Sales Management in Green Finance: Investment Efficiency and Business Innovation in Financial Institutions

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Abstract

This study explores the dynamics of sales management within the context of green finance, focusing on the efficiency of investments and the role of business innovation in advancing sustainability goals. Through a detailed analysis of the European green bond market, the paper identifies the financial, regulatory, and economic factors influencing green bond costs. Utilizing a dataset of 364 EUR-denominated green bonds issued between 2014 and 2024, the research employs descriptive statistics and panel regression models to assess the impact of variables such as coupon rates, inflation, credit ratings, bond maturity, and seniority. Key findings indicate that higher coupon rates and inflation positively correlate with green bond yields, while superior credit ratings and senior bond categories lower yield costs. Sovereign issuers generally command higher yields compared to corporate issuers, reflecting differences in risk and market positioning. The analysis also underscores the critical influence of the German benchmark yield on green bond pricing across Europe. This paper contributes to the literature by integrating financial metrics with regulatory frameworks like the EU Green Bond Standard, providing actionable insights for policymakers and investors. It highlights the strategic alignment of green bond issuance with the European Green Deal's sustainability objectives, offering pathways for fostering investment efficiency and business innovation in green finance.

1. Introduction

During the Covid-19 pandemic in order to achieve the objectives set by the European Green Deal, the European Commission mobilized under its unique debt generating instrument NextGenerationEU approximately and the EU's multiannual

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budget approximately 30% of the amount of money to green investments. From this micro-level that is supposed to bring companies and organizations closer to the global ESG standards to the issue of green bonds these efforts represent a significant shift toward sustainable finance aimed at funding projects that support environmental and climate-friendly initiatives. Additionally, by the end of 2022, over 5,000 financial actors managing approximately $120 trillion in assets had signed the United Nations Principles for Responsible Investment (UNPRI), highlighting ESG as an emerging concept that prioritizes sustainability over financial performance (Chen and Xie, 2022).

However, although there is a strong demand for green bonds, they still represent only a small part of the bond market. The global green bond market is estimated to be only 0.36% of the total bond offering between 2012 – 2021 (Dutordoir et al. 2024). Policy debates and press materials discus why green issuance remains low although investors are interested in sustainability (Sangiorgi and Schopohl, 2023). In academic circles, the debate just started because data just stared to be available on the major platforms that collect financial information. Davidescu et al. (2022) emphasize the critical role of green finance in accelerating the transition to a low-carbon economy, aligning with the European Green Deal's sustainability targets. To gain a deeper understanding of what drives the issue of green bonds there is a need to obtain an understanding of what drives their costs. Until recently, the major data platforms provided too few observations to allow meaningful analysis of the costs for green bonds since the issue of green bonds grew exponentially in the last five years (Barua & Chiesa, 2019, Environmental Finance, 2023).

For the European Union, the progress was quite slow in terms of issuance, but progress is still made on the legislative side. In 2021, the European Commission introduced a voluntary Green Bond Standard along with a taxonomy of environmentally sustainable activities to enhance transparency and harmonization within the green bond market (Badenhoop, 2022). Further policy measures focused on strengthening the transparency and disclosure practices for securities issuance to ensure that issuers provide relevant environmental information. Figure 1 presents the green bond issuance volume across Europe based on the data obtained from Refinitiv. Each country is color-coded based on its share of the total green bonds issued, with lighter shades of green representing higher percentages.
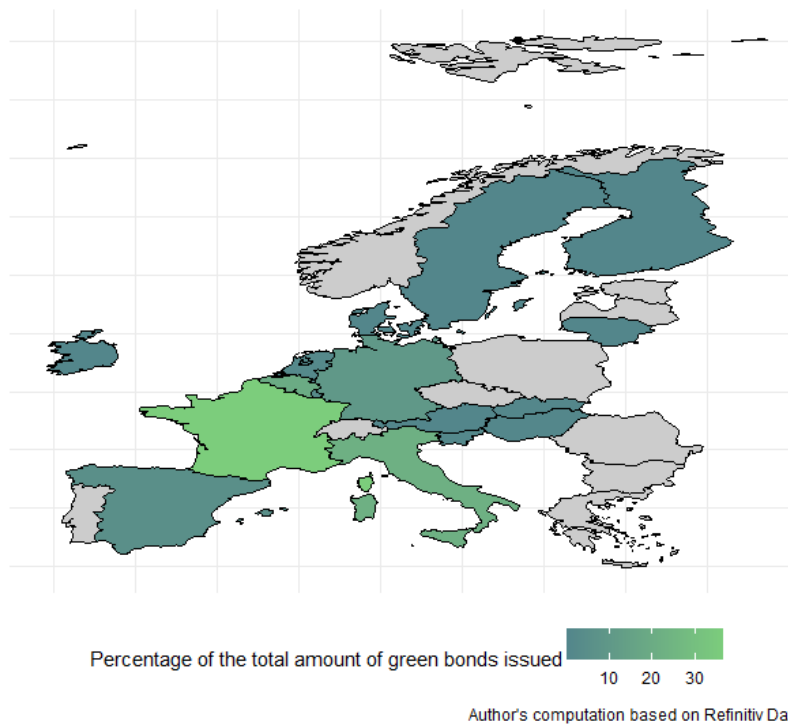
Green Bonds Issuance Percentage across Europe

Percentage of the total amount of green bonds issued

10 20 30

Author's computation based on Refinitiv Data

Figure 1. Green bond issuance in Europe

Note: Visual depiction of the data utilized in this model, made by author. (Data collected as bonds were issued in the market up to October 2024)

France and Italy stand out as one of biggest green bond issuers with a percentage of over 30%. France issues approximately 36.5% of the total amount issued across the analyzed countries, while Italy takes the second place with 21.9%. Belgium is the third major contributor, with nearly 20% of the total issuance. Its dark green shade reflects this high level of activity in the green bond market. Germany contributes almost 10% of the total issuance, which is notable but smaller compared to the top three countries. This positions Germany as a strong but not leading player. At the opposite end, Austria (0.29%), Finland (0.27%), Ireland (0.28%), and Denmark (0.12%) have very small shares in the green bond market, each contributing less than 0.3%. Their minimal activity is reflected by their darker green shades on the map. Hungary (0.41%) and Slovakia (0.39%) also contribute less than half a percent, indicating a limited role in green bond issuance. Sweden, despite being part of the environmentally conscious Nordic region, contributes only 0.2% of the total issuance. Lithuania, with a share of just 0.03%, contributes the smallest percentage of all, showing practically no significant presence in the green bond market. Most countries in Eastern Europe are shaded in grey, indicating no data available.

Moreover, I divide the amount of green bonds based on the issuer type. Figure 2 presents the results. The largest issuer category is "Govt/Treasury/Central Bank," which has issued a total of $102.68 billion, highlighting the significant role of government entities and central banks in financing large-scale sustainability projects. The second-largest contributor is "Agency," with $73.72 billion issued, demonstrating the importance of specialized institutions, such as development banks and public agencies, in supporting green initiatives. Corporate issuers rank third with a total issuance of $57.80 billion, indicating substantial private-sector involvement, although their contribution remains smaller compared to public-sector entities like governments and agencies. "Other Gov/Supra" has issued $42.22 billion, showing some participation by other governmental and supranational bodies. Finally, "Non-US Munis" account for the smallest issuance at $3.47 billion, suggesting limited activity or financial capacity among non-US municipal issuers. The graph emphasizes the dominant role of public entities, particularly governments and central banks, in driving green bond markets while also showing notable but smaller contributions from private corporations and smaller governmental bodies.
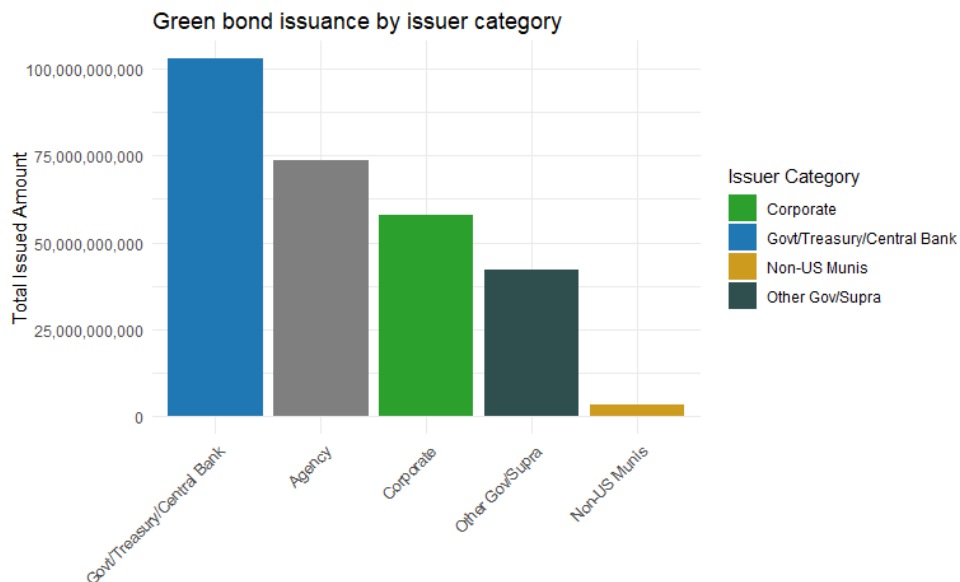

Figure 2. Green bond issued by issuer category
Note: Green bonds based on issuer type considered in the model, compiled by the author. (Data collected as bonds were issued in the market up to October 2024)

This research aims to identify the main factors driving the cost of green bonds in European markets and to examine their implications for the European Green Deal's ESG agenda. Key objectives include analyzing how financial, economic, and regulatory factors influence green bond yields in Europe, where

issuance remains a small share of the bond market despite rising interest. The study also investigates the impact of ESG standards and regulatory frameworks, such as the EU Green Bond Standard, on green bond costs, contributing to a deeper understanding of sustainable finance. By examining issuer types, credit ratings, and bond characteristics, the research seeks to clarify how different factors affect green bond yields. Ultimately, this work aims to provide insights for policymakers and investors, showing how economic conditions and regulations interact to shape green bond costs and align with Europe's climate and environmental goals.

The results of this research reveal that the cost of green bonds in European markets is significantly influenced by factors such as coupon rates, inflation, credit rating, bond maturity, and seniority. Additionally, regulatory frameworks like the EU Green Bond Standard and ESG standards play a role in shaping yields, with sovereign issuers often commanding higher yields than corporate issuers. Notably, the German benchmark yield emerges as a critical reference, highlighting its influence on green bond pricing across Europe. These findings suggest that both financial characteristics and regulatory alignment under the European Green Deal are crucial in determining green bond costs, offering valuable insights for policymakers and investors aiming to expand sustainable finance in Europe.

This paper examines the factors driving the cost of green bonds in European markets and their alignment with the European Green Deal's sustainable finance objectives. Part 2 explores research on sustainable finance and EU regulatory impacts, establishing a framework for the analysis. Part 3 describes the selection of EUR-denominated green bonds, key variables like coupon rates and maturity, and the panel regression model used to assess cost drivers. Part 4 presents descriptive statistics and regression findings, highlighting the impact of factors such as inflation, seniority, and issuer type on bond yields. Finally, part 5 synthesizes findings, discussing implications for sustainable finance policy and offering recommendations for enhancing green bond growth in Europe, aligned with the Green Deal's objectives.

2. Literature review

The growth of green bonds in Europe highlights the EU's steadfast commitment to sustainable finance, in line with the Paris Agreement and the European Green Deal. These bonds have become essential for funding projects aimed at reducing carbon emissions, enhancing renewable energy, and supporting environmental protection, thereby establishing the EU as a global leader in sustainable finance (Fatica et al., 2021; Ordonez-Borrallo et al., 2024). The EU's structured policy framework reflects its dedication to sustainability through a series of key regulations, which define the criteria for ESG investments and support transparency in sustainable finance.

The EU has established key regulations to standardize sustainable finance practices and support its environmental goals. These regulations include the **EU Taxonomy Regulation** defines criteria for what constitutes an environmentally sustainable activity, focusing on areas such as climate change mitigation and

adaptation, water resource management, and biodiversity protection. By setting these standards, it aims to clarify which investments qualify as genuinely sustainable, fostering transparency and integrity in the market. **Sustainable Finance Disclosure Regulation (SFDR)** mandates that financial entities disclose sustainability-related characteristics of their products. It categorizes financial products based on their sustainability focus: from those without explicit environmental objectives (Article 6) to those specifically focused on sustainability (Article 9), thus helping investors make informed choices. **Corporate Sustainability Reporting Directive (CSRD)** expands reporting requirements to a broader array of companies, mandating standardized disclosures on how their activities affect, and are impacted by, sustainability issues. CSRD aligns corporate reporting with the EU Taxonomy, further enhancing transparency and accountability.

The Bank for International Settlements (BIS), in its 2021 report, recognized the EU's taxonomy as a pioneering model but also identified limitations. While essential for harmonizing sustainable finance criteria within Europe, the BIS noted that the EU taxonomy may not yet be fully adaptable for global use due to differing environmental priorities and economic development levels across regions. The BIS recommended that for the EU taxonomy to be a global model, it should incorporate more flexibility to accommodate regional differences without compromising its environmental rigor. Moreover, the BIS cautioned that rigid classifications might inadvertently exclude beneficial activities or investments in regions where adhering to EU standards may be challenging. This vision aligns closely with the findings in recent research papers, which also highlight the importance of adaptable, inclusive standards for sustainable finance, underscoring the need for policies that facilitate broad-based participation in green financing initiatives while managing regional constraints and specificities

In their examination of green bonds as a mechanism for supporting environmental objectives, Jian (2023) emphasizes the importance of a cohesive policy framework within the European Union (EU) to foster international alignment and reduce barriers to cross-border investment. This alignment would ensure that green bonds genuinely advance sustainability, particularly through internationally harmonized standards and definitions. By setting such clear, unified criteria, EU regulators can prevent greenwashing, a deceptive practice where entities exaggerate or misrepresent their environmental contributions.

Issuing green bonds enables companies to enhance their reputation by presenting themselves as environmentally responsible and committed to sustainable practices. This approach aligns with the priorities of investors focused on sustainability, making green bonds particularly attractive (Ordonez-Borrallo et al., 2024). The appeal of green bonds to sustainability-oriented investors can increase demand for a company's debt instruments and, potentially, its equity, thereby strengthening both its capital position and market valuation (Karim et al., 2023; Fatica et al., 2021). This rise in demand is especially advantageous for companies operating in industries facing heightened environmental expectations, as it provides an opportunity to positively shape public perception of their environmental practices and sustainability commitments. In the European market, green bond issuers are required to adhere to specific reporting and verification standards,

reducing the risk of greenwashing. Liu et al. (2024) emphasize that European regulations support internal and external governance mechanisms, such as third-party verification of green bond projects, which hold companies accountable for the environmental impact of their bond-funded projects.

Risk management in the green bond sector has also been a focal point, as studies explore the correlations between green bonds and traditional markets. Understanding these dependencies is vital for protecting investors and stabilizing the rapidly expanding market, ensuring that the pursuit of sustainability does not compromise financial security (Karim et al., 2023). Based on the paper mentioned, green bonds have exhibited safe-haven properties, especially noticeable during economic disruptions like the COVID-19 pandemic. This behavior has positioned green bonds as a stabilizing force in investor portfolios, acting as a hedge against conventional market downturns. Karim et al. outline that while green bonds often move in opposition to traditional assets, they maintain a negative correlation with major financial indices like the U.S. dollar, providing robust diversification benefits.

Adding to this, Liu et al. (2024) emphasize the governance mechanisms inherent in green bonds, which increase corporate accountability in environmental responsibility. The paper finds that European green bond issuers often strengthen internal and external oversight mechanisms to enhance transparency and commitment to green projects, thereby helping mitigate risks associated with greenwashing. This regulatory attention and corporate responsibility in Europe align with the EU's broader regulatory framework, which mandates clear reporting and accountability in ESG financing. These structural supports further reinforce green bonds' reliability as a stable investment vehicle, particularly within the European market, where strict reporting standards are prioritized to ensure that green finance genuinely advances sustainability goals.

3. Methodology and Data

The dataset used in this analysis specifically focuses on bonds denominated in EUR, selected from the European ESG bond market. The data source is Refinitiv Data platform. I selected the variables of interest to analyze the influence of various financial factors on all 364 green bond yields issued between 2014-2024. All the selected variables are presented in Table 1:

Variables descriptions

Tabel 1

Variable	Description
Green bond yield	The variable represents the monthly return an investor earns from holding a green bond, expressed as a percentage. The yield is calculated based on the bond's coupon payments (periodic interest payments) and its current market price.
Rating	A dummy variable taking the value 0 is the green bond is rated as B (in any B category of the rating agencies) and the value 1 if the green bond is rated as A (in any A category of the rating agencies)

Variable	Description
Maturity (years)	Maturity (years) refers to the time remaining until the green bond reaches its expiration date, at which point the issuer is obligated to repay the principal amount to the bondholder. This variable is expressed in years and is a critical characteristic of any bond.
Seniority type	Seniority Type refers to the ranking or priority of a bond in the event of the issuer's liquidation or bankruptcy. It determines the order in which bondholders are repaid, with more senior bonds being repaid before junior or subordinated bonds. This variable is encoded from 1 to 8 according to the following categories (Junior Unsecured, Subordinated Unsecured, Senior Subordinated Unsecured, Senior Non-Preferred, Unsecured, Senior Unsecured, Senior Preferred, Senior Secured)
Sovereign / Corporate Issuer	This is a dummy variable taking the value 1 if the issuer of the bond is sovereign and 0 if the issuer of the bond is corporate.
Inflation	This is the monthly value of inflation for the Eurozone.
Benchmark Germany Yield	Benchmark Germany Yield refers to the yield on German government bonds often considered the benchmark for bond markets in Europe due to Germany's economic stability and the high credit rating.

Note: Variable used on the model collected from Refinitiv and ECB dataset.

For methodology, I make various descriptive statistics analytics to dive into the dataset and several results are presented in section 4.1. For the second part, I employed a pool panel regression that take the following form:

$$Y_{it} = \alpha + \beta_1 Coupon_{it} + \beta_2 Inflation_{it} + \beta_3 Rating_{it} + \beta_4 Maturity_{it}$$
$$+ \beta_5 Seniority\ Type_{it}$$
$$+ \beta_6 Sovereign/Corporate\ Issuer_{it}$$
$$+ \beta_7 Benchmark\ Germany\ Yield_{it} + \varepsilon_{it}$$

where:
1. Y_{it} : The dependent variable, represented by the bond yield, is recorded at the end of each month from the issuance date until either the bond's maturity date or October 2024, whichever comes first
2. α : Constant term
3. $Coupon_{it}$: Annual coupon rate for each green bond
4. $Inflation_{it}$: Monthly European inflation rate data
5. $Rating_{it}$: A rating dummy variable, where ratings reflect the company's creditworthiness (such as A & B ratings)
6. $Maturity_{it}$: Bond maturity in years
7. $Seniority\ Type_{it}$: An indicator reflecting the bond's seniority in the security structure. The hierarchy, ordered from least secure to most secure, includes:

Junior Unsecured (or Junior Subordinated Unsecured), Subordinated Unsecured, Senior Subordinated Unsecured, Senior Non-Preferred, Unsecured, Senior Unsecured, Senior Preferred, and Senior Secured.

8. **Sovereign/Corporate Issuer**$_{it}$: A dummy variable distinguishing between sovereign and corporate issuers, with significance in model (6).

9. **Benchmark Germany Yield**$_{it}$: Yield curve spot rate, for Government bond, nominal, all issuers whose rating is triple A - Euro area (changing composition), which is significant in model (6). Based on bond maturity in years, the maturity was categorized into different groups, where benchmark yield is assigned according to bond maturity ranges:
   - If the bond maturity is 5 years or less, the yield is taken from the 5-year maturity benchmark (Maturity5Y).
   - If the bond maturity is between 5 and 7 years, the yield is sourced from the 7-year benchmark (Maturity7Y).
   - Similarly, 10-year, 15-year, 20-year, 25-year, and 30-year benchmark yields are applied to bonds with corresponding maturity ranges.
   - For bonds with maturity beyond 30 years, the 30-year benchmark yield is used.

10. ε_{it}: Error term.

4. Results

4.1 Descriptive Statistics

Sustainable debt issuance is largely driven by Green Bonds, with CBI Aligned Green Bonds forming the majority. These bonds focus on financing projects with clear environmental benefits, such as renewable energy initiatives, and reached their highest issuance level in 2022 due to increased investor interest in environmentally oriented financial products. Social Bonds and Sustainability Bonds represent another significant portion, targeting broader sustainability goals beyond environmental impacts, such as affordable housing and healthcare. Since 2018, issuance in these categories has surged, reflecting greater awareness of social sustainability. Recently, Sustainability-Linked Bonds have emerged as a flexible alternative. Unlike traditional green bonds, these bonds link financial terms to the issuer's progress on specific sustainability goals, appealing to issuers aiming for measurable sustainability outcomes.
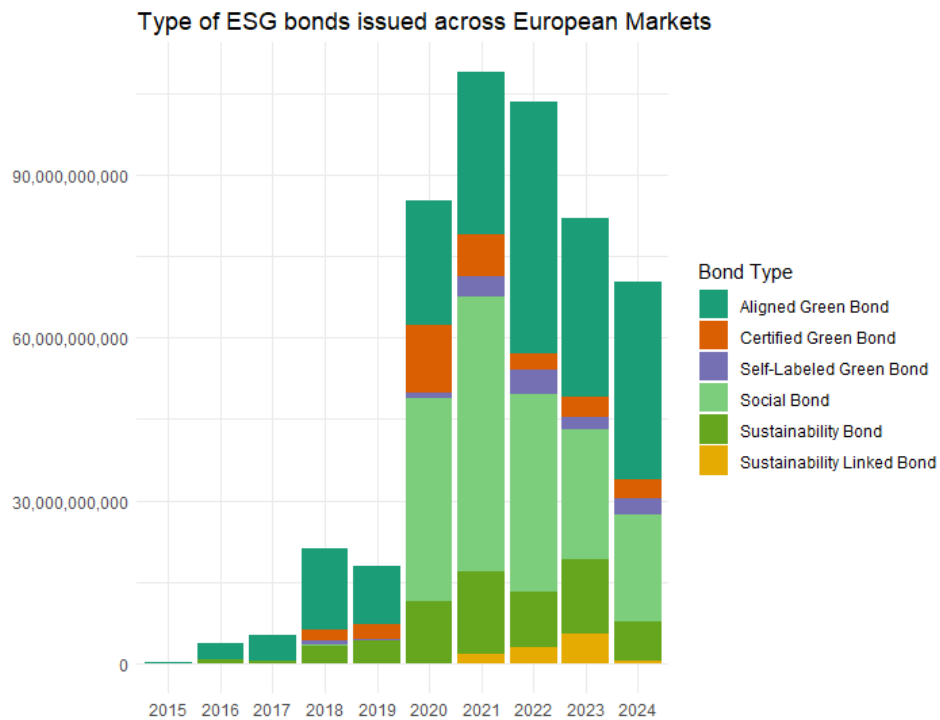
Figure 3. ESG bond issuance across the European Markets
Note: Graphical representation of ESG bond issuance classified by type created by author
(Data collected as bonds were issued in the market up to October 2024)

Figure 3 presents the distribution of ESG bonds based on their types. From 2015 to 2017, the issuance of ESG bonds was relatively low, with only Aligned Green Bonds showing significant contributions. Between 2018 and 2020, there was a notable increase in bond issuance, driven primarily by Aligned Green Bonds, Certified Green Bonds, and Social Bonds. The period from 2020 to 2021 saw a significant peak in total issuance, largely attributed to substantial contributions from Aligned Green Bonds and Social Bonds, as well as notable growth in Sustainability Bonds. From 2022 to 2024, while the overall issuance declined slightly compared to the peak in 2021, Sustainability Bonds and Aligned Green Bonds continued to dominate, with smaller contributions from other bond types.

The table provides an overview of 364 EUR-denominated bonds issued in the European market, classified by seniority and security type. It presents each category's share of the total issuance amount, average coupon rates, and bond counts, offering insight into the distribution and risk-return profile of these instruments.

Seniority Type

Seniority Type	% Amount Issued	Average of Coupon	Number of bonds
Senior Unsecured	85.32%	2.19	283.00
Subordinated Unsecured	1.20%	3.67	9.00
Unsecured	5.37%	1.47	15.00
Junior Unsecured or Junior Subordinated Unsecured	1.10%	4.42	6.00
Senior Non-Preferred	4.55%	2.79	27.00
Senior Preferred	2.27%	3.31	21.00
Senior Secured	0.14%	2.50	2.00
Senior Subordinated Unsecured	0.05%	0.8	1.00
Grand Total	**100.00%**	**2.34**	**364.00**

Note: Green bonds based on seniority type considered in the model, compiled by the author

At the top of this hierarchy (lowest risk to highest risk) are **Senior Secured Bonds**, comprising just 0.14% of the issuance (2 bonds – Corporate bonds issued by company in Forest & Wood Products sector). These bonds, backed by specific assets, offer the highest level of security and thus attract investors seeking stability. The average coupon rate for these bonds is 2.50% (higher than the average for the selected portfolio; however, the majority of bonds in the portfolio 66.7% are issued by government agencies, state governments, supranational entities, and other municipalities.), reflecting the low-risk nature of asset-backed securities, which typically yield lower returns due to their reduced risk profile.

Senior Preferred Bonds follow, with high repayment priority though they are not always asset backed. Making up 2.27% of the issuance (21 bonds, Corporate bonds), these bonds provide a slightly higher average coupon of 3.31% (The bonds are issued primarily within the financial sector, covering services such as general banking, personal and auto loans, corporate banking, and factoring). This rate reflects investor compensation for the senior preferred status, appealing to those looking for a combination of priority and slightly higher yield.

Senior Unsecured Bonds are the most prominent in the sample, accounting for 85.32% of the total issuance (283 bonds). With an average coupon rate of 2.19%, these bonds reflect a strong market preference or abundance of unsecured senior-priority debt, offering a balance of high security and competitive returns.

Senior Unsecured Bonds by issuer type

Issuer Type	Issued Amount (% of total)	Number of bonds	Average Coupon
Agency	36.77%	84.00	1.79
Corporate	21.91%	105.00	2.69
Govt/Treasury/Central Bank	24.15%	14.00	2.21

Issuer Type	Issued Amount (% of total)	Number of bonds	Average Coupon
Non-US Municipality	0.83%	13.00	2.45
Other Gov/Supranational	16.33%	67.00	1.88
Grand Total	**100.00%**	**283.00**	**2.19**

Note: Green bonds based on seniority type and issuer type compiled by the author

Below senior unsecured bonds in priority are **Senior Non-Preferred Bonds**, which account for 4.55% of the issuance (27 bonds). These bonds offer an average coupon of 2.79% (issued primarily within the financial sector, covering services such as general banking and corporate banking), balancing moderate risk with slightly higher yields. This category attracts investors looking for a middle ground between security and yield, making it suitable for moderate-risk portfolios.

Lower in the hierarchy, **Senior Subordinated Unsecured Bonds** make up a very small portion of the portfolio, consisting of only one bond issued by an insurance company in 2019, with an average coupon rate of 0.8%.

Subordinated Unsecured Bonds hold a lower priority in the repayment structure and represent 1.20% of the issuance (9 Corporate bonds). These bonds offer a higher average coupon of 3.67% (primarily issued within the financial and insurance sectors), compensating investors for the added credit risk associated with subordinated status, appealing to those willing to accept higher risk for increased returns.

Near the bottom of the hierarchy are **Junior Unsecured or Junior Subordinated Unsecured Bonds**, a high-risk category comprising 1.10% of the issuance (6 bonds). With the highest average coupon of 4.42%, these bonds attract investors seeking significant yield premiums for the elevated risk that comes with lower repayment priority.

Lastly, **Unsecured Bonds**, potentially representing general unsecured debt without specific priority, make up 5.37% of the issuance (15 bonds). A primary factor for the lower average coupon is that 85% of these bonds are issued by the French organization UNEDIC. Specializing in financing unemployment insurance, UNEDIC supports the long-term financial stability of France's unemployment system, ensuring that insurance rules reflect the realities of job seekers. This focus on social welfare financing and the organization's established position contribute to the relatively lower coupon rates for these bonds.

4.2 Panel regression results

The regression analysis table provides insight into the factors that impact bond yields across six distinct models, illustrating how each variable helps to explain variations in yields within the selected bond sample.

Yields regressions on different variable

Tabel 4

	(1)	(2)	(3)	(4)	(5)	(6)
Coupon	0.50***	0.47***	0.46***	0.46***	0.46***	0.15***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inflation	0.21	0.21***	0.21***	0.21***	0.21***	0.05***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rating (0/1)		-0.40**	-0.40**	-0.38***	-0.27	-0.32
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Maturity (years)			0.02**	0.02**	0.03**	0.00
			(0.00)	(0.00)	(0.00)	(0.00)
Seniority type				-0.15***	-0.11***	-0.11***
				(0.00)	(0.00)	(0.00)
Sovereign / Corporate Issuer					0.26***	0.34***
					(0.00)	(0.00)
Benchmark Germany Yield						1.06***
						(0.00)
R-Squared	**0.65**	**0.67**	**0.56**	**0.54**	**0.45**	**0.75**

*Note: * significant at the 5% level,*
*** significant at the 1% level,*
**** highly significant at the 0.1% level*

In Model (1), two variables, Coupon and Inflation, are analysed as predictors of green bond yields. The coupon rate shows a strong positive relationship with bond yield, with a coefficient of 0.50, highly significant at the 0.1% level (***). This indicates that higher coupon rates lead to higher yields, as bonds with larger coupon payments generate greater returns for investors. This finding aligns with expectations, as the coupon payment directly influences the income received from the bond, thus increasing its yield.

Inflation is also included in the model, with a coefficient of 0.21. However, it does not reach standard significance levels, suggesting that while there may be a slight positive relationship between inflation and yield, it is not a dominant factor in this model. The relationship hints that rising inflation could push yields up to offset purchasing power erosion, though this effect is not strongly pronounced here.

The model's R-squared value of 0.65 suggests that these two variables explain 65% of the variance in green bond yields, with the coupon rate playing a central role and inflation adding a minor contribution. This demonstrates that coupon rates are a key determinant of green bond yields in this analysis.

In Model (2), three variables—Coupon, Inflation, and Rating—are used to predict green bond yields. The coupon rate remains a significant positive predictor with a coefficient of 0.47, higher coupon rates lead to higher yields as they increase the bond's return to investors.

Inflation is also highly significant (***), with a coefficient of 0.21, indicating a positive relationship with bond yields. This suggests that is likely to compensate for the erosion in purchasing power. This variable is now highly significant, underscoring its influence in this model.

The Rating variable, introduced in this model, is a dummy variable where 0 represents B-rated bonds and 1 represents A-rated bonds. The coefficient for Rating is -0.40, significant at the 1% level (**), suggesting that A-rated bonds tend to have lower yields than B-rated bonds. This relationship reflects the reduced risk associated with higher-rated bonds, which leads to lower yields as investors accept lower returns for greater security.

With an R-squared of 0.67, Model (2) explains 67% of the variance in green bond yields, indicating that the addition of the Rating variable has improved the model's explanatory power, highlighting the importance of credit quality alongside coupon rates and inflation in determining yields.

In Model (3), the analysis of green bond yields includes four variables: Coupon, Inflation, Rating, and Maturity. The coupon rate remains a strong predictor with a coefficient of 0.46, highly significant at the 0.1% level (***), confirming that higher coupon rates lead to higher yields, as bonds with greater periodic payments are more attractive to investors. Inflation remained constant for this model. The Rating variable, coded as 0 for B-rated bonds and 1 for A-rated bonds, has a negative coefficient of -0.40, significant at the 1% level (**). This suggests that A-rated bonds, considered less risky, have lower yields than B-rated bonds, reflecting investor preferences for safer assets at lower returns.

The newly introduced Maturity variable shows a small positive coefficient of 0.02, significant at the 1% level (**), indicating that longer-term bonds tend to have higher yields, likely due to increased interest rate risk over extended durations.

With an R-squared of 0.56, Model (3) explains 56% of yield variability, showing the combined impact of coupon rates, inflation, credit rating, and maturity.

In Model (4), five variables—Coupon, Inflation, Rating, Maturity, and Seniority Type—are analyzed to predict green bond yields. The coupon rate remains a significant predictor, with a coefficient of 0.46, indicating that higher coupon rates are strongly associated with higher yields. Inflation remained constant for this model. The Rating variable, with a coefficient of -0.38 (highly significant), indicates that A-rated bonds have lower yields than B-rated bonds, reflecting their safer profile. Maturity also shows a positive, albeit modest, effect on yields, with a coefficient of 0.02, indicating slightly higher yields for longer-term bonds. The newly added Seniority Type variable has a coefficient of -0.15, highly significant, meaning that more senior bonds—viewed as safer—tend to offer lower yields.

With an R-squared of 0.54, Model (4) explains 54% of the variance in green bond yields, showing how factors like coupon rates, inflation, credit rating, maturity, and seniority type combine to influence bond returns.

In Model (5), six variables Coupon, Inflation, Rating, Maturity, Seniority Type, and Sovereign/Corporate Issuer are used to predict green bond yields. The coupon rate remains a strong positive predictor, with a coefficient of 0.46, highly

significant, indicating that higher coupon rates lead to higher yields. Inflation remained constant for this model. The Rating variable, though less significant here, has a coefficient of -0.27, indicating that A-rated bonds may yield lower returns than B-rated bonds. Maturity has a positive effect with a coefficient of 0.03, showing that longer-term bonds tend to have higher yields.

Seniority Type retains its negative coefficient (-0.11) and high significance, meaning that more senior (safer) bonds typically offer lower yields. The newly added Sovereign/Corporate Issuer variable, with a positive coefficient of 0.26 and high significance, indicates that sovereign bonds generally yield more than corporate bonds.

With an R-squared of 0.45, Model (5) explains 45% of the variance in green bond yields, highlighting how issuer type, in addition to credit, maturity, and seniority, affects bond returns.

In Model (6), seven variables, including the newly added Benchmark Germany Yield, are analyzed to explain green bond yields. The coupon rate still positively impacts yield, with a coefficient of 0.15, though its effect is reduced in this model. Inflation remained constant for this model. The Rating variable shows a negative relationship (-0.32) but lacks statistical significance, suggesting limited influence when other factors are controlled. Seniority Type remains a significant predictor, with more senior bonds yielding less due to lower risk. Sovereign/Corporate Issuer is positive and significant (0.34, ***), indicating that sovereign bonds generally yield more than corporate ones.

The Benchmark Germany Yield emerges as the strongest predictor, with a coefficient of 1.06 (***), highlighting Germany's key role in setting regional yield expectations. The model's R-squared of 0.75, the highest among all models, indicates that this comprehensive approach, including the German benchmark yield, explains 75% of the variation in green bond yields.

5. Conclusions

This research concludes that the cost of green bonds in European markets is influenced by several key factors, including financial characteristics, regulatory standards, and issuer type. The coupon rate consistently emerged as a primary driver of bond yield, aligning with the expected positive relationship where higher coupon rates lead to higher yields. Inflation also showed a positive correlation with yield, suggesting that yields adjust to compensate for rising prices. Credit rating, bond maturity, and seniority level significantly impacted bond yields, reflecting investor preferences for risk-adjusted returns.

Additionally, sovereign issuers, compared to corporate issuers, often commanded higher yields, potentially due to perceived differences in risk profiles and market dynamics. The inclusion of the German benchmark yield in the analysis underscores its critical role, indicating that German government bond yields influence green bond pricing across Europe. These findings highlight that a combination of financial metrics and regulatory alignment, particularly with the EU Green Bond Standard, are crucial for understanding green bond costs, offering

valuable insights for policymakers and investors committed to expanding sustainable finance within the framework of the European Green Deal.

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