SCHOOL OF
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Talk green to me: An Analysis of Green, Sustainability-Linked and Conventional Bonds in the U.S. Market

How different are actually sustainable bonds compared to conventional ones?

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Abstract

In recent years, sustainability has become an increasingly important theme in financial markets, leading to the growth of green bonds and sustainability-linked bonds (SLBs). These instruments both fall under the umbrella of Environmental, Social and Governance (ESG) labeled bonds, though they differ in structure and how sustainability is integrated into the bond terms. It is clear that they have a sustainable purpose, but how they actually differ from conventional bonds in fundamental variables, like risk and return, remains unexplored. Earlier studies have shown mixed results. Some find evidence of improved performance or a so-called "greenium". It occurs when a green bond has a lower yield or higher price than an otherwise identical conventional bond, reflecting investors preference for supporting environmentally friendly projects over non-green alternatives. Others report no significant differences or raise concerns about credibility.

This thesis investigates the financial characteristics of 210 U.S. corporate bonds that are either green, sustainability-linked or conventional. The results show no significant return differences, but SLBs exhibit higher liquidity risk and both green and SLBs have significantly higher Option-Adjusted-Spread (OAS). ESG scores and SLB coupon penalty structures show no meaningful pricing impact.

Key words: *Conventional bonds, Green bonds, SLBs, ESG, Risk, Return, YTM, OAS, Liquidity risk, Modified Duration*

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1. Introduction

In recent years, sustainable finance has become one of the fastest-growing areas in global capital markets. Investors, regulators and companies are increasingly focused on environmental and social responsibility, which has led to the rapid development of new financial instruments such as green bonds and SLBs. These ESG-labeled bonds are designed to support sustainable initiatives while offering investors fixed-income exposure.

Despite their growing popularity, there is still uncertainty about whether green bonds and SLBs differ from conventional bonds in terms of risk and return. While some studies suggest that investors accept lower yields others find no significant pricing differences. These mixed results reflect broader uncertainty in the field of sustainable finance. One contributing factor may be the lack of standardization in how sustainability is defined, measured and disclosed. Particularly in the case of SLBs, where financial terms are tied to sustainability targets that vary widely in credibility and enforcement. This thesis seeks to address these gaps by asking: *How do the return and risk profiles of conventional, green and sustainability-linked bonds differ in the U.S. market and are ESG features reflected in bond pricing?* Limited historical data, evolving ESG frameworks and the relatively recent emergence of these instruments are some possible reasons why the question has not been completely answered before.

The empirical analysis in this thesis is based on a cross-sectional dataset of 210 U.S. dollar-denominated corporate bonds collected in April 2025 using Refinitiv Eikon. The sample includes three categories of corporate bonds: conventional, green and sustainability-linked. To ensure consistency and comparability, only bonds with complete information were included. For each bond, we manually calculated the return using prices and coupon payments from 2024 to 2025. Additional variables such as Yield to Maturity (YTM), Liquidity Risk, Modified Duration and OAS were retrieved directly from Eikon's bond profile data. These variables allow us to analyze both the return and risk characteristics of different bond types in a consistent and structured way.

To identify whether ESG-labeled bonds differ from conventional bonds in terms of return and risk, several OLS regressions with different dependent variables and two ESG focused sub-regressions were computed. By analyzing each regression separately, we provide a clearer understanding of where potential differences lie. This approach is appropriate because it offers a transparent and focused way to detect systematic differences between bond types. It also aligns well with our aim of identifying whether ESG labels are associated with financial characteristics that investors care about.

The results of this study show that ESG-labeled bonds, such as green bonds and SLBs, do not differ significantly from conventional bonds in terms of return or YTM. However, the analysis reveals important differences in how these bonds are priced in relation to risk. SLBs exhibit higher liquidity risk, suggesting that they are less liquid and may involve greater trading costs. Moreover, both green bonds and SLBs are found to have higher OAS, indicating that investors require additional compensation for structural risk.

Furthermore, the sub-regressions examining issuer ESG scores and SLB compensation provide a more nuanced view. Neither variable shows a statistically significant relationship with bond returns, reinforcing the idea that specific sustainability features are not strongly reflected in performance outcomes. Together, these results suggest that while ESG labels may affect how bonds are perceived from a risk perspective, they do not appear to drive return expectations on their own.

Our dissertation contributes to the finance literature by offering one of the first bond-level analyses to directly compare green bonds, SLBs and conventional bonds in the U.S. market using recent data. While earlier studies have typically focused on either green bonds or SLBs in isolation, this thesis includes all three bond types in one framework. By using conventional bonds as a baseline, the analysis allows for a direct comparison that shows how sustainable labels may influence financial characteristics. The results contribute to the policy debate by providing new insights into how investors respond to different types of sustainable bonds in practice.

This thesis is organized as follows: Section 2 provides an overview of the existing literature on the different chosen bond types, as well as theoretical perspectives relevant to sustainable finance. Section 3 gives background on the U.S. bond market and outlines key characteristics of the bond types studied. In Section 4, we describe the data collection process and define the variables used. Section 5 presents the regression models and main empirical results. This is followed by a discussion of the findings in section 6. Finally, section 7 concludes the thesis and offers suggestions for future research.

2. Literature review

2.1 Previous literature on the subject

In recent years, a growing body of literature has examined the relationship between sustainability and financial performance.

Chen et al. (2023) contribute to this literature by analyzing over 3,300 companies across a ten-year period, finding a statistically significant and positive relationship between ESG ratings and corporate financial performance. Firms with higher ESG scores tend to achieve better returns on assets and show improved risk management (Chen et al., 2023). Their findings support the idea that ESG performance can enhance firm value, which in turn motivates this thesis's inclusion of ESG scores in one of the sub-regressions to test whether this relationship also appears in bond return data. However, not all studies find a clear pricing effect. Gehricke et al. (2024) show that incorporating ESG factors into corporate bond investment strategies does not result in either systematic outperformance or underperformance (Gehricke et al., 2024).

De Jounge and Karlsson (2024) investigates potential differences in YTM between SLBs and green bonds within the European bond market. Drawing on a broad dataset of approximately 1500 bonds, the authors conclude that the yields of the two bond types do not differ in a statistically significant way. Their findings indicate that, despite differing structures and design features, SLBs and green bonds tend to be valued similarly by investors (De Jounge & Karlsson, 2024). By comparing two types of ESG-labeled bonds directly, rather than contrasting them with traditional corporate bonds, the study offers a different angle for our thesis.

The role of liquidity in sustainable bond pricing is highlighted by Boutabba and Rannou (2022), who show that green bonds carry a liquidity premium, meaning investors require higher yields to compensate for lower market liquidity. This premium varies across maturities and issuer types. They also find that green bond yields are influenced by market conditions and investor behavior (Boutabba & Rannou, 2022). This phenomenon contradicts the study of Lau et al. (2022), suggesting that there instead exists a greenium (Lau et al., 2022). In other words, the liquidity premium raises the cost of capital for green bonds, while the greenium lowers it. These two effects work in opposite directions in sustainable bond pricing.

Furthermore, in more liquid markets, the bid-ask spread (liquidity risk) tends to be narrower, reflecting the ease with which these assets can be bought or sold without impacting their price significantly. Traders see the bid-ask spread as a sign of how easily an asset can be traded. When it's hard to match buyers and sellers, known as high friction, the spread widens and thus showing that the market is less liquid. Hence, the bid-ask spread serves as a useful measure of liquidity. Narrower spreads signal higher market liquidity and lower trading costs and wider spreads indicate higher liquidity risk (Ganti, 2024).

Lastly, Doumbia and Ul Haq (2022) examine structural features within SLBs that may weaken the intended link between financial penalties and sustainability performance. One of the key findings in their study indicate that average penalties are often lower than the sustainability premium investors pay, meaning issuers can benefit financially even if they fail to meet targets. These findings raise serious concerns about greenwashing, which refers to the misleading practice in which companies invest more in portraying themselves as environmentally responsible than in actually reducing their environmental impact (Ul Haq & Doumbia, 2022; Dempere et al., 2024).

2.2 Economic theories related to the subject

2.2.1 Signaling theory

Signaling theory, introduced by Michael Spence in 1973, explains how people in markets with unequal access to information try to communicate qualities that can not be directly observed. In job markets, for example, employers can not see an applicant's true ability before hiring them. Instead, they rely on signals, such as education, that give clues about a person's productivity. People invest in education not just to learn, but because it acts as a visible signal of their skills and effort. For a signal to be effective, it must be costly or difficult to fake for someone who does not actually have the quality and it must clearly reflect something true about the person or company sending it. Over time, if employers beliefs about what certain signals mean are consistently proven correct, the market reaches a “signaling equilibrium”, where decisions based on signals align with real outcomes (Spence, 1973).

Since 1973, signaling theory has been widely adopted and extended across various disciplines. It has been used in corporate contexts to interpret firm behavior during crises, initial public offerings and dividend policies. Beyond business, fields like psychology, anthropology and even religious studies have employed signaling theory to analyze how observable behaviors communicate deeper, often hidden attributes. This expansion underscores the theory’s broad relevance in settings where asymmetric information plays a critical role in decision-making (Karasek & Bryant, 2012).

2.2.2 Behavioral economics

The origins of behavioral economics can be traced back to the 1950s, when economist Harold Johnson first introduced the concept in a 1958 publication (Johnson, 1958). Since then, it has developed into a distinct field within economics that seeks to better understand how people actually make decisions. Behavioral economics challenges the idea that people always act to maximize utility based on stable preferences. Instead, it shows that preferences are often inconsistent, influenced by context and sensitive to how choices are presented (Hargreaves Heap, 2013).

Prospect theory, developed by Kahneman and Tversky (1979), is an extension of behavioral economics that offers a more psychologically realistic view of how individuals evaluate risk and return. Central to the theory is the concept of reference dependence, where people assess outcomes as gains or losses relative to a subjective benchmark, rather than based on final wealth. This leads to loss aversion, meaning that losses tend to weigh more heavily than equivalent gains. Additionally, probability weighting describes how individuals tend to overestimate small probabilities and underestimate large ones, leading them to place disproportionate value on extreme outcomes. In the field of finance, prospect theory has been applied to better understand patterns in asset pricing and investor behavior that traditional models struggle to explain (Kahneman & Tversky, 1979; Barberis, 2013).

2.2.3 Efficient Market Hypothesis

The Efficient Market Hypothesis implies a relationship between available information and market efficiency. An efficient market is one in which prices "fully reflect" all accessible information. EMH is commonly divided into three forms depending on the type of information considered. The first form, the weak-form, only assumes that market participants base their decisions on past prices. The semi-strong form of market efficiency focuses on how quickly and accurately asset prices incorporate information that is openly accessible to the public, such as corporate earnings reports, stock split declarations and other widely released data. Finally, the strong-form of EMH examines if individuals or institutional investors possess exclusive non-public information that enables them to consistently achieve returns above the market average (Fama, 1970).

While the EMH provides a useful framework for understanding how information affects asset prices, Fama (1970) also outlines the underlying assumptions required for a market to be perfectly efficient. These include the absence of transaction costs, equal and free access to all relevant information for all market participants and a shared understanding among investors about how new information affects asset values. Under these ideal conditions, asset prices should always reflect all known information, making it impossible for any investor to systematically earn excess returns (Fama, 1970).

However, Fama also acknowledges that these conditions are rarely met in real-world markets. Transaction costs exist, information is not always equally available and investors often interpret the same data in different ways. This recognition introduces a more nuanced view of market efficiency. While markets may strive toward efficiency, they often operate under imperfect conditions (Fama, 1970). This perspective is particularly relevant when studying newer or less standardized financial instruments, such as green bonds and SLBs, where transparency, regulation, and market consensus may vary.

3. Background

3.1 U.S Corporate Bond Market

The U.S corporate bond market is one of the largest and most actively traded bond markets in the world. As of May 1 2025, over 11 000 corporate bonds were actively traded, reflecting a wide range of issuers and credit profiles. On that day alone, the market saw trading volumes exceed $42 billion, highlighting its deep liquidity and importance for institutional investors. These bonds are primarily traded over-the-counter, meaning they are bought and sold directly between parties, such as through broker-dealers, rather than on centralized exchanges. Moreover, they are frequently bought by mutual funds, pension funds and insurance companies seeking stable returns (FINRA, 2024; FINRA, 2025).

Investor behavior in the U.S. corporate bond market is closely influenced by the liquidity and risk profile of the bonds they trade. Research shows that dealers, who act as intermediaries between buyers and sellers, adjust their strategies depending on how frequently a bond is traded and how risky it is to hold. For less liquid and higher-risk bonds, dealers tend to avoid keeping these bonds for long and instead aim to quickly match buyers with sellers, reflecting a cautious approach to managing risk (Goldstein & Hotchkiss, 2020).

3.2 Bond market development and characteristics

Conventional corporate bonds are a major part of the U.S. bond market. A conventional corporate bond is a form of debt issued by a company to borrow money from investors. Companies use this method of financing to raise capital for purposes such as expanding their business, investing in new projects or refinancing existing obligations. Bonds are categorized by the length of time before the issuer must return the principal to investors, a period referred to as maturity. When investors buy these bonds, they are providing capital to the company, which in return commits to paying regular interest and repaying the full principal amount when the bond matures. This timeframe may be less than three years, between four and ten years, or more than ten years. Generally, bonds with longer maturities offer higher interest to compensate for the increased uncertainty and potential price fluctuations over time (U.S. Securities and Exchange Commission, n.d.).

The green bond market is still relatively young. The first bond explicitly labeled as green was issued in 2007 by the European Investment Bank (EIB) and within a decade, the market expanded rapidly across various types of issuers (Baker et al., 2022). By 2024, the total amount of green bonds available in the market had grown to nearly $3 trillion, a significant increase from around $500 billion in 2018 (Demski et al., 2025). Green bonds are usually structured like conventional bonds, with the main difference being that they include a "use of proceeds" clause. This clause ensures that the money raised is dedicated specifically to environmentally friendly projects or assets. Unlike conventional bonds, which can finance a company's general operations, green bonds are intended only for green purposes, such as renewable energy, energy efficiency, or sustainable infrastructure. However, investors are still supported by the issuing company as a whole. This means that if the specific green project does not perform as expected, the investor’s repayment still comes from the company's overall financial resources, not just from the project being funded (Maltais & Nykvist, 2020).

Since the first SLB was issued by the utility company Enel in September 2019, the market has grown rapidly (Vulturius et al., 2022). As of 2024, total SLB issuance had reached $279 billion (Climate Bonds Initiative, 2024). A SLB is a type of bond that encourages companies to meet certain sustainability goals. Unlike green bonds, SLBs do not require the money raised to be used for specific environmental projects, instead, the funds can be used for general business purposes.

The distinguishing feature of SLBs is that their financial conditions (such as the interest rate) are tied to how well the issuing company meets specific sustainability goals. These goals are based on specific performance measures, called key performance indicators (KPIs), like reducing carbon emissions, improving ESG ratings or increasing workplace diversity. The company’s progress is usually checked by independent third parties. If the issuer fails to meet the targets, the bond's coupon increases, commonly by 25 basis points. By explicitly tying financial consequences to sustainability outcomes, SLBs serve as both an incentive mechanism and a public commitment tool. They signal to the market which sustainability goals matter and what the financial consequences will be (Kölbel & Lambillon, 2022).

4. Method

In the work of this thesis we have used Chat GPT to check grammar, assist with the structure and translation.

4.1 Data

4.1.1 Data Source

The data used in this study was retrieved from the financial database Refinitiv Eikon. This platform was chosen because it offers reliable and consistent financial data for both conventional and ESG-labeled bonds in the U.S. market.

4.1.2 Data Collection

We constructed a cross-sectional dataset consisting of 210 dollar-denominated bonds issued by corporate entities with fixed coupons. These bonds were selected in April 2025 and cover three categories: green, sustainability-linked and conventional. Only bonds with complete information on key financial variables were collected for the main regression models. With this in mind, only 70 SLBs in the Eikon terminal fulfilled our requirements. Therefore, we made a decision to only retrieve 70 bonds from each type. Bonds with callable features, perpetual structures, or missing data were excluded. While a larger sample would increase statistical power, we limited our dataset to ensure consistency across observations. This resulted in a balanced sample of 210 bonds, which is sufficient for a cross-sectional OLS analysis. Furthermore, 140 bonds of the total sample were retrieved to conduct the first sub-regression, 70 SLBs and 70 green bonds. However, among this sub-sample, several bonds did not contain issuer ESG scores. Hence, the observations were limited to a total of 122. For the second sub-regression, the 70 SLBs were collected. Four of these bonds did not contain a coupon rate penalty and were therefore excluded.

4.1.3 Data Conversion and Variables

The Holding Period Return, called Return in the regressions, measures the total return an investor earns from holding a bond over a specific period. It includes both the price change and any coupon payments received during that time. This metric reflects the return either actually earned if the bond was held, or expected if the investment is being evaluated in advance (Corporate Finance Institute, n.d.). In this study, the return was calculated using the formula:

$$(P1 - P0 + coupon) \div P0$$

, where $P0$ represents the individual bond's price as of 2024. $P1$ is the price at the end of the holding period, which is 2025. By retrieving the bond prices from 2024 and 2025, along with the current coupon for each individual bond, we were able to manually calculate the Holding Period Return.

YTM represents the total annual return an investor can expect to earn if they purchase a bond at its current market price and hold it until it matures. Unlike the bond's coupon rate, which remains fixed, YTM can vary depending on the bond's market price. When calculating YTM it is generally assumed that all interest payments are reinvested at the same rate. However, YTM does not factor in taxes or any transaction costs related to buying or selling the bond (FINRA, 2022). The YTM for each individual bond was retrieved directly from the bond’s profile.

Liquidity Risk refers to the challenges investors may face when buying or selling bonds without significantly affecting their price. It can be calculated as the difference between the bid and ask prices, known as the bid-ask spread. In accordance, we calculated the spread by gathering the current ask and bid prices in Eikon for all bonds and then subtracting the bid from the ask. The spread is a key indicator of liquidity in the bond market (Ganti, 2024).

Modified Duration is a metric that quantifies how much the value of a bond will change in response to fluctuations in interest rates. It reflects the inverse relationship between bond prices and interest rates, meaning as rates rise, bond prices typically fall and vice versa.
It is a crucial measure since bonds with higher modified durations are more sensitive to interest rate changes, which results in greater price volatility compared to bonds with lower durations (Chen, 2022). This variable was obtained from the individual bond profiles.

OAS is a measure used to evaluate bonds that include features like embedded options, for example the option of the issuer to repay the bond early. These options can affect the bond's pricing and OAS adjusts the bond’s yield to remove the impact of those options. This makes it easier to compare bonds with and without such features on equal terms. The OAS shows how much additional yield a bond offers over a similar risk-free government bond, and a higher OAS generally indicates a higher level of risk (Chen, 2021). As with earlier variables, this information was found on each separate bond’s data page.

An ESG score is a rating that evaluates the ESG performance of a company. This score helps investors to assess how well a company manages risks and opportunities in these sustainable areas. Different rating agencies may use varying criteria to measure ESG performance, but the scores typically reflect a company’s impact on the environment, its relationships with stakeholders and the quality of its leadership and governance practices. ESG scores are subject to change over time, influenced by both industry-wide trends and updates to scoring methodologies. A higher ESG score generally implies that a company is more responsible in managing ESG risks and is likely to perform better than its competitors in these areas (Miller, 2022). The ESG scores were found in the profile overviews of the companies that issued the selected bonds.

SLB compensation percentage is commonly referred to as the "coupon step-up" which was found in the bond profile. This shows the increase in interest rate the issuer must pay as a penalty for reaching the targets or KPIs set at the time of issuance (Lefournier, 2023). From the viewpoint of investors, the coupon step-up in SLBs must be carefully designed to be both meaningful and financially sustainable. On the one hand, the penalty should be significant enough to motivate issuers to meet their sustainability goals. On the other hand, it should not be so large that it creates financial strain or increases the company's credit risk if triggered (Reznick, 2022).

4.2 Descriptive statistics

Table 4.2.1 and 4.2.2 present descriptive statistics of the variables used in the regressions. By displaying the descriptive statistics, the reader receives a helpful overview of the distribution and variation in the data before proceeding to the regression results.

Table 4.2.1: Descriptive statistics Main variables

Variable	n	mean	sd	min	median	max
Return	210	0.07	0.09	-1.00	0.07	0.76
YTM	210	6.22	1.55	3.41	5.75	13.42
Liquidity Risk	210	0.38	0.38	-3.25	0.34	2.00
Modified Duration	210	5.52	3.31	1.68	4.57	15.82
OAS	210	194.32	165.24	-12.50	142.20	946.70

Note*: Table 4.2.1 reports descriptive statistics for all variables included in the main regressions. The table provides information of sample size, mean, standard deviation and range for each variable.*

Table 4.2.2: Descriptive statistics Sub-variables

Variable	n	mean	sd	min	median	max
ESG Score	122	70.12	15.82	19.69	72.67	93.14
SLB Compensation	66	0.26	0.15	0.05	0.25	1.00

Note*: The table 4.2.2 reports descriptive statistics for the two variables included in the sub-regressions. The table provides information of sample size, mean, standard deviation and range for each variable.*

4.3 Regression Analysis

To examine how bond type and sustainability characteristics relate to risk and return, we estimate a series of linear regression models using OLS:

Main regressions

$$Y_{Return_i} = \beta_0 + \beta_1 \times Green_i + \beta_2 \times SLB_i + \varepsilon_i \quad (1)$$

$$Y_{YTM_i} = \beta_0 + \beta_1 \times Green_i + \beta_2 \times SLB_i + \varepsilon_i \quad (2)$$

$$Y_{LiquidityRisk_i} = \beta_0 + \beta_1 \times Green_i + \beta_2 \times SLB_i + \varepsilon_i \quad (3)$$

$$Y_{ModifiedDuration_i} = \beta_0 + \beta_1 \times Green_i + \beta_2 \times SLB_i + \varepsilon_i \quad (4)$$

$$Y_{OAS_i} = \beta_0 + \beta_1 \times Green_i + \beta_2 \times SLB_i + \varepsilon_i \quad (5)$$

Every main regression has a different dependent variable (Y_i): Return, YTM, Liquidity Risk, Modified Duration, and OAS. In each model, the explanatory variables are two dummy variables: Green and SLB. These are binary indicators coded as 1 if the bond is a green bond or a SLB, respectively, and 0 otherwise. Conventional bonds, which are neither green nor SLB, are coded as 0 for both variables and serve as the reference category in all regressions. Using a zero-coded reference category, working as the baseline, is a standard approach when using dummy variables in a regression model. The reason why is to avoid perfect multicollinearity, a situation where the model includes too much overlapping information and cannot separate the effects of each variable (Hayes, 2024). This setup allows us to isolate the average effect of being a green or sustainability-linked bond relative to conventional bonds.

In this regression setup, the constant term (β_0) represents the intercept for every individual regression model. Since conventional bonds are coded as 0 for both the Green and SLB dummy variables, (β_0) captures the expected outcome when both dummies equal zero, that is, when the bond is neither green nor sustainability-linked. Thus, (β_0) reflects the baseline level of Return (or YTM, Liquidity risk, Modified duration, or OAS) for conventional bonds, against which the effects of green and SLB labels are measured.

Sub regressions	
$Y_{Return_i} = \beta_0 + \beta_1 \times ESG\_score_i + \varepsilon_i$	(1)
$Y_{Return_i} = \beta_0 + \beta_1 \times SLB\_comp_i + \varepsilon_i$	(2)

In addition, we estimate two sub-regressions where Return is the dependent variable. Sub-regression (1) includes all bonds for which an ESG score is available, hence a subsample containing only green bonds and SLBs. The regression examines the relationship between return and ESG_score. Sub-regression (2) focuses solely on a sample of sustainability-linked bonds and regresses return on SLB_comp, which captures the size of the financial penalty if sustainability targets are not met. This approach allows us to go beyond simple bond classifications and test whether variation in sustainability quality or commitment is reflected in bond performance. By focusing on ESG ratings and the financial penalties linked to unmet targets, we can explore whether investors reward stronger sustainability characteristics with higher returns.

5. Results

5.1 Main regressions

Table 5.1. OLS: Main regressions

	Return (1)	YTM (2)	Liquidity Risk (3)	Modified Duration (4)	OAS (5)
Intercept	0.061***	6.103***	0.303***	5.515***	123.500***
	(0.011)	(0.186)	(0.045)	(0.392)	(18.859)
Green	-0.003	0.066	0.063	0.683	92.330***
	(0.016)	(0.262)	(0.063)	(0.555)	(26.670)
SLB	0.021	0.272	0.158*	-0.680	120.123***
	(0.016)	(0.262)	(0.063)	(0.555)	(26.670)
Observations	210	210	210	210	210
R-squared	0.013	0.006	0.030	0.028	0.097
Adjusted R-squared	0.003	-0.004	0.021	0.019	0.088
Mean of dependent variable	0.067	6.221	0.377	5.520	194.937

Note: *The table and regressions have been created with the programming language "R". Table 5.1 presents the results from five separate OLS regressions, where the dependent variables are: Return, YTM, Liquidity Risk, Modified Duration, and OAS. The explanatory variables of interest are binary indicators for whether a bond is classified as a green bond or a SLB. Standard errors are in parentheses. Significance, assigned by R, is denoted by:* $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

In regression (1), SLBs are associated with a *Return* that is 0.021 higher than that of conventional bonds, while green bonds are associated with a *Return* that is 0.003 lower. However, neither result is statistically significant. The average return of conventional bonds is given by the intercept, 0.061. To understand the economic size of this difference, we compare it to the overall average return in the sample, which is 0.067. The SLB return premium therefore corresponds to approximately 31 percent of the sample's average return of all 210 bonds ($0.021 \div 0.067$). In dollar terms, for a $10,000 investment, the results would imply an additional $210 per year for SLBs, compared to a $30 lower return for green bonds. While these are economically meaningful amounts, the low statistical precision and R-squared of 0.013 make the results statistically unreliable and insufficient for drawing firm conclusions.

In regression (2), the results for *YTM* are similarly inconclusive. Both green bonds and SLBs are associated with a higher *YTM*, 0.066 and 0.272, compared to conventional bonds. These effects translate to approximately $6.60 and $27.2 more per $10,000 invested per year. However, neither estimate is statistically significant, suggesting that investors in this sample are not consistently rewarded or penalized in *YTM* terms for holding labeled sustainable bonds.

Regression (3), focusing on *Liquidity Risk* as measured by the bid-ask spread, reveals a statistically significant result for SLBs at the 5 percent level. SLBs are associated with a 0.158 increase in the bid-ask spread relative to conventional bonds. In dollar terms, this implies an additional $15.80 in trading cost per $10,000 traded. Green bonds show a smaller increase, 0.063, or $6.30 more per $10,000 traded. However, this result is not statistically significant.

In regression (4), no statistically significant difference in *Modified Duration* is found across bond types. SLBs appear to have slightly shorter *Modified Durations* (−0.680) and green bonds slightly longer ones (+0.683), compared to conventional bonds. These estimates are not statistically distinguishable from zero. This implies that *Modified Duration* is similar across green bonds, SLBs, and conventional bonds and that pricing differences are unlikely to be driven by *Modified Duration*.

Regression (5), which models the *OAS,* produces the most statistically robust differences. Green bonds are associated with a 92.330 higher *OAS*, and SLBs with a 120.123 higher *OAS* than conventional bonds, both statistically significant at the 0.001 level. The increase in *OAS* reflects the additional yield investors demand to compensate for holding green or SLB bonds, relative to conventional bonds. In dollar terms, this translates to approximately $92.33 more for green bonds and $120.12 more for SLBs in annual compensation per $10,000 invested compared to conventional bonds.

5.2 Sub regressions

Table 5.2 OLS: Sub-regressions

	Return ESG score (1)	Return SLB Compensation (2)
(Intercept)	0.080	0.088***
	(0.050)	(0.022)
ESG Score	-0.000	
	(0.001)	
SLB Compensation		-0.024
		(0.075)
Observations	122	66
R-squared	0.001	0.002
Adjusted R-squared	-0.008	-0.014
Mean of dependent variable	0.070	0.070

***Note**: The regressions and tables have been created with the programming language "R". Table 5.2 reports OLS estimates from two separate sub-regressions with bond return as the dependent variable. Model (1) examines the relationship between return and the issuer's ESG score, while Model (2) examines the effect of the SLB coupon step-up. Standard errors are shown in parentheses. The intercept represents the expected return when the independent variable equals zero. Significance, assigned by R, is denoted by:* $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

We estimate two sub-regressions to explore the relationship between *Return* and specific ESG-related features. In Model (1), *Return* is regressed on the variable *ESG Score*. The coefficient is approximately zero, indicating that *ESG Score* has no measurable effect on *Return*. The model explains almost none of the variation in *Return* ($R^2 = 0.001$), suggesting that issuer-level ESG ratings are not systematically reflected in bond pricing.

Model (2) examines *SLB Compensation* in relation to *Return*. The coefficient is −0.024, meaning that a one-unit increase in *SLB Compensation* is associated with a 0.024 decrease in *Return*. For a $10,000 investment, this would correspond to a potential $240 loss in annual return. However, the coefficient is not statistically significant and the explanatory power of the model is minimal ($R^2 = 0.002$), indicating that SLB compensation levels do not reliably explain return differences across bonds.

The intercept in Model (2) is highly significant (0.088***), which reflects the model's predicted return when *SLB Compensation* theoretically equals zero since no such value exists in the actual sample. According to the model, SLBs are associated with relatively high returns regardless of the penalty size, but this interpretation should be treated with caution because it relies on something outside the observed data range. Moreover, both sub-regression models are based on smaller sample sizes (122, 66) and have low explanatory power. Hence, the results should be interpreted with caution as they lack statistical robustness.

6. Discussion

The results of this thesis offer a nuanced view of how green bonds, SLBs and conventional bonds differ in the U.S. market. While SLBs and green bonds do not deliver significantly different returns, they do exhibit distinct risk-related characteristics. These findings partially support prior literature and economic theory, though they also challenge some common assumptions about sustainable finance. The implications vary depending on which aspect of bond pricing is considered: return, risk, or the credibility of ESG-related features.

Starting with bond returns, neither green bonds nor SLBs show a statistically significant difference compared to conventional bonds. While SLBs are associated with higher average returns and green bonds with slightly lower ones, these differences lack statistical robustness. This finding aligns with Gehricke et al. (2024), who find no systematic out- or underperformance when ESG factors are integrated into bond investment strategies. Similarly, De Jounge and Karlsson (2024) found no significant yield difference between green bonds and SLBs in Europe.

From an EMH perspective, this risk pricing does not necessarily contradict efficiency. If investors interpret sustainability-labeled bonds as more complex or less liquid, they may rationally demand higher compensation, meaning prices still reflect available information, even if the outcome is higher spreads rather than lower ones. From the perspective of the EMH, particularly its semi-strong form, these findings suggest that publicly available ESG information is already incorporated into bond prices. If markets efficiently reflect this information, as EMH proposes, then investors should not be able to systematically achieve excess returns by simply choosing green or SLB bonds over conventional ones.

At the same time, the return effect observed for SLBs (though not statistically significant) invites further interpretation. One possible explanation is linked to signaling theory. SLBs are forward-looking instruments, and their structure may be perceived as a signal of commitment to long-term ESG goals. However, Doumbia and Ul Haq (2022) point out that SLBs often lack strong enforcement mechanisms, which can weaken the credibility of the signal. In this context, the higher average return for SLBs could reflect a risk premium rather than a reward for sustainability. Investors may demand higher returns from SLBs due to uncertainty about the reliability of future ESG performance or the penalty structure. However, once again, this interpretation is made with caution and is not statistically supported.

The risk-related variables reveal more noticeable differences across bond types. Regression (3) shows that SLBs are associated with significantly wider bid-ask spreads (liquidity risk), implying lower market liquidity. These findings align with Ganti (2024), who point out that a wider spread can be influenced by the difficulty to match buyers and sellers and thus showing that the market is less liquid. Since SLBs are relatively new instruments, the amount of bonds, buyers and sellers are naturally lower than for a more established type of bond market. Hence, that could be an explanation why the SLBs in our sample have a wide bid-ask spread.
In addition, this result also aligns with Boutabba and Rannou (2022), who show that green bonds carry a liquidity premium where investors require higher yields to compensate for higher transaction costs. However, this finding contradicts the concept of a greenium, which has been documented in parts of the literature (e.g. Lau et al., 2022). From the perspective of behavioral economics, particularly prospect theory, this may be explained by investor sensitivity to perceived risk. If investors overweight the downside of holding complex low-liquidity assets, they may demand higher compensation even if the underlying risk is hard to quantify.

Even more striking are the results from regression (5), where green bonds and SLBs are associated with significantly higher OAS compared to conventional bonds. This indicates that investors require more compensation for option risk when purchasing sustainable bonds. The risk compensation could reflect skepticism about ESG labels, lack of standardization in SLB structures, or simply that these instruments are seen as less transparent or more volatile.

The regression results also offer insights into how the market reacts to ESG-related features beyond the label itself. The sub-regressions show that ESG scores have no measurable effect on bond returns, despite evidence from Chen et al. (2023) that ESG ratings are positively correlated with corporate financial performance. This difference may arise because ESG scores are more relevant for equity (stock) markets or because investors remain skeptical about the comparability and reliability of ESG data in fixed income. Similarly, the lack of significance for SLB compensation supports the concerns raised by Doumbia and Ul Haq (2022), who argue that many SLBs do not impose meaningful financial consequences for missed sustainability targets. If the penalty is too small to matter, or if investors do not believe it will be enforced, it is unlikely to affect pricing.

Viewed through the lens of signaling theory, this raises an important point: for a sustainability label to affect pricing, the signal must be credible. A green bond or SLB without strong sustainability performance, robust ESG disclosure or clear penalty enforcement may fail to differentiate itself from conventional bonds in the eyes of investors. As Spence (1973) argues, signals must be costly to fake and informative enough to be credible. If ESG labels are cheap to obtain or loosely regulated, they lose signaling power. The fact that OAS is higher for ESG-labeled bonds may reflect the market's skepticism toward such weak or inconsistent signals.

Overall, the findings suggest that sustainability labels influence perceived risk more than return. Investors seem to assign a risk and liquidity premium, rather than a greenium, to ESG-labeled bonds, particularly SLBs. The market seems to respond more to how reliable the bond's sustainability commitments are, how easily it can be traded and how transparent its structure is rather than to the ESG label alone. This nuanced result aligns with EMH's more realistic assumptions. While markets process public information, imperfections in how that information is produced, accessed or interpreted can still affect pricing outcomes without violating the principle of market efficiency.

7. Conclusion

This thesis set out to examine how the return and risk profiles of green, sustainability-linked and conventional bonds differ in the U.S. market and whether ESG features are reflected in bond pricing. Using a cross-sectional dataset of 210 U.S. dollar-denominated corporate bonds and applying five main and two sub-regressions, we find no significant differences in returns or yields across bond types. However, ESG-labeled bonds exhibit clear differences in risk-related characteristics. SLBs are associated with higher bid-ask spreads, indicating lower liquidity, which could be explained by the early state of the market. Both green bonds and SLBs possess higher OAS than conventional bonds, indicating that investors perceive them as riskier and thus need more compensation.

The analysis also shows that specific ESG features, such as issuer ESG scores and SLB penalty structures have no statistically significant effect on returns. These results may be explained by low credibility and a lack of standardization. Overall, our findings contribute to the sustainable finance literature by providing updated U.S.-based evidence and underscore the importance of strengthening the link between ESG variables and measurable financial outcomes.

As the sustainable bond market is still relatively young, this study is based on a limited dataset. However, the number of SLBs and green bonds continues to grow each year, which means that future research will have access to broader and more representative datasets. This will make it easier to detect patterns and evaluate pricing effects with greater precision. Future studies could also include additional financial variables beyond those analyzed here to gain a more nuanced understanding of how these bonds behave. Moreover, applying alternative econometric models could offer deeper insights into the dynamics between ESG features and bond performance. Finally, since financial markets are strongly influenced by macroeconomic conditions, future research could benefit from explicitly incorporating macroeconomic variables to better explain variation in risk and return across bond types.

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