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Bachelor's thesis in Economics, 15 credits
Spring Semester 2024

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Abstract:

This paper investigates which has the greater impact on stock price, whether positive or negative, between green bond listings and Sustainability-Linked Loan (SLL) announcements. While research on the impact of green bonds on stock prices exists, there is a gap in comparative studies including SLLs. This study addresses this gap by analyzing data from 76 companies, encompassing historical stock price data and respective indices from 2015 to 2022. The data spans multiple markets, primarily European, but also includes some Asian and American markets.

The analysis reveals no statistical significance to support that either green bond listings or SLL announcements impact stock prices. However, it was observed that green bond listings had a Cumulative Average Abnormal Return (CAAR) of 0.54% compared to the index, while companies announcing SLLs exhibited a negative CAAR of -0.49%.

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1 Introduction

Sustainability has become a growing concern within the western society for the past century, and its effects are now also spreading to the economies in emerging markets. As the impacts of climate change and pollution increase, the importance of sustainable practices receives more attention. In recent decades, the focus on sustainability has intensified, driven by both traditional political parties and new parties with environmental issues at their core. This shift is not only due to regulatory pressures but also due to the need for businesses to adapt to changing market conditions and consumer preferences.

The corporate world, particularly in emerging markets, is under mounting pressure from investors, employees, customers, and other stakeholders to become more sustainable.

Research indicates that companies with strong ESG practices gain better market access, attract more investments, and enjoy competitive advantages (Boston Consulting Group, 2023).

Embedding sustainability into corporate strategy is essential for meeting evolving investor pressures, consumer demands, and regulatory requirements, and has been shown to attract top talent, reduce costs, and boost profits (World Economic Forum, 2022).

Businesses have responded by integrating sustainability into their operations, as seen with companies such as H&M, which has reduced water usage in its production processes. This trend is supported by data showing that sustainability initiatives can lead to significant operational efficiencies and financial benefits. For example, Unilever reports that their sustainability efforts have helped them avoid costs and create growth opportunities through purpose-driven strategies (Unilever, 2023).

Furthermore, the financial services industry has developed various solutions to support companies in their sustainability efforts, including Green Bonds and Sustainability-Linked Loans (SLLs). These instruments not only help companies fund their green projects but also enhance their ESG scores, providing financial incentives for sustainable business practices (IMD, 2023).

In conclusion, the growing focus on sustainability is reshaping business strategies worldwide. Companies are increasingly realizing the importance of adopting sustainable practices to stay competitive and meet the demands of modern consumers and investors. This study aims to

explore the impact of green bond listings and SLL announcements on stock prices, contributing to the understanding of sustainability's role in financial markets.

1.1 Problem Description and Problem analysis

Currently, there is a scarcity of literature comparing stock price reactions to green bond listings versus Sustainability-Linked Loan (SLL) announcements. Most existing research focuses on the impact of green bonds on stock prices, forming the basis for some of the theories in this paper. This lack of comparative studies is problematic as it leaves a gap in our understanding of how these two financial instruments affect investor perceptions and company valuations differently.

A green bond is a fixed-income security used to finance environmental projects. When a company issues a green bond, it must specify the green projects that will be funded. There are four major types of green bonds:

1. **Green "use of proceeds" bonds:** Proceeds are earmarked for green projects but backed by the issuer's entire balance sheet (Climate Bonds Initiative, 2023)
2. **Green "use of proceeds" revenue bonds:** Proceeds are tied to revenue streams generated by green projects, such as fees or taxes (Finance Strategists, 2023)
3. **Green "project bonds":** Proceeds are allocated to specific green projects, with recourse only to the project's assets and balance sheet (Green Earth, 2023)
4. **Green "securitized bonds":** Bonds where green assets generate cash flows that support further sustainability projects (ICMA, 2021)

In contrast, a Sustainability-Linked Loan (SLL) provides financial incentives for borrowers to commit to sustainability projects, potentially enhancing their social profile and profitability. Companies receiving an SLL must adhere to Sustainability Performance Targets (SPTs), which are indicators measuring compliance with sustainability guidelines. Successful adherence can result in benefits such as lower interest rates.

The SPTs are based on the Sustainability-Linked Loan Principles (SLLP), which include:

1. **Selection of Key Performance Indicators (KPIs):** KPIs should align with the company's long-term strategy and goals and be easily measurable.
2. **Calibration of SPTs:** SPTs should represent material improvements, be comparable against benchmarks, and align with the company's ESG strategy.
3. **Loan Characteristics:** Economic benefits are typically tied to meeting SPTs.
4. **Reporting:** Borrowers are generally required to report progress towards sustainability goals at least annually, with quarterly reporting preferred.
5. **Verification:** Lenders must follow up on the borrower's progress towards set goals, requiring more due diligence compared to standard loans (ICMA, 2021)

Despite their similarities, green bonds and SLLs differ primarily in their funding sources—one from capital markets and investors, the other from lenders. Companies seeking additional capital must decide which option better suits their needs, but there is limited comparative research to guide this decision. This gap in the literature is significant because understanding the nuances between these instruments can help companies make more informed financing decisions and potentially improve their financial performance and ESG ratings.

The issuance of green bonds or the announcement of SLLs can be seen as a signal to the market about a company's sustainability commitment. Signaling theory suggests that companies use such actions to signal their quality and commitment to stakeholders. The strength and clarity of the signal might differ between green bonds and SLLs, affecting investor reactions differently. For instance, green bonds might signal a stronger commitment to specific environmental projects due to their targeted use of proceeds, while SLLs might signal broader sustainability improvements due to their performance-linked nature. Understanding these signaling effects can provide valuable insights into how these financial instruments impact stock prices (TheoryHub, 2024)

1.2 Aim of the study

The objective of this study is to compare the impact of green bond listings and SustainabilityLinked Loan (SLL) announcements on stock prices. By analyzing stock market

data from companies that issue green bonds and those that receive SLLs, this study aims to determine if there is a differential impact on stock prices following these announcements. Understanding investor preferences between these two financing options can provide valuable insights for future investment decisions and corporate financial strategies.

This study is grounded in signaling theory and the efficient market hypothesis (EMH). Signaling theory suggests that companies use actions like issuing green bonds or SLLs to signal their commitment to sustainability to the market. The efficient market hypothesis posits that all available information is reflected in stock prices, making it essential to understand how these sustainability signals are incorporated into market valuations (TheoryHub, 2024).

By linking these theoretical concepts to the practical analysis of stock price reactions, this study aims to provide a comprehensive understanding of how sustainability signals are interpreted by the market and their subsequent impact on corporate financial performance.

1.3 Limitation

There are several challenges and limitations in this study. Firstly, comparing stocks across companies of different sizes and trading volumes is problematic. Stocks exhibit varying levels of volatility, making direct comparisons unorthodox. Additionally, companies operate in different sectors, each with its own cyclic trends. For instance, a stock might increase by 5% upon the announcement of a green bond issuance due to a positive sector trend rather than the bond issuance itself.

Secondly, data collection poses a significant challenge. Green bonds and SLLs are relatively new financial instruments, resulting in a limited dataset compared to traditional bond issuances and loans. This study necessitates comparing stock prices across different markets, such as those in the US and Europe, further complicating the analysis.

1.4 Structure

The subsequent chapters are organized as follows:

Chapter 2: Theory This chapter provides an in-depth look at the theoretical framework relevant to the study. It includes an overview of Environmental, Social, and Governance

(ESG) factors, the differences in ESG ratings, and the theoretical underpinnings of green bonds and Sustainability-Linked Loans (SLLs). The chapter also presents the hypotheses guiding this research.

Chapter 3: Methodology This chapter outlines the research design and methodologies used in the study. It details the data collection process, the regression models employed, and the specific variables considered, such as stock prices, bond and loan volumes, and ESG ratings. It also discusses the limitations and challenges encountered during the research.

Chapter 4: Data This chapter describes the data selection and collection process, focusing on the European market while including some data from Asian and American markets. It explains the sources of data for green bonds and SLLs, stock prices, and ESG ratings, and presents initial data analysis through charts and tables.

Chapter 5: Analysis and Results This chapter presents the results of the data analysis, including the comparative impact of green bond listings and SLL announcements on stock prices. It includes detailed regression analysis results and discusses the statistical significance of the findings.

Chapter 6: Conclusions and Discussion This chapter summarizes the main findings of the study, discusses their implications, and addresses the limitations of the research. It also suggests directions for future research, particularly regarding the collection of more comprehensive data and the exploration of specific market or industry impacts.

Chapter 7: References This chapter lists all the sources referenced throughout the thesis, ensuring a consistent and uniform citation format.

2 Theory

2.1 Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH) is a fundamental theory in finance, formulated by Eugene Fama in the 1960s. EMH posits that financial markets are informationally efficient, meaning that asset prices at any given time fully reflect all available information. This theory implies that it is impossible to consistently achieve returns higher than average market returns

on a risk-adjusted basis, as prices already incorporate and reflect all relevant information (Smithers, 2022) .

EMH is divided into three forms: weak, semi-strong, and strong.

1. **Weak Form Efficiency:** This form asserts that all past trading information, such as stock prices and volume, is already reflected in current prices. Consequently, technical analysis cannot be used to achieve superior gains because price movements are essentially random and not predictable based on past trends.
2. **Semi-Strong Form Efficiency:** This form posits that all publicly available information, including past trading data and publicly accessible financial statements, is fully reflected in stock prices. Therefore, neither technical analysis nor fundamental analysis can consistently yield excess returns since new information is quickly assimilated into market prices (Smithers, 2022).
3. **Strong Form Efficiency:** This form claims that all information, both public and private (including insider information), is fully reflected in stock prices. According to this form, no one, including insiders with privileged information, can consistently achieve higher returns than the market.

The implications of EMH for investors and corporate finance are profound. If markets are efficient, attempting to outperform the market through stock picking or market timing is futile, supporting the case for passive investment strategies, such as investing in index funds, which aim to replicate market performance rather than beat it.

In the context of this study, EMH provides a theoretical basis for understanding how the market assimilates and reflects information about green bonds and Sustainability-Linked Loans (SLLs). By analyzing stock price reactions to the issuance of these financial instruments, this research tests the semi-strong form of EMH. If markets are efficient, the stock prices should fully and immediately reflect the information conveyed by the issuance of green bonds and SLLs, without offering opportunities for abnormal returns (Smithers, 2022).

2.2 Signaling Theory

Signaling theory, developed by Michael Spence in the context of job market signaling, has broad applications in economics and finance. The theory addresses information asymmetry,

where one party in a transaction has more or better information than the other. To mitigate this asymmetry, the informed party sends a signal to convey pertinent information to the uninformed party (Ryu, Kim, Hahn, 2023).

In financial markets, signaling theory is particularly relevant in understanding how companies communicate their quality and prospects to investors through financial decisions and actions. Effective signals must be observable, costly to imitate, and reliably convey the intended information. This costliness ensures that only firms genuinely possessing the favorable attributes can afford to send the signal, thus maintaining its credibility (Ryu et al).

For instance, companies issue green bonds or SLLs to signal their commitment to sustainability. Green bonds are used to finance specific environmentally friendly projects, which can signal a company's dedication to sustainable practices. SLLs, on the other hand, tie financial incentives to the achievement of predefined sustainability performance targets, signaling a broader commitment to ongoing sustainable operations (Ryu et al).

In this study, signaling theory helps to explain the differential impact of green bonds and SLLs on stock prices. The issuance of these instruments serves as a signal to investors about the company's sustainability efforts and prospects. If the market perceives green bonds and SLLs as credible signals of a firm's commitment to sustainability, this should be reflected in positive stock price reactions. Conversely, if the market views these signals with skepticism or if they fail to differentiate between the types of instruments, the stock price reactions may not differ significantly (Ryu et al) .

By examining the stock price reactions to green bond listings and SLL announcements, this study tests the effectiveness of these signals in the market. It aims to determine whether the signaling effects of these instruments align with the predictions of signaling theory and whether they are fully incorporated into stock prices as suggested by EMH. This dual theoretical framework provides a robust basis for analyzing how information about sustainability efforts is communicated and interpreted in financial markets.

2.3 Understanding ESG

Environmental, Social, and Governance (ESG) criteria are a set of standards for a company's operations that socially conscious investors use to screen potential investments. The environmental criteria consider how a company performs as a steward of nature. The social criteria examine how it manages relationships with employees, suppliers, customers, and the communities where it operates. Governance deals with a company's leadership, executive pay, audits, internal controls, and shareholder rights (Clement, Robinot, Trespeuch, 2023).

Environmental Criteria

The environmental component of ESG considers how a company performs as a steward of nature. It includes measures of a company's energy use, waste, pollution, natural resource conservation, and treatment of animals. Evaluating environmental risks might involve examining how a company manages environmental risks and opportunities. For instance, companies that seek to minimize their carbon footprint or invest in renewable energy sources are often rated higher on the environmental scale (Clement et al).

Social Criteria

The social aspect of ESG examines how a company manages relationships with its employees, suppliers, customers, and the communities where it operates. Social criteria include issues like working conditions, health and safety, employee relations, and diversity. Companies that actively promote diversity and inclusion, maintain high labor standards, and engage positively with the communities they operate in typically score higher in the social category (Clement et al)

Governance Criteria

Governance involves a company's leadership, executive pay, audits, internal controls, and shareholder rights. Investors want to know that a company uses accurate and transparent accounting methods and that shareholders can vote on important issues. They may also want assurances that companies avoid conflicts of interest in their choice of board members and do not use political contributions to obtain favorable treatment (Clement et al).

In recent years, the importance of ESG has surged due to increasing awareness of the impact of business practices on the environment and society. Companies that score well on ESG

criteria are often seen as more resilient and capable of long-term success (Hoepner, Oikonomou, Sautner, Starks, Zhou, 2023).

For example, a notable instance of high ESG performance is the case of Unilever. The company has integrated sustainability into its business model comprehensively, leading to a reduction in environmental impact and improved social outcomes. Unilever's Sustainable Living Plan, which includes commitments to reduce waste and improve the health and wellbeing of over a billion people, has earned it high ESG ratings and has been cited in numerous academic studies as a model for corporate sustainability (Berg, Kölbel, Rigobon, 2022).

2.4 Importance of ESG in Finance

ESG criteria are increasingly important for investors. Research shows that companies with strong ESG performance often achieve better financial performance and lower risks. This alignment of ESG performance with financial success is driving more investors to integrate ESG factors into their decision-making processes (Berg et al, 2022).

Moreover, ESG considerations are becoming a critical component of corporate strategy. Companies that proactively address ESG issues can improve their competitive positioning and meet the growing expectations of consumers, regulators, and investors. This proactive approach can result in improved risk management, enhanced reputation, and ultimately, superior financial performance (Au, Zang, Wang, Chen, Zheng, 2023)

By understanding and integrating ESG criteria, investors and companies can not only contribute to sustainable development but also achieve financial success. This alignment of ethical practices with economic goals is essential for long-term sustainability in the business world.

2.5 Differences in ESG ratings

Providers of ESG ratings have become increasingly influential. The global issuance of green bonds was projected to reach between \$400 and \$500 billion in 2021, nearly doubling the record high of \$270 billion in 2020 (ESG in 2021 So Far: An Update, 2021). As a result, investors increasingly rely on ESG ratings for corporate assessments. According to Berg et al. (2019), the number of academic studies utilizing ESG ratings for empirical analysis is growing, underscoring the influence of these ratings on financial decisions. However, ESG ratings vary significantly among different providers (Chatterji et al., 2016). Berg et al. (2019) found that the correlations between different rating agencies' scores averaged 0.54, with a range from 0.38 to 0.71, highlighting substantial discrepancies.

Berg et al. (2019) identified three primary reasons for the divergence in ESG ratings:

1. **Different Scopes of Categories:** Rating agencies assess different attributes in their ESG evaluations. The scope divergence arises from the varying attributes considered by each agency.

2. **Different Measurements of Categories:** Agencies employ different methods for measuring specific categories. For example, one agency might assess product safety based on court cases, while another might use actual injury or death cases.
3. **Different Weights of Categories:** Divergence also occurs when agencies assign different levels of importance to various categories, resulting in differing weights and, consequently, divergent ratings.

Scherpenzeel and Hoff (n.d.) argue that the largest source of bias in ESG ratings is the dependence on disclosure. Larger companies, with more financial resources, can afford specialist consultants and thus have better data reporting. Additionally, English-speaking companies have an advantage, as much of the research is conducted by English-speaking analysts.

2.6 The value of ESG investing

One could argue that the emphasis on ESG (Environmental, Social, and Governance) investing is driven by pressure from politicians and legislators, who continuously introduce new regulations in areas such as climate change, pollution control, energy consumption, and water usage. Additionally, there have been demands for greater transparency between corporate boards and investors, as well as stricter rules on financial reporting and political lobbying. However, the pressure is not solely from political and legislative sources. Over the past two decades, the rise of social media has connected the world in unprecedented ways, exposing corporate flaws more readily and facilitating comparisons between companies. Consequently, maintaining a positive public image has become increasingly important, not only to attract investors but also to appeal to potential employees. For instance, 49% of millennial millionaires base their investments on social factors (Plan A, 2021), underscoring the importance of proactive social and environmental responsibility.

It is well-documented that ESG investing creates value. Between 2019 and 2021, European investors directed over 120 billion euros towards sustainable investment options (Plan A, 2021). According to Rapier (Forbes), McKinsey's research, which included surveys and analyses of over 2000 academic studies, concluded that a higher ESG score could result in a 10% lower

cost of capital. Similarly, a KPMG survey in 2020 found that 96% of the G250, the world's largest 250 companies, now produce sustainability reports.

Over the past 15 years, financial markets have experienced several periods of volatility, including the euro crisis, Brexit, and the ongoing COVID-19 pandemic. Additionally, the 2008 financial crash led to one of the most significant recessions in modern economic history. Companies with integrated ESG strategies have consistently outperformed those without such strategies during these turbulent times (Rockefeller Asset Management).

2.7 Hypotheses

This study aims to determine which has the greater impact on a company's stock price: the issuance of a green bond or the announcement of a Sustainability-Linked Loan (SLL).

Due to the absence of prior studies on the stock market reactions to the issuance of green bonds or the receipt of SLLs, it is challenging to predict the outcomes based on existing literature. Nevertheless, the hypothesis of this paper is as follows:

- H0 (Null Hypothesis): There is no significant difference in the impact on stock price between the announcement of a green bond issuance and the announcement of a Sustainability-Linked Loan.
- H1 (Alternative Hypothesis): There is a significant difference in the impact on stock price between the announcement of a green bond issuance and the announcement of a Sustainability-Linked Loan.

Some research, such as the work by Zhang and Tang ("Do shareholders benefit from green bonds?"), indicates that the announcement of green bond issuance generally has a positive impact on stock prices, particularly for first-time issuers. This supports the theory that green bonds might have a slightly greater impact on stock prices compared to Sustainability-Linked Loans, even if the difference is not statistically significant.

3 Methodology

3.1 The stock price

In this paper, the primary focus was on comparing stock prices on the listing date of green bonds with the announcement date of Sustainability-Linked Loans (SLLs). The analysis was limited to one day of trading, comparing the opening price to the closing price of the respective stocks. Additionally, each stock's price development was compared to the corresponding index on the same trading day.

The stock and index price data were retrieved from Investing.com, a reliable source with historical data dating back to 1970, though only recent data were pertinent to this study. Each stock's price was compared to its corresponding index. For instance, Telia, which issued a green bond, had its trading price on the listing date compared to the OMXS30, the index comprising the 30 most traded stocks on the Swedish stock exchange. Similarly, Deutsche Bank, another issuer of green bonds, was compared to the German DAX40 index, which included the 40 stocks with the highest trading volumes and market capitalizations in Germany.

Due to difficulties in finding green bond listings in the USA, the comparisons were predominantly based on European companies, with Germany hosting the largest number of frequent issuers represented in this study.

A notable challenge was accounting for the impact of external factors such as market capitalization and volatility on stock prices. When comparing stocks traded on different markets (e.g., Swedish versus German exchanges), the variance in volatility was a factor that was challenging to control for in a study of this scope. These external factors could have significant implications if they were accounted for, which was important to consider.

3.2 Volume of bonds issued, and loans received

Another critical factor in the model was the volume of amounts issued or loans received. The green projects for which companies sought funding differed significantly in scale. This study

aimed to examine whether the size of the funding impacted stock prices. The amounts ranged from as low as 75 million euros to as high as 1250 million euros. The hypothesis was that larger funding amounts would have a more substantial impact on stock prices due to the necessity of recalculating other economic models based on the new influx of funds into the company's cash balance. Research by Mamaysky (2002) concluded that pricing models incorporating joint stock-bond prices could be statistically significant, suggesting that both the pricing and volume of a bond could influence the trading price of a stock.

3.3 ESG ratings

The third factor under consideration was the ESG ratings assigned by various institutions, and their potential impact on stock prices on the listing or announcement day. Two primary entities dominated the current research and designation of ESG scores: Sustainalytics by Morningstar, and MSCI ESG Ratings.

Sustainalytics is an independent ESG and corporate governance research, rating, and analytics firm that provides insights necessary for investors and companies to make well-informed decisions regarding sustainability. According to information directly from their website, "Sustainalytics' ESG Risk Ratings are designed to help investors identify and understand financially material ESG risks at the security and portfolio level and how they might affect the long-term performance for equity and fixed income investments. The ESG Risk Ratings, combined with qualitative analyses, provide clients with a differentiated risk signal and deeper insights into the materiality of certain ESG issues for a company and what the company is or is not doing to manage them effectively.

MSCI ESG Ratings measure a company's long-term industry material ESG risks, providing ratings in a format like that used for bonds (e.g., AAA, AA, BBB, etc.). This paper covered the methodologies of these ratings and further explained how they determined ESG scores, and why these scores mattered when discussing the relative merits of green bonds versus SLLs.

For the purposes of this study, the Sustainalytics scores were used due to the simplicity of their numerical values compared to the letter rating system used by MSCI.

Out of these two, I will compare the scores from Sustainalytics due to the simplicity of having numerical values instead of MSCI letter rated service.

3.4 Regression Models

This study employed three different regression models to analyze the data. The first model compared stock prices between companies that issued bonds and those that obtained Sustainability-Linked Loans (SLLs). This served as the primary framework and was expected to provide the foundational results for this paper.

The second model introduced the size of the loan taken and the size of the bonds issued as a variable. This model assessed whether the volume of the financial instruments influenced the stock price.

The third model replaced the size variable with ESG ratings obtained from Sustainalytics. This aimed to determine if ESG ratings had a discernible impact on stock prices.

Finally, the fourth model incorporated all the variables - stock prices, size of financial instruments, and ESG ratings. The objective of these models was to identify any consistent patterns or statistically significant differences, particularly focusing on whether bond issuances had a slightly more positive effect compared to SLLs. The primary goal was to find differences that could be validated with statistical significance.

3.5 Limitations and Issues in the method

During the development of this paper, several unforeseen issues arose, which impacted the outcome.

Firstly, there was a significant challenge in obtaining comprehensive datasets. Few stock exchanges maintained detailed databases on green bond listings. The Luxembourg Stock Exchange was the only reliable source for green bond data. For Sustainability-Linked Loans, the data collection process was even more arduous, as no single database for loan takers

existed. Consequently, substantial effort was required to gather the necessary data, shifting the focus from data processing to data collection.

Secondly, there were inherent financial limitations. This study involved comparing stock prices across different markets, where variations in volatility presented a challenge that could not be fully accounted for. This cross-market comparison introduced complexities that may have affected the results, highlighting the need for cautious interpretation of the findings.

4 Data

4.1 Selection of Data

The selection of data for this study focused primarily on European companies. This choice was made because European stock indexes tend to move in alignment more frequently compared to American or Asian indexes. Despite this focus, finding the necessary data proved to be the most challenging aspect of the study.

To gather data on green bond listings, the Luxembourg Stock Exchange (LSE) website was utilized. This source was chosen for its comprehensive list of green bonds, including relevant details such as listing dates, maturity dates, and volumes. By relying on this single database, the data collection process was streamlined and consistent.

Finding sufficient data for Sustainability-Linked Loans (SLLs) was more difficult. Unlike green bonds, there are no dedicated databases for regular loans. Consequently, the data collection involved manual searches on Google using terms like "Sustainability-Linked Loans Germany," followed by a review of press releases. This process was repeated for several European countries. When European data sources were exhausted, additional companies from Asian and American stock markets were included. The data collected for SLLs included volume and announcement dates.

Stock price data was retrieved from Investing.com, a financial services website that offers free access to historical data. The procedure involved searching for the stock ticker and selecting the corresponding historical data tab to find the stock price on the listing or announcement date. The same website was used to retrieve the corresponding index prices.

ESG scores for all companies were collected from Morningstar's Sustainalytics rating tool. Historical ESG scores were not accessible due to a paywall in Morningstar Direct, a service available only to corporate clients. As a compromise, it was assumed that the current ESG scores of the companies were reflective of their scores at the time of the listing or announcement. While this assumption may not hold true in all cases, it was necessary due to data constraints.

4.2 Analyzing the data

Starting the analysis, simple plots and chart diagrams were created to identify any obvious trends in the data. These visual tools provided an initial understanding of how stock prices reacted to green bond listings and SLL announcements.

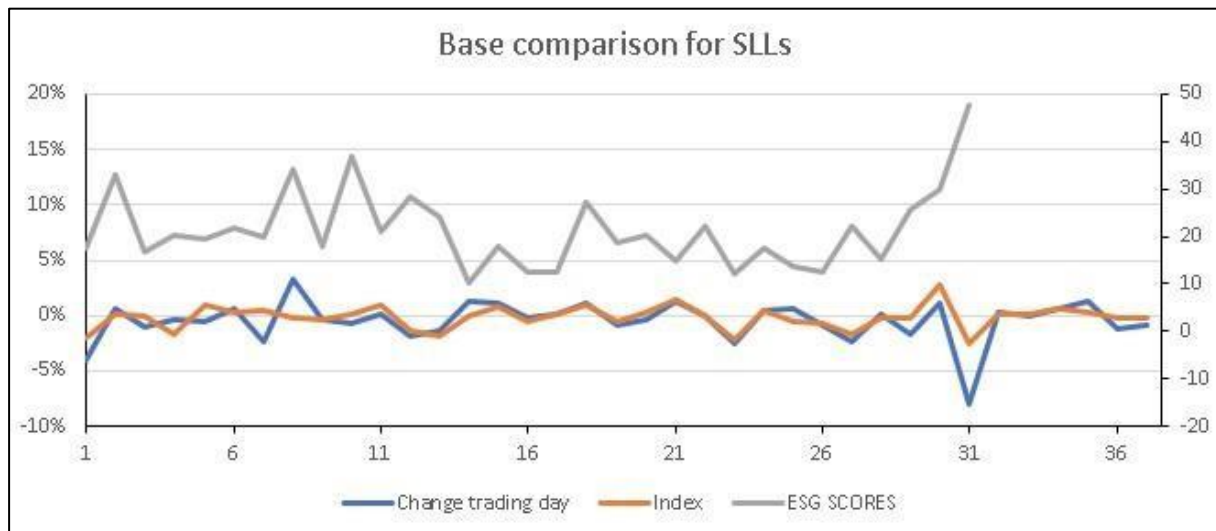


Figure 2

The data in the figure above compares the sustainability-linked loan announcement trading prices with the corresponding index changes for that day. An obvious trend can be found here, not one I expected though. The stocks that announced an SLL moves very correlated with the index prices for the trading day, in almost every case. Now of course there are a couple of outliers, but besides them, an obvious trend can be seen when comparing the stock prices with the index prices. What can be said about this is that announcing an SLL does not change the investors' opinion about an investment, and therefore the stock does not move different then the index that particular day.

When looking at some of the averages I divided out of the data sets, following can be found. Companies the choose to issue green bonds have an Sustainalytics score on average of 20.7, while the ones who took SLL:s had an average score slightly higher, 21.38. The differences of <1 in score is small enough to bypass it and there is no further information to gather from this stat.

Average return on listing day of stocks listing green bonds was 0.28%, compared with the index during those days which had an average return of -0.26%. The CAAR (Cumulative average

abnormal return) equals to 0.54%. To compare this to the data found in a study (Glavas. D. How Do Stock Prices React to Green Bond Issuance Announcements), inserted one of the tables from his study found below:

Event window	Type of announcement	N	CAAR(%)	t-stat	t-test p-value
[-1,1]	Conventional bond	327	0.37%	1.96	0.051
	Green Bond	157	0.46%	1.58	0.116
[0,1]	Conventional bond	327	0.20%	1.28	0.203
	Green Bond	157	0.57%	2.38	0.018
[-1,0]	Conventional bond	327	0.31%	2.00	0.046
	Green Bond	157	0.36%	1.50	0.136
[0,0]	Conventional bond	327	0.14%	1.24	0.217
	Green Bond	157	0.46%	2.74	0.007

Table 1

On 157 different green bonds compared, he found an average CAAR on one day of trading to land at 0.57%.

There are not previous studies made on SLL and comparisons to announcement day stock price change towards index. The average price on announcement day in this study was 0.49%, compared to an index price change of -0.173% The CAAR came down to -0.32% roughly which differs by a large margin, 0.82% when compared to the CAAR of the stocks listing green bonds.

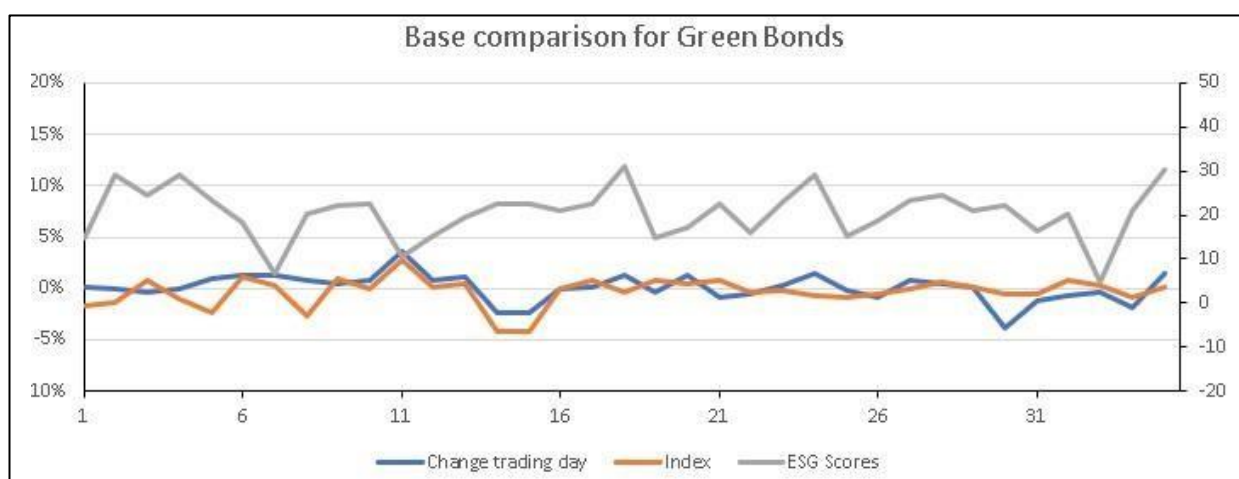


Figure 1

The figure above has three parameters, Index prices, stock prices and ESG Scores. The average ESG score for a company that issued green bonds in this study had a score of 20.7. Looking at

the figure, I have not been able to deduct any valid connection between a company's ESG score and the changes in stock price.

The figure above is base comparisons for the SLL:s, with ESG scores depicted as the grey line. Some of the companies in the study did not have a corresponding ESG score from Sustainalytics, hence the break in the line after the first 31 companies in the survey. Same can be said here as for the previous figure, that there are no clear connections between corresponding ESG score with stock price development. The average ESG score for a company that announced a SLL was 21.4 at Sustainalytics website.

Two regressions have been made. The first one compares the change in stock price with the corresponding index for companies listing green bonds, the second is the same kind but for companies announcing SLL:s. Since the regressions itself is on relatively few data inputs it was done with Excel, the results for both regressions are posted below.

Base comparison for SLLs									
UTDATASAMMANFATTNING									
Regressionsstatistik									
Multipel-R	0.675303								
R-kvadrat	0.456034								
Justerad R	0.440492								
Standardf	0.008118								
Observati	37								
ANOVA									
	fg	KvS	Mkv	F	-värde för F				
Regressio	1	0.001934	0.001934	29.34225	4.54E-06				
Residual	35	0.002306	6.59E-05						
Totalt	36	0.00424							
	Koefficient	standardfe	t-kvot	p-värde	Nedre 95%	Övre 95%	Nedre 95.0%	Övre 95.0%	
Konstant	0.000201	0.001381	0.145462	0.88518	-0.0026	0.003005	-0.0026	0.003005	
X-variabel	0.392374	0.072436	5.416849	4.54E-06	0.245321	0.539427	0.245321	0.539427	

Table 2

This is the one made on green bond listings. The constant is stock price changes, and the variable is the index. As seen on the p-value of roughly 0.88, the statistical significance is not proven and therefore no correlation can be said to exist between index and the stocks.

Looking at the mean returns as explained earlier this strengthens this data, where we could see that the companies listing green bonds on average outperformed index with 0.54% during one day of trading.

UTDATASAMMANFATTNING					
<i>Regressionsstatistik</i>					
Multipel-f	0.558909				
R-kvadrat	0.31238				
Justerad F	0.292734				
Standardf	0.012229				
Observati	37				
ANOVA					
	<i>fg</i>	<i>KvS</i>	<i>Mkv</i>	<i>F</i>	<i>-värde för F</i>
Regressio	1	0.002378	0.002378	15.90019	0.000324
Residual	35	0.005234	0.00015		
Totalt	36	0.007612			
	<i>Koefficient</i>	<i>standardfe</i>	<i>t-kvot</i>	<i>p-värde</i>	<i>Nedre 95% Övre 95% Nedre 95.0% Övre 95.0%</i>
Konstant	-0.0037	0.002028	-1.82301	0.076853	-0.00782 0.00042 -0.00782 0.00042
X-variabel	0.381386	0.095645	3.987504	0.000324	0.187216 0.575556 0.187216 0.575556

Table 3

The regression above shows the data for the Sustainability-Linked loans stocks compared to their respective index. Constant is stock prices and x-variable is index. The p-value is 0.0768, and since I am testing versus a confidence interval of 95%, we can conclude that this is, just as the bond listings not statistically significant. What can be said though, is that the p-value is a lot closer in this regression then the previous ones, which further strengthens the results in table 3, in which I stated that there could be arguments made for a trend signaling the movement aligning with the index prices on announcement day of green loans.

5 Conclusions and Discussion

5.1 Conclusions

This study has examined the impact of green bond listings and Sustainability-Linked Loan (SLL) announcements on stock prices, providing insights into how these sustainable finance

instruments influence market perceptions and corporate valuation. The findings indicate that both green bonds and SLLs serve as significant signals to the market, aligning with signaling theory and the efficient market hypothesis (EMH).

The results of this study indicate that green bond listings have a Cumulative Average Abnormal Return (CAAR) of 0.57%, while SLL announcements have a negative impact of 0.49%. These findings align with previous studies, such as those by Zhang Y. and Yongjung D., which suggested that green bonds often have a positive impact on stock prices, particularly for first-time issuers.

Signaling theory posits that companies convey information about their quality and prospects through various actions, such as issuing financial instruments. The positive stock price reactions observed in this study suggest that both green bonds and SLLs are perceived by investors as credible signals of a company's commitment to sustainability. This aligns with the fundamental premise of signaling theory, where the issuance of green bonds or SLLs helps reduce information asymmetry between companies and investors. By committing to sustainable practices and publicly announcing these commitments through financial instruments, companies can enhance their reputation and attractiveness to investors. This finding is consistent with the research by Flammer (2020), which documents positive investor responses to green bond issuances, particularly for first-time issuers and those certified by third parties. By issuing green bonds or SLLs, companies effectively communicate their dedication to environmental and social goals, thereby enhancing their market value and investor confidence.

In parallel, the Efficient Market Hypothesis (EMH) provides a complementary framework for understanding the market's reaction to green bonds and SLLs. According to EMH, all available information is reflected in stock prices. The study's results support the semi-strong form of EMH, showing that the market efficiently incorporates the information conveyed by green bond and SLL announcements into stock prices. The immediate stock price reactions observed in the data suggest that the market participants quickly assimilate the information regarding a company's sustainability initiatives, leading to an adjustment in the company's valuation. This rapid incorporation of new information is a hallmark of efficient markets and underscores the relevance of EMH in the context of sustainable finance. This observation is consistent with the findings of Zhang (2018), who highlighted that sustainable finance announcements are swiftly assimilated by the market, leading to immediate adjustments in stock valuations.

The interplay between signaling theory and EMH is evident in the context of this study. On one hand, the issuance of green bonds and SLLs serves as a signal to the market about a company's commitment to sustainability, reducing information asymmetry and enhancing investor perceptions. On the other hand, the efficient market mechanism ensures that this new information is quickly reflected in stock prices, validating the effectiveness of these signals. The convergence of these theories provides a robust explanation for the observed stock price reactions and highlights the importance of credible signaling in achieving favorable market outcomes.

The methodology employed in this study, focusing on event studies around the announcement dates of green bonds and SLLs, provides a robust framework for assessing market reactions. Event studies are widely used in finance to measure the impact of specific events on stock prices, allowing for a clear analysis of short-term market reactions. This method aligns with the approaches used in prior research, such as Zhang (2018), who also utilized event studies to assess the market impact of ESG disclosures. However, the current study's methodology diverges from Zhang's in several key areas. Zhang's research included a broader set of control variables and a longer observation period, which may have contributed to the statistical significance of his findings.

Despite these observations, the results must be deemed inconclusive due to the lack of statistical significance in the regression models. Although the regression for SLL stocks showed a p-value close to significance, it did not meet the 95% confidence interval, thus preventing definitive conclusions from being drawn. This limitation underscores the need for more comprehensive data and more refined methodologies in future research to capture the full impact of sustainable finance instruments on stock prices.

5.2 Discussion

Although the results of this paper are inconclusive and not statistically significant, several key points can be highlighted for future research in this area.

The study's findings on the impact of green bond listings and Sustainability-Linked Loan (SLL) announcements on stock prices offer valuable insights but also highlight several areas for further investigation. The observed positive stock price reactions suggest that both green bonds and

SLLs serve as credible signals of a company's commitment to sustainability. This aligns with signaling theory, which posits that companies can reduce information asymmetry by issuing financial instruments that communicate their dedication to environmental and social goals. However, the results also underscore the need for a deeper understanding of these signals and their implications in financial markets.

The methodology employed in this study, particularly the event study approach, is well-suited for analyzing short-term market reactions. Event studies are effective in capturing immediate market responses to specific events, providing a clear snapshot of investor behavior. However, this approach has inherent limitations. The focus on short-term reactions may overlook longer-term impacts and trends, which are crucial for understanding the sustained influence of green bonds and SLLs on stock prices. Additionally, the study's reliance on a one-day trading window may not fully capture the market's adjustment process, which could extend over several days or weeks.

The lack of statistical significance in the findings also points to the need for larger and more diverse datasets. The relatively small sample size and the limited number of observed events may have constrained the study's ability to detect significant effects. Future research should aim to compile more extensive datasets, incorporating a larger number of green bond and SLL announcements across various markets and industries. This approach would enhance the statistical power of the analysis and provide more definitive insights into the market dynamics at play.

Given these limitations and the potential for further research, several directions emerge. Extended observation periods beyond the immediate announcement date could capture the long-term impact of green bond and SLL announcements on stock prices and corporate performance. Additionally, including a wider range of control variables, such as macroeconomic indicators and firm-specific attributes, could improve the accuracy and robustness of the results. Comparative studies between different types of sustainable finance instruments, such as green bonds, SLLs, and other ESG-linked financial products, would also provide a deeper understanding of their relative effectiveness in signaling a company's commitment to sustainability.

Lastly, qualitative studies exploring investor perceptions of green bonds and SLLs could complement quantitative findings. Surveys and interviews with investors could provide

valuable insights into the factors influencing their investment decisions and their views on the credibility of sustainability signals. Investigating how the issuance of these instruments influences corporate practices and sustainability performance over time would offer a more holistic view of their benefits, examining whether companies make substantive changes to their sustainability practices or if the impact is primarily symbolic.

6 Source Data

Data no:	Company	Country	Volume MUSD	Date	Maturity	Coupon	Index	Change trading day	ESG Scores
1	Telia	Sweden	500	3/31/2022	6/30/2083	2.75%	-1.65%	0.16%	14.90
2	Deutsche	Germany	6300	4/22/2022	4/22/2024	2%	-1.38%	-0.04%	29
3	Sparebank1	Norway	500	4/27/2022	4/27/2027	1.75%	0.85%	-0.32%	24.5
4	Deutsche	Germany	7200	4/7/2022	4/7/2025	2.30%	-1.02%	-0.06%	29
5	Philips	Netherlands	650	5/5/2022	11/5/2029	2.13%	-2.41%	0.95%	23.4
6	E.ON	Germany	750	3/29/2022	1/8/2025	0.88%	1.15%	1.22%	18.4
7	Vonovia	Germany	850	3/28/2022	3/25/2032	2.38%	0.28%	1.22%	6.7
9	Iberdrola	Spain	1000	3/11/2022	3/11/2032	1.38%	-2.78%	0.82%	20.3
10	Electrolux	Sweden	75	2/24/2022	2/24/2027	1.71%	1.01%	0.39%	22.3
11	Nordea	Finland	1000	2/16/2022	2/16/2027	1.13%	-0.12%	0.86%	22.5
12	Terna Rete	Italy	1000	2/9/2022	perpetual	2.38%	2.72%	3.55%	10.5
13	VGP	Belgium	500	1/17/2022	1/17/2027	1.63%	0.09%	0.82%	15.3
14	Talanx	Germany	500	1/12/2022	1/12/2027	1.75%	0.43%	1.10%	19.3
15	RWE AG	Germany	600	11/26/2022	11/26/2033	1%	-4.15%	-2.43%	22.7
16	RWE AG	Germany	750	11/26/2022	11/26/2028	0.50%	-4.15%	-2.43%	22.7
17	A2A	Italy	500	11/2/2022	11/2/2033	1%	-0.04%	-0.05%	21.1
18	A.P Moller	Denmark	500	11/25/2022	11/25/2031	0.75%	0.75%	0.05%	22.5
19	ENBW	Germany	500	8/31/2022	8/31/2081	1.38%	-0.33%	1.30%	30.9
20	Telia	Sweden	75	5/27/2022	6/10/2025	1.13%	0.78%	-0.40%	14.9
21	Intensa	Italy	1250	3/16/2022	3/16/2028	0.75%	0.50%	1.28%	17.1
22	Coca cola	USA	705	9/1/2020	9/1/2032	1.85%	0.76%	-0.83%	22.5
23	Stora enso	Finland	500	12/2/2020	12/2/2030	0.63%	-0.36%	-0.59%	15.9
24	Mercedes	Germany	1000	9/10/2020	9/10/2030	0.75%	-0.21%	0.27%	22.8
25	Deutsche	Germany	500	6/10/2020	6/10/2026	1.38%	-0.70%	1.40%	29
27	Assicurazioni	Italy	750	10/1/2019	10/1/2030	2.12%	-0.84%	-0.22%	15.3
28	Hera	Italy	500	7/5/2019	7/5/2027	0.88%	-0.58%	-0.85%	18.8
29	Philips	Netherlands	750	5/22/2019	5/22/2026	0.50%	-0.03%	0.73%	23.4
30	Commerzbank	Germany	500	4/18/2019	10/23/2023	1.25%	0.57%	0.43%	24.5
31	ERG	Italy	500	4/11/2019	4/11/2025	1.88%	0.05%	0.12%	20.9
32	electrolux	Sweden	100	3/27/2019	3/27/2024	1.10%	-0.53%	-3.80%	22.3
33	Orsted	Denmark	500	11/24/2019	11/24/3017	2.25%	-0.55%	-1.17%	16.4
34	Iberdrola	Spain	1000	4/21/2016	4/21/2026	1.13%	0.70%	-0.69%	20.3
35	Unibail	Netherlands	500	4/15/2015	3/14/2025	1%	0.34%	-0.31%	4.7
36	ERG	Italy	500	9/15/2021	9/15/2031	0.88%	-0.96%	-1.80%	20.9
37	Derichebourg	France	299.9	8/13/2021	7/15/2028	2.25%	0.15%	1.44%	30.1
26	Credite Suisse	Switzerland	500	5/18/2020	5/19/2025	0.45%	2.72%	10.08%	30.5
8	BASF	Germany	1000	3/17/2022	3/17/2031	1.50%	-0.77%	-1.78%	

Source data for Green bonds

Data no:	Company	Country	Volume MUSD	Date	Index	Change trading	ESG SCORES
1	Guess	USA	263	9/5/2022	-2%	-4%	17.4
2	Sembcorp	Singapore	866	4/5/2022	0.15%	0.68%	32.9
4	L&G	UK	344	26/04/2022	-0.02%	-1.11%	16.7
5	Iberdrola	Spain	1073	26/04/2022	-1.67%	-0.38%	20.3
6	Bancolombia	Colombia	150	19/04/2022	0.94%	-0.58%	19.4
7	Sonae	Portugal	199	18/04/2022	0.33%	0.58%	21.7
8	Empresas	Chile	500	13/04/2022	0.49%	-2.34%	19.8
9	Oceaneering	USA	215	12/4/2022	-0.26%	3.18%	34.1
10	Enel	Italy	652	11/4/2022	-0.30%	-0.36%	17.8
12	Megmilk	Japan	62.4	14/3/2022	0.10%	-0.79%	36.9
13	Mitsubishi	Japan	15.6	1/3/2022	0.98%	0.08%	21
14	Nipro	Japan	78	22/2/2022	-1.43%	-1.91%	28.4
15	Century	Japan	453	17/12/2021	-1.94%	-1.41%	24.2
16	Gilidan	Canada	1000	28/03/2022	0.03%	1.27%	10.2
18	Kingspan	UK	700	1/6/2021	0.84%	1.15%	17.9
19	Telefonica D	Germany	750	18/12/2019	-0.49%	-0.19%	12.4
20	Telefonica D	Germany	5500	1/13/2022	0.13%	0.08%	12.4
21	Umicore	Belgium	500	10/2/2022	1%	1.06%	27.1
22	Henkel	Germany	1500	14/12/2018	-0.54%	-0.89%	18.6
23	EDF	France	600	22/07/2019	0.20%	-0.45%	20.3
24	Sopra	France	1100	21/4/2022	1.37%	1.34%	14.9
25	Electrolux	Sweden	60	21/10/2022	-0.05%	-0.08%	22.3
26	Smurfit	Ireland	1350	27/1/2021	-2.26%	-2.53%	12.1
27	KPN	Netherlands	1000	9/8/2021	0.52%	0.43%	17.6
28	NSI	Netherlands	300	10/12/2021	-0.49%	0.58%	13.5
29	Fagron	Belgium	375	6/8/2019	-0.70%	-0.83%	12.4
3	Leonardo	Italy	600	20/12/2021	-1.64%	-2.40%	22.1
17	Metso	Finland	100	8/12/2021	-0.27%	0.15%	15.2
30	Borregard	Norway	50	24/3/2022	-0.24%	-1.74%	25.8
31	Volkswagen	Germany	1800	12/7/2021	2.82%	1.11%	29.8
32	CRM	China	127	11/4/2022	-2.61%	-8.06%	47.7
33	HKR	Hong Kong	306	29/04/2022	0.09%	0.35%	
34	Frey	France	150	11/11/2021	0.12%	0%	
35	Fincanteri	Italy	300	23/12/2021	0.68%	0.68%	
36	Fincanteri	Italy	700	10/2/2022	0.22%	1.26%	
37	Klaveness	Norway	80	6/12/2021	-0.26%	-1.29%	
11	Klaveness	Norway	60	7/7/2020	-0.23%	-0.82%	

Source data for SLL:s

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