

INSTITUT DE HAUTES
ÉTUDES INTERNATIONALES
ET DU DÉVELOPPEMENT

GRADUATE INSTITUTE
OF INTERNATIONAL AND
DEVELOPMENT STUDIES



BlueOrchard
Impact Investment Managers | Member of the Schroders Group

Labelled Bonds and Drivers of Financial Performance

Ahmad Hazim Bin Khairul

Enkhjin Bum-Erdene

Gabriela Cangussu

Panthini Trivedi

May, 2026

Artificial intelligence was used to support coding, figure formulation and language/grammar edits. All opinions and mistakes are of full responsibility of the authors.

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List of Abbreviations

bps	Basis Points
ECB	European Central Bank
ESG	Environmental, Social, and Governance
FE	Fixed Effects
GBP	Green Bond Principles (ICMA)
GHG	Greenhouse Gas
GSS+	Green, Social, Sustainability and Sustainability-Linked
ICMA	International Capital Market Association
ISIN	International Securities Identification Number
KPI	Key Performance Indicator
LGX	Luxembourg Green Exchange

MSCI	Morgan Stanley Capital International
OAS	Option-Adjusted Spread
OLS	Ordinary Least Squares
PRI	Principles for Responsible Investment
RQS	Reporting Quality Score
SBP	Social Bond Principles (ICMA)
SDG	Sustainable Development Goal
SLB	Sustainability-Linked Bond
SSA	Sovereigns, Supranationals, and Agencies
tCO_2e	Tonnes of CO_2 Equivalent
UNEP FI	United Nations Environment Programme Finance Initiative
YTM	Yield to Maturity

1. Executive Summary

Problem Statement and Research Overview

As the labelled bond market surpasses USD 5.2 trillion (MSCI,2025), a critical gap remains in understanding whether impact is a material driver of financial performance or just a symbolic designation. This research, in partnership with BlueOrchard, addresses the drivers of performance in these financial instruments. The project looks at how specific elements factor into bond pricing, exploring how impact efficacy and reporting quality influence yields (materialiasing, or not, a greenium), credit spreads and investor demand.

Methodology

The study utilizes a mixed-method approach, starting with a quantitative framework that leverages high-granularity impact data from Luxembourg Green Exchange. We used a Fixed Effects Panel Regression model with different specifications. This quantitative foundation is then further validated via semi-structured interviews with industry experts at investment firms.

Key Findings

- Transparency as a Primary Material Factor: Results show that Reporting Quality Scores have a more robust negative correlation with credit spreads than absolute physical impact metrics such as GHG reduction. This suggests a Credibility Premium, where the market rewards the mitigation of information asymmetry over raw environmental data[1].
- Credibility Infrastructure Matters: The financial performance of labelled bonds depends on hard financial factors along with the impact. However, this study found that the infrastructure to measure the credibility of the impact is of utmost importance. These measures are composed of alignment to ICMA frameworks, external reviews, second-party opinions, reporting standards and post-issuance verification mechanisms.

[1] Further explained in section 4.2 to 5

- Institutional Preference for Verified Data: There is a significant bias toward reported and verified data which reinforces the notion of reduction of information asymmetry. High quality disclosures are treated as proxy for superior management and reduced long-term regulatory risk

Conclusions

The research concludes that transparency is key in the modern debt market. For investors, the study provides a data-driven basis to view reporting as a leading indicator for risk reduction. For issuers, findings suggest that the most effective way to reduce cost of capital is to invest in reporting guidelines such as ICMA guidelines. As a whole, as policy frameworks are developed across various markets, verified impact data will be the primary factor of financial success in the labelled bond markets.

2. Introduction

Leveraging financial resources to accelerate sustainability and social development priorities is an emerging need that has been gaining momentum from both investor and issuer sides. In this context, labelled bond markets are an essential actor in this progress, relying on the issuance of debt to finance strictly defined activities. The labelled-bond market currently amounts to approximately USD 5.2 trillion (MSCI, 2025), with a continuous growth trend.

Bonds have historically been key to raise capital and enable development of new projects, particularly for infrastructure development. They turn investment and income generation into a possibility from credit - that is - a promise of payment. While initially used mostly by sovereign actors, over time, corporations and supranational institutions also adopted bonds as one of the primary tools for accessing long-term debt financing.

In the last two decades, the introduction of labelled-bonds has been a substantial innovation in the debt market. They differ from traditional instruments by earmarking their use of proceeds for particular activities (for example, renewable energy projects, affordable housing, or clean transportation). The first of such bonds were issued by supranational entities - the European Investment Bank's Climate Awareness Bond in 2007 and the World Bank's Green Bond in 2008. Sovereigns and corporations, respectively, followed suit. This subtype of debt instrument extends the traditional purpose of the usual fixed-income instruments by explicitly allocating proceeds towards projects that benefit social outcomes and environmental protection. The ability of labelled bonds to help close financing gaps depends largely on whether they can lower the cost of capital, allow for longer maturities, more liquidity, and increase the scale of financing to SDG investments, particularly in developing countries.

Whenever an agent chooses to finance a new activity through the bond market, investor confidence is key. Repayment obligations upon reaching maturity need to be met, a condition that remains true for labelled instruments despite the results or impact achieved by the projects connected with their use of proceeds. There is an important question on whether alignment with green or social objectives can increase the confidence necessary to leverage investment, as well as whether the requirements to be fulfilled for alignment actually reflect better performance - that is, more secure repayment conditions and a better return, in terms of finances and impact, from the comparable vanilla bond. In principle, labelled bonds would

have the same credit characteristics of their “vanilla” equivalents — i.e. conventional bonds from the same issuer with comparable maturity and coupon structure, which serve as the natural benchmark for measuring any yield differential attributable to the sustainability label.

There are four main types of labelled bonds, which have distinct elements amongst themselves, as well as different shares of market participation. These are: green bonds, social bonds, sustainability bonds, and sustainability-linked bonds (Pictet, 2025). Green bonds continued to be the most frequently issued label (USD 303 billion and 57% of all labeled bonds issued in the first half of 2025), followed by sustainability bonds (24%), social bonds (15%) and lastly, sustainability-linked bonds (4%) (MSCI, 2025) . The latter has particular connections between the repayment obligations and the use of proceeds, varying at the bond level, and will therefore not be covered in this work.

The International Capital Market Association has particular guidelines which should be followed upon claims of alignment, risking severe reputational risk (ICMA, 2025). For example, Green, Social or Sustainability Bonds must have 100% of the proceeds dedicated towards Green and Social Projects. Nevertheless, these guidelines remain voluntary. The following table summarises the particular definitions as specified by the ICMA:

Label	Definition
Green	Any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance projects with clear environmental benefits and which are aligned with the four core components of the GBP. Eligible Green Project categories include renewable energy, energy efficiency, pollution prevention and control, eco-efficient and/or circular economy adapted products, production technologies and processes, green buildings, terrestrial and aquatic biodiversity conservation, clean transportation etc

Sustainability	Any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance a combination of Green and Social Projects and which are aligned with the four core components of the GBP and SBP.
Social	Finance projects that directly aim to address or mitigate a specific social issue and/or seek to achieve positive social outcomes, especially but not exclusively for a target population(s). Social Project categories include providing and/or promoting: affordable basic infrastructure, access to essential services, affordable housing, employment generation, food security, or socioeconomic advancement and empowerment.

Table 1: ICMA guidelines for Green, Social and Sustainability bonds. Source: own elaboration based on ICMA.

Despite rapid growth, there is no real consensus on whether labelled bonds systematically outperform, underperform, or behave similarly to conventional bonds. Understanding relationships between impact metrics and financial outcomes may influence how asset managers price risk, creditworthiness and make the best investment decisions with the data available, as well as guide issuers on reducing risk perception. Furthermore, empirical evidence on these relationships can guide the evolving landscape of taxonomies and disclosure requirements, ensuring that labels are meaningful and translate into actual impact.

This work intends to examine the role of impact indicators in driving financial performance for labelled bonds, as well as whether they offer distinct financial characteristics compared to conventional bonds. Departing from the assumption that

understanding the historic performance and key performance indicators of labelled bonds is critical for making evidence-based investment decisions, we use an econometric approach to evaluate the impact indicators mostly connected to improved financial performance. We also try to measure the sustainability credentials of these instruments to understand if they translate into measurable financial outcomes, and for whom. This data can be viewed both from the investor, in terms of securing financial returns, as well as from the issuer perspective, lowering the cost of capital and enabling sustainable and social development.

The rapid growth of the labelled bond market sits within a broader push to mobilise private capital for sustainable development. Landmark frameworks — the Addis Ababa Action Agenda (2015) and the Paris Agreement (2015) — explicitly called for financial flows aligned with climate and development objectives, and estimates suggest global climate investment must reach USD 1.3 trillion annually in developing countries alone by 2030 (LSE, 2025). Public resources cannot close this gap alone. By earmarking proceeds for environmental or social projects while preserving the risk-return structure of conventional fixed income, labelled bonds have become a key bridge between policy commitments and private capital markets.

2.1. Research Questions

The conceptual framework of this study rests on the premise that financial and sustainability performance are not independent dimensions of bond assessment, but potentially interconnected signals that sophisticated market participants process simultaneously. Rather than treating impact reporting as a disclosure obligation decoupled from pricing dynamics, this research investigates whether the labelled bond market has reached a level of maturity at which non-financial data, specifically the quality and content of post-issuance impact disclosures, functions as a reliable input into investor valuation and, by extension, into the cost of capital for issuers. Two primary research questions structure the empirical analysis:

Which impact reporting characteristics are most strongly associated with the financial performance of labelled bonds?

This question moves beyond the binary presence or absence of a greenium to ask which specific dimensions of post-issuance disclosure - GHG reduction intensity, reporting granularity, external verification, adherence to recognised methodological frameworks - carry

the most consistent and statistically robust association with yield and credit spread. The objective is to identify whether the market rewards impact outcomes themselves, the credibility of the process through which those outcomes are reported, or both.

Does reporting quality serve as a differentiating signal within the labelled bond universe?

This question examines whether bonds with stronger reporting practices systematically price differently from those with weaker practices, even after controlling for issuer type, geography, bond size, and macro conditions. If reporting quality is priced, it suggests that investors are actively incorporating disclosure standards into their assessment of labelled instruments, a finding with direct implications for issuers considering the level of transparency and rigour to invest in their post-issuance reporting processes.

2.2. About BlueOrchard

Founded in 2001 at the initiative of the UN, BlueOrchard is a leading global impact investment manager and a member of the Schroders Group (BlueOrchard, 2021) . They are widely recognized as the world's first commercial managers of microfinance debt instruments. Over the last two decades, they have transitioned from a microfinance specialist into a multi-asset impact house, managing the largest commercial microfinance fund globally and reaching over 300 million people across 100+ markets.

What distinguishes BlueOrchard's approach from much of the industry is its treatment of impact measurement as an investment input rather than a reporting obligation. Where many asset managers rely on third-party ESG scores designed primarily around risk mitigation, BlueOrchard operates through a proprietary framework called B.Impact, which structures investment decision-making around three sequential considerations: intent, contribution, and measurement. Intent asks whether an instrument has clearly defined social or environmental objectives that are consistent with a long-term impact strategy. Contribution assesses the specific value that BlueOrchard's capital would add - in other words, what would not happen without it. Measurement translates these objectives into a scorecard of real-world outcomes that can be tracked and reported over the life of the investment.

In listed debt, BlueOrchard treats green, social, and sustainability bonds as particularly significant vehicles for emerging market development. Their due diligence process operates at two stages. At issuance, the team scrutinises the bond framework and intended use of proceeds, with particular attention to definitional ambiguity that could facilitate greenwashing - loose project eligibility criteria, vague impact commitments, or proceeds categories that blend genuine sustainability investment with business-as-usual expenditure. Post-issuance, allocation and impact reports are reviewed approximately one year after issuance to verify whether capital reached its stated destination and whether the reported outcomes are credible. Central to this post-issuance evaluation is BlueOrchard's concept of impact efficiency - a normalised metric that expresses the quantum of impact delivered per million dollars invested, enabling comparison across bonds, issuers, and asset classes on a consistent basis.

2.3. Investor Preference

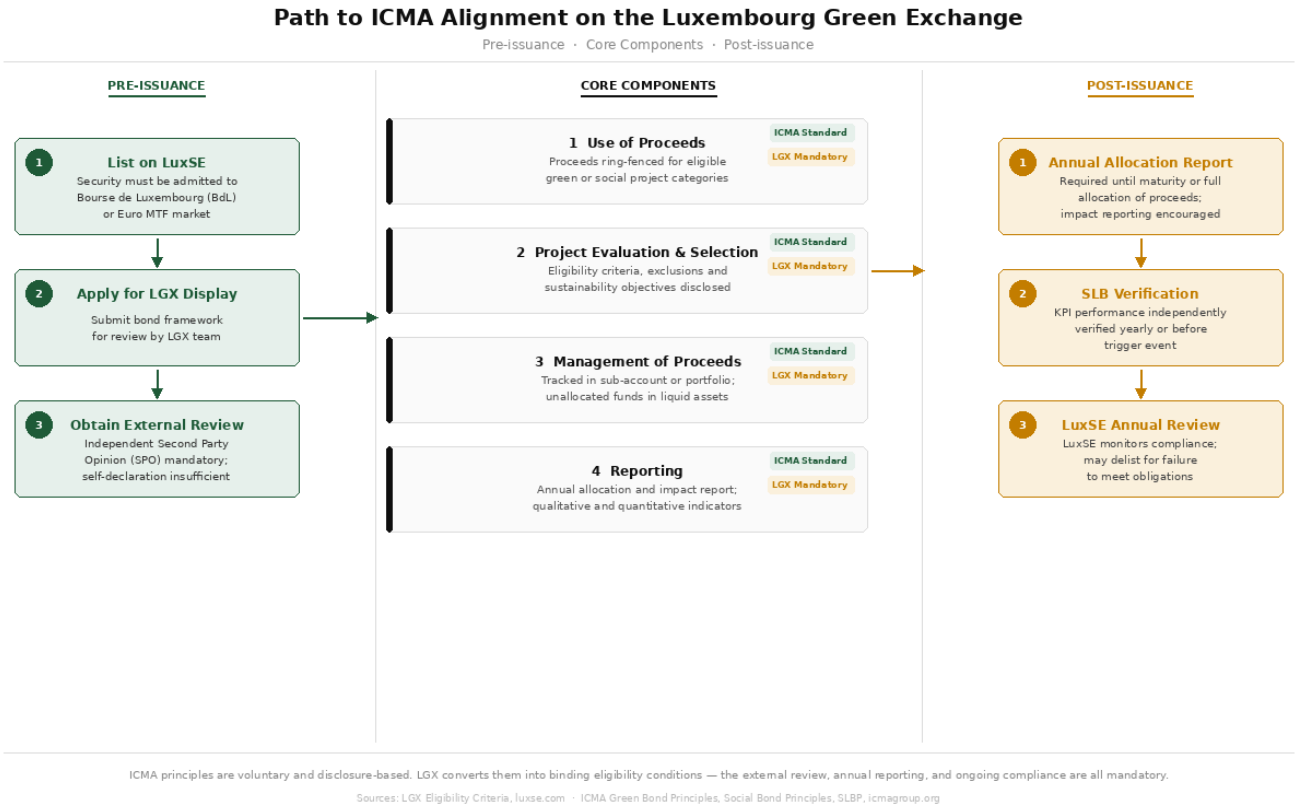
2.3.1. The rise of labelled bonds and investor preference for sustainability

The rise of the labelled bond market cannot be attributed solely to the shifts in regulatory markets, but also to the evolving intentions of the investment community. Over the past decade, we have seen this in action with a profound transformation in investor preferences that involves a direct approach, with fiduciary duty being defined to include the mitigation of long term climate and social risks (UNEP FI, 2019).

The Glasgow Financial Alliance for Net Zero (GFANZ) and the Principles for Responsible Investment (PRI) make this particularly evident. Both have effectively standardized and institutionalized pro-environment behavior by the world's largest asset managers. These alliances create demand for labelled bonds and other labelled instruments, as participants are often bound by internal mandates or directives to transition their portfolios towards net-zero alignment. By participating in these labelled markets, investors help lower the barrier for sustainable projects, effectively bridging the gap between abstract policy goals and practical allocation of private capital.

Furthermore, the act of holding labelled debt provides significant reputational utility for institutional investors, serving as a big signal to stakeholders, clients and regulators that the firms are actively interacting with (Flammer et al, 2021). This behavioral shift suggests that many investors are no longer purely motivated by immediate returns but instead are looking at long-term risk reduction and social, environmental impact that these labelled bonds provide. The credit models for labelled bonds can also incorporate climate transition risk, regulatory risk and compliance factors into portfolio construction to make the risks measurable and palatable for the investor risk appetite.

Another structural feature of labelled bonds relative to conventional debt is the existence of impact monitoring checkpoints that run in parallel with the financial life of the instrument. The use of ICMA principles and other regulatory measures like reporting annual impact and allocation reporting obligations attempt to bridge the gap between investor preferences for conventional versus labelled bond choices. Further safeguards can be put in place - as is done by the Luxembourg Green Exchange, demonstrated below:



Flow chart 1: ICMA core components and LGX alignment requirements. Source: own elaboration based on LGX and ICMA.

This research explores how these measures are being accounted for into the pricing mechanism itself.

2.3.2. Credit rating

The efficacy of labelled bonds as a tool for sustainable development is inextricably linked to how they are perceived by any credit rating agencies, particularly within emerging and developing markets. Historically, the "sovereign ceiling" has acted as primary constraint on debt financing, as a bond's credit rating is traditionally capped by how reliable the host country is on paying its debt back, its liquidity and solvency. Sovereign credit ratings are thus associated with default risk, with one-year and three-year forward default rates rising as ratings decline (ECOSOC, 2026). Obtaining a good rating is generally a prerequisite for accessing international capital markets.

However, labelled bonds create a unique opportunity to challenge this stigma through targeted de-risking mechanisms (World Bank, 2025). When a green or social bond is issued

with credit guarantees by supranational agencies like World Bank or the International Finance Corporation, it can potentially have a higher credit rating than its sovereign parents. This allows issuers in less developed regions or countries to access these international capital markets at a lower cost, effectively making credit cheaper for specific environmental or social projects that would be isolated from the broader macroeconomic volatility of that country.

Furthermore, while a labelled bond fundamentally shares the same risk default as a regular bond from the same issuer, the rigorous transparency and reporting requirements mandated by the International Capital Market Association (ICMA) often lead to stricter governance structures (ICMA, 2022; ECB, 2022). This enhanced disclosure provides investors with a better overview of an issuer's operational resilience and long term health, which can translate to more stable credit spreads and higher investor confidence. As the market matures and develops, the ability of these labelled instruments to reflect better performance and secure more or better repayment conditions will be critical in proving that alignment with sustainable objectives is not just a moral one but also a better financial choice. By reducing risk optics through a standardized framework, labelled bonds serve as a vital instrument for attracting the private investment and capital necessary to close the financing gap for Sustainable Development Goals.

3. Literature Review

3.1 Labelled Bonds: Definition

As the need to align public and private finance with environmental and social objectives grows, labelled bonds have emerged as a key mechanism for channeling capital toward sustainability-oriented investment. These instruments generally fall into five categories: green bonds, transition bonds, social bonds, sustainability bonds, and sustainability-linked bonds (Pictet, 2025). The largest amount of issued labelled bonds are green and sustainability bonds, which have also been the focus of the largest part of literature and also of this study.

3.2 Rise of the Labelled Bond Market

The rise of labelled bonds has seen rapid market expansion, with forecasts suggesting that they will continue to increase their share of global fixed-income markets as demand for sustainable finance intensifies (Maltais & Nykvist, 2020). Tolliver et al. (2019) document this growth, noting that proceeds are often directed toward renewable energy and high-priority greenhouse gas reduction projects, while highlighting the importance of linking bond impacts to national policy goals and the Sustainable Development Goals in order to build investor confidence.

Geographically, most labelled bonds have been issued in developed country markets, particularly in Europe. Public sector participation in Emerging Markets labeled bond markets remains low, representing 23% of overall issuances, compared to 42% in Advanced Markets labeled bond markets (World Bank, 2025). Most bonds are issued in hard currencies, led by EUR (47%), USD (29%), GBP (3%), JPY (3%), SED (1.6%). Amongst developing country markets, CNY leads issuance (representing 11% of total issuances) (MSCI, 2025). Nevertheless, emerging and developing markets progressively dedicate more attention to the issue, with significant market shares taken by countries such as Brazil, Chile, the Philippines, Peru, as well as interesting sovereign bond launches by countries such as Fiji, Barbados and Solomon Islands.

Despite this expansion, Ryung Kim & Laskarides (2025) caution that GSS+ bonds (Green, Social, Sustainability and Sustainability-Linked bonds) continue to face structural barriers in developing country markets, including high issuance costs, shorter maturities, and administrative complexities. Their comparative analysis of issued amounts, credit ratings, and average coupon rates across green and conventional bonds suggests that the greenium (the yield concession investors accept on labelled bonds relative to equivalent conventional bonds) does not reliably materialise in these contexts, despite showing promise in more developed markets. The authors argue that the success of these instruments ultimately depends on improving financing conditions for developing countries, recommending expanded de-risking mechanisms and a shift from voluntary guidelines toward binding requirements.

3.3 The Greenium: Evidence and Debate

A central question in the labelled bond literature concerns whether these instruments offer distinct financial characteristics relative to conventional fixed-income benchmarks — directly motivating Research Question 2 in this work.

Early empirical work by Bachelet et al. (2019) identified a puzzling pattern: green bonds often exhibit higher yields despite lower return variance and increased liquidity compared to unlabelled "brown" bonds, suggesting a greenium. This anomaly may reflect the additional due diligence required for green bond issuance, as well as the importance of issuer credibility. Institutional issuers, in particular, can attract investors willing to accept lower returns due to trust and perceived environmental impact. More recently, Panizza et al. (2025), using a dataset of 332 matched pairs of green and conventional sovereign bonds issued between 2014 and 2023, find a small but statistically significant greenium averaging around 2 basis points for advanced-economy issuers and up to 13 basis points for emerging-market sovereigns — though the authors note that even in the latter case, absolute savings remain economically modest.

The conditions under which a greenium materialises, however, appear to be highly context-dependent. Berdiev (2025), analysing Japan's primary corporate bond market between 2016 and 2023 through multivariate regression models, finds that yield differentials at issuance occur selectively — more frequently among firms recognised for strong

environmental performance. This underscores the centrality of issuer credibility and investor confidence in determining financial outcomes.

Bonds that fulfil all four ICMA Green Bond Principles components and have also been externally reviewed may exhibit a larger greenium, since obtaining an external review is costly and time-consuming for the issuer and therefore signals a stronger commitment to transparency (ECB, 2022). Caramichael and Rapp (2024) find that green bond issuers from common law countries reduce their greenium by 0.5 percentage points when they commission an external review, with assurances provided by Big Four auditing firms and external reviews by rating agencies significantly reducing the cost of green bonds relative to non-externally reviewed bonds

Similarly, Schroeders (2025) finds that carefully selected impact equities can generate positive abnormal returns, lower volatility, smaller drawdowns, and higher Sharpe ratios compared to broad market indices — though these results depend on rigorous impact selection processes and are subject to limitations including survivorship bias, sector concentration, and the inability to construct true point-in-time portfolios.

Taken together, multiple studies using regression analysis, propensity score matching, difference-in-differences, and panel analysis consistently find a greenium typically ranging from 1 to 63 basis points, with third-party certification, high-quality environmental disclosure, and frequent issuance associated with larger effects, as these factors reduce information asymmetry and greenwashing concerns (Liu & Hu, 2025). These findings suggest that superior financial performance is not an automatic consequence of the labelled bond designation, but rather emerges under specific conditions of credibility, rigour, and market context.

3.4 Sustainability Characteristics and Financial Performance

Beyond the greenium debate, broader evidence supports the financial relevance of sustainability characteristics. MSCI's 2024 study on the financial materiality (the degree to which ESG factors translate into measurable impacts on cash flows, risk, and valuation) of sustainability confirms that ESG factors provide information beyond traditional credit metrics. Higher-ESG-rated issuers exhibit lower option-adjusted spreads, stronger operating fundamentals — including profitability, competitiveness, and debt-servicing capacity — and

reduced systematic and idiosyncratic risk, even after controlling for credit quality, duration, and liquidity. The study identifies three channels through which sustainability risks influence credit performance: cash-flow resilience, systematic risk reduction, and firm-specific risk mitigation. While return differentials are generally modest, the evidence demonstrates that ESG characteristics materially affect credit pricing and risk, particularly in high-yield segments, reinforcing the value of ESG integration in fixed-income portfolios.

The credibility of labelled bonds depends heavily on adherence to established standards such as the International Capital Market Association (ICMA) Green Bond Principles, which outline expectations for use-of-proceeds transparency, project evaluation and selection, management of proceeds, and post-issuance reporting (ICMA, 2022). Despite these frameworks, implementation remains inconsistent. Variations in issuers' methodologies, external review practices, and reporting quality contribute to ongoing concerns regarding comparability and market integrity (OECD, 2023). Many issuers provide only limited disclosures or focus exclusively on allocation reporting, hindering investors' ability to assess actual environmental or social outcomes. Evidence suggests that the presence of a greenium depends critically on issuer credibility and robust impact reporting (UNDP, 2022).

Panizza et al. (2025) extend this critique through a novel analysis of bond documentation, finding that most sovereign green bonds do not embed binding commitments to measurable environmental outcomes. Rather, the "green" label tends to carry symbolic rather than legally enforceable value — a finding with direct implications for investors seeking genuine impact alongside financial returns.

In the sovereign and emerging market context, Scheer et al. (2025) review 68 sovereign green, social, and sustainability bond frameworks and find only moderate integration of just transition elements[2], with developing countries more likely to include social considerations. Standing (2023) further notes that while ESG-labelled bonds in the Global South raise significant funding, they carry risks related to debt sustainability, the credibility of impact claims, and the absence of a reliable greenium. The rapid growth of ESG-labelled issuance in vulnerable economies thus highlights the need for robust governance frameworks to ensure both developmental and financial integrity.

[2] The principle that the shift to a low-carbon economy should be equitable, protecting workers and communities most affected by the transition

The effectiveness of labelled bond markets is not solely a function of issuer conduct, as investor behaviour plays an equally important role. Saravade et al. (2025), using experimental choice scenarios, find that investors are more likely to be drawn to green bond instruments based on the label itself rather than the quality of impact reporting. This dynamic materially increases the risk of greenwashing behaviour on the part of issuers. The authors further highlight the role of pro-environmental preferences in shaping investment decisions, pushing back against an exclusively profit-maximising view of financial markets. Nevertheless, when experiment participants are presented with a choice between a green bond with stronger financial performance and one with stronger impact reporting, they consistently favour the former — reflecting innate loss aversion even among investors with stated altruistic tendencies. This tension between impact intent and financial self-interest reinforces the call for more stringent requirements for GSS+ label alignment to ensure market integrity.

Lehmann and Martins (2023) argue that sovereign green bonds, which focus on use-of-proceeds rather than outcomes, have limited capacity to influence climate policy or signal credible transition risk. They propose that sustainability-linked bonds (SLBs), which tie financial terms to measurable sustainability performance indicators, could provide more effective mechanisms - provided key performance indicators (KPIs) are transparent, verifiable, and enforceable. Tuhkanen (2020) similarly identifies challenges in financing adaptation projects through green bonds, citing low returns and underscoring the need for robust risk assessment frameworks to mobilise private investment.

In aggregate, the literature establishes that labelled bonds hold significant promise for channeling capital toward sustainability objectives, and that ESG characteristics can influence financial performance and risk profiles in meaningful ways. Empirical evidence demonstrates that impact-driven investment can enhance returns and reduce risk under the right conditions. However, the mere designation of a bond as "green" or "sustainable" seems insufficient to guarantee either genuine impact or superior financial performance. Effectiveness depends on adherence to robust standards, transparent and verifiable reporting, and rigorous due diligence by both issuers and investors.

3.5 Analytical Framework and Research Gap

A consistent gap emerges across the literature: while much attention has been paid to the existence and magnitude of the greenium as an aggregate phenomenon, relatively little work has examined which specific impact KPIs are most strongly associated with financial performance outcomes at the bond level. Existing studies tend either to assess financial performance without granular reference to impact indicators, or to evaluate impact quality without connecting it systematically to yield differentials or risk-adjusted returns. This study addresses that gap directly, examining the relationship between specific impact KPIs and financial performance across labelled bond categories, with particular attention to differences in standards across instrument types and the implications for investor decision-making.

4. Methodology

4.1 Sources of Data and Analytical Scope

This study draws on two primary data sources: the Luxembourg Green Exchange (LGX) for post-issuance sustainability disclosures and impact metrics, and Refinitiv for weekly financial market data. Together they provide the empirical foundation for a panel-based analysis of how impact reporting quality influences bond pricing across geographies and issuer types. The combination of granular issuer-level disclosures and high-frequency market pricing data allows for an unusually comprehensive treatment of the greenium question — one that moves beyond static cross-sectional comparisons to exploit the time-series variation in yields and spreads that weekly observations afford. The final sample comprises 300 unique labelled bonds observed weekly between January 2020 and January 2026, yielding 353,634 panel observations across 317 distinct weeks. Of the 300 bonds, 251 (83.7%) are green bonds and 49 (16.3%) are sustainability bonds; no transition or social-only bonds are included. Social bonds are excluded because their impact metrics — covering access to services, housing, and social beneficiaries — are not directly comparable to the environmental KPIs that form the core of the analytical framework.

Primary Data Source	Core Analytical Purpose	Rationale (Why)
Luxembourg Green Exchange (LGX) Data	Impact indicator construction and reporting quality assessment	Provides harmonised post-issuance sustainability disclosures, impact metrics, and credibility indicators required to quantify environmental and social performance at the bond level
Refinitiv	Financial performance and control variables	Supplies weekly yield to maturity (YTM) and credit spread observations, forming the core

		dependent variables and enabling a panel structure across bonds and time

Table 2: Overview of data sources.

4.2 Indicators and data

To assess the environmental and social performance of labelled bonds, this study uses issuer-reported impact indicators sourced from the Luxembourg Green Exchange (LGX), comprehensive repository of post-issuance sustainability disclosures currently available. LGX aggregates harmonised, self-reported impact metrics across green, social, sustainability, and sustainability-linked bond instruments, enabling systematic comparison across issuers and facilitating the quantification of realised sustainability outcomes at both the bond and issuer level. Critically, LGX data is collected on a bond-by-bond basis and linked to specific International Securities Identification Numbers (ISINs)s, making it directly joinable to financial market data pulled from Refinitiv on the same identifier.

Financial performance data, specifically weekly yield to maturity and credit spread observations, was sourced from Refinitiv. These two metrics serve as the study's primary dependent variables. Yield to Maturity (YTM) captures the total expected return to an investor holding the bond to maturity, incorporating both the coupon and any price discount or premium relative to par. Credit spread measures the yield differential over a risk-free or benchmark rate and is a more direct proxy for the market's assessment of issuer-specific risk, stripped of the macro interest rate component. Using both metrics is intentional: they capture complementary dimensions of pricing, and comparing their responses to impact indicators allows for a richer interpretation of the greenium phenomenon.

Their use as primary financial performance measures follows an established tradition in the empirical greenium literature. Panel regression frameworks that regress option-adjusted spreads on bond, issuer, and macro characteristics - with fixed effects for issuer, year, debt type, currency, and seniority - represent the dominant methodological approach in this field, with standard errors clustered at the bond level to account for serial correlation within bonds over time (ECB, 2022). The weekly frequency of the Refinitiv data is a material advantage

over studies relying on snapshot or annual observations, as it allows time fixed effects to absorb the substantial macro variation in interest rates - particularly important given that the sample period spans the 2020–2022 low-rate environment and the subsequent aggressive rate-hiking cycle.

All impact indicators were normalised by allocated bond proceeds, being expressed, for instance, as tonnes of carbon dioxide equivalent emissions (tCO_2e) avoided per EUR million allocated. This intensity-based approach ensures that comparisons reflect the efficiency of capital deployment rather than the absolute scale of an issuer's activities, which would mechanically favour larger institutions. The analysis focuses on a core set of impact metrics that are both consistently disclosed across a sufficiently large share of issuers and directly correspond to the environmental and social objectives most commonly targeted by labelled bonds. These include GHG reduction intensity (tCO_2e per EUR million allocated), renewable energy generation capacity (MW and GWh per EUR million), and energy savings from green building and energy efficiency projects (GWh per EUR million).

4.2.1.GHG Reduction Intensity

However, reporting coverage across these indicators is highly uneven, and this heterogeneity directly shaped the empirical strategy. The panel is structurally unbalanced: not all bonds report on all indicators, and the set of indicators disclosed varies systematically with bond type, issuer category, and geography. GHG reduction intensity is by far the most consistently reported metric, with non-null values for approximately 96% of bonds in the sample - reflecting both its centrality to green bond frameworks and the relatively standardised methodology for its calculation under the ICMA Harmonised Framework and GHG Protocol. Renewable energy generation metrics are available for roughly 54% of bonds, concentrated almost entirely among bonds with a primary allocation to renewable energy projects, where they are highly informative but structurally inapplicable to issuers focused on green buildings, clean transportation, or social outcomes. Energy savings figures are reported by approximately 74% of bonds, predominantly those with allocations to energy efficiency and green building categories.

This pattern of missing data is not random. It reflects the category-specific nature of impact reporting: a green building bond will report energy savings and emissions reductions per square metre but will not report renewable energy capacity installed, because no such

capacity exists within its project portfolio. Including these indicators simultaneously in a single regression would therefore impose listwise deletion - dropping any bond that does not report on every variable in the model - reducing the effective sample from several hundred bonds to a small fraction of that, biased toward multi-category issuers with broader reporting obligations. This selection problem would introduce precisely the kind of survivorship bias the normalisation procedure was designed to avoid.

For this reason, GHG reduction intensity serves as the primary impact indicator in the regression analysis. Its near-universal coverage preserves the maximum possible sample size, avoids inducing systematic selection, and ensures that the estimated relationship between impact performance and financial outcomes is identified from variation across the broadest and most representative cross-section of labelled bonds available. Renewable energy generation and energy savings metrics are retained in the exploratory and descriptive analysis - where they add meaningful context about the distribution of impact performance across bond categories and geographies - but are not included as simultaneous regressors in the main specifications.

4.3 Reporting Quality Assessment

Beyond the impact indicators themselves, the quality of post-issuance reporting is treated as a distinct, independently meaningful variable, and is likely the most novel contribution of the analytical framework deployed here. A bond may direct proceeds toward genuinely impactful projects yet communicate those outcomes poorly; conversely, a bond with marginal environmental impact may be supported by exemplary disclosure practices. Disentangling these two dimensions is essential to understanding what, precisely, the market rewards (cf. Caramichael and Rapp, 2024; ECB, 2022).

To operationalise reporting quality, this study constructs a composite Reporting Quality Score ranging from zero to six. The score is additive, with each of the following six binary criteria contributing one point:

1. **Dedicated impact report**: whether the issuer published a standalone post-issuance impact or allocation report, rather than embedding disclosures within a broader annual or sustainability report. Dedicated reports signal a deliberate commitment to transparency and are more accessible to bond-specific analysis by investors.

2. **External verification**: whether the post-issuance report was subject to any form of independent third-party review. The presence of external verification introduces accountability into the reporting process and reduces the risk of greenwashing by subjecting claimed outcomes to independent scrutiny.
3. **Reasonable assurance**: whether the external verification reached the higher standard of reasonable assurance, as opposed to the more common and less demanding limited assurance. This distinction is material: limited assurance requires the verifier only to conclude that nothing has come to their attention to suggest the information is incorrect, whereas reasonable assurance involves positive confirmation that the information is accurately stated - a substantially higher evidentiary bar.
4. **ICMA Harmonised Framework adherence**: whether the issuer explicitly aligns its impact reporting with the ICMA Harmonised Framework for Impact Reporting, and falls into the definition provided by the Luxembourg Green Exchange, which involves confirmations. Adherence to this framework promotes comparability across issuers and reduces the discretion available to issuers in how outcomes are presented and calculated.
5. **Category-level granularity**: whether the impact report disaggregates outcomes by use-of-proceeds category rather than reporting only at a global aggregated level. Category-level reporting allows investors to attribute performance to specific project types and assess whether the stated environmental or social objectives of each category are being met.
6. **Project-level granularity**: whether the report provides disclosure at the level of individual financed projects, representing the highest standard of transparency currently practised in the market. Project-level reporting is rare but highly informative, enabling investors to independently verify outcomes and assess the materiality of individual financing decisions.

The composite score is used in the regression analysis as a single ordinal regressor, and is also decomposed into its six individual components in a parallel specification. This decomposition is important because it tests whether the composite score's association with financial outcomes is driven by the market uniformly rewarding all dimensions of quality, or whether specific practices, such as external verification, ICMA adherence, or granularity, carry disproportionate weight.

It is worth noting two structural features of the dataset that bear on the interpretation of reporting quality. First, most bonds in the sample report on a cumulative rather than a yearly basis, meaning that stated impact figures represent the total outcomes achieved since issuance rather than annual flows. This is accounted for in the normalisation procedure but introduces some noise in cross-bond comparisons, particularly between recently issued bonds and those with longer track records. Second, reporting quality is measured at the bond level and is time-invariant within a given bond's panel observations - it does not update week to week. This feature has direct methodological implications: standard issuer fixed effects would absorb the reporting quality signal entirely, requiring the use of cross-sectional identification strategies that exploit variation between bonds rather than within them over time.

4.4 Model Specifications and Samples

The analysis estimates two sets of panel regression models across three samples - the full sample of 300 labelled bonds, a developed markets sub-sample, and a developing markets sub-sample - using two financial performance outcomes: yield to maturity (YTM) and credit spread. For each sample and outcome, two specifications are reported. The first is a pooled Ordinary Least Squares (OLS) model with issuer-clustered standard errors; the second augments this with week and country fixed effects (FE) estimated via within-group demeaning, absorbing unobserved time variance and country-level heterogeneity such as differences in monetary policy environment, regulatory frameworks, and domestic investor base composition.

Together, the week and country fixed effects address two of the most significant sources of confounding in bond pricing panels: the time-series variation driven by macroeconomic conditions and the structural cross-country differences in yield and spread levels that would otherwise bias the impact reporting coefficients (ECB, 2022). All specifications include controls for GHG reduction intensity, log issue size, issuer type (financials and Sovereigns, Supranationals and Agencies (SSA) relative to corporate), and a developing market dummy. Standard errors are clustered at the issuer level throughout. The full-sample YTM and credit spread regressions are estimated on 140,649 and 134,454 weekly observations respectively, spanning 155 and 142 issuer clusters across 314 and 313 weeks.

The baseline pooled OLS model takes the following form: (Equation 1)

$$Yi = \alpha + \beta 1RQi + \beta 2GHGi + \beta 3Xi + \varepsilon iYi = \alpha + \beta 1RQi + \beta 2GHGi + \beta 3Xi + \varepsilon i$$

where Yi is the mean financial outcome - either yield to maturity or credit spread - for bond i. RQ is the reporting quality measure of interest, either the composite score or individual elements; GHGi is the log-transformed GHG reduction intensity; Xi is a vector of bond-level controls including log issue size, issuer type dummies, and a developing market indicator; and εiεi is the error term with standard errors clustered at the issuer level.

The country and week fixed effects specification exploits the full panel structure: (Equation 2)

$$Yit = \beta 1RQ{\sim}i + \beta 2GHG{\sim}i + \beta 3X{\sim}i + \gamma t + \varepsilon itYit = \beta 1RQ{\sim}i + \beta 2GHG{\sim}i + \beta 3X{\sim}i + \gamma t + \varepsilon it$$

where Yit is the financial outcome for bond i in week t; and γt is a week fixed effect.

4.5 Qualitative element

The qualitative component of this research was made to complement and interpret the quantitative findings. While econometric models identify statistical relationships among impact indicators, especially reporting quality, and financial outcomes, they are limited in their ability to explain the underlying context, investor behavior, and market interpretations that drive these results. We explored *how investors interpret and price labelled bonds*. The interviews also had the intention of validating quantitative results and looking for angles to interpret them.

In order to understand the significance of the regressions, we questioned how institutional investors define their reporting mandates, how it is translated into a framework and finally how this plays alongside financial return in driving labelled bond demand. The role of investor preferences and credibility measures of reporting are material to inspect. The qualitative study, through the means of interviews, bridges this gap in real-world investment logic. It attempts to give the numbers institutional context drawn from active market participants.

7 semi-structured interviews were conducted with active practitioners across the labelled bond investment chain. The interviewees span portfolio management, impact analysis, bond structuring, and credit assessment. This coverage of the full investment process ensured that the use and interpretation of impact indicators, especially reporting

quality, could be traced from the point at which investor preferences are first accommodated into drafting frameworks to the final portfolio construction decision. The key themes were a) Investment Decision Drivers Financial Factors, b) Role of the Label Non-Financial Factors and c) Reporting Quality and Impact Credibility.

The semi-structure nature allowed for a wider range of exploration of how different market participants interpret labelled bonds. A tentative interview questionnaire was developed (available in the Appendix) and circulated to ensure the respondents had scope and time to cover key topics while also engaging in their individual perspectives. The questions were designed to move beyond surface-level responses and probe how labelled bond indicators are integrated into investment processes.

5. Empirical Results

5.1 Data characteristics

The sample is broadly diversified across issuer types, accounting for 130 corporate, 96 financial institutions, and 74 SSA issuers. It is evenly split (as a choice) between developed and developing market issuers, with 134 and 149 bonds respectively. Geographically, Asia accounts for the largest share of bonds at 126, followed by Europe at 70, with meaningful representation from Oceania (33), North America (30), South America (23), and Supranational issuers (17). China is the single largest country with 120 bonds, followed by Canada (30) and Australia (29).

The median issue size is EUR 300 million, the mean EUR 672 million, and the aggregate face value of bonds in the sample totals approximately EUR 201.7 billion. Financial pricing data is available for 276 bonds on YTM and 254 bonds on credit spread, representing 150,481 and 143,821 weekly observations respectively - the remainder have no Refinitiv pricing, reflecting likely illiquidity or the absence of secondary market trading.

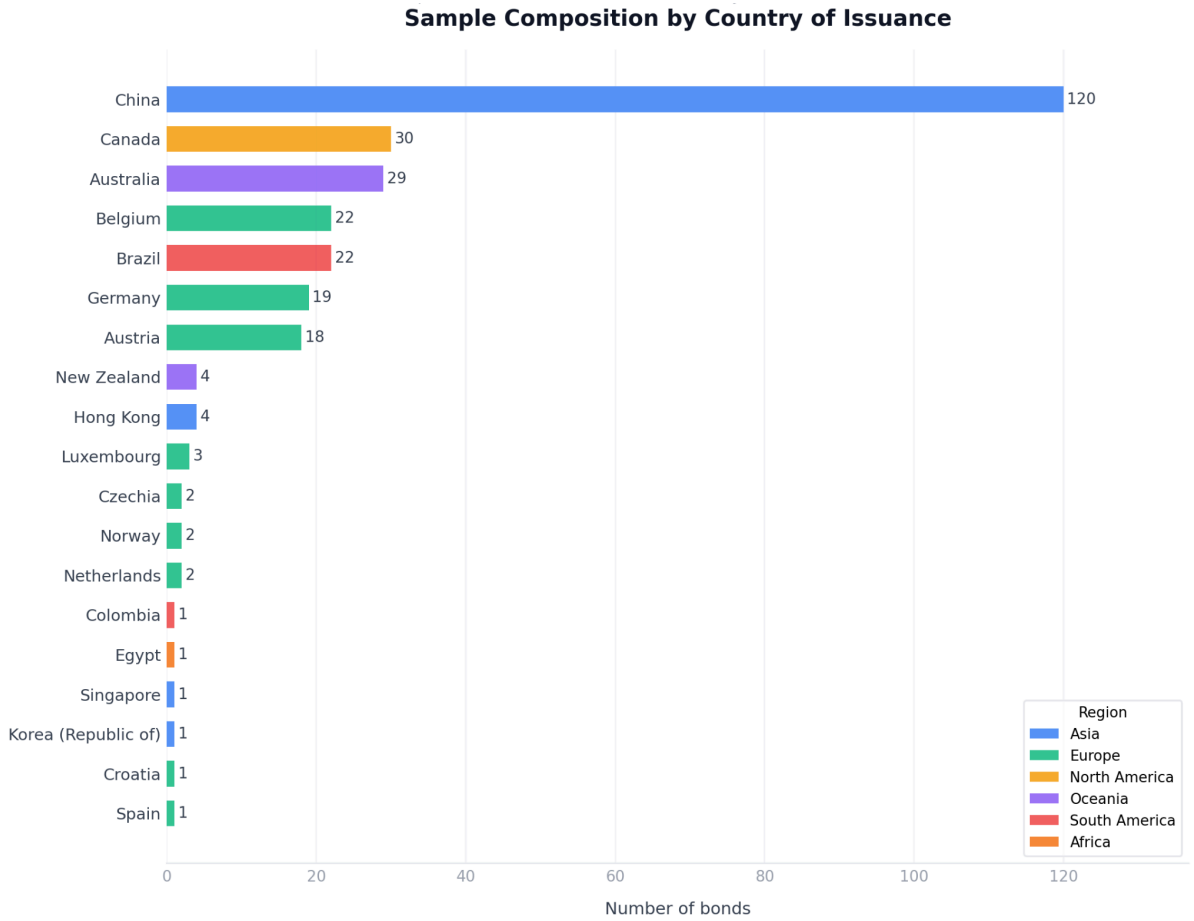


Figure 1: Sample Composition by Country of Issuance. Source: Authors' calculations using LXG (2000-2025) data.

The maturity profile of labelled bonds in the sample reflects both geographic and issuer-type characteristics. As shown in the figure the median tenor is approximately five years, though the distribution is right-skewed with a meaningful tail of longer-dated issuances extending beyond ten years. By issuer type, financials have the shortest median maturity at four years, reflecting the shorter-duration nature of covered bonds and financial institution funding instruments, while SSA and corporate issuers are broadly similar at five years, with wider dispersion suggesting greater diversity in programme structures. Maturity is not included as a regression control, but these distributional differences are relevant context for interpreting spread differentials across sub-samples.

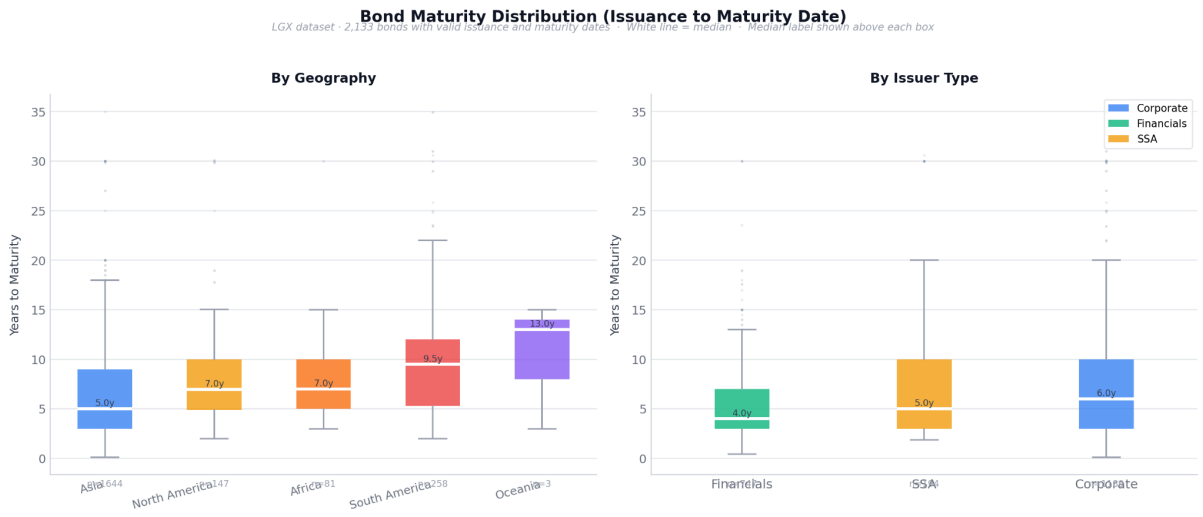


Figure 2: Bond Maturity Distribution. Source: Authors' own calculations based on LGX data (2020–2025).

As a first step to quantitative analysis, a correlation matrix was established between three impact KPIs: GHG reductions, energy savings, and renewable energy generation, each normalised per EUR million of proceeds, and two financial outcome variables, yield-to-maturity (YTM) and credit spread.

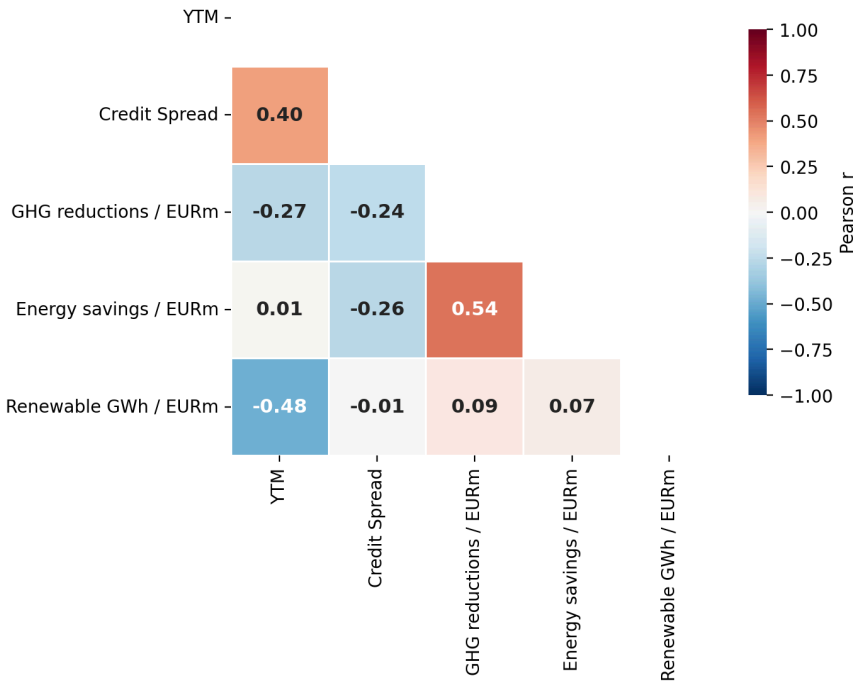


Figure 3: Impact KPIs correlation coefficients. Source: Authors' own calculations based on LGX and Refinitiv data (2020–2025).

The most notable finding is the moderate negative correlation between renewable GWh per EURm and YTM (r = -0.48), suggesting that bonds associated with higher renewable energy generation intensity tend to exhibit lower yields. This is consistent with the hypothesis that tangible, measurable environmental output is rewarded by investors in the form of a yield concession, lending empirical support to the greenium literature. GHG reductions per EURm show a weaker but directionally consistent negative relationship with both YTM (r = -0.27) and credit spread (r = -0.24), indicating that emissions reduction intensity is also associated, to a modest degree, with more favourable pricing.

Energy savings per EURm, by contrast, shows a near-zero correlation with YTM (r = 0.01) and a moderate negative relationship with credit spread (r = -0.26), suggesting that its financial relevance may be more pronounced in spread pricing than in absolute yield terms. The strong positive correlation between energy savings and GHG reductions (r = 0.54) reflects the expected co-movement between these two KPIs, as energy efficiency improvements typically produce both outcomes simultaneously, and warrants attention in subsequent multivariate analysis to avoid multicollinearity. The positive correlation between YTM and credit spread (r = 0.40) is expected and confirms that both variables capture related but not identical dimensions of financial risk pricing.

Taken together, these bivariate relationships provide preliminary evidence that renewable energy generation intensity is the impact KPI most consistently associated with financial performance, while energy savings and GHG reductions play a secondary and more nuanced role. These patterns motivate the multivariate analysis that follows, where confounding factors were controlled for together with GHG reduction intensity, the impact KPI present for most analysed bonds.

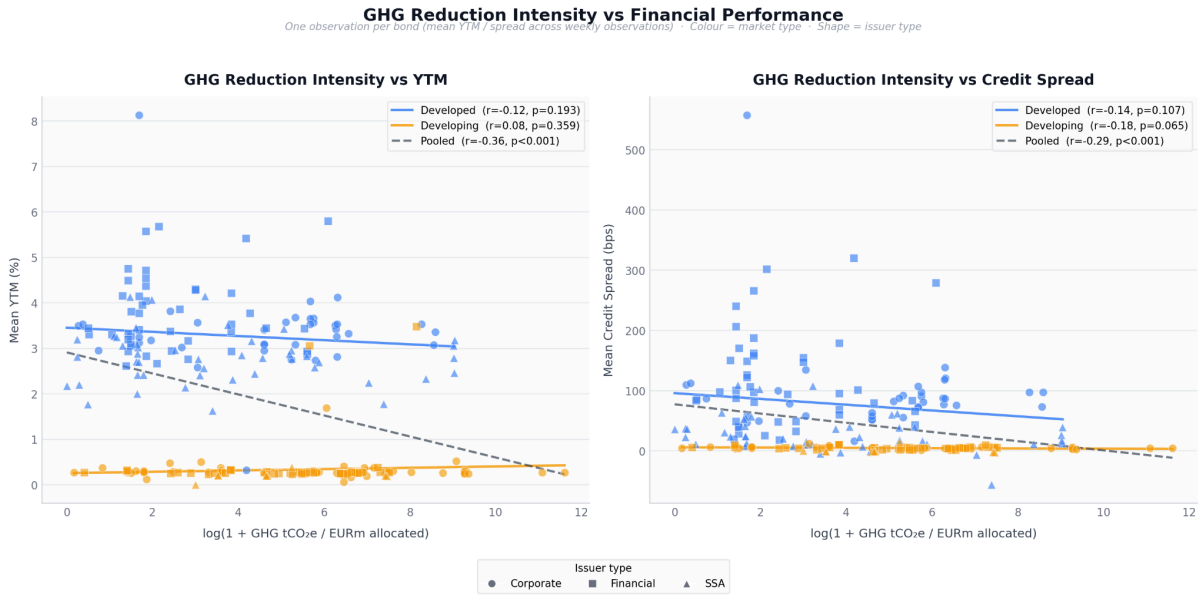


Figure 4: GHG reduction intensity vs. financial performance. Source: Authors' own calculations based on LGX and Refinitiv data (2020–2025).

5.2 Reporting quality and financial performance

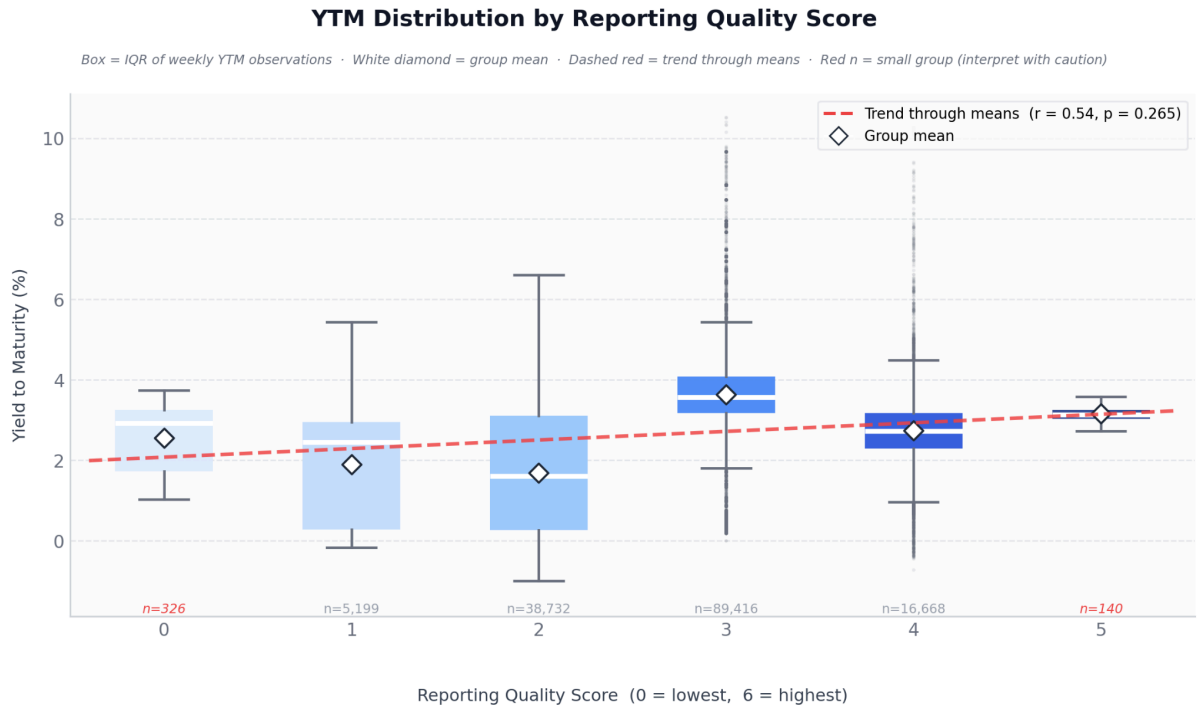


Figure 5: YTM distribution by Reporting Quality Score. Source: Authors' own calculations based on LGX and Refinitiv data (2020–2026).

The figure plots the distribution of weekly YTM observations across bonds grouped by their Reporting Quality Score, a composite index ranging from 0 to 6 that captures six dimensions of post-issuance impact reporting quality: whether the issuer published a dedicated report, obtained external verification, achieved reasonable assurance, adhered to the ICMA harmonised methodology, and reported at category and project level.

The raw distribution reveals a non-monotonic pattern: median YTM declines from score 1 to score 2, rises sharply at score 3 - which is the largest group, with 89,416 observations, composed predominantly of German mortgage-covered bonds - before falling again at score 4. This concentration at score 3 reflects a composition effect rather than a genuine relationship between reporting quality and pricing: score 3 bonds are disproportionately high-yield corporate issuers, inflating the group mean.

Scores 0 and 5 are represented by very few observations (326 and 140 respectively) and should be interpreted with caution. The trend line fitted through group means carries a positive slope ($r = +0.54$, $p = 0.265$), driven by the composition effect at score 3 described above rather than a genuine positive relationship between reporting quality and yield. The absence of statistical significance ($p = 0.265$) and the non-linearity in the raw data underscore the importance of controlling for issuer type, country, and macro timing in the regression analysis. There, the expected negative relationship emerges more cleanly.

5.3 Regression analysis

Tables 3 and 4 present results for the composite Reporting Quality Score (RQS), a six-point index capturing dedicated report issuance, external verification, reasonable assurance, ICMA methodology adherence, and category-level and project-level granularity.

Table 1 — Yield to Maturity: Composite Reporting Quality Score

Outcome: YTM (%). Controls: GHG intensity, issue size, issuer type, market type. Week FE + Country FE.

Variable	Full sample		Developed		Developing	
	OLS	*Country FE*	*OLS*	*Country FE*	*OLS*	*Country FE*
GHG intensity (log)	-0.007	-0.003	-0.012	0.004	0.007	0.003
	(0.036)	(0.039)	(0.054)	(0.057)	(0.005)	(0.003)
Reporting Quality Score	-0.173	-0.276	-0.226	-0.289	0.460*	0.158*
	(0.264)	(0.296)	(0.328)	(0.324)	(0.233)	(0.085)
External verification	0.325	0.421	0.283	0.298	0.048	0.060
	(0.434)	(0.453)	(0.641)	(0.605)	(0.138)	(0.071)
Financials (vs Corp.)	0.111	0.088	0.099	0.128	-0.023	-0.020
	(0.361)	(0.369)	(0.430)	(0.445)	(0.035)	(0.018)
SSA (vs Corp.)	-0.533***	-0.604***	-0.570*	-0.706**	-0.252	-0.115
	(0.165)	(0.213)	(0.309)	(0.305)	(0.168)	(0.070)
log(Issue size)	-0.144	-0.181	-0.150	-0.164	0.019	-0.017
	(0.145)	(0.152)	(0.194)	(0.189)	(0.038)	(0.014)
Developing market	-2.994***	0.000	-0.000	0.000	-0.352	-0.000
	(0.192)	(0.000)	(0.000)	(0.000)	(1.743)	(0.000)
Intercept	-0.106***	-0.110***	-0.110***	-0.110***	-0.004***	-0.004***
	(0.023)	(0.034)	(0.034)	(0.034)	(0.001)	(0.001)
N	140,649	137,071	121,840	121,840	15,200	15,200
R^2	0.719	0.512	0.526	0.539	0.461	0.353
Adj. R^2	0.718	0.511	0.525	0.538	0.451	0.341
Clusters	155	150	76	76	74	74
Week FE	314 wks	314 wks	314 wks	314 wks	275 wks	275 wks
Country FE	No	Yes	No	Yes	No	Yes

*Clustered SE at issuer level. *** p<0.01 ** p<0.05 * p<0.10 | Country FE via within-group demeaning*

Table 3: Regression results – Dependent variable: Yield to Maturity. Source: Authors' own calculations based on LGX and Refinitiv data (2020–2025).

Table 2 — Credit Spread: Composite Reporting Quality Score

Outcome: Credit Spread (bps). Controls: GHG intensity, issue size, issuer type, market type. Week FE + Country FE.

Variable	Full sample		Developed		Developing	
	OLS	*Country FE*	*OLS*	*Country FE*	*OLS*	*Country FE*
GHG intensity (log)	-1.850 (2.744)	-1.268 (3.098)	-2.261 (4.241)	-1.692 (4.233)	-0.099 (0.114)	-0.136 (0.098)
Reporting Quality Score	-16.032 (18.196)	-19.389 (20.326)	-14.913 (22.857)	-19.335 (22.299)	0.607 (0.872)	-0.418 (0.284)
External verification	29.969 (30.476)	30.872 (32.117)	19.810 (44.297)	18.925 (42.292)	-2.847 (2.216)	-0.291 (0.608)
Financials (vs Corp.)	-0.936 (30.343)	-1.684 (30.971)	-3.235 (36.543)	-3.086 (36.746)	0.669 (0.962)	0.697 (0.859)
SSA (vs Corp.)	-47.455*** (10.788)	-58.834*** (15.604)	-54.929** (20.791)	-70.387*** (22.325)	-2.200 (2.475)	-4.912*** (0.876)
log(Issue size)	-15.686* (9.062)	-12.998 (10.561)	-15.732 (12.221)	-11.213 (13.185)	-0.885** (0.416)	-0.841** (0.345)
Developing market	-73.112*** (15.399)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	13.713 (0.000)	0.000 (0.000)
Intercept	0.151 (0.273)	0.046 (0.391)	0.046 (0.392)	0.046 (0.392)	-0.364 (0.335)	-0.364 (0.335)
N	134,454	130,880	117,988	117,988	12,887	12,887
R^2	0.296	0.240	0.238	0.253	0.643	0.706
Adj. R^2	0.295	0.238	0.236	0.251	0.636	0.701
Clusters	142	137	76	76	60	60
Week FE	313 wks	313 wks	313 wks	313 wks	239 wks	239 wks
Country FE	No	Yes	No	Yes	No	Yes

*Clustered SE at issuer level. *** p<0.01 ** p<0.05 * p<0.10 | Country FE via within-group demeaning*

Table 4: Regression results – Dependent variable: Credit Spread.Source: Authors' own calculations based on LGX and Refinitiv data (2020–2025).

Across the full sample, the RQS carries a negative coefficient in both the OLS and country FE specifications for both outcomes, consistent with the hypothesis that higher reporting quality is associated with lower financing costs. For YTM the coefficient is −0.173 (OLS) and −0.276 (country FE), and for credit spread −16.0 bps (OLS) and −19.4 bps (country FE). However, none of these estimates reach conventional levels of statistical significance, with standard errors of 0.264–0.296 on YTM and 18.2–20.3 on credit spread. The direction of the relationship is stable across specifications but the signal is too diffuse across the heterogeneous full sample to identify precisely.

The developed market sub-sample tells a broadly similar story. RQS coefficients remain negative at −0.226 and −0.289 on YTM and −14.9 and −19.3 bps on credit spread, with slightly tighter standard errors reflecting the more homogeneous sample of 76 issuers. Again, neither outcome achieves significance. The one consistently significant variable in this sub-sample is the SSA issuer dummy, which is negative and significant at the 5% and 1% level across both outcomes — confirming that SSA bonds trade at meaningfully tighter

spreads (−54.9 to −70.4 bps) and lower yields (−0.57 to −0.71 pp) than corporate bonds, a finding driven by credit quality rather than impact reporting.

The developing market sub-sample produces the most striking result in the composite model. Here the RQS coefficient reverses sign and becomes statistically significant at the 10% level in both the OLS and country FE specifications for YTM, at +0.460 and +0.158 respectively, while remaining small and insignificant for credit spread. This positive association in developing markets is counterintuitive and should be interpreted carefully.

One plausible explanation is a composition effect, as the bonds in this sub-sample with higher reporting quality scores could be from investment grade corporates that also carry higher yields relative to the domestic risk-free rate in their markets. Reporting quality in this context may be proxying for issuer size and market access rather than capturing a genuine pricing premium for disclosure quality. Furthermore, the sample in the developing market is made up mostly of one country (China), which can distort the results. Even though this reflects actual issuance, purposefully balancing the sample could yield more substantial results.

Tables 5 and 6 decompose the composite score into its four active components - external verification, reasonable assurance, ICMA adherence, and category-level granularity - allowing identification of which specific practices drive the pricing relationship.

Two components of the six-point composite score are excluded from the decomposed specification: the dedicated report dummy and the project-level granularity dummy. The dedicated report indicator was excluded considering its small variance, as 99.5% of bonds in the priced sub-sample published a dedicated impact report, meaning the variable is effectively a constant. Project-level granularity is excluded for the same reason in the opposite direction: only 1.6% of bonds in the sub-sample report at project level, making the dummy too sparse to estimate a reliable coefficient and prone to being driven by a handful of outlier observations. Both components are retained in the composite score, where their contribution is appropriately weighted alongside the four active components, but they cannot be identified separately in the cross-sectional regression.

Table 3 — Yield to Maturity: Individual Reporting Quality Components

Outcome: YTM (%). Controls: GHG intensity, issue size, issuer type, market type. Week FE + Country FE.

Variable	Full sample		Developed		Developing	
	OLS	*Country FE*	*OLS*	*Country FE*	*OLS*	*Country FE*
External verification	0.208	0.176	-0.030	-0.046	0.011	0.055
	(0.213)	(0.216)	(0.301)	(0.261)	(0.066)	(0.065)
Reasonable assurance	0.121	0.167	0.268	0.080	1.276***	1.302***
	(0.314)	(0.404)	(0.411)	(0.468)	(0.080)	(0.117)
ICMA adherence	-0.446	-0.626	-0.535	-0.636	2.719***	0.000
	(0.456)	(0.464)	(0.517)	(0.481)	(0.070)	(0.000)
Category granularity	0.243*	0.176	0.359**	0.261*	0.044	0.022
	(0.126)	(0.162)	(0.179)	(0.154)	(0.033)	(0.025)
CONTROLS						
GHG intensity (log)	-0.010	-0.013	-0.017	-0.005	0.005	0.002
	(0.036)	(0.041)	(0.057)	(0.060)	(0.003)	(0.002)
log(Issue size)	-0.107	-0.102	-0.042	-0.045	0.005	-0.008
	(0.109)	(0.106)	(0.149)	(0.125)	(0.013)	(0.008)
Financials (vs Corp.)	0.145	0.113	0.149	0.168	0.000	-0.001
	(0.377)	(0.387)	(0.462)	(0.474)	(0.016)	(0.012)
SSA (vs Corp.)	-0.344	-0.474**	-0.479	-0.628**	-0.118*	-0.091**
	(0.226)	(0.233)	(0.325)	(0.299)	(0.066)	(0.040)
Developing market	-2.873***	-0.000	0.000	0.000	0.226	-0.000
	(0.148)	(0.000)	(0.000)	(0.000)	(0.365)	(0.000)
Intercept	-0.106***	-0.110***	-0.110***	-0.110***	-0.004***	-0.004***
	(0.023)	(0.034)	(0.034)	(0.034)	(0.001)	(0.001)
N	140,649	137,071	121,840	121,840	15,200	15,200
R^2	0.726	0.526	0.540	0.553	0.875	0.571
Adj. R^2	0.725	0.524	0.539	0.552	0.873	0.563
Clusters	155	150	76	76	74	74
Week FE	314 wks	314 wks	314 wks	314 wks	275 wks	275 wks
Country FE	No	Yes	No	Yes	No	Yes

*Clustered SE at issuer level. *** p<0.01 ** p<0.05 * p<0.10 | Country FE via within-group demeaning*

Table 5: Regression results – Dependent variable: Yield to Maturity. Decomposite RQS Source: Authors' own calculations based on LGX and Refinitiv data (2020–2025).

Table 4 — Credit Spread: Individual Reporting Quality Components

Outcome: Credit Spread (bps). Controls: GHG intensity, issue size, issuer type, market type. Week FE + Country FE.

Variable	Full sample		Developed		Developing	
	OLS	*Country FE*	*OLS*	*Country FE*	*OLS*	*Country FE*
External verification	16.056	13.531	0.723	-3.825	-2.240	-0.709
	(16.160)	(15.666)	(21.254)	(19.280)	(1.588)	(0.585)
Reasonable assurance	-8.547	4.858	6.570	8.445	0.000	-0.000
	(19.678)	(20.732)	(21.726)	(20.932)	(0.000)	(0.000)
ICMA adherence	-24.695	-35.623	-24.460	-36.675	-0.000	-0.000
	(35.352)	(35.389)	(41.348)	(36.816)	(0.000)	(0.000)
Category granularity	6.812	6.498	14.428	13.095	0.607	-0.418
	(7.757)	(8.520)	(11.381)	(8.322)	(0.872)	(0.284)
CONTROLS						
GHG intensity (log)	-1.879	-1.667	-2.138	-2.063	-0.099	-0.136
	(2.913)	(3.398)	(4.538)	(4.603)	(0.114)	(0.098)
log(Issue size)	-13.572*	-8.996	-11.079	-4.620	-0.885**	-0.841**
	(6.984)	(7.929)	(9.639)	(9.696)	(0.416)	(0.345)
Financials (vs Corp.)	0.659	-0.019	-0.222	-0.252	0.669	0.697
	(31.915)	(32.365)	(38.869)	(38.785)	(0.962)	(0.859)
SSA (vs Corp.)	-38.788**	-51.238***	-50.027**	-65.853***	-2.200	-4.912***
	(16.130)	(16.925)	(23.060)	(21.771)	(2.476)	(0.876)
Developing market	-66.121***	-0.000	-0.000	0.000	14.017	0.000
	(12.182)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	0.151	0.046	0.046	0.046	-0.364	-0.364
	(0.273)	(0.391)	(0.392)	(0.392)	(0.335)	(0.335)
N	134,454	130,880	117,988	117,988	12,887	12,887
R^2	0.298	0.248	0.242	0.263	0.643	0.706
Adj. R^2	0.296	0.246	0.240	0.261	0.636	0.701
Clusters	142	137	76	76	60	60
Week FE	313 wks	313 wks	313 wks	313 wks	239 wks	239 wks
Country FE	No	Yes	No	Yes	No	Yes

*Clustered SE at issuer level. *** p<0.01 ** p<0.05 * p<0.10 | Country FE via within-group demeaning*

Table 6: Regression results – Dependent variable: Credit Spread. Decomposite RQS Source: Authors' own calculations based on LGX and Refinitiv data (2020–2025).

Across the full sample, no individual component achieves significance for either YTM or credit spread, though the signs are informative. ICMA adherence carries the most consistently negative coefficient at −0.446 on YTM (OLS) and −24.7 bps on credit spread (OLS), directionally consistent with the hypothesis that alignment with a recognised methodological standard signals credibility to investors. External verification is positive across full-sample specifications. This is difficult to interpret causally and could reflect selection, with bonds subject to scrutiny tend to be those in riskier or more contested categories. Category granularity is positive and significant at 10% in the full-sample OLS YTM specification (+0.243), a result that also inverts expectations and warrants caution.

In the developed markets sub-sample, category granularity emerges as the most consistent significant predictor of YTM, positive and significant at the 5% level in OLS (+0.359) and at 10% in the country FE specification (+0.261). The positive sign again defies

the intuitive expectation and is likely a composition effect specific to the developed sample: bonds reporting at category level in this sub-sample include a concentration of German mortgage-covered bonds and Belgian financial institutions, which tend to carry higher yields relative to the sovereign than, for instance, SSA bonds which report less granularly.

For developing market reasonable assurance is positive and significant at the 1% level in both OLS and country FE specifications for YTM (+1.276 and +1.302), while ICMA adherence is large and positive in OLS (+2.719, $p<0.01$) but collapses to zero in the country FE model. The positive sign on reasonable assurance in developing markets reinforces the composition interpretation noted above: bonds achieving the higher verification standard in this sub-sample are not being rewarded by lower yields but rather are selected from issuers operating in higher-yield environments. The ICMA result collapsing entirely in the FE specification suggests it reflects between-country variation.

5.4 Across models

GHG reduction intensity, our primary impact indicator, carries a negative coefficient in every specification, directionally supporting the hypothesis that higher impact efficiency is associated with lower financing costs. However, it achieves statistical significance in none of the specifications, suggesting that while the direction is correct, the magnitude is too small relative to sampling noise and macro variation to identify robustly in this panel.

SSA bonds trade consistently and significantly tighter than corporate bonds across all full-sample and developed-market specifications. The country FE estimates for credit spread range from −51 to −70 bps ($p<0.01$), and for YTM from −0.47 to −0.71 pp ($p<0.01$ and $p<0.05$). This is the most robust and theoretically expected finding in the dataset: SSA issuers (sovereigns, supranationals, and quasi-sovereigns) carry implicit or explicit government backing that structurally reduces their credit risk relative to private sector issuers, independent of their impact reporting practices.

Issue size is negative throughout but only reaches significance in the credit spread specifications, particularly for developing markets where it is significant at the 5% level across both OLS and FE (−0.885 and −0.841). Larger bond programmes in developing markets appear to trade at tighter spreads, consistent with liquidity effects: larger, more

frequently traded bonds attract greater secondary market activity and narrower bid-ask spreads.

The developing market dummy is large and highly significant in OLS across all models - at approximately −3.0 pp on YTM and −66 to −73 bps on credit spread. It disappears entirely in the country FE specification as expected, since it is absorbed by the within-country demeaning. This confirms that the yield and spread difference between developing and developed market labelled bonds is big, but is a structural market phenomenon rather than attributable to reporting quality.

5.5 Bridging data and practitioners' views

The quantitative analysis establishes the relevance of reporting quality across pricing. The practitioner interviews were key to explain the mechanisms behind this. The interviews, along with literature about help ground the statistics in real-world investment logic that produced them. The central question they help answer is not whether reporting quality matters, but how and why it carries financial weight, and at what point in the investment process it does so.

Country and issuer-specific characteristics

Two structural points raised in the interviews bear directly on the regression design. First, currency risk was flagged as a material source of yield variation: practitioners cited a 150–200 basis point yield differential attributable purely to currency denomination within the LGX universe. This reinforces the importance of country fixed effects in absorbing cross-country pricing differences that would otherwise confound the reporting quality coefficients. Second, for sovereign issuers, practitioners cautioned against purely quantitative treatment, noting that sovereigns typically have superior disclosure capabilities and structurally distinct use-of-proceeds profiles compared to corporate issuers. This supports the analytical decision to include SSA as a separate issuer type dummy and points toward qualitative assessment as a necessary complement to the regression framework for this category.

Investor Preference and the Selection Process

An important insight from the interviews is that investor preferences do not enter the bond selection process at a single point - they are assessed, weighted, and acted upon differently by impact analysts, credit analysts, and portfolio managers, each of whom interrogates the same bond through a distinct lens. Understanding where reporting quality matters to each of these actors is essential to interpreting why it appears in pricing data at all.

Stage 1: Impact Analyst

Impact Analysts are responsible for assessing the sustainability and impact quality of a bond. A framework is built from investor preferences. Different priorities, mandates, and exclusion criteria are marked in the sustainability framework that translates those preferences into a practical screening tool. The baseline of every framework is alignment with ICMA principles. But ICMA is just the floor. A bond scoring highly on the composite index is precisely the kind of bond that passes the impact analyst's screen with confidence. Bond profile, issuer profile and third party reviews are important factors within the impact analysis.

Stage 2: Credit Analyst

Credit analysts are responsible for assessing the financial viability and risk profile of a bond. The bonds are screened based on their creditworthiness and return viability. Investor preference comes into play here primarily as sustainability, market orientation, and risk-appetite shape the frameworks followed by portfolio managers and credit analysts. The diversification benefits of labelled bonds, the share allotment, minimum return requirement, market orientation, investor risk appetite, sector wise return requirement, liquidity and credit spread limits are a few among the many requirements that translate to the pre-screening on labelled bonds.

Stage 3: Portfolio Manager

Portfolio manager receives the screened recommendations, applies investor preferences again in terms of portfolio-level constraints such as concentration limits, benchmark tracking requirements, and aggregate impact targets, and makes the final judgement on whether the greenium, the yield concession relative to a vanilla equivalent, is acceptable given the investor mandate. As one portfolio manager at a leading investment bank put it, the framework is ultimately trying to answer a crude but fundamental question:

'is sustainability justified?'. This question sums the tension at the heart of the quantitative findings: the market does not price reporting quality as a mechanical formula, but it does reward the kind of institutional credibility that strong reporting quality signals.

Reporting is an indication of management quality

Across all three stages, a consistent theme emerged: reporting quality is not a compliance exercise but a signal of management quality (interviews with impact analyst, credit analyst, and portfolio manager, April 2026). The depth of a sustainability framework, the rigour of a methodology, the willingness to commission and publish external verification are all interpreted by practitioners as indicators of how seriously an issuer takes its environmental commitments and, by extension, how reliably it will manage the risks associated with them. This framing is directly consistent with the regression finding that ICMA adherence and external verification carry the most consistently negative coefficients on pricing across specifications. They are precisely the dimensions that practitioners identified as markers of genuine institutional commitment.

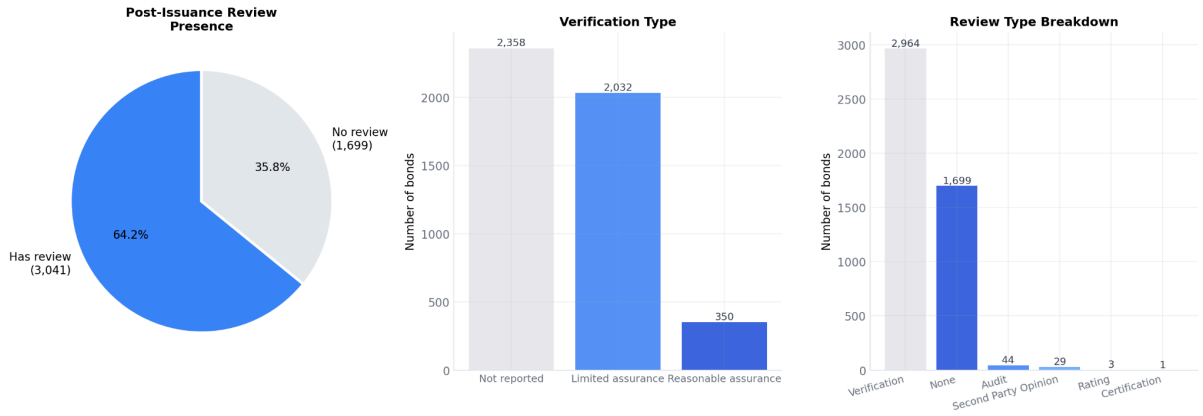


Figure 6: Post-issuance review. Source: Authors' own calculations based on LGX and Refinitiv data (2020–2026).

Credibility matters

Practitioners were explicit that third-party review headline matters less than the methodology and framing behind it (interviews with credit analyst and portfolio manager, April 2026). The wide range of verification types and styles to the quality of the review itself, as observed in the figure, leaves a lot of work to be done by impact managers and analysts. The analyst assesses whether the issuer sits within a credible, holistic sustainability story across multiple areas. The issuer is screened for sustainable operations, the communication

and marketing quality of the operations, transition plans, capital expenditure (capex) allocated to the transition, use of the debt funds, and if their methodologies are aligned with the sustainability framework and taxonomy. Independent reviews are assessed critically rather than accepted at face value. The practitioners also noted that while most bonds use the corporate and standardised rating like the MSCI, newer, upcoming bonds had their own sophisticated methodology of sustainability reports and scores.

Impact itself is a symptom, but not the only factor

Furthermore, interviewees confirmed that GHG reduction intensity is not a decisive selection factor. Its primary analytical value is as an indicator of the presence of proper reporting infrastructure - a bond reporting credible, benchmarked GHG metrics has almost certainly invested in disclosure quality more broadly. This is consistent with the regression results, in which GHG intensity carries a consistently negative but statistically insignificant coefficient. The market does not price GHG intensity directly; rather, it is a symptom of the reporting ecosystem around which it sits.

6. Discussion

The core finding of this study resists a simple greenium narrative. Across all specifications - pooled OLS, and country and week fixed effects - the results consistently indicate that the market does not price the magnitude of environmental impact directly. GHG reduction intensity, the most comprehensive and widely reported impact indicator in the dataset, carries a negative coefficient throughout but achieves statistical significance in none of the main specifications. This is consistent with the broader empirical record: recent research has increasingly focused on the greenness of both the bond and the issuer in bond pricing (Berdiev et al., 2025). What the market does appear to respond to, more consistently, is the existence of impact control: the institutional infrastructure around how impact is measured, reported, and independently verified.

This distinction is important. A bond that avoids large quantities of CO_2 per million euros allocated does not, on the evidence here, trade systematically tighter than one that avoids less. But a bond whose issuer has aligned its reporting with the ICMA Harmonised Framework, subjected its outcomes to independent verification, and disclosed at category level, in other words, a bond that has invested in the credibility of its sustainability narrative, does show a pricing advantage, particularly in the country fixed effects specification, where confounding structural factors are most rigorously absorbed. The market, to the extent it prices sustainability at all within the labelled universe, appears to reward standardisation and independent accountability rather than the volume or detail of disclosed environmental outcomes per se.

This finding is in line with the practitioner view expressed consistently across the seven interviews conducted. The general sentiment was that investor interest in labelled bonds reflects a balance of financial returns and mandate eligibility, and that within the impact dimension of that balance, credibility of the sustainability narrative matters as much as the label itself. Investors are not interested in the green label only; but in the institutional depth behind it.

The sequential logic of bond selection (as described in the results section) has a direct implication for interpreting the regression results. The absence of a statistically significant

reporting quality premium across the full sample does not mean the market is indifferent to disclosure quality. It may instead reflect that reporting quality operates primarily as a screening threshold rather than a continuous pricing variable. Bonds that fail the impact analyst's screen are excluded from mandated portfolios before financial analysis begins; among those that pass, financial fundamentals dominate. The regression, estimated on the universe of bonds that have already survived a first filter, in order to be included in the Luxembourg Green Exchange Platform (even though not all bonds are in the Green Exchange itself), is therefore identifying variation within a pre-screened set - a setting in which the marginal pricing effect of additional reporting quality is naturally weakened.

In the case of ICMA-adherence, for example, achieving the classification on the Luxembourg Green Exchange is a substantive process, not a self-certification exercise. While ICMA's principles function as industry best practices, LGX makes them a mandatory requirement (LuxSE, 2017), elevating voluntary disclosure standards into binding eligibility conditions. An issuer must first be listed on one of LuxSE's regulated markets before it can apply for display on the platform, and must obtain an independent external review — typically a Second Party Opinion — confirming alignment with the applicable ICMA principles across all four core components (LuxSE, n.d.). Self-declaration is not sufficient. Post-issuance, obligations continue: annual allocation reports are required until maturity or full allocation of proceeds, KPI performance must be independently verified for sustainability-linked bonds, and LuxSE reserves the right to withdraw a security for non-compliance (LuxSE, n.d.; LuxSE, 2016). ICMA adherence under LGX therefore demands documented intent, third-party validation, and continuous disclosure.

Investors who can obtain and verify project-level impact data, which is the absolute minority in the bond universe, as noted in the figure, are receiving something meaningfully different from investors holding bonds that merely claim a green category. The yield concession they extend in return is a rational response to reduced information risk. A bond whose impact claims are granular, verifiable, and independently assessed carries less greenwashing risk, less reputational risk, and potentially less long-term transition risk than one that cannot make equivalent claims. The granularity gap between the best and worst reporters in the labelled universe is therefore a genuine source of financial differentiation - one that the current regression framework captures imperfectly due to composition effects, but which the qualitative evidence confirms as economically meaningful.

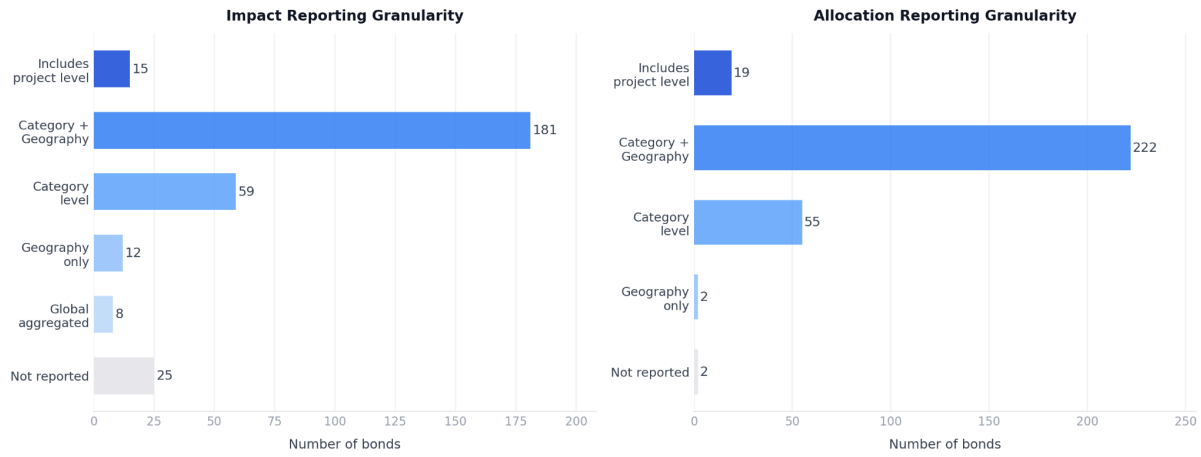


Figure 7: Impact reporting granularity. Source: Authors' own calculations based on LGX data (2020–2025).

A critical qualification on all the above is that the relationship between reporting quality and financial performance is almost certainly not static. Evidence from comparable equity market research demonstrates that the financial effect of environmental disclosure quality is concentrated in the early years following the introduction of reporting standards, after which the relationship stabilises and in some dimensions reverses as markets absorb and normalise the information (Khanchel and Lassoued, 2022).

The labelled bond market is likely subject to the same dynamic. The directional negative relationship between reporting quality and yield identified in this study may reflect the current early-adoption phase of impact disclosure standards — a period in which high-quality reporting meaningfully differentiates bonds and issuers in ways that markets reward precisely because the differentials are still wide. As ICMA principles become more universally adopted, the marginal financial value of superior reporting quality is likely to compress. What functions as a differentiating signal today may become table stakes tomorrow.

This has direct practical implications. The reporting quality premium identified here should not be treated as a structural feature of the labelled bond market but as a time-sensitive signal whose strength will likely reduce as the market matures and disclosure floors rise. For investors, this suggests that the window for extracting yield advantage through superior identification of reporting quality may be limited - and that the more durable advantage lies in the selection and engagement capabilities built around impact assessment, rather than in the pricing differential itself.

7. Limitations

While this research employs a mixed-methods approach combining panel econometrics with practitioner interviews, several inherent limitations must be acknowledged. These do not invalidate the findings but bound the confidence with which they can be generalised.

First, endogeneity and selection bias remain big challenges. Issuers with superior financial health and governance are more likely to pursue green certifications making it difficult to isolate whether the label causes the performance or simply reflects the existing quality of said firm. This creates a selection problem: the reporting quality premium identified in this study may partly reflect the underlying quality of the issuer rather than a causal effect of disclosure practices on pricing.

Furthermore, Refinitiv pricing data is available for only 276 of the 300 bonds on YTM and 254 on credit spread, with the remainder having no secondary market pricing. These gaps are not random - bonds without pricing data are typically smaller, less liquid instruments issued in domestic markets with limited secondary market activity. The regression sample is therefore biased toward larger, more actively traded bonds, which are also more likely to be held by institutional investors with sophisticated reporting quality screening processes.

Furthermore, the representation of the labelled bonds market is still reduced, and substantial limitations exist in terms of access to consistent data across all relevant metrics. This translates into the tremendous data heterogeneity encountered in the quantitative aspect of this work. One of the biases is also the overrepresentation of data from China, which is 120 out of 300 bond selection (40%). The sub-sample of developing countries should therefore be interpreted with particular caution, as it may reflect China-specific composition effects rather than a generalised relationship.

Expanded data access could further benefit future studies by allowing for samples more comprehensive of all different markets and with expanded financial indicators. Impact metrics sourced from the Luxembourg Green Exchange are self-reported by issuers, vary substantially in methodology and granularity, and are not subject to standardised calculation requirements across all categories.

The qualitative component was conducted through seven semi-structured interviews with practitioners across the sustainable fixed income ecosystem. While the interviews provided

rich and directionally consistent insights, seven participants is a limited sample that cannot claim to be representative of the full diversity of investment approaches, mandate structures, and geographic contexts present in the labelled bond market. Participants were drawn primarily from impact-oriented asset managers and banks, which may have introduced a selection bias toward more sophisticated and systematic approaches to impact assessment than would be found in the broader investor community. Furthermore, the interviews were conducted at a single point in time and do not capture how practitioner views and investment processes may evolve as the market matures and regulatory frameworks tighten.

Lastly, the regression analysis is conducted entirely within the labelled bond universe and does not compare labelled bonds to matched conventional equivalents. This means the study cannot directly estimate a greenium in the traditional sense. The research question is instead about variation in pricing within the labelled universe, which is a meaningful and underexplored question but is distinct from the greenium literature's central concern. This is an avenue for future research that could more clearly establish the role of impact in driving financial performance. Readers should be careful not to conflate the reporting quality associations identified here with evidence about the greenium as typically defined.

8. Final Considerations

Four structural features of the labelled bond market emerge from the combined quantitative and qualitative evidence as relevant context for the findings:

1. **Investor preference matters**

Investor preference is the ‘invisible hand’ of the labelled bond market (cf. Section 4.5). The preference is not only financial, even if heavily influenced by it, but also driven by pro-environmental behaviour. Issuers who understand and respond to these preferences through robust frameworks, credible transition stories, and high-quality impact reporting are rewarded with stronger demand and a measurable reduction in their cost of capital.

2. **Labelled bonds still have a reduced market share**

Despite the rapid growth of the labelled bond market over the past decade (cf. Section 4.1), labelled instruments remain a relatively small share of overall fixed income markets. This limited market share has direct implications for investors. The pool of investable labelled bonds that simultaneously meet credit quality thresholds, liquidity requirements, impact credibility standards, and mandate constraints is considerably smaller than the equivalent vanilla universe. This structural scarcity contributes to the greenium but it also creates portfolio construction challenges, particularly for larger funds that require benchmark-sized positions and cannot absorb the liquidity risk of smaller issuances.

3. **Traditional drivers still dominate choice**

Despite the growth of pro-environmental investor behaviour, the practitioner interviews from portfolio and investment managers especially were clear to indicate one point: traditional financial drivers remain the primary determinant of bond selection. Yield, credit quality, liquidity, duration, and currency alignment are assessed first. Sustainability credentials are layered on top, and they can differentiate between otherwise comparable bonds. In a mandate-constrained portfolio they add to the decision-making process, but they do not override the financial fundamentals. As one of the interviewees noted, only a small segment of the market, estimated at around 5–10% of bond funds, operates under mandates strict enough to require labelled bonds regardless of yield. For the remainder, sustainability might be a preference, but not an absolute constraint

4. **Transparency is key**

The evidence suggests that reporting quality actively shapes financing costs (cf. Sections 4.2 and 4.3). Bonds that invest in credible, independently verified, and methodologically rigorous disclosure are associated with lower yields and tighter spreads. This relationship operates through two reinforcing channels: reduced information asymmetry, which lowers the risk premium investors require, and a credibility signal that differentiates the issuer within an increasingly crowded labelled universe. For issuers, this means that investment in reporting infrastructure is not a compliance cost but a capital markets investment - one that compounds over repeated issuances and across the broader debt programme

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Appendix 1

Glossary

Basis Point (bp/bps): One hundredth of one percentage point (0.01%). Used to express differences in bond yields and credit spreads.

Credit Spread: The yield differential between a bond and a benchmark risk-free rate (e.g. a government bond of equivalent maturity). Measures the market's assessment of issuer-specific credit risk.

Fixed Effects (FE): A regression technique that controls for unobserved time-invariant or entity-invariant characteristics by demeaning the data within groups (e.g. within-country or within-week).

Greenium: The yield concession — typically expressed in basis points — that investors accept for holding a green or labelled bond relative to an otherwise equivalent conventional bond.

GHG Reduction Intensity: Greenhouse gas emissions avoided (measured in tCO_2e) per EUR million of bond proceeds allocated, used as a normalised impact efficiency metric.

GSS+ Bonds: Green, Social, Sustainability, and Sustainability-Linked bonds. A collective term for the labelled bond universe.

ICMA: International Capital Market Association. The body that publishes the Green Bond Principles, Social Bond Principles, and Sustainability Bond Guidelines that form the voluntary standard for labelled bond issuance.

ISIN: International Securities Identification Number. A 12-character alphanumeric code that uniquely identifies a security globally.

KPI: Key Performance Indicator. A quantifiable metric used to evaluate the achievement of a specific objective — in this context, environmental or social impact targets.

Labelled Bond: A bond instrument that earmarks its use of proceeds for specific environmental, social, or sustainability objectives, and that carries a label (e.g. “green”, “social”, “sustainability”) reflecting this designation.

LGX: Luxembourg Green Exchange. One of the world’s largest dedicated sustainable securities platforms, providing harmonised post-issuance impact disclosures used as the primary data source in this study.

OLS: Ordinary Least Squares. A standard regression method that estimates model parameters by minimising the sum of squared residuals.

Option-Adjusted Spread (OAS): A credit spread measure that accounts for any embedded options in a bond (e.g. call provisions), providing a cleaner comparison across instruments with different structural features.

Panel Data: A dataset that tracks multiple entities (here: bonds) over multiple time periods (here: weekly), enabling both cross-sectional and time-series analysis.

Reporting Quality Score (RQS): A composite index (0–6) constructed in this study to quantify the rigour of post-issuance impact reporting, based on six binary criteria: dedicated report, external verification, reasonable assurance, ICMA framework adherence, category-level granularity, and project-level granularity.

Reasonable Assurance: The higher of two external verification standards (vs. limited assurance). Requires the verifier to positively confirm that stated impact outcomes are accurately reported, rather than merely finding no evidence of error.

SSA: Sovereigns, Supranationals, and Agencies. A bond issuer classification covering government entities, multilateral development banks, and state-backed agencies.

tCO_2e: Tonnes of CO_2 equivalent. A standardised unit for expressing the global warming potential of greenhouse gas emissions, converting all gases to their CO_2 equivalent.

YTM: Yield to Maturity. The total annualised return an investor earns if the bond is held until maturity, incorporating both coupon payments and any capital gain or loss relative to the purchase price.

List of questions for semi-structured interviews, in no particular order or category, with impact analysts, credit analysts and portfolio/ investment managers:

What are the kinds of weights assigned to different indicators?

Is contribution to SDGs an indicator that has proven effective? What is their framework?

How much yield difference than its vanilla equivalent (greenium %) would you be willing to accept for a green bond?

In your experience, what drives pricing differences within labelled bonds?

Have you realised significant motivation factors behind investors who choose labelled bonds instead of their comparable vanilla bonds?

Do you adjust credit risk models for labelled vs non-labelled bonds?

How are bond-level attributes (currency, maturity, coupon type, issuer sector, geography) standardized across issuers? For investment in sovereign bonds, where do these bonds fall?

How do you choose the issuer type while screening investments?

When you evaluate labelled bonds, at what stage of your investment process does the sustainability label matter? Is it part of the initial screening, the credit analysis, or mainly a portfolio allocation decision?

Do you look at how material the financed projects are relative to the issuer's overall activities?

Does the scale or strategic importance of the project influence your investment decision?

What kinds of impact indicators are most consistently reported (e.g., CO_2 avoided, renewable capacity added, social beneficiaries)?

How much do you rely on external reviews or second-party opinions when assessing a labelled bond? How do these reviews translate into your perception of risk?