UNIVERSIDADE CATÓLICA PORTUGUESA

# The Pricing of Sustainable Asset Securitisation Bonds

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By

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# Resumo

A emissão de Sustainable Securities (Green, Social e Sustainability) introduziu uma nova área de estudo, caracterizada pela associação de instrumentos financeiros e de financiamento a projetos promotores de benefícios ambientais e/ou sociais relevantes. Nesta categoria de títulos sustentáveis incluem-se, entre outros, os títulos verdes garantidos por ativos (ABS) e os títulos verdes garantidos por hipotecas (MBS).

A crescente importância dos ativos financeiros sustentáveis surge num mercado ainda marcado por desafios relevantes, nomeadamente a falta de normalização, a ausência de harmonização regulamentar e a limitada transparência na definição do que se qualifica como "sustentável". Estas questões contribuem e potenciam riscos como o greenwashing, agravando problemas de assimetria de informação, limitando a eficiência dos mercados financeiros sustentáveis.

Neste contexto, esta dissertação propõe-se investigar a existência de um efeito de greenium, que se carateriza por um spread inferior nas obrigações sustentáveis quando comparadas com obrigações convencionais. Apesar de existirem inúmeros estudos que analisam a existência de greenium nas green bonds tradicionais, verifica-se uma lacuna literária no que diz respeito às obrigações colateralizadas por ativos (securitisation bonds). Desta forma, este trabalho contribui para o preenchimento desta lacuna literária, ao efetuar uma análise comparativa dos spreads de asset-backed securities (ABS) e mortgage-backed securities (MBS) sustentáveis versus aquelas que não têm por objetivo financiar os projetos ESG, avaliando ainda o impacto de variáveis clássicas de risco de crédito, bem como o efeito do período da pandemia COVID-19 nos spreads.

Tendo por base dados extraídos da DCM Analytics, foi possível concluir que apenas as ABS e MBS com rótulo verde e social apresentam consistentemente spreads significativamente mais baixos. No entanto, este efeito desaparece quando se utiliza uma amostra emparelhada, o que sugere que o greenium poderá estar relacionado a outras características dos títulos e não unicamente ao rótulo sustentável. Por outro lado, não existem diferenças significativas nos spreads entre securities colateralizadas por empréstimos de sustentabilidade. Adicionalmente, os fatores tradicionais de risco de crédito, como os ratings, mantêm-se determinantes na formação dos spreads, enquanto o impacto do rating discordance se verifica apenas nos instrumentos convencionais. Por fim, durante o período da COVID-19, o greenium associado às green securities, em alguns modelos da amostra total, enfraquece e desaparece na matched sample, indicando que o efeito poderá não refletir uma preferência robusta destes ativos pelos investidores em momentos de relativa incerteza elevada.

Palavras-chaves: Sustainable Securitisation; Greenium; Spread; ABS; MBS; COVID-19

# Abstract

The issue of Sustainable Securities (Green, Social and Sustainability) has introduced a new area of study, which is characterised by the issuance of financial instruments that fund projects that promote significant environmental and social benefits. This category of securities includes sustainable asset-backed securities (ABS) and sustainable mortgage-backed securities (MBS).

Their growing importance is associated with a market that faces challenges due to a lack of standardisation, regulatory harmonization, and transparency in defining what qualifies as "sustainable". These issues contribute to limiting the effectiveness of sustainable financial markets by instigating risks such as greenwashing and information asymmetry.

This work therefore sets out to investigate the existence of greenium in this type of instrument, which is characterised by a lower return on sustainable securities when compared to conventional securities. Extant literature is extensive, namely in the study of this phenomena for conventional green bonds. However, the literature analysing this effect for ABS and MBS sustainable bonds is non-existent. To fill this gap in the literature, this work conducts a comparative analysis of the credit spreads of sustainable ABS and MBS to their conventional equivalents and, consequently, to check whether variables related to credit risk are determining factors in the spreads of these securities, and if the COVID-19 pandemic affected both pricing and greenium.

By extracting ABS and MBS from DCM Analytics, results show that only green and social-labelled securities consistently have significantly lower spreads. However, this effect disappears in a matched sample, emphasizing that potential securities characteristics affect more greenium. On the other hand, sustainability labels show no statistically significant differences in prices. In addition, credit ratings continue to influence spreads across segments, while the impact of rating discordance is limited to conventional securities. Finally, during the COVID-19 period, the greenium effect associated with green securities weakens in the full sample and dissolves in the matched sample, indicating that investor preference for green assets may not persist under higher uncertainty.

Keywords: Sustainable Securitisation; Greenium; Spread; ABS; MBS; COVID-19

Number of words: 9998

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# 1. Introduction

The growing urgency of aligning financial markets with environmental, social, and governance (ESG) goals has driven innovation in the capital markets, through the development of sustainable financial instruments (Cusano et al., 2024). Asset securitisation, when aligned with ESG principles, has emerged as a contemporary instrument in the green economic transition, offering financial institutions a transformative mechanism for raising funds and financing sustainable projects on a large scale (Agliardi, 2022). Sustainable securities help diversify portfolios, reduce systemic risk, and expand credit for sustainable projects, developing a more inclusive financial ecosystem aligned with global sustainable development goals (Jobst, 2007; DeMarzo, 1997; Climate Bond Initiative, 2018; Schmittmann & Gao, 2022; Agliardi, 2022).

Cusano et al. (2024) and Flammer (2021) highlight the securitisation's role in mobilising capital for key areas such as renewable energy and green infrastructure. Integrating ESG criteria into asset-backed (ABS) and mortgage-backed securities (MBS) develops a market where sustainable instruments can benefit from reduced spreads (Agliardi, 2022). The perceived lower risk of these sustainable instruments and investors' growing preference for investments that incorporate ESG objectives may reflect the greenium effect (Riedl & Smeets, 2017; Cusano et al., 2024; Schmittmann & Gao, 2022). This idea that investors may accept lower returns for investments aligned with sustainability goals is emphasised by Baker et al. (2018) and Flammer (2021).

However, the magnitude and consistency of greenium can vary and be influenced by factors like external certification and market conditions (Li et al., 2024) and structural variables, which include subordination, maturity, credit quality determined by credit agencies and collateral characteristics that impact the spread of ABS and MBS (Zerbib, 2019; Fatica et al., 2021; Pinto & Ribeiro, 2024; He et al., 2012).

Although concerns like greenwashing are mitigated with credible external certifications but still affect investor confidence and pricing (Li et al., 2024). As Pinto & Ribeiro (2024) and Löffler et al. (2021) note, contextual factors like market volatility have a considerable impact on the risk perception and return of these instruments. Therefore, even though different ESG assessments by specialised agencies can prevent the real capture of risk and the determination of the true return, the credibility and consistency of the ratings remain crucial (Gibson et al., 2021; Avramov et al., 2021; Christensen et al., 2022).

Evidence shows the importance of studying credit risk and green securities' spreads, since the disagreement between ratings and the lack of standardisation in ESG classification can hinder their pricing (Marques & Pinto, 2020; Gabbi & Sironi, 2005; Elton et al., 2001).

Given this lack of standardisation, as Petit & Schlosser (2020) point out, it's essential to implement regulations aimed at issuing green instruments to mitigate the risks arising from information asymmetry and greenwashing, which obstructs comparability between different ESG assets and limits the development and scalability of the market (Schmittman & Gao, 2022; Baker et al., 2022). However, as Cusano et al. (2024) mention, regulations such as the EU Green Bond Standard define the principle of 'use of proceeds' as a common European label for green instruments, and this definition increases transparency and credibility. Thus, with greater rigour in disclosure requirements, it is possible to reduce concerns about greenwashing and, consequently, encourage the issue of these new assets with lower capital costs for issuers (Cusano et al., 2024).

Despite regulatory advances, the sustainable securitisation market still faces significant challenges, especially related to the lack of data on private issuances (Li et al., 2024). In addition, the demand growth for sustainable securities increases the complexity of these instruments, which may require more sophisticated methodologies to assess their risks and returns (Cusano et al., 2024; Li et al., 2024).

The COVID-19 pandemic has been characterised by intensified interest for sustainable instruments. Perote et al. (2023) demonstrate that green instruments, in the face of economic uncertainty, have shown resilience, and Garel & Petit-Romec (2021) report that companies with high environmental scores have shown superior performance during the crisis. However, research on the specific performance of sustainable ABS and MBS during the pandemic is rather limited and even non-existent, compared to conventional green bonds. For green bonds, Giovanardi et al. (2023) found evidence of a significant greenium and greater liquidity during this period of pandemic crisis. This result suggests that investors' demand for sustainability may influence the formation of sustainable securities spreads, even if banks seem to prefer securitising less sustainable loans (Cusano et al., 2024). Global climate agenda and institutional commitments to the transition to a low-carbon economy have accelerated the growth of ESG asset securitisation (Garel & Petit-Romec, 2021; Agliardi, 2022).

On the global scene, this sustainability growing relevance has motivated expanding research, but mainly focused on debt instruments such as conventional green bonds (Cusano et al., 2024; Liberati & Marinelli, 2022). In contrast, research into green securitisation remains scarce (Agliardi, 2022; Müller et al., 2022). Specifically, during the research, no study was identified that carried out a comparative analysis of the spreads of sustainable (green, social, and sustainability) ABS and MBS compared to their conventional equivalents. This work is therefore motivated by the intention to fill this gap in the literature by analysing the asset securitisation market and the weight of sustainable operations. In addition, given the challenge posed by the lack of standardisation and detailed data on green securities, as pointed out by Cusano et al. (2024), this thesis aims to complement the scarcity of data through comparative spread analyses and an assessment of the role of sustainable operations in corporate financing.

Accordingly, this dissertation addresses three research questions: (i) whether sustainable (green, social and sustainability) ABS and MBS exhibit lower issuance spreads than comparable conventional instruments; (ii) the extent to which traditional credit risk factors, including tranche rating and rating discordance, influence the pricing of these securities; and (iii) whether the green premium became more pronounced during the COVID-19 period.

Using a dataset spanning from 2014 to 2024 and with a sample of 154 sustainable ABS and MBS securities and 40,468 conventional ABS and MBS, this work tests three key hypotheses. Hypothesis 1 (H1) posits that sustainable securities have lower spreads than conventional securities, reflecting the existence of a greenium driven by investor preference and regulatory incentives. Hypothesis 2 (H2) is confirmed for green securities, as higher credit ratings are linked to lower spreads. However, rating discordance is not significant in this segment, suggesting limited investor sensitivity to rating disagreement in green-labelled instruments**.** The last hypothesis (H3) relates to the sustainable securities premium that was higher in the COVID-19 pandemic when compared to other periods.

Results show that only green and social-labelled securities exhibit significantly lower spreads, while sustainability labels show no consistent pricing advantage. However, this effect evaporates in the matched sample. H2 is confirmed for green securities, with lower spreads for higher ratings. Rating discordance is only significant for conventional. Regarding H3, the green premium weakens in the full sample during the COVID-19 period and disappears entirely in the matched sample, suggesting that under conditions of market stress, investors don’t shift towards environmental sustainability.

This work is organized as follows. Chapter 2 reviews the literature, structured into three main sections: asset securitization, ESG financing, and sustainable securities, spread determinants, and COVID-19 effects. Chapter 3 introduces the research hypotheses. Chapter 4 describes the methodology and data, detailing the sample selection, the regression model (OLS), the variables used, and their respective descriptive statistics. Chapter 5 conducts a univariate analysis, providing a comparative analysis between sustainable and conventional securities. Chapter 6 presents the regression results and the main findings. Finally, the conclusion summarizes the key results, discusses limitations, and offers suggestions for future research.

# 2. Literature Review

## 2.1 Asset Securitisation

Asset securitisation is currently recognised as a cornerstone of modern financial innovation that allows illiquid assets and their cash flows to be transformed into liquid and tradable securities, enabling financial disintermediation and increasing market liquidity (Fabozzi et al., 2006; Pinto & Alves, 2016). This process involves the sale of cash flow-generating assets by the originator to another entity created specifically for this purpose, which issues securities backed by these assets (Fabozzi et al., 2006; Pinto & Alves, 2016).

As a Structured Finance [1] technique, securitisation allows access to credit by avoiding traditional financial disintermediaries (Pinto & Alves, 2016). In this way, it involves the pooling of assets or non-cash flow generators, like mortgages, loans or accounts receivable, by financial institutions or companies, which are then transferred to a securitisation vehicle, called a Special Purpose Vehicle (SPV), that isolates the assets from the originator's balance sheet and insulates investors from credit risk (Correia & Pinto, 2023; Coval et al., 2009; Fabozzi et al., 2006; Marques & Pinto, 2020; Lupica, 1998).

These securities are structured in tranches to fulfil the various investors' preferences, with senior tranches having higher credit ratings and priority in payments, and junior tranches absorbing a bigger risk in exchange for a higher return.

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[1] It involves structuring financial assets into risk tranches to support risk transfer, liquidity, and capital efficiency (Josephson & Shapiro, 2020; Marques & Pinto, 2020; Cumming, 1987; Jobst, 2007).

Fabozzi et al. (2006) also point out that the tranche structure increases the marketability by providing greater flexibility and diversification. Furthermore, securitisation can follow a "cash flow-based" model, where the assets are directly sold to the SPV, and "synthetic" securitisation, which uses credit derivatives to transfer risk without transferring the assets (Tasca & Zambelli, 2005).

Emerging around the 1970s [2] in the United States (US) with the issue of MBS by Government National Mortgage Association, securitisation addressed the housing market's liquidity need and this instrument allowed financial institutions to manage balance sheet restrictions and, simultaneously, satisfy investor demand for fixed-income securities (Fabozzi et al., 2006; Loutskina, 2011; Pinto & Alves, 2016; Tasca & Zambelli, 2005). Over time, the range of securitisation asset classes has expanded and started to include Asset-Backed Securities (ABS) [3], Mortgage-Backed Securities (MBS) [4] and Collateralised Debt Obligations (CDOs) [5] (Blum & DiAngelo, 1997; Choudhry & Fabozzi, 2004; Correia & Pinto, 2023; Pinto & Alves, 2016).

In Western Europe and at the beginning of the 21st century, securitisation experienced remarkable growth, driven by the introduction of the euro and the regulatory simplification (Pinto & Alves, 2016). Thus, as described by Pinto & Alves (2016), there was a volume increase, from €78.2 billion in 2000 to €753.9 billion in 2008.

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[2] However, Bertay et al. (2017) and Cumming (1987) mention the beginning of securitisation in the 1960s.

[3] Backed by a pool of assets, such as consumer, auto, and personal loans. (Correia & Pinto, 2023; Altunbas et al., 2009; Riddiough, 1997; Vink & Thibeault, 2008).

[4] An ABS type where the underlying assets are mortgages. (Correia & Pinto, 2023; Baghai & Becker, 2020; Vink & Thibeault, 2008).

[5] Backed by a pool of debt obligations (Vink & Thibeault, 2008; Marques & Pinto, 2020; Coval et al., 2009).

This expansion was accompanied by the adoption of standardised structures, notably involving SPVs to manage and structure transactions. Thereby, the SPV uses the cash flows from the underlying assets to pay interest and principal to investors, independently of the originator's financial situation (Pinto & Alves, 2016). In Europe, the standard structure involves the originator selling assets to the SPV, which issues bonds backed by those assets (Altunbas et al., 2009). In contrast, the US model uses trusts, permitting investors direct stakes in the pooled assets (Fabozzi et al, 2006).

In the European context, SPVs are often incorporated under corporate law with restricted activities and in some cases, they can benefit from tax exemptions, depending on national legislation (Pinto & Alves, 2016). Regardless of jurisdiction, securitisation requires rigorous processes, including collateral assessment, risk quantification and cash flow modelling (Pinto & Alves, 2016). Hence, the guarantee of the quality of securities derives from asset quality, structure and credit ratings provided by the agencies and the due diligence precision (Correia & Pinto, 2023; Brennana & Subrahmanyam, 1995; Lupica, 1998).

Compared to the US, European securitisation is characterised by a limited direct government intervention and greater dependence on private financial institutions' guarantees (Pinto & Alves, 2016; Correia & Pinto, 2023; Baghai & Becker, 2020; Arif, 2020).

This context influenced not only the structure but also the type of securitised assets. Securitisation assets range from mortgages and car loans to credit card loans (Pinto & Alves, 2016). More recently, sustainable assets, such as green mortgages and renewable energy loans, were included, aligning securitisation with ESG objectives.

These developments show that the economic securitisation implications are profound by decoupling asset ownership from the originator's balance sheet, providing "distance from bankruptcy" and protecting investors from insolvency risk (Tasca & Zambelli, 2005; Correia & Pinto, 2023; Pinto & Alves, 2016).

For the originator, the main benefits are: 1) greater liquidity, allowing the expansion of credit operations and economic growth, 2) transfer of risk to the investor by unlocking capital from their balance sheet, 3) potential reduction in financing costs and 4) diversification of funding sources and for the investors, the main benefit is associated with access to different risk-return profiles and sectors that would otherwise be inaccessible (Bertay et al., 2017; Altunbas et al., 2009; Jobst, 2006a; Fabozzi et al, 2006; Roever & Fabozzi, 2003; Fabozzi & Kothari, 2007).

The capital structure irrelevance theorem of Modigliani & Miller (1958) assumes a world without securitisation, derived from a perfect liquid market and perfect information symmetry. However, the market has inefficiencies, agency conflicts, and information asymmetry, which underlines the value created for the company by minimising the associated net costs (Pinto & Alves, 2016).

Additionally, Pinto & Alves (2016) emphasise the relevance of securitisation for institutions that finance capital-intensive projects, including infrastructure development and ESG initiatives.

As mentioned, the transfer of risk allows originators to manage credit exposure while investors gain access to diversified portfolios and personalized risk-return profiles (Correia & Pinto, 2023; Jobst, 2006a). The dual function highlights securitization's capacity for maximizing market efficiency and promoting greater economic expansion.

Despite its advantages, the financial crisis of 2007-2008 exposed the fragilities of this market, leading to a sharp drop in issuance volumes. By 2014, the amount issued had plummeted to €199 billion, showing the impact of the crisis and subsequent economic and regulatory pressures (IMF, 2008a; IMF, 2008b; Brunnermeier, 2009; Pinto & Alves, 2016). Pinto & Alves (2016) also describe the drastic fall in the USA, from $2044.9 billion in 2007 to $933.6 billion in 2008.

Furthermore, securitisation entails several associated challenges. Before the crisis of 2007-2008, product opacity in securitisation products contributed majorly to systemic fragility (Brunnermeier, 2009; Purnanandam, 2011; Gorton, 2009; Jobst, 2009; Pinto & Alves, 2016). The key challenges are the information asymmetry, which encourages adverse selection and moral hazard (Albertazzi et al., 2015; Gorton, 2009; Purnanandam, 2011) and legal and administrative opacity, resulting in excessive transaction costs (Cardone-Riportella et al., 2010).

Notably, Gorton (2009) and Purnanandam (2011) point out the structural complexity of instruments like the CDOs that dominated the 2008 financial crisis. Pinto & Alves (2016) and Fabozzi et al. (2006) note that such complexity, particularly of the CDOs and the so-called CDO-squared products, can obstruct proper risk evaluation of underlying assets.

As Pinto & Alves (2016) and Gorton (2009) show, investors' confidence was eroded by limited information access, correlating the securitisation market to a "lemon market". Systemic risks are heightened by misaligned incentives between originators and investors, poor credit rating practices, and agency conflicts (Brunnermeier, 2009; Jobst, 2006a).

Following the 2007-2008 financial turmoil, regulators aimed to enhance transparency and robustness. In the US, it resulted in the Dodd-Frank Act, which reshaped the financial architecture and attempted to increase rating agencies accountability (Josephson & Shapiro, 2020). In the European Union (EU), Regulation (EU) 462/2013 harmonized the regulatory framework for credit rating activities, while Regulation (EU) 2017/2402 introduced the STS framework to decrease information asymmetries (Correia & Pinto, 2023). While the regulations after the 2008 crisis have alleviated some of the issues, the price distortion remains, pointing the necessity for more transparency and standardization (Correia & Pinto, 2023).

Despite its challenges, securitisation remains a transformative tool that unleashes liquidity, enhances financing efficiency and shifts risk. With the inclusion of ESG factors, a change towards more sustainable, resilient practices is underway.

## 2.2 ESG Financing

The integration of ESG factors has revolutionised financing and the decision-making approach of companies and investors, aligning investments and financial performance with sustainability goals (Edmans & Kacperczyk, 2022; Pedersen et al., 2021; Berrada et al., 2022; Pinto & Ribeiro, 2024; Apergis et al., 2022; Ng & Rezaee, 2015; Tang & Zhang, 2020).

ESG criteria have three dimensions: environmental factors, which include carbon emissions, energy efficiency, resource conservation and climate resilience; social factors associated with labour practices and rights, community involvement and customer welfare; and governance factors, related to transparency, ethical leadership, board diversity and shareholder rights (Edmans & Kacperczyk, 2022).

Amid growing social and regulatory pressures, ESG criteria have become non-optional to investor behaviour, requiring corporate strategies to align with ethical and sustainability objectives (Flammer, 2021; Edmans & Kacperczyk, 2022; Apergis et al., 2022).

In response, institutions such as the EU have set up regulatory frameworks that require ESG disclosures, encouraging transparency and standardisation in sustainable finance reporting (Berrada et al., 2022; Flammer, 2021; Feldhütter et al., 2024).

The growing importance of ESG criteria is demonstrated by the sustainable financial instrument's rapid adoption, especially green bonds and sustainability-linked bonds, SLBs (Pinto & Ribeiro, 2024; Berrada et al., 2022; Feldhütter et al., 2024). Green bonds finance environmentally beneficial projects, while SLBs link financial performance to measurable sustainability objectives, like key performance indicators (KPIs), demonstrating the company's commitment to ESG principles (Flammer, 2021).

The announcement of green bonds generates positive reactions in the stock market, as investors see alignment between corporate and economic objectives (Berrada et al., 2022; Flammer, 2021). This "label effect" concept, highlighted by Zerbib (2019) and Flammer (2021), can improve company reputation and attract ESG-focused capital. However, their market performance depends on factors such as the issuer's sector, credit rating and adherence to third-party certification standards (Pinto & Ribeiro, 2024; Apergis et al., 2022; Berrada et al., 2022; Fatica et al., 2021).

SLBs, while promoting transparency and accountability, still lack robustness (Berrada et al., 2022). Thus, challenges continue, including the pricing inefficiencies due to the lack of transparency and information asymmetry. Berrada et al. (2022) highlight a 20% overvaluation at issuance, leading to negative secondary market returns and wealth transfers to the shareholders. This contemplates the non-inclusion of conditional penalties and insufficient disclosure of real risks (Berrada et al., 2022).

The main problems with green bonds are: 1) liquidity risk, 2) lack of standardisation, 3) greenwashing, 4) information asymmetry and 5) market sensitivity (Flammer, 2021; Schmittmann & Gao, 2022; Baker et al., 2022; Wang et al., 2020; Febi et al., 2018).

The risk of greenwashing, where companies exaggerate or misrepresent ESG commitments to attract investment, damages market signals and erodes investor confidence (Zerbib, 2019). To guarantee the integrity of ESG-labelled securities, Berrada et al. (2022) promote stricter disclosure standards and third-party certifications. Schmittmann & Gao (2022) add that coherent carbon pricing can help mitigate greenwashing, while Flammer (2021) emphasises the certification role, like the Green Bond Principles and the Climate Bonds Initiative.

To establish benchmarks for reducing greenhouse gas emissions, strengthening social equity and promoting responsible corporate governance, frameworks like the Paris Agreement and the United Nations Sustainable

Development Goals have emerged (Edmans & Kacperczyk, 2022). Companies using ESG financing mechanisms, like green securities, demonstrate tangible improvements in environmental performance and stronger alignment with regulatory and social expectations (Edmans & Kacperczyk, 2022; Flammer, 2021; Zerbib, 2019; Berrada et al., 2022).

Securitisation aligned with the ESG criteria introduces an innovative dimension to sustainable finance and ABS and MBS become vehicles for financing renewable energy and green infrastructure (Hong et al., 2020).

Although still under-researched, Schmittmann & Gao (2022), Zerbib (2019) and Febi et al. (2018) show that green bonds [6] often benefit from greenium, derived from their perceived lower risk and their alignment with long-term goals.

This lower cost of capital serves as an indication of the market's confidence in ESG-compatible assets and, as Flammer (2021) found, green bonds and SLBs provide issuers with a growing pool of ESG-focused capital and a corresponding reduction in their cost of debt amid favourable price dynamics.

Green bonds and SLBs generate reputational and financial benefits, derived from increased credibility with investors and stakeholders (Flammer, 2021; Tang & Zhang, 2020; Cicchiello et al., 2022). This sets the theme explored in the next section.

[6] Pedersen et al. (2021) and Pástor et al. (2021) emphasise that green assets tend to offer lower returns, protecting against climate-related risks.

## 2.3 Sustainable Securities, spreads determinants and COVID-19 effects

Green securities are financial instruments developed to finance projects with a positive environmental impact and include a wide range of assets, including green ABS, MBS and CDOs (Cusano et al., 2024; Agliardi, 2022). However, their definition faces challenges due to the lack of standartised definitions and methodologies (Cusano et al., 2024). Whether a security is labelled as "green" may depend on the nature of the underlying assets, use of proceeds, and the stakeholder commitment to sustainability (Cusano et al., 2024).

This complexity is amplified by dependence on systems like NACE [7], which evaluates sustainability based on the borrower's economic activity (Cusano et al., 2024). The limited data and the absence of regulatory standardisation obstruct an accurate analysis and raise concerns over the risk of greenwashing, information asymmetry and contractual inconsistencies (Cusano et al., 2024; Petit & Schlosser, 2020; Nguyen et al., 2022).

In the European green securitisation market, there has been a consistent and steady growth, but it remains limited compared to other segments of the sustainable market (Cusano et al., 2024). Between 2017 and 2023, green securitisations issued increased from 1 to 16, reaching €5.4 billion in 2023, with green ABS representing more than 50% of the total volume (Cusano et al. 2024, European Central Banking, 2024).

Sustainable securities have been crucial in funding small-scale sustainable projects, including energy-efficient buildings, electric vehicles and solar energy systems (Climate Bond Initiative, 2017, 2018; Fitch Ratings, 2021, 2022).

[7] The Statistical Classification of Economic Activities in the European Community.

However, the global green securities market shows significant regional disparities, highlighting different degrees of market maturity (Cusano et al., 2024). The US and the Netherlands lead in issuance, benefiting from financial infrastructures and government agencies like Freddie Mac and Fannie Mae (Cusano et al., 2024). In contrast, markets like Italy have seen limited adoption due to weak information structures (Cusano et al., 2024). The EIB (2021) warned of the need for specific support in less integrated or developing markets, containing public incentives and securitisation platforms.

Although not global, this growth has driven by investor awareness and regulatory initiatives like the EU Green Bond Standard, which aim to promote transparency and standardisation (Fitch Ratings, 2022; Cusano et al., 2024).

One central aspect of this growth is the greenium [8], which, as already mentioned, consists of a green instrument's spreads reduction compared to conventional securities (Schmittmann & Gao, 2022; Eskildsen et al., 2024).

Baker et al. (2018), Zerbib (2019), Flammer (2021) and Gianfrate & Peri (2019) suggest that green bonds often show lower yields, reflects a pre-disposition on the part of investors to accept slightly lower returns in exchange for ethical alignment with environmental, social and governmental objectives compared to conventional assets. This overlap between ethical and financial decisions is evidenced by Riedl & Smeets (2017) and Cusano et al. (2024).

Tang & Zang (2020) and Bachelet et al. (2019) find no statistically significant premium for green bonds.

However, green bonds are often perceived as lower risk due to transparency and the resilient nature of the underlying projects, such as low-carbon infrastructure (Müller et al., 2022; Apergis et al., 2022).

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[8] Fatica et al. (2021) refer to the existence of greenium for corporate green bonds and even bigger for supranational entities.

While empirical evidence is mixed for certain green instruments, this analysis is lacking for green securities.

While most literature focuses on green bonds, Pinto & Ribeiro (2024) separately examine green, social, and sustainability bonds. They find no significant spread premium for social or sustainability labels, even in matched samples. Their analysis highlights the relevance of structural features like subordination and tranche number, rather than issuer characteristics.

The introduction of frameworks like the EU Green Bond Standard, a green label for green bonds, the Green Taxonomy, a system for classifying sustainable activities, and the Sustainable Finance Disclosure Regulation has reduced issuance costs and improved regulation (EBA, 2022; Cusano et al., 2024). However, costs related to ESG data reporting increased (EBA, 2022). Furthermore, Cusano et al. (2024) point out that in the Italian banking sector, the lack of regulatory alignment between regions makes market interoperability difficult.

Despite growing investor attention in sustainable securities, concerns about the speculative bubble continue. Aramonte & Zabai (2021) warn that overvaluation in sustainable sectors may distort asset prices and create long-term instability. Although investors may accept greenium, the exaggerations in the spread differentials can reduce market efficiency due to information asymmetry and greenwashing (Baker et al., 2018; Zerbib, 2019; Berrada et al., 2022).

To combat these problems, regulatory efforts like the Securities and Exchange Commission and Regulation (EU) 2020/852 try to standardise the ESG labels and reduce information asymmetry (Pinto & Ribeiro, 2024).

Despite its advantages, the green securities market faces challenges related with data standardisation gaps and weak ESG monitoring, difficult assessment of green loans and increasing misclassification risk (EBA, 2022; Petit & Schlosser, 2020). Cusano et al. (2024) warn that only half of green issuances between 2017 and 2023 were verified by a Second Party Opinion (SPO), with the rest relying on issuer self-declarations. This lack of independent certification erodes the market credibility and investor confidence, accentuating the need for stronger regulatory structures and international standards, like the International Capital Market Association (ICMA) [9] principles (Petit & Schlosser, 2020; Cusano et al., 2024).

A relevant limitation is excluding securitised loans from banks' carbon intensity metrics, overestimating financed emissions and underestimating the bank’s contribution to the green transition (Cusano et al., 2024).

In Italy, loans backing “brown” securitisation grew faster than green ones between 2010 and 2019, especially after the 2015 Paris Agreement, suggesting that banks kept green loans for their low credit risk and sustainability interest (Cusano et al., 2024). As Faiella & Lavecchia (2020) documented, excluding securities loans can distort the environmental impact assessment. Moreover, securitising high climate risk loans without proper risk evaluation may reallocate environmental exposures away from balance sheets (Nguyen et al., 2022; Müller et al., 2022).

Credit spreads, which represent yield premiums above a reference bond, are influenced by credit rating, systematic risk, contractual characteristics and macroeconomic factors (Correia & Pinto, 2023; Marques & Pinto, 2020; He et al., 2012; Berrada et al., 2022; Pinto & Ribeiro, 2024).

Conventional bonds are impacted by rating, transaction size and currency risk, with rates and gross spreads showing a positive correlation (Pinto & Ribeiro, 2024). While sustainable bonds (green, social and sustainability) are influenced by the subordination, number of tranches, ESG alignment and issuer experience, with gross spreads having an insignificant impact (Pinto & Ribeiro, 2024).

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[9] The four components are: use of proceeds, process for project evaluation and selection, management of proceeds, and reporting (ICMA, 2018).

Sustainable bonds investors tend to rely less on ratings than investors in conventional bonds (Pinto & Ribeiro, 2024). Green ABS investors may accept greenium due to environmental preferences, but this is sensitive to greenwashing and information asymmetry (Berrada et al., 2022; Zerbib, 2019; Barclays, 2015; Ehlers & Packer, 2017). In ESG-focused securitisation, spreads are impacted through ESG ratings, regulation and the presence of green instruments as control variables, but model risk remains a challenge (Marques & Pinto, 2020; He et al., 2012).

During the COVID-19 pandemic, studies have shown mixed evidence on greenium. Some studies documented a premium for green bonds during uncertainty periods, reflecting investors' increased preference for sustainable assets (Baker et al., 2018; Gianfrate & Peri, 2019), yet Pinto & Ribeiro (2024) find no significant greenium in primary market spreads of green, social, and sustainability bonds to those of conventional bonds, even during the pandemic.

However, it is important to distinguish between green bonds and sustainable securities. These are structured products linked to sustainable assets, yet the market is still nascent and lacks standardisation (Cusano et al., 2024). In Italy, between 2010–2019, banks were more likely to securitise loans to 'brown' sectors than to 'green' ones, to manage reputational and transition risks, rather than benefiting from any clear price-based advantage (Cusano et al., 2024). This suggests that greenium effects may not apply to securitization.

While literature focuses especially on green bonds, studies on sustainable securitisation remain limited (Cusano et al., 2024; Liberati & Marinelli, 2022). Agliardi (2022) and Müller et al. (2022) point out that studies on green securitisation are quite scarce and during my research, I didn't find any studies that carried out a comparative analysis of the spread of sustainable ABS, MBS versus conventional ABS, MBS. This dissertation addresses this gap and analyses the sustainable securitisation market.

Despite the crucial role, the lack of standardisation and detailed data creates barriers to sustainable securitisation (Cusano et al., 2024).

# 3. Hypotheses

The increasing relevance of sustainable finance has sparked interest in the pricing of sustainable securities, being essential to assess whether they have different market characteristics (Ferreira et al., 2016; Cusano et al., 2024). Correia & Pinto (2023) observe that ABS and MBS spreads depend on more than ratings, raising the question of whether ESG incorporation reduces spreads. Without this effect, green instruments cannot be negotiated with a premium, showing that ESG characteristics aren't always compensated with lower yields, as pricing is often influenced by factors like subordination, maturity and transaction size (Pinto & Ribeiro, 2024; Lau et al., 2022; Karpf & Mandel, 2018).

Some studies propose that sustainable asset-backed securities exhibit lower risk profiles and higher demand, inducing possible lower yields (Pástor et al., 2021; Pedersen et al., 2021). Sustainable investors may influence pricing by excluding "sin stocks" [10] and supporting green issuers, reducing their perceived cost of capital (Baker et al., 2021; Zerbib, 2022; Gormsen & Huber, 2024). Based on the literature and empirical findings, the following hypotheses are proposed.

**Hypothesis 1 (H1):** Sustainable (green, social and sustainability) ABS and MBS have lower spreads than comparable conventional ABS and MBS.

This hypothesis stems from the concept of the greenium, which suggests that investors may accept lower yields for green instruments due to their environmental benefits and increasing demand for sustainable investments (Flammer, 2021; Zerbib, 2019; Schmittmann & Gao, 2022).

[10] Company's shares involved in activities considered unethical or harmful to society, such as tobacco, alcohol or gambling (Hong & Kacperczyk, 2009).

Studies indicate that green bonds, for instance, tend to exhibit lower yields relative to their conventional counterparts, reflecting a potential pricing premium for sustainability (Baker et al., 2018; Zerbib, 2019; Gianfrate & Peri, 2019; Fatica et al., 2021; Immel et al., 2021). Furthermore, the regulatory efforts, such as the European Union's Green Bond Standard (EBA, 2022), have incentivized the issuance of sustainable securities by reducing information asymmetry and moral hazard, possibly reducing spreads (Cusano et al., 2024). However, studies on sustainable securitisation remain limited, especially because private placement offerings of green ABS issuances and some related data are publicly unavailable (Li et al., 2024).

**Hypothesis 2 (H2):** Credit risk variables (rated tranche, rating tranche or rating discordance) are significant determinants of sustainable ABS and MBS spreads.

The impact of credit risk on sustainable securities spreads remains a subject of debate. While financial theory suggests that credit variables significantly influence bond spreads (Collin-Dufresne et al., 2001), the extent to which these variables, rated tranche, rating tranche and rating discordance affect sustainable securities is less explored (Marques & Pinto, 2020; Gabbi & Sironi, 2005; Elton et al., 2001). As sustainable securities adhere to sustainability criteria and if evaluated by an agency, investors may perceive them as lower risk, which can influence pricing (Yu et al., 2024; Zerbib, 2019; Fatica et al., 2021). Disparities in rating methodologies, the absence of standardized and the complex green securities' pooling structure may cause rating discordance and greenwashing, possibly increasing spreads (Petit & Schlosser, 2020; He et al., 2024; Baker et al., 2021; Lopez-de-Silanes et al., 2024). Empirical studies from Hong et al. (2020), Pástor et al. (2022) and Chang & Chen (2014) highlight how investor sentiment and risk perception influence sustainable asset pricing, reinforcing the importance of credit risk. However, as Flammer (2021) and Tang & Zhang (2020) state that green titles do not always have lower spread than brown ones, though credit risk variables remain significant pricing determinants.

**Hypothesis 3 (H3):** The premium effect for ABS and MBS was higher in the COVID-19 pandemic period compared to the other periods.

Sustainable securities have emerged as valuable and robust allies in risk management, during economic crises (Di Filippo et al., 2022). The COVID-19 pandemic accelerated demand for sustainable financial instruments, promoting the “green recovery” and showing the resilience of green ABS in uncertainty (Petit & Schlosser, 2020; Di Filippo et al., 2022). In Italy, the green securities market showed an upward trend during COVID-19, strengthening its role as a stabilizing asset class (Cusano et al., 2024). Giovanardi et al. (2023) observed higher liquidity and significant greenium for green bonds during the pandemic, which may indicate a similar trend for green ABS and MBS, derived from the growing investor sustainability preferences. However, the market responses are influenced by the specific nature of the crisis, instrument characteristics, in this case, sustainable securities, and investor sentiment, all of which influence pricing behaviour (Petit & Schlosser, 2020).

By testing these hypotheses, this study aims to provide insights into the pricing of sustainable securities and their interaction with credit risk factors and the pandemic, contributing to the broader discourse on sustainable finance.

# 4. Methodology

## 4.1 Sample Selection

This section outlines the dataset used in this study, extracted from the DCM Analytics database. This work focuses on conventional and sustainable (green, social and sustainability) ABS and MBS, covering the period from 2014 to 2024, with 2015 marking the first sustainable issuance on the platform.

To ensure a meaningful comparison, several filters were applied. Firstly, conventional securities from countries without observations for sustainable securities were excluded. Similarly, the matching was conducted at the industry level, specifically on Company General Industry Group, Use of Proceeds, and Tranche Collateral Type. Additionally, only securities with similar maturities and tranche sizes (USD) were retained.

After removing outliers and missing information, the final sample consists of 154 sustainable and 40,468 conventional securities. The limited sustainable group reflects the fact that most of these operations are not publicly disclosed, as mentioned earlier. This selection ensures comparability and reduces potential biases in the empirical analysis of ABS and MBS pricing.

The dataset enables a comprehensive examination of the issuance patterns, industry, and geographical distribution. Panel A presents the geographical securities distribution, highlighting the key regions where these securities were issued. North America, led by the US, dominates conventional issuance, representing 72.24% of total issuance value. In contrast, green securities are more prominent in Europe (31.02%), especially in the Netherlands and the United Kingdom. Asia contributes 4.96% of the green securities' total value and the entirety of sustainability securities, with issuers from China and Hong Kong.

The Panel B provides insights into the sectoral composition of the sample, detailing the predominant industries issuing sustainable and conventional securities. The financial sector dominates in both conventional (99.42%) and green securities (98.01%). Contrary to expectations, environmental-related industries such as construction and energy remain marginal, with less than 1% of total issuance.

Panel C illustrates the issuance trends over the studied period, capturing the evolution of securities from 2014 to 2024. The sustainable securities showed a pronounced growth, especially after 2019, peaking in 2024 with $9504 million. Social and sustainability securities also accelerated in 2023 and 2024, with sustainability securities representing 69.52% of the category's total value in 2024. When compared, conventional securities exhibited a more stable trajectory, reaching over $20.8 trillion cumulatively by 2024.

Finally, Panel D encompasses the top issuers of each type of security. For conventional securities, Octagon Investment Partners Ltd leads by value (1.53%), followed by CIFC Funding Ltd and Madison Park Funding Ltd. For green securities, Green Storm BV holds the highest share (12.86%), while Brighte Green Trust leads in volume (26.61%). The social securities market appears highly concentrated, with Gemgarto Plc and BX Commercial Mortgage Trust responsible for 30.37% and 28.44% of the total issuance value, respectively. The sustainability securities market is dominated by Bauhinia ILBS Ltd, which represents 79.57% of issuance value and 77.78% of the number of deals, indicating a highly concentrated and nascent segment.

By employing a rigorous filtering process and ensuring comparability, this study provides robust insights into the sustainable versus conventional securitisation dynamics.

**Table 1:** Sample Characteristics

**Panel A: Geographic distribution**

| Geographic location of issuer | Conventional Securities | | | Green Securities | | | Social Securities | | | Sustainability Securities | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of tranches | Total value [$ Million] | Percent of total value | Number of tranches | Total value [$ Million] | Percent of total value | Number of tranches | Total value [$ Million] | Percent of total value | Number of tranches | Total value [$ Million] | Percent of total value |
| **Europe** | **6 918** | **3 406 711** | **16,34%** | **21** | **9 956** | **31,02%** | **16** | **7 911** | **49,72%** | **0** | **0** | **0,00%** |
| United Kingdom | 6 141 | 2 928 799 | 14,05% | 1 | 1 029 | 3,21% | 10 | 5 622 | 35,33% | 0 | 0 | 0,00% |
| Germany | 245 | 183 767 | 0,88% | 6 | 1 486 | 4,63% | 6 | 2 289 | 14,39% | 0 | 0 | 0,00% |
| France | 257 | 144 610 | 0,69% | 5 | 1 647 | 5,13% | 0 | 0 | 0,00% | 0 | 0 | 0,00% |
| Netherlands | 275 | 149 535 | 0,72% | 9 | 5 794 | 18,05% | 0 | 0 | 0,00% | 0 | 0 | 0,00% |
| **America** | **29 594** | **15 073 299** | **72,31%** | **9** | **3 168** | **9,87%** | **12** | **6 278** | **39,45%** | **0** | **0** | **0,00%** |
| United States | 29 440 | 15 057 372 | 72,24% | 5 | 2 440 | 7,60% | 12 | 6 278 | 39,45% | 0 | 0 | 0,00% |
| Mexico | 48 | 4 633 | 0,02% | 2 | 334 | 1,04% | 0 | 0 | 0,00% | 0 | 0 | 0,00% |
| Brazil | 106 | 11 295 | 0,05% | 2 | 394 | 1,23% | 0 | 0 | 0,00% | 0 | 0 | 0,00% |
| **Asia** | **846** | **802 468** | **3,85%** | **8** | **1 593** | **4,96%** | **0** | **0** | **0,00%** | **9** | **3 650** | **100,00%** |
| China | 824 | 794 715 | 3,81% | 8 | 1 593 | 4,96% | 0 | 0 | 0,00% | 0 | 0 | 0,00% |
| Hong Kong (China) | 8 | 2 284 | 0,01% | 0 | 0 | 0,00% | 0 | 0 | 0,00% | 7 | 2 904 | 79,57% |
| Singapore | 14 | 5 470 | 0,03% | 0 | 0 | 0,00% | 0 | 0 | 0,00% | 2 | 746 | 20,43% |
| **Australia** | **3 110** | **1 561 646** | **7,49%** | **71** | **17 380** | **54,15%** | **8** | **1 723** | **10,83%** | **0** | **0** | **0,00%** |
| **Total** | **40 468** | **20 844 124** | **100,00%** | **109** | **32 098** | **100,00%** | **36** | **15 912** | **100,00%** | **9** | **3 650** | **100,00%** |

**Panel B: Industrial distribution**

| Industrial category of issuer | Conventional Securities | | | Green Securities | | | Social Securities | | | Sustainability Securities | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of tranches | Total value [$ Million] | Percent of total value | Number of tranches | Total value [$ Million] | Percent of total value | Number of tranches | Total value [$ Million] | Percent of total value | Number of tranches | Total value [$ Million] | Percent of total value |
| Construction/Building | 154 | 50 066 | 0,24% | 0 | 0 | 0,00% | 6 | 2 289 | 14,39% | 0 | 0 | 0,00% |
| Computers & Electronic | 38 | 7 678 | 0,04% | 2 | 394 | 1,23% | 0 | 0 | 0,00% | 0 | 0 | 0,00% |
| Finance | 40 269 | 20 784 322 | 99,71% | 105 | 31 460 | 98,01% | 30 | 13 623 | 85,61% | 9 | 3 650 | 100,00% |
| Utility & Energy | 7 | 2 057 | 0,01% | 2 | 243,82 | 0,76% | 0 | 0,00 | 0,00% | 0 | 0,00 | 0,00% |
| **Total** | **40 468** | **20 844 123** | **100,00%** | **109** | **32 098** | **100,00%** | **36** | **15 912** | **100,00%** | **9** | **3 650** | **100,00%** |

**Table 2:** Sample Characteristics (continued)

| Panel C: Distribution of Securities by year | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Conventional Securities | | | Green Securities | | | Social Securities | | | Sustainability Securities | | |
| Year | Number of tranches | Total value [$ Million] | Percent of total value | Number of tranches | Total value [$ Million] | Percent of total value | Number of tranches | Total value [$ Million] | Percent of total value | Number of tranches | Total value [$ Million] | Percent of total value |
| 2014 | 938 | 545692 | 2,62% | 0 | 0,00 | 0,00% | 0 | 0,00 | 0,00% | 0 | 0,00 | 0,00% |
| 2015 | 972 | 563896 | 2,71% | 1 | 777,38 | 2,42% | 0 | 0,00 | 0,00% | 0 | 0,00 | 0,00% |
| 2016 | 1 364 | 773449 | 3,71% | 4 | 1 731,99 | 5,40% | 0 | 0,00 | 0,00% | 0 | 0,00 | 0,00% |
| 2017 | 3 253 | 1708288 | 8,20% | 5 | 1 437,75 | 447,93% | 0 | 0,00 | 0,00% | 0 | 0,00 | 0,00% |
| 2018 | 4 853 | 2588413 | 12,42% | 7 | 3 028,22 | 9,43% | 0 | 0,00 | 0,00% | 0 | 0,00 | 0,00% |
| 2019 | 3 651 | 1919860 | 9,21% | 12 | 2 625,74 | 8,18% | 0 | 0,00 | 0,00% | 0 | 0,00 | 0,00% |
| 2020 | 2 584 | 1316179 | 6,31% | 10 | 1 629,77 | 5,08% | 0 | 0,00 | 0,00% | 0 | 0,00 | 0,00% |
| 2021 | 7 416 | 3995149 | 19,17% | 8 | 2 453,34 | 7,64% | 8 | 5 134,48 | 32,27% | 1 | 361,10 | 9,89% |
| 2022 | 3 465 | 1834164 | 8,80% | 22 | 5 712,58 | 17,80% | 16 | 7 381,70 | 46,39% | 0 | 0,00 | 0,00% |
| 2023 | 3 038 | 1362961 | 6,54% | 17 | 3 185,94 | 9,93% | 5 | 1 201,78 | 7,55% | 2 | 749,05 | 20,52% |
| 2024 | 8 934 | 4236072 | 20,32% | 23 | 9 515,27 | 29,64% | 7 | 2 194,41 | 13,79% | 6 | 2 539,75 | 69,58% |
| **Total** | **40 468** | **20 844 123** | **100%** | **109** | **32 098** | **100,00%** | **36** | **15 912** | **100%** | **9** | **3 650** | **100%** |

**Table 3:** Sample Characteristics (continued)

**Panel D: Top issuers**

**Conventional Securities**

| Firm | By value of deals | By number of deals |
|---|---|---|
| Octagon Investment Partners Ltd | 1,53% | 1,46% |
| CIFC Funding Ltd | 1,43% | 1,41% |
| Madison Park Fund Ltd | 1,64% | 1,35% |
| Palmer Square CLO Ltd | 1,35% | 1,35% |
| Neuberger Berman CLO Ltd | 1,24% | 1,33% |
| KKR CLO Ltd | 1,02% | 1,14% |
| Ares CLO Ltd | 1,25% | 1,12% |
| Ginnie Mae REMIC Trust | 1,21% | 1,11% |
| Golub Capital Partner CLO Ltd | 1,22% | 1,04% |
| OHA Credit Partners | 1,12% | 1,03% |

**Green Securities**

| Firm | By value of deals | By number of deals |
|---|---|---|
| Brighte Green Trust | 11,89% | 26,61% |
| humm ABS Trust | 7,58% | 12,84% |
| Flexi ABS Trust | 5,66% | 11,01% |
| Green Storm BV | 12,86% | 6,42% |
| Golden Ray SA | 4,63% | 5,50% |
| Plenti PL-Green ABS Trust | 2,70% | 3,67% |
| River Green Finance dac | 2,57% | 3,67% |
| Triton Trust Bond | 6,66% | 2,75% |
| Ruby Bond Trust | 2,91% | 2,75% |
| China Guodian Financial Leasing Green ABS | 2,01% | 2,75% |

**Social Securities**

| Firm | By value of deals | By number of deals |
|---|---|---|
| Pepper Social Trust | 10,83% | 22,22% |
| Gemgarto plc | 30,37% | 19,44% |
| Fortuna Consumer Loan ABS dac | 14,39% | 16,67% |
| BX Commercial Mortgage Trust | 28,44% | 11,11% |
| Merchants Bank of Indiana Multifamily Housing Mortgage Loan Trust | 4,44% | 8,33% |
| Exmoor Funding plc | 4,96% | 8,33% |
| Freddie Mac Multifamily Multiclass Certificates | 1,96% | 5,56% |
| CRBT Multifamily Housing Mortgage Loan Trust | 1,72% | 5,56% |
| Fannie Mae REMIC Trust | 2,40% | 2,78% |

**Sustainability Securities**

| Firm | By value of deals | By number of deals |
|---|---|---|
| Bauhinia ILBS Ltd | 79,57% | 77,78% |
| Bayfront Infrastructure Capital Pte Ltd | 20,43% | 22,22% |

# 4.2 Regression Models and Variables Description

This dissertation determines the impact of several independent variables on the spread of sustainable versus conventional securities (dependent variable measured in basis points), using the model presented in Equation (1) (Marques & Pinto, 2020; Correia & Pinto, 2023; Pinto & Ribeiro, 2024; Fabozzi & Vink, 2012; Campbell & Taksler, 2003; Fatica et al., 2021). This research applies ordinary least squares regression, OLS, which was adjusted for heteroskedasticity using robust standard errors. Given the differences between countries and the variation in risk premia, standard errors were clustered both by year and by country (Marques & Pinto, 2020)

Appendix A contains detailed definitions of the independent variables, the sources from which they were taken, and their expected impact on the dependent variable.

$$\begin{aligned} Spread_{it} = \alpha_0 &+ \beta_1 SustainableSecurity_{it} + \beta_2 Rated_{it} \\ &+ \beta_3 RatingDiscordance_{it} + \sum_{n=1}^{21} \beta_n RatingDummy_n \\ &+ \gamma ContractualCharacteristics_{it} + \varphi MacroeconomicFactors_t \\ &+ \varepsilon_{it} \end{aligned} \tag{1}$$

$$\begin{aligned} Spread_{it} = \alpha_0 &+ \beta_1 Green_{it} + \beta_2 Social_{it} + \beta_3 Sustainability_{it} \\ &+ \beta_4 Rated_{it} + \beta_5 RatingDiscordance_{it} + \sum_{n=1}^{21} \beta_n RatingDummy_n \\ &+ \gamma ContractualCharacteristics_{it} + \varphi MacroeconomicFactors_t \\ &+ \varepsilon_{it} \end{aligned} \tag{2}$$

## 4.2.1 Spread

In this study, the Spread is the dependent variable, quantified in basis points and defined as Option-Adjusted Spread (OAS).This variable represents the cost of the risk associated with a security at the time of closing, reflecting the difference in yield between the security and a reference treasury asset in the same currency and with a similar maturity (Marques & Pinto, 2020).

### 4.2.2 Sustainable Security Dummy

The existence of a premium related to sustainable ABS and MBS is a topic with little analysis. To my knowledge, only one article so far attempts to evaluate the greenium of green ABS and the respective impact of external certification (Li et al., 2024). This work proposes a new approach, the incorporation of an explanatory variable, a dummy that takes the value of 1 if ABS or MBS has a Green, Social, or Sustainability component, and 0 otherwise. In the second model, the sustainable dummy is replaced with three distinct dummies: green, social, and sustainability.

### 4.2.3 Credit Ratings

Credit ratings and rating agencies are key determinants of credit spreads (Marques & Pinto, 2020; Driss et al., 2019; Aktas et al., 2021; Gabbi & Sironi, 2005; Collin-Dufresne et al., 2001; Elton et al., 2001; Hull et al., 2004; Titman et al., 2004; Longstaff et al., 2005).

In this sample, tranches that have an associated credit rating by Moody's, S&P, or Fitch, are converted into a numerical scale, where AAA=1, AA+=2, AA=3 and so on, up to D=22 (Marques & Pinto, 2020; Gabbi & Sironi, 2005; Cornaggia et al., 2017). However, some tranches do not have an associated rating because first-loss securities in securitization are not typically rated. To control the absence of ratings, a dummy called Rated was incorporated, which takes the value of 1 if it has a rating by at least one of the agencies and 0 otherwise (Marques & Pinto, 2020). Given the rating disagreement between the agencies and following Marques & Pinto (2020) and Gabbi & Sironi (2005), a Rating Discordance dummy was introduced, which takes the value of 1 if there is a rating disagreement and 0 if not. When the tranche has two or three ratings, their average is used.

Given the inverse scale, where higher numerical values represent lower credit quality, it's expected that a higher rating score and the presence of rating discordance will increase the spreads.

### 4.2.4 Contractual Characteristics

In addition to the impact of the explanatory variables of the criteria, spread is also impacted by contractual characteristics, which influence the pricing of sustainable instruments (Pinto & Ribeiro, 2024; Marques & Pinto, 2020; Gabbi & Sironi, 2005; Elton et al., 2001; Campbell & Taksler, 2003; Chen et al., 2007). These include maturity of the bond, number of tranches per transaction, transaction size, currency risk, whether the security is subordinated, whether it has fixed collateral, and whether it has a call option (Pinto & Ribeiro, 2024; Correia & Pinto, 2023).

The larger transaction size normally indicates greater liquidity and consequently lower uncertainty (Sorge & Gadanecz, 2008; Chen et al., 2007; Gabbi & Sironi, 2005). Hyun et al. (2020) and Kapraun et al. (2021) point out that the size of a green bond issue can reduce its premium.

Longer maturities are associated with higher risk and consequently higher spreads (Pinto & Ribeiro, 2024).

The subordination dummy controls payment priority. Subordinated tranches, due to higher risk in the event of default, are expected to offer higher returns as compensation (Pinto & Ribeiro, 2024).

For exchange rate risk, a currency risk dummy was created that equals 1 if there is such a risk and 0 otherwise (Pinto & Ribeiro, 2024). As Vink & Thibault (2008) point out, the expected effect is that tranches with associated exchange rate risk have a higher spread. A dummy variable for collateral type assumes 1 if it is guaranteed by fixed assets and 0 if it is backed by current assets (Pinto & Ribeiro, 2024).

Lastly, the number of tranches in a transaction is also controlled, and a higher number may reflect greater structural complexity, which is expected to negatively affect spreads.

### 4.2.5 Macroeconomic factors

To analyze the influence of macroeconomic factors on spreads, the variable EUSA5y-Libor3M was included, and calculated as based on the difference between the five-year euro swap rate and the three-month Libor rate (Marques & Pinto, 2020). Subsequently, to account market volatility, the Chicago Board Options Exchange Volatility Index (VIX) was used (Marques & Pinto, 2020). Some studies show that a steeper yield curve reduces spreads, while volatility tends to increase them (Campbell & Taksler, 2003; Titman et al., 2004; Cuchra, 2005; Löffler et al., 2021).

On the other hand, as a control variable, country risk was incorporated and is measured by the numerical conversion of the S&P Global Ratings, AAA=1; AA+=2, AA=3 and successively up to D=22, where higher risk is expected to increase spreads (Marques & Pinto, 2020; Gabbi & Sironi, 2005).

To control for observed macroeconomic trends and sector variations, year and industry dummies were used (Marques & Pinto, 2020; Riachi & Schwienbacher, 2015).

Finally, a COVID-19 dummy variable was created to differentiate issues during the pandemic period, between February 1, 2020, and May 5, 2023, from the remaining issues outside this interval (Pinto & Ribeiro, 2024), capturing the pandemic's impact.

Aloui et al. (2023) warned that crises can impact sustainable markets, limiting the effectiveness of the ECB's green quantitative easing, which tends to be stronger in periods of stability. Zaghini (2024) found that the green bonds issuance led to a 20 bps spread reduction after the launch of the PEPP, with an additional drop of 17 bps for ECB eligible securities.

A matched sample was constructed by pairing each of the 38 sustainable securities (31 green and 7 social) with 38 conventional counterparts based on rating, transaction size, and maturity, using a Euclidean distance approach. This sample was used for the univariate analysis and the regression.

# 5. Univariate Analysis

The analysis began with a comparison of pricing features between sustainable securities and conventional securities. It then continues to present the Wilcoxon z-test results for the continuous variables as well as for the dummy variables, Fisher's exact test results.

Sustainable securities consistently showed lower credit spreads compared to conventional securities. Mean spreads are 239.4 bps for green, 205.2 bps for social, and 240.3 bps for sustainability securities. These differences are significant at the 1% level for green and social securities.

Concerning credit quality, sustainable securities tend to have improved ratings. Green securities carry an average rating of 4.1, whereas social securities and sustainability securities have even better average ratings, at 3.5 and 2.6, respectively. These figures far surpass the 5.3 on conventional securities.

Sustainable securities issue fewer tranches by a slight margin. Green, social, and sustainability securities issue, on average, 6.6, 6.4, and 6.0 tranches, compared to the average 7.1 tranches of conventional ones. The decline is statistically significant for sustainability securities.

Market conditions, measured, for example, by the EUSA5y–Libor3m, reveal a mixed pattern. Green securities exhibit a higher average of 11.0 compared to that of conventional ones, 8.5, while social securities register an elevated average of 50.2. In contrast, sustainability securities register a significantly negative value of -83.4.

The average issue size varies widely by category. Traditional securities are issued at average sizes of $515.1 million, whereas green securities are issued at much lower sizes, $294.5 million. On the other hand, social and sustainability securities were issued at larger average sizes, at $442.0 million and $405.5 million, respectively.

In terms of country risk scores, sustainable securities tend to have lower scores, with green, social, and sustainability categories averaging between 1.8 and 1.9, whereas conventional securities average a score of 2.2.

In contrast to the initial expectations, sustainable securities do not necessarily show greater maturity. Green and sustainability securities have average maturities of 15.1 years and 20.6 years, respectively, while social securities have a distinguishing average of 30.1 years. These values compare with the average for conventional securities of 15 years.

Volatility is slightly greater for green securities, 18.7, compared to traditional securities, 17.7, and much greater for social, 22.2, and sustainability securities, 20.4. The results for sustainable securities are significant at a statistical level.

In terms of contractual characteristics, sustainable securities are less likely to be subordinated. Only 10.1% of green securities and none of sustainability securities are subordinated, compared to 69.7% for conventional securities. Social securities also show a lower subordination rate of 36.1%.

ABS classification also varies, with 73.4% of green, 16.7% of social, and all sustainability securities being ABS, against 80.6% for conventional.

Fixed-rate structures are not common, especially for sustainable securities. A mere 5.5% of green securities are fixed-rate, whereas social and sustainability securities use fixed-rate structures, compared to 0.4% for traditional securities. Most securities are callable, with a colossal 85.3% of green securities, 86.1% of social securities, as well as 100% of sustainability securities containing a call provision, and 87.1% for conventional ones.

In terms of MBS, green securities exhibit a higher proportion, 26.6%, than conventional ones, 19.3%, while social securities reach 83.3%. No sustainability securities are classified as MBS. A large proportion of sustainable securities were issued during the COVID-19 crisis period. Social securities at a rate of 86.1% and sustainability securities at a rate of 100% were issued compared to a mere 35.1% for conventional securities.

Sustainable securities also show significant variation regarding currency exposure. While only 26.8% of traditional securities are exposed to currency risk, the share rises to 95.4% for green and 66.7% for social securities, with no exposure at all for sustainability securities.

Regarding rating presence, 91% of traditional securities are rated, compared to 87.2% for green, 69.4% for social, and 88.9% for sustainability securities. Finally, rating discordance is low overall, with 3.2% for conventional, 2.8% for green, and none for social and sustainability.

The matched sample univariate test results are presented in Appendix B.

**Table 4:** Univariate Analysis

| Variable of interest | Conventional Securities | Sustainable Securities | | | Variable of interest | Conventional Securities | Sustainable bonds | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Green Securities | Social Securities | Sustainability Securities | | | Green Securities | Social Securities | Sustainability Securities |
| ***Univariate analysis - continuous variables*** | | | | | | | | | |
| **Credit spread (bps)** | | | | | **Transaction Size ($ Million)** | | | | |
| Number | 40 468 | 109 | 36 | 9 | Number | 40 468 | 109 | 36 | 9 |
| Mean | 289,9 | 239,4 *** | 205,2 *** | 240,3 | Mean | 515.1 | 294,5 *** | 442,0 ** | 405,5 * |
| Median | 210 | 164 | 120 | 160 | Median | 457,0 | 182,3 | 263,1 | 423,3 |
| **Rating [1-22 weak]** | | | | | **Country risk [1-22 weak]** | | | | |
| Number | 40 468 | 109 | 36 | 9 | Number | 40 468 | 109 | 36 | 9 |
| Mean | 5,3 | 4,1 ** | 3,5 ** | 2,6 * | Mean | 2,2 | 1,8 *** | 1,9 ** | 1,8 * |
| Median | 3 | 1 | 1 | 1 | Median | 2 | 1 | 2 | 2 |
| **Number of tranches** | | | | | **Maturity (years)** | | | | |
| Number | 40 468 | 109 | 36 | 9 | Number | 40 468 | 109 | 36 | 9 |
| Mean | 7,1 | 6,6 | 6,4 | 6,0 *** | Mean | 15,0 | 15,1 *** | 30,1 *** | 20,6 *** |
| Median | 7 | 7 | 7 | 6 | Median | 13,0 | 9,0 | 30,5 | 20,0 |
| **EUSA5y-Libor3m** | | | | | **Volatility** | | | | |
| Number | 40 468 | 109 | 36 | 9 | Number | 40 468 | 109 | 36 | 9 |
| Mean | 8,5 | 11,0 | 50,2 * | -83,4 *** | Mean | 17,7 | 18,7 * | 22,2 *** | 20,4 ** |
| Median | 22.2 | 25 | 27 | -113 | Median | 16,3 | 16 | 22,9 | 22,4 |
| ***Univariate analysis - dummy variables*** | | | | | | | | | |
| **Subordinated** | | | | | **Callable** | | | | |
| Nr. of tranches | 40 468 | 109 | 36 | 9 | Nr. of tranches | 40 468 | 109 | 36 | 9 |
| Nr. of tranches with d=1 | 28 207 | 11 *** | 13 *** | 0 *** | Nr. of tranches wit | 35 257 | 93 | 31 | 9 |
| % of total | 69,7% | 10,1% | 36,1% | 0,0% | % of total | 87,1% | 85,3% | 86,1% | 100,0% |
| **ABS** | | | | | **MBS** | | | | |
| Nr. of tranches | 40 468 | 109 | 36 | 9 | Nr. of tranches | 40 468 | 109 | 36 | 9 |
| Nr. of tranches with d=1 | 32 611 | 80 * | 6 *** | 9 | Nr. of tranches wit | 7 807 | 29 * | 30 *** | 0 |
| % of total | 80,6% | 73,4% | 16,7% | 100,0% | % of total | 19,3% | 26,6% | 83,3% | 0,0% |
| **Fixed** | | | | | **COVID-19** | | | | |
| Nr. of tranches | 40 468 | 109 | 36 | 9 | Nr. of tranches | 40 468 | 109 | 36 | 9 |
| Nr. of tranches with d=1 | 160 | 6 *** | 0 | 0 | Nr. of tranches wit | 14 197 | 38 | 31 *** | 9 |
| % of total | 0,4% | 5,5% | 0,0% | 0,0% | % of total | 35,1% | 34,9% | 86,1% | 100,0% |
| **Currency Risk** | | | | | **Rating Discordance** | | | | |
| Nr. of tranches | 40 468 | 109 | 36 | 9 | Nr. of tranches | 40 468 | 109 | 36 | 9 |
| Nr. of tranches with d=1 | 10 835 | 104 *** | 24 *** | 0 | Nr. of tranches wit | 1 299 | 3 | 0 | 0 |
| % of total | 26,8% | 95,4% | 66,7% | 0,0% | % of total | 3,2% | 2,8% | 0,0% | 0,0% |
| **Rated** | | | | | | | | | |
| Nr. of tranches | 40 468 | 109 | 36 | 9 | | | | | |
| Nr. of tranches with d=1 | 36 844 | 95 | 25 *** | 8 | | | | | |
| % of total | 91,0% | 87,2% | 69,4% | 88,9% | | | | | |

Note: This table reports summary statistics for a sample of conventional and sustainable securities, including green, social, and sustainability securities, issued between 2014 and 2024. The data used for this analysis were collected from DCM Analytics and Datastream. We test for differences in contractual characteristics using the Wilcoxon rank-sum test for continuous variables and Fisher's exact test for dummy variables. *** indicates significance at the 1% level, ** indicates significance between the 1% and 5% levels, * indicates significance at the 10% level. Securities ratings are based on S&P and Moody's ratings at the time of issuance, converted to a numeric scale where AAA = Aaa = 1, AA+ Aa1 = 2, and so on until D = 22. For detailed variable definitions, see Appendix A.

# 6. Regression Results

## 6.1 Sustainable versus conventional ABS and MBS.

To examine whether sustainable structured securities benefit from a pricing advantage in the primary market, a series of OLS regressions were estimated using credit spreads as the dependent variable. The main explanatory variables are dummy indicators for green, social, and sustainability-labelled securities, with conventional ABS and MBS serving as the reference category. The models progressively control contractual features of the securitisation, credit quality, and macroeconomic conditions.

The results, summarized in Tables 3 (Models [1]-[5]) and 4 (Models [6]-[10]), show that the greenium depends on the models' specification and the sample used. In the full sample, there is evidence of a statistically significant greenium. In the baseline regression, Model [3], the Sustainability Security dummy shows a spread reduction of 44.57 bps, and in Model [9], the Green Securities reach -46.46 bps with a p-value of 0.001, confirming a statistically significant pricing advantage for sustainable securities.

However, when analysing the matched sample, the effect disappears. In Model [5], the Sustainable Security coefficient is -72.74 bps but not statistically significant, and a similar pattern is seen in Model [10], with Green Securities presenting a reduction of -46.13 bps and a p-value of 0.667. These findings suggest that the full sample may reflect other issuer-level or securities differences rather than the effect of the label itself.

Social securities show negative and significant effects in the full sample, but not in the matched one, while sustainability effects remain positive but insignificant.

Therefore, the results partially confirm Hypothesis H1. While in the full sample, the greenium was visible, it disappeared once some characteristics were controlled. These findings align with Pinto & Ribeiro (2024), who find no significant spread differences between sustainable and conventional bonds in matched samples.

**Table 5:** The pricing of sustainable versus conventional securities

| **Dependent variable:** Credit spread (bps) | [1] All securities | [2] All securities | [3] All securities | [4] All securities | [5] All securities \| Matched Sample |
|---|---|---|---|---|---|
| **Independent variables:** | | | | | |
| Intercept | 449.85 *** | 574.76 *** | 429.36 *** | 527.95 *** | 645.99 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.257) |
| Sustainable Security | -32.14 | -35.74 ** | -44.57 ** | -45.52 *** | -72.74 |
| | (0.121) | (0.024) | (0.019) | (0.002) | (0.499) |
| AAA | | -156.84 *** | | -163.21 *** | -173.43 |
| | | (0.000) | | (0.000) | (0.269) |
| AA+ | | -122.88 *** | | -134.25 *** | -104.9416 |
| | | (0.000) | | (0.000) | (0.442) |
| AA | | -119.05 ** | | -125.90 *** | -56.94 |
| | | (0.017) | | (0.000) | (0.730) |
| AA- | | -99.56 *** | | -103.22 *** | -57.23 |
| | | (0.000) | | (0.000) | (0.667) |
| A+ | | -71.44 *** | | -91.57 *** | 81.95 |
| | | (0.000) | | (0.000) | (0.689= |
| A | | -63.99 *** | | -70.62 *** | -25.65 |
| | | (0.000) | | (0.000) | (0.890) |
| A- | | -46.10 *** | | -48.91 *** | 2.12 |
| | | (0.002) | | (0.000) | (0.991) |
| BBB+ | | 13.98 | | 2.31 | 164.17 |
| | | (0.316) | | (0.863) | (0.371) |
| BBB | | 32.50 | | 21.13 | 82.55 |
| | | (0.025) | | (0.109) | (0.651) |
| BBB- | | 63.20 *** | | 57.12 *** | 138.77 |
| | | (0.000) | | (0.000) | (0.428) |
| BB+ | | 193.29 *** | | 182.02 *** | 158.30 |
| | | (0.000) | | (0.000) | (0.381) |
| BB | | 237.83 *** | | 228.04 *** | 266.22 |
| | | (0.000) | | (0.000) | (0.145) |
| BB- | | 349.83 *** | | 343.23 *** | 470.98 *** |
| | | (0.000) | | (0.000) | (0.005) |
| B+ | | 263.73 *** | | 255.00 *** | ** |
| | | (0.000) | | (0.000) | |
| B | | 325.39 *** | | 315.59 *** | 448.16 ** |
| | | (0.000) | | (0.000) | (0.012) |
| B- | | 504.39 *** | | 506.31 *** | 66.29 |
| | | (0.000) | | (0.000) | (0.672) |
| CCC+ | | 195.534 *** | | 188.25 *** | |
| | | (0.000) | | (0.000) | |
| CCC | | 145.52 *** | | 148.08 *** | |
| | | (0.01) | | (0.001) | |
| CCC- | | 55.17 ** | | 97.05 * | |
| | | (0.013) | | (0.071) | |
| CC | | 192.61 | | 174.84 * | |
| | | (0.141) | | (0.071) | |
| Rating Discordance | | -34.53 ** | | -36.22 *** | -109.89 * |
| | | (0.019) | | (0.002) | (0.057) |
| Subordinated | 185.57 *** | 42.44 *** | 188.68 *** | 45.40 *** | 45.76 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.399) |
| Log maturity | 7.59 | -9.43 | 5.88 | -10.72 * | -0.57 |
| | (0.393) | (0.111) | (0.484) | (0.061) | (0.985) |
| Log transaction size | -66.88 *** | -59.19 | -59.72 *** | -52.14 *** | -103.10 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.176) |
| Number of tranches | 11.74 *** | 11.18 *** | 11.59 *** | 11.23 *** | 25.22 * |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.07) |
| Currency risk | 63.48 *** | 7.59 | 59.83 *** | 3.64 | 25.48 |
| | (0.000) | (0.639) | (0.000) | (0.604) | (0.168) |
| Callable | 9.70 | 27.22 * | 18.72 | 46.56 *** | -3.83 |
| | (0.390) | (0.062) | (0.798) | (0.002) | (0.927) |
| Fixed | -39.31 | -37.81 | -49.04 | -50.86 | -72.55 |
| | (0.404) | (0.194) | (0.350) | (0.144) | (0.447) |
| Volatility | 1.46 * | 1.12 | -0.01 | 0.04 * | 2.88 |
| | (0.096) | (0.136) | (0.987) | (0.07) | (0.602) |
| Country risk | -15.17 * | -20.07 ** | -12.56 * | -17.34 ** | -8.04 |
| | (0.061) | (0.013) | (0.071) | (0.012) | (0.675) |
| EUSA5y-Libor3m | 0.09 | 0.03 | 0.01 | -0.08 | -0.91 *** |
| | (0.406) | (0.834) | (0.972) | (0.689) | (0.001) |

*(continued)*

| **Dependent variable:** Credit spread (bps) | [1] All securities | [2] All securities | [3] All securities | [4] All securities | [5] All securities \| Matched Sample |
|---|---|---|---|---|---|
| **Independent variables:** | | | | | |
| Covid | -3.67 | 2.08 | 24.50 | 28.60 * | 88.71 |
| | (0.859) | (0.922) | (0.108) | (0.084) | (0.164) |
| Industry fixed effects | No | No | Yes | Yes | Yes |
| Year fixed effects | No | No | Yes | Yes | Yes |
| Number of observations | 40 622 | 40 622 | 40 622 | 40 622 | 76 |
| *of which sustainable* | 154 | 154 | 154 | 154 | 38 |
| *of which conventional* | 40 468 | 40 468 | 40 468 | 40 468 | 38 |
| Adjusted $R^2$ | 0.19 | 0.76 | 0.22 | 0.79 | 0.92 |

Note: This table presents OLS regressions for the determinants of credit spreads using a binary indicator for sustainable securities. Models [1] to [4] include all securities, with different specifications and controls. Model [5] is based on a matched sample of 76 bonds (38 sustainable and 38 conventional). Estimated coefficients are reported with p-values in parentheses. All models include year fixed effects; industry fixed effects are included in Models [4] and [5]. Standard errors are clustered by year and country. Adjusted $R^2$ values are reported. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

**Table 6:** The pricing of sustainable versus conventional securities: category breakdown

| **Dependent variable:** | [6] | [7] | [8] | [9] | [10] |
|---|---|---|---|---|---|
| Credit spread (bps) | All securities | All securities | All securities | All securities | All securities \| Matched Sample |
| **Independent variables:** | | | | | |
| Intercept | 449.82 *** | 575.12 *** | 430.94 *** | 529.20 *** | 723.70 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.161) |
| Green Security | -28.59 | -36.51 ** | -40.71 * | -46.46 *** | -46.13 |
| | (0.284) | (0.05) | (0.073) | (0.001) | (0.667) |
| Social Security | -74.477 *** | -60.39 *** | -90.53 *** | -71.23 ** | -194.52 |
| | (0.000) | (0.025) | (0.000) | (0.021) | (0.203) |
| Sustainability Security | 93.95 ** | 70.95 *** | 91.67 | 66.90 * | |
| | (0.044) | (0.008) | (0.139) | (0.085) | |
| AAA | | -156.89 *** | | -163.26 *** | -194.38 |
| | | (0.000) | | (0.000) | (0.203) |
| AA+ | | -123.27 *** | | -134.65 *** | -117.21 |
| | | (0.000) | | (0.000) | (0.383) |
| AA | | -119.13 *** | | -125.98 *** | -82.12 |
| | | (0.000) | | (0.000) | (0.616) |
| AA- | | -100. *** | | -103.27 *** | -95.15 |
| | | (0.000) | | (0.000) | (0.485) |
| A+ | | -71.54 *** | | -91.67 *** | 67.48 |
| | | (0.000) | | (0.000) | (0.744) |
| A | | -64.10 *** | | -70.72 *** | -50.95 |
| | | (0.000) | | (0.000) | (0.782) |
| A- | | -46.14 *** | | -48.97 *** | -33.07 |
| | | (0.002) | | (0.000) | (0.854) |
| BBB+ | | 13.90 | | 2.22 | 142.65 |
| | | (0.318) | | (0.868) | (0.441) |
| BBB | | 32.47 ** | | 21.1 | 66.07 |
| | | (0.025) | | (0.109) | (0.706) |
| BBB- | | 63.10 *** | | 57.01 *** | 86.75 |
| | | (0.000) | | (0.000) | (0.622) |
| BB+ | | 193.18 *** | | 181.91 *** | 158.34 |
| | | (0.000) | | (0.000) | (0.367) |
| BB | | 237.79 *** | | 227.99 *** | 240.53 |
| | | (0.000) | | (0.000) | (0.176) |
| BB- | | 349.75 *** | | 343.14 *** | 443.86 *** |
| | | (0.000) | | (0.000) | (0.008) |
| B+ | | 263.81 *** | | 255.09 *** | |
| | | (0.000) | | (0.000) | |
| B | | 325.53 *** | | 315.46 *** | 406.14 ** |
| | | (0.000) | | (0.000) | (0.02) |
| B- | | 504.26 *** | | 506.19 *** | 18.38 |
| | | (0.000) | | (0.000) | (0.901) |
| CCC+ | | 195.34 *** | | 187.97 *** | |
| | | (0.000) | | (0.000) | |
| CCC | | 146.72 *** | | 149.345 *** | |
| | | (0.001) | | (0.001) | |
| CCC- | | 55.05 ** | | 96.94 *** | |
| | | (0.013) | | (0.000) | |
| C | | 192.53 | | 174.77 * | |
| | | (0.142) | | (0.071) | |
| Rating Discordance | | -34.56 ** | | -36.26 *** | -77.63 |
| | | (0.018) | | (0.002) | (0.178) |
| Subordinated | 185.68 *** | 42.55 *** | 188.80 *** | 45.52 *** | 38.49 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.429) |
| Log maturity | 7.64 | -9.46 | 5.93 | -10.75 * | 38.82 |
| | (0.393) | (0.112) | (0.482) | (0.061) | (0.228) |
| Log transaction size | -66.89 *** | -59.22 *** | -59.72 *** | -52.16 *** | -97.63 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.186) |
| Number of tranches | 11.74 *** | 11.18 *** | 11.58 *** | 11.23 *** | 14.43 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.259) |
| Currency risk | 63.59 *** | 7.73 | 59.93 *** | 3.78 | 13.27 |
| | (0.000) | (0.633) | (0.000) | (0.590) | (0.808) |
| Callable | 9.65 | 27.18 * | 18.65 * | 46.51 *** | -0.08 |
| | (0.86) | (0.062) | (0.074) | (0.002) | (0.998) |
| Fixed | -39.44 | -37.84 | -49.13 | -50.90 | -74.18 |
| | (0.402) | (0.194) | (0.350) | (0.144) | (o.409) |
| Volatility | 1.46 * | 1.11 | -0.02 | 0.036 | 4.19 |
| | (0.097) | (0.137) | (0.978) | (0.950) | (0.343) |

*(continued)*

| **Dependent variable:** | [6] | [7] | [8] | [9] | [10] |
|---|---|---|---|---|---|
| Credit spread (bps) | All securities | All securities | All securities | All securities | All securities \| Matched Sample |
| Country risk | -15.18 * | -20.11 ** | -12.56 * | -17.37 ** | -13.13 |
| | (0.061) | (0.013) | (0.071) | (0.012) | (0.460) |
| EUSA5y-Libor3m | 0.09 | 0.03 | 0.008 | -0.08 | -0.68 * |
| | (0.402) | (0.831) | (0.968) | (0.691) | (0.053) |
| Covid | -3.60 | 2.13 | 25.13 | 28.68 * | 63.57 |
| | (0.862) | (0.921) | (0.106) | (0.083) | (0.397) |
| Industry fixed effects | No | No | Yes | Yes | Yes |
| Year fixed effects | No | No | Yes | Yes | Yes |
| Number of observations | 40 622 | 40 622 | 40 622 | 40 622 | 76 |
| *of which green* | 109 | 109 | 109 | 109 | 31 |
| *of which social* | 36 | 36 | 36 | 36 | 7 |
| *of which sustainability* | 9 | 9 | 9 | 9 | 0 |
| *of which conventional* | 40 468 | 40 468 | 40 468 | 40 468 | 38 |
| Adjusted $R^2$ | 0.19 | 0.76 | 0.22 | 0,72 | 0,93 |

Note: This table presents OLS regressions for the determinants of credit spreads. Models [6] to [9] include all securities, with separate estimates for green, social, and sustainability securities. Model [10] uses a matched sample of 38 conventional and 38 sustainable securities. The sustainable sample includes 109 green, 9 social, and 36 sustainability securities. Estimated coefficients are shown with p-values in parentheses. All models include industry and year fixed effects, except Models [6] and [7]. Standard errors are clustered by year and country. Adjusted $R^2$ values are reported. *, *, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

## 6.2 The pricing of sustainable versus conventional ABS and MBS

Hypothesis H2 investigates whether standard credit risk variables remain relevant in the pricing of sustainable securities. The models include (i) a dummy for rated securities, (ii) a numerical credit rating score, and (iii) a measure of rating discordance across agencies.

The results confirm that credit fundamentals remain significant in pricing sustainable securities. While some early models explored the effect of rated dummy, this variable was excluded due to strong multicollinearity with credit ratings, leading to instability in coefficient estimates. Therefore, the analyses focus on credit rating scores and rating discordance.

The empirical findings in Table 7 validate H2, which asserts that credit risk factors continue to play significant roles in explaining credit spreads in structured securities. In Model [12], high credit sustainable securities ratings are invariably linked with decreased spreads. AAA-ranked securities are associated to a 229.92 bps spread drop with a p-value of 0.014, while AA+ securities decrease by 157.93 bps, with a significant 1% level. In contrast, B+ and B- have a spread increase of 329.10 and 341.16 bps, with significant values of 0.002 and 0.005, respectively.  These results show that credit quality plays an overriding pricing factor for sustainable securities.

Model [13], regarding green securities, the relationship is equally robust. AAA securities are linked with a spread decrease of 409.41 bps and a p-value of 0.02. AA- and AA+ ratings have equally significant effects, with -351.72 bps and 300.39 bps spread decrease, respectively and statistically significant at the 10% significance level. These findings show that ESG labelling does not supersede conventional credit risk concerns.

Regarding rating discordance, it's only statistically significant for conventional securities (Model [11]), indicating that markets penalize this inconsistency when there is no ESG labelling.

For sustainable securities, discordance has a coefficient of −23.12 basis points ($p = 0.576$), while for green securities it is slightly positive at 3.59 basis points ($p = 0.896$). Though both are statistically insignificant, the opposing signs suggest differing market views on rating disagreement across ESG-labelled products.

These results are in line with Pinto & Ribeiro (2024) in confirming the role of credit fundamentals in pricing. Rating discordance, however, only appears to affect conventional securities. Overall, the evidence supports H2 and reinforces the relevance of traditional credit risk factors in sustainable finance.

**Table 7:** The pricing of sustainable versus conventional securities: subsample breakdown

| **Dependent variable:** Credit spread (bps) | [11] Conventional securities | | [12] Sustainable securities | | [13] Green securities | |
|---|---|---|---|---|---|---|
| **Independent variables:** | | | | | | |
| Intercept | 533.73 | *** | 288.46 | | 1150.76 | *** |
| | (0.000) | | (0.103) | | (0.001) | |
| AAA | -163.59 | *** | -229.92 | ** | -409.41 | ** |
| | (0.000) | | (0.014) | | (0.02) | |
| AA+ | -134.90 | *** | -157.93 | *** | | |
| | (0.000) | | (0.008) | | | |
| AA | -126.39 | *** | -148.17 | | -351.72 | * |
| | (0.000) | | (0.180) | | (0.069) | |
| AA- | -103.61 | *** | | | -300.39 | * |
| | (0.000) | | | | (0.092) | |
| A+ | -92.07 | *** | -68.31 | | | |
| | (0.000) | | (0.447) | | | |
| A | -71.11 | *** | -95.72 | | -300.47 | |
| | (0.000) | | (0.349) | | (0.107) | |
| A- | -49.46 | *** | | | | |
| | (0.000) | | | | | |
| BBB+ | 1.91 | | -118.16 | | | |
| | (0.886) | | (0.193) | | | |
| BBB | 20.44 | | 6.91 | | -226.20 | |
| | (0.122) | | (0.948) | | (0.210) | |
| BBB- | 56.68 | *** | 13.17 | | -233.27 | |
| | (0.000) | | (0.878) | | (0.223) | |
| BB+ | 181.55 | *** | 130.58 | | -52.89 | |
| | (0.000) | | (0.215) | | (0.764) | |
| BB | 227.74 | *** | | | | |
| | (0.000) | | | | | |
| BB- | 342.80 | *** | 188.76 | * | | |
| | (0.000) | | (0.079) | | | |
| B+ | 253.90 | *** | 329.10 | *** | 146.41 | |
| | (0.000) | | (0.002) | | (0.445) | |
| B | 314.25 | *** | 341.16 | *** | | |
| | (0.000) | | (0.005) | | | |
| B- | 505.91 | *** | | | | |
| | (0.000) | | | | | |
| CCC+ | 187.712 | *** | | | | |
| | (0.000) | | | | | |
| CCC | 150.96 | *** | -18.16 | | | |
| | (0.001) | | (0.840) | | | |
| CCC- | 96.94 | *** | | | | |
| | (0.000) | | | | | |
| C | 174.77 | * | | | | |
| | (0.071) | | | | | |
| Rating Discordance | -36.26 | *** | -23.12 | | 3.59 | |
| | (0.002) | | (0.576) | | (0.896) | |
| Subordinated | 45.52 | *** | -50.19 | | -16.34 | |
| | (0.000) | | (0.298) | | (0.705) | |
| Log maturity | -10.75 | * | 48.31 | *** | 39.09 | ** |
| | (0.061) | | (0.001) | | (0.031) | |
| Log transaction size | -52.16 | *** | -16.69 | *** | -15.88 | |
| | (0.000) | | (0.345) | | (0.354) | |
| Number of tranches | 11.23 | *** | 26.77 | *** | 19.26 | *** |
| | (0.000) | | (0.000) | | (0.002) | |
| Currency risk | 3.78 | *** | 9.46 | | 68.20 | |
| | (0.590) | | (0.858) | | (0.392) | |
| Callable | 46.50 | *** | 96.43 | * | 78.66 | |
| | (0.002) | | (0.09) | | (0.360) | |
| Fixed | -50.90 | | -31.38 | | -66.28 | |
| | (0.144) | | (0.729) | | (0.403) | |
| Volatility | 0.04 | | -0.45 | | -3.72 | |
| | (0.950) | | (0.911) | | (0.305) | |
| Country risk | -17.37 | ** | 0.82 | | -36.20 | |
| | (0.012) | | (0.947) | | (0.101) | |
| EUSA5y-Libor3m | -0.08 | | -1.28 | *** | -1.35 | *** |
| | (0.691) | | (0.000) | | (0.000) | |

*(continued)*

| **Dependent variable:** | [11] | [12] | [13] |
|---|---|---|---|
| Credit spread (bps) | Conventional securities | Sustainable securities | Green securities |
| Covid | 28.68 * | 43.20 | 16.23 |
| | (0.083) | (0.394) | (0.766) |
| Industry fixed effects | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes |
| Number of observations | 40 468 | 154 | 109 |
| Adjusted $R^2$ | 0,79 | 0,83 | 0,54 |
| Rating dummies as as independent variables only | | | |
| Adjusted $R^2$ | 0,71 | 0,63 | 0,65 |
| Differences in adjusted $R^2$ | 0,08 | 0,20 | -0,11 |

Note: This table presents OLS regressions for the determinants of credit spreads, estimated separately for conventional, sustainable, and green securities (Models [11] – [13]). The sustainable sample includes 154 securities: 109 green and 45 social. Estimated coefficients are reported with p-values in parentheses. All models include industry and year fixed effects. Standard errors are clustered by year and country. Adjusted $R^2$ values are reported. *, *, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

## 6.3 The impact of COVID-19 on pricing and premium

Hypothesis H3 explores whether the greenium intensified during the COVID-19 pandemic. This is tested by re-estimating the models on two distinct sub-periods: during the pandemic (2020-2023) and outside that period. The results are presented in Table 8, using the overall sample and the matched sample of sustainable or conventional securities.

In the complete sample, the Sustainable Security dummy is associated with a spread reduction of –40.77 bps outside the COVID-19 period, Model [4a], significant at the 5% level. During the pandemic, this premium decreases to -44.94 bps, Model [4b], and is statistically significant at 5%, suggesting a possible weakening of the sustainable label's pricing influence under adverse market conditions.

Models [5a] and [5b] do the same, but for the matched sample, including 38 sustainable securities and 38 conventional securities. In Model [5a], outside the pandemic period, the Sustainable Security coefficient is 18.12 bps (p-value: 0.906), and in Model [5b], during the pandemic, it increases to 147.20 bps (p-value: 0.618). Both are statistically insignificant, showing that any greenium effect remains when controlling for some security characteristics.

Table 9 examines disaggregated sustainable securities, green, social, and sustainability-labelled on the full and matched sample. In Model [10a], using the sample outside the COVID-19 period, green securities spread reduction of 114.49 bps, while during the pandemic, Model [10b], the coefficient becomes 194.95 bps, though neither result is statistically significant, likely due to the limited sample size.

For Sustainability-labelled securities, the coefficients are positive in Model [9a] with 62.98 bps but statistically insignificant and in Model [9b] with 34.30 bps, at a 5% significance level. For social securities, significant results are found only in full sample during the pandemic, Model [9b] (-59.60 bps and p-value: 0.057) and in the matched sample outside the COVID-19 period, Model [10a] (-400.48 bps and p-value: 0.036), demonstrating lack of consistency, so no conclusion can be extracted.

The results suggest that the greenium appears in some models using the full sample but disappears once issuer characteristics are controlled for through matching. In the matched sample, coefficients lose statistical significance across periods, indicating that the observed premiums may reflect issuer-level differences. H3 is supported for green securities under less restrictive settings, partially for sustainability labels, and not for social ones. These findings are in line with Pinto & Ribeiro (2024), who find no significant pricing premium for sustainable bonds when issuer-level matching is applied, including during the COVID-19 period.

**Table 8:** The pricing of sustainable versus conventional securities: COVID-19 period vs out Covid period

| **Dependent variable:** Credit spread (bps) | [4a] All securities \| Out-COVID period | [4b] All securities \| COVID period | [5a] All securities \| Out-Covid period \| Matched Sample | [5b] All securities \| COVID period \| Matched Sample |
|---|---|---|---|---|
| **Independent variables:** | | | | |
| Intercept | 564.46 *** | 473.2 *** | 223.09 | -703.573 |
| | (0.000) | (0.000) | (0.853) | (0.614) |
| Sustainable Security | -40.77 ** | -44.94 *** | 18.12 | 147.20 |
| | (0.028) | (0.005) | (0.906) | (0.618) |
| AAA | -169.43 *** | -163.27 *** | -16.12 | -425.65 *** |
| | (0.000) | (0.000) | (0.773) | (0.003) |
| AA+ | -139.48 *** | -131.68 *** | 6.97 | |
| | (0.000) | (0.000) | (0.907) | |
| AA | -130.37 *** | -130.96 *** | 29.91 *** | -304.66 |
| | (0.000) | (0.000) | (0.860) | (0.126) |
| AA- | -107.80 *** | -98.99 *** | 68.41 | -23.99 |
| | (0.000) | (0.000) | (0.623) | (0.955) |
| A+ | -94.59 *** | -101.33 *** | | -370.20 * |
| | (0.000) | (0.000) | | (0.092) |
| A | -77.32 *** | -71.72 *** | 98.09 | -254.62 |
| | (0.000) | (0.000) | (0.515) | (0.167) |
| A- | -56.47 *** | -42.42 *** | 58.83 | 60.60 |
| | (0.004) | (0.006) | (0.633) | (0.852) |
| BBB+ | -9.55 | 6.92 | | -280.58 ** |
| | (0.656) | (0.491) | | (0.046) |
| BBB | 12.40 | 28.40 ** | 276.70 ** | -135.60 |
| | (0.513) | (0.046) | (0.05) | (0.374) |
| BBB- | 48.92 *** | 59.69 *** | | -29.19 |
| | (0.008) | (0.000) | | (0.909) |
| BB+ | 164.99 *** | 193.79 *** | 346.11 *** | |
| | (0.000) | (0.000) | (0.001) | |
| BB | 225.43 *** | 219.17 *** | 551.70 *** | 56.93 |
| | (0.000) | (0.000) | (0.000) | (0.791) |
| BB- | 319.77 *** | 371.16 *** | 606.46 *** | 284.60 |
| | (0.000) | (0.000) | (0.000) | (0.191) |
| B+ | 254.00 *** | 247.83 *** | | |
| | (0.000) | (0.000) | | |
| B | 302.1 *** | 334.27 *** | | 195.86 |
| | (0.000) | (0.000) | | (0.257) |
| B- | 484.77 *** | 537.51 *** | | -23.46 |
| | (0.000) | (0.000) | | (0.943) |
| CCC+ | 171.58 *** | 199.83 *** | | |
| | (0.000) | (0.002) | | |
| CCC | 73.64 *** | 248.63 *** | | |
| | (0.007) | (0.000) | | |
| CCC- | 86.88 *** | | | |
| | (0.000) | | | |
| C | 156.65 | | | |
| | (0.114) | | | |
| Rating Discordance | -36.64 *** | -40.31 * | -3.75 | |
| | (0.005) | (0.064) | (0.986) | |
| Subordinated | 40.54 *** | 58.24 *** | 18.74 | 156.30 |
| | (0.000) | (0.000) | (0.878) | (0.250) |
| Log maturity | -1.76 | -26.26 ** | 45.58 ** | -14.48 |
| | (0.789) | (0.013) | (0.580) | (0.880) |
| Log transaction size | -48.26 *** | -50.43 *** | 27.38 | 12.92 |
| | (0.000) | (0.000) | (0.895) | (0.946) |
| Number of tranches | 10.82 *** | 12.82 *** | 14.93 | 81.43 *** |
| | (0.000) | (0.000) | (0.127) | (0.001) |
| Currency risk | -0.17 | 10.72 | -35.57 | 65.78 |
| | (0.986) | (0.313) | (0.552) | (0.384) |
| Callable | 36.50 ** | 68.84 *** | -44.78 | 217.08 |
| | (0.026) | (0.007) | (0.354) | (0.250) |
| Fixed | -57.54 | 54.34 | 6.05 | |
| | (0.128) | (0.232) | (0.898) | |
| Volatility | -0.34 | 0.28 | -2.70 | 10.95 |
| | (0.475) | (0.763) | (0.828) | (0.228) |
| Country risk | -14.64 * | -26.51 ** | 11.91 | 28.41 |
| | (0.052) | (0.029) | (0.372) | (0.538) |
| EUSA5y-Libor3m | -0.42 * | 0.22 * | -0.21 | -0.15 |
| | (0.091) | (0.052) | (0.932) | (0.876) |

*(continued)*

| **Dependent variable:** | [4a] | [4b] | [5a] | [5b] |
|---|---|---|---|---|
| Credit spread (bps) | All securities \| Out-COVID period | All securities \| COVID period | All securities \| Out-Covid period \| Matched Sample | All securities \| COVID period \| Matched Sample |
| **Independent variables:** | | | | |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Number of observations | 26 360 | 14 262 | 38 | 38 |
| *of which green* | 71 | 38 | 18 | 13 |
| *of which social* | 10 | 26 | 3 | 4 |
| *of which sustainability* | 8 | 1 | 0 | 0 |
| *of which conventional* | 26 271 | 14 197 | 17 | 21 |
| Adjusted $R^2$ | 0.78 | 0.81 | 0.97 | 0.98 |

Note: This table presents OLS regression results for the determinants of credit spreads. Models [4a] and [4b] include all securities, with 26,360 and 14,262 observations for the out-of-COVID and COVID periods, respectively. The sustainable sample includes 71 securities before COVID (62 green, 9 social) and 38 during COVID (18 green, 1 social). Models [5a] and [5b] use a matched sample of 38 conventional and 38 sustainable securities. Standard errors are clustered by year and country. Adjusted $R^2$ is reported. Statistical significance is indicated at the 10%, 5%, and 1% levels by *, **, and ***, respectively.

**Table 9:** The pricing of sustainable versus conventional securities: COVID-19 period vs out COVID period – subcategory breakdown

| **Dependent variable:** Credit spread (bps) | [9a] All securities \| Out-COVID period | [9b] All securities \| COVID period | [10a] All securities \| Out-Covid period \| Matched Sample | [10b] All securities \| COVID period \| Matched Sample |
|---|---|---|---|---|
| **Independent variables:** | | | | |
| Intercept | 566.75 *** | 472.86 *** | 1469.1 ** | -821.24 |
| | (0.000) | (0.000) | (0.048) | (0.587) |
| Green Security | -45.81 *** | -36.88 ** | -114.49 | 194.95 |
| | (0.004) | (0.033) | (0.157) | (0.587) |
| Social Security | -89.41 | -59.60 * | -400.4862 ** | 136.93 |
| | (0.257) | (0.057) | (0.036) | (0.616) |
| Sustainability Security | 62.98 | 34.30 | | |
| | (0.103) | (0.036) | | |
| AAA | -169.48 *** | -163.25 *** | -114.32 ** | -414.47 *** |
| | (0.000) | (0.000) | (0.013) | (0.007) |
| AA+ | -139.84 *** | -131.64 *** | -49.39 * | |
| | (0.000) | (0.000) | (0.068) | |
| AA | -130.37 *** | -130.96 *** | -18.66 | -295.20 |
| | (0.000) | (0.000) | (0.686) | (0.174) |
| AA- | -107.89 *** | -98.92 *** | -8.23 | 3.12 |
| | (0.000) | (0.000) | (0.844) | (0.995) |
| A+ | -94.71 *** | -101.34 *** | | -336.58 |
| | (0.000) | (0.000) | | (0.235) |
| A | -77.44 *** | -71.73 *** | 20.60 | -242.80 |
| | (0.000) | (0.000) | (0.655) | (0.231) |
| A- | -56.59 *** | -42.38 *** | -63.93 * | 70.38 |
| | (0.003) | (0.006) | (0.069) | (0.875) |
| BBB+ | -9.65 | 6.90 | | -263.97 |
| | (0.652) | (0.491) | | (0.139) |
| BBB | 12.41 | 28.34 ** | 195.74 *** | -122.62 |
| | (0.513) | 0.046 | (0.000) | (0.470) |
| BBB- | 48.79 *** | 59.68 *** | | -25.50 |
| | (0.008) | (0.000) | | (0.922) |
| BB+ | 164.90 *** | 193.82 *** | 253.90 *** | |
| | (0.000) | (0.000) | (0.000) | |
| BB | 225.32 *** | 219.17 *** | 470.74 *** | 74.86 |
| | (0.000) | (0.000) | (0.000) | (0.753) |
| BB- | 319.67 *** | 371.15 *** | 546.95 *** | 289.24 |
| | (0.000) | (0.000) | (0.000) | (0.201) |
| B+ | 253.85 *** | 248.11 *** | | |
| | (0.000) | (0.000) | | |
| B | 301.99 *** | 334.07 *** | | 208.06 |
| | (0.000) | (0.000) | | (0.276) |
| B- | 484.62 *** | 537.48 *** | | -2.09 |
| | (0.000) | (0.000) | | (0.995) |
| CCC+ | 171.42 *** | 199.70 *** | | |
| | (0.000) | (0.002) | | |
| CCC | 73.52 *** | 250.74 *** | | |
| | (0.007) | (0.000) | | |
| CCC- | 86.76 *** | | | |
| | (0.000) | | | |
| C | 156.60 | | | |
| | (0.114) | | | |
| Rating Discordance | -36.64 *** | -40.39 * | -48.16 | |
| | (0.005) | (0.063) | (0.440) | |
| Subordinated | 40.67 *** | 58.32 *** | -33.16 | 156.76 |
| | (0.000) | (0.000) | (0.585) | (0.274) |
| Log maturity | -1.83 | -26.12 ** | 124.18 ** | -18.26 |
| | (0.780) | (0.014) | (0.019) | (0.864) |
| Log transaction size | -48.32 *** | -50.36 *** | -153.83 | 45.17 |
| | (0.000) | (0.000) | (0.128) | (0.850) |
| Number of tranches | 10.81 *** | 12.82 *** | -1.43 | 76.48 *** |
| | (0.000) | (0.000) | (0.792) | (0.003) |
| Currency risk | 0.01 | 10.68 | 5.01 | 55.52 |
| | (0.999) | (0.314) | (0.841) | (0.516) |
| Callable | 36.47 ** | 68.66 *** | -1.69 | 233.30 |
| | (0.026) | (0.007) | (0.943) | (0.269) |
| Fixed | -57.50 | 54.22 | 51.75 | |
| | (0.128) | (0.234) | (0.201) | |

*(continued)*

| **Dependent variable:** Credit spread (bps) | [9a] All securities \| Out-COVID period | [9b] All securities \| COVID period | [10a] All securities \| Out-Covid period \| Matched Sample | [10b] All securities \| COVID period \| Matched Sample |
|---|---|---|---|---|
| Volatility | -0.35 | 0.28 | -0.28 | 9.93 |
| | (0.457) | (0.762) | (0.937) | (0.99) |
| Country risk | -14.68 * | -26.46 ** | -17.48 | 30.53 |
| | (0.051) | (0.03) | (0.111) | (0.522) |
| EUSA5y-Libor3m | -0.42 * | 0.22 ** | -0.11 | 0.003 *** |
| | (0.092) | (0.05) | (0.794) | (0.000) |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Number of observations | 26 360 | 14 262 | 38 | 38 |
| *of which green* | 71 | 38 | 18 | 13 |
| *of which social* | 10 | 26 | 3 | 4 |
| *of which sustainability* | 8 | 1 | 0 | 0 |
| *of which conventional* | 26 271 | 14 197 | 17 | 21 |
| Adjusted $R^2$ | 0.78 | 0.81 | 0,99 | 0,98 |

Note: This table reports OLS regressions for credit spread determinants. Models [4a] and [4b] refer to all securities during the out-of-COVID and COVID periods, respectively. Models [5a] and [5b] use a matched sample of 38 conventional and 38 sustainable securities. The sustainable sample includes 31 green and 7 social securities. Standard errors are clustered by year and country. Adjusted R² is reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

# Conclusion

This work investigates differences between ABS and MBS sustainable securities, including green, social, and sustainability securities, vis-à-vis conventional and comparable ones. Using a dataset covering a total of 40,622 securities, including 40,468 conventional and 154 sustainable, the results lead to three principal findings. Firstly, when using the full sample, there is solid evidence of a greenium in the structured green debt market: green and social-labelled MBS and ABS exhibit lower issuance spreads than conventional ABS and MBS. However, the effect disappears in the matched sample, suggesting that the premium may reflect other characteristics. Conversely, sustainability-labelled securities do not exhibit a statistically significant pricing premium, indicating that investor recognition remains unbalanced across categories. Secondly, credit ratings remain key across all segments, while rating discordance matters only for conventional securities, reflecting differences in how credit risk is priced. This shows the prevalence of classical risk-based pricing mechanisms, even within ESG-oriented markets. Thirdly, the analysis identifies that the greenium in some full-sample models weakens during the COVID-19 period and disappears in the matched sample, suggesting that the effect may not reflect the investor preference shift under market stress. These findings complement a limited existing body of research on sustainable securitisation, with novel evidence on the interaction between sustainability labels and credit risk in bond pricing.

This dissertation adds to the growing body of research on sustainable securities pricing by exploring the prevalence of a greenium across ABS and MBS green, social, and sustainability labels. While most of the previous research concentrated on green bonds, this research broadens its scope to the securitised debt, presenting new evidence on whether sustainability labels influence spreads. It also investigates the impact of credit risk factors, including tranche rating and rating discordance, on investor opinion, and how these consequences changed under the COVID-19 pandemic.

With the sustainable securitisation market at an early stage, this study contributes valuable insights and sets the stage for further research. As the volume of sustainable securities issuances grows, subsequent research will benefit from larger datasets and could include the firm's characteristics, as Pinto & Ribeiro (2024) did for bonds. This research will gain yet greater significance as market norms changes and sustainability considerations play a larger role in capital allocation decisions.

# Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of my written work/thesis, "The Pricing Sustainable Asset Securitisation Bonds", Chat GPT was used for the following tasks: literature review, use of Stata and grammar check, with the prompts used listed at the end of the document in the Prompts List section. After using this tool, I reviewed and edited the content as necessary, and I take full responsibility for the content of the work presented.

I also declare that I am aware of and respect the Artificial Intelligence Rules of Conduct of Católica Porto Business School.

**Full name:** Maria Inês Pereira Pacheco

**Student number:** 355123008

**Date:** 01/05/2025

**Signature:** Maria Inês Pereira Pacheco

# Prompt List

- Can you give me a Stata tutorial?
- Check if this paragraph is in British English and without grammar errors.
- How do I cluster standard errors by year and country in Stata?
- How should I structure my literature review, knowing that my thesis is related to the greenium in sustainable securities?

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# Appendices

## **Appendix A:** Variable Definitions and Expected Impact on Credit Spread

| Variable name | Variable definition | Source |
|---|---|---|
| **Dependent variable:** | | |
| Credit spread | Margin yielded by the security at issue above a corresponding currency treasury benchmark with a comparable maturity (OAS). | DCM Analytics |
| **Independent variables:** | | |
| ***Core variables*** | | |
| Sustainable Security | Dummy equal to 1 if a bond is classified as sustainable securites (green, social, and sustainability securities), and 0 otherwise. | DCM Analytics |
| Green | Dummy equal to 1 if a bond is classified as green security (instruments made available for the purposes of financing a 'green project'), and 0 otherwise. | DCM Analytics |
| Social | Dummy equal to 1 if a bond is classified as social security (instruments made available for the purposes of financing projects designed to deliver social benefits or achieve positive social outcomes), and 0 otherwise. | DCM Analytics |
| Sustainability | Dummy equal to 1 if a bond is classified as sustainable security (instruments made available for the purposes of (re)financing a combination of both green and social projects), and 0 otherwise. | DCM Analytics |
| Rating | Bond credit rating based on the S&P, Fitch and Moody's rating at the time of bond issuance. The rating is converted as follows: AAA = Aaa = 1, AA+=Aa1=2, and so on until CC=20. Code 0 = note rated. | DCM Analytics |
| Rating Discordance | Dummy equal to 1if S&P, Fitch and Moody's assign a different credit rating for the same tranche, and 0 otherwise. | DCM Analytics |
| Rated | Dummy equal to 1 if the bond has a credit rating from S&P, Fitch or Moody's, and 0 otherwise. | DCM Analytics |
| ***Contractual characteristics*** | | |
| Subordinated | Dummy equal to 1 if the bond is subordinated, and 0 otherwise. | DCM Analytics |
| Maturity | Maturity of bonds, in years. | DCM Analytics |
| Transaction size | Bond transaction size. Transaction size is converted into Dollar millions when | DCM Analytics |
| Number of tranches | The number of tranches per transaction. | DCM Analytics |
| Fixed Rate | Dummy equal to 1 if the security is fixed price, and 0 otherwise. | DCM Analytics |
| Currency risk | Dummy equal to 1 for bonds that are denominated in a currency different from the currency in the deal's nationality, and 0 otherwise. | DCM Analytics |
| Callable | Dummy equal to 1 if the bond has a call option, and 0 otherwise. | DCM Analytics |
| ***Macroeconomic factors*** | | |
| Volatility | The Chicago Board Options Exchange Volatility Index (VIX). VIX reflects a market estimate of future volatility. | Datastream |
| Country risk | S&P's country credit rating at close. The rating is converted as follows: AAA=1, AA+=2, and so on until D=22. | S&P Global Ratings |
| COVID-19 | Dummy equal to 1 if the issue date belongs to the COVID-19 pandemic (from 1 February 2020 through to 5 May 2023), and 0 otherwise. | Author |
| EUSA5y-LIBOR3m | The slope of the Euro swap curve.Obtained as the difference between the five-year Euro swap rate and the 3-month Libor Rate. | Datastream |

Note: "–" indicates a negative impact on the credit spread, "+" a positive impact, and "?" an unclear or mixed effect based on theoretical or empirical literature.

## **Appendix B:** Matched Sample Univariate Analysis

| Variable of interest | Conventional Securities | Sustainable Securities | | | Variable of interest | Conventional Securities | Sustainable bonds | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Green Securities | Social Securities | Sustainability Securities | | | Green Securities | Social Securities | Sustainability Securities |
| ***Univariate analysis - continuous variables*** | | | | | | | | | |
| **Credit spread (bps)** | | | | | **Transaction Size ($ Million)** | | | | |
| Number | 38 | 31 | 7 | 0 | Number | 38 | 31 | 7 | 0 |
| Mean | 282,7 | 328,6 | 80,7 *** | 0,0 | Mean | 341,5 | 168,1 *** | 218,2 *** | 0,0 |
| Median | 200 | 205 | 90 | 0 | Median | 324,7 | 141,6 | 215,7 | 0,0 |
| **Rating [1-22 weak]** | | | | | **Country risk [1-22 weak]** | | | | |
| Number | 38 | 31 | 7 | 0 | Number | 38 | 31 | 7 | 0 |
| Mean | 4,7 | 3,9 | 0,9 *** | 0,0 | Mean | 2,4 | 2,5 *** | 1,7 * | 0,0 |
| Median | 3 | 1 | 0 | 0 | Median | 2 | 1 | 2 | 0 |
| **Number of tranches** | | | | | **Maturity (years)** | | | | |
| Number | 38 | 31 | 7 | 0 | Number | 38 | 31 | 7 | 0 |
| Mean | 6,0 | 6,5 * | 3,1 ** | 0,0 | Mean | 10,0 | 8,1 *** | 12,3 | 0,0 |
| Median | 6 | 7 | 1 | 0 | Median | 9,5 | 7,0 | 9,0 | 0,0 |
| **EUSA5y-Libor3m** | | | | | **Volatility** | | | | |
| Number | 38 | 31 | 7 | 0 | Number | 38 | 31 | 7 | 0 |
| Mean | 48,1 | 23,5 | 53,2 | 0,0 | Mean | 19,5 | 18,1 | 21,6 | 0,0 |
| Median | 42 | 49 | 29 | 0 | Median | 18,5 | 17 | 18,5 | 0,0 |
| ***Univariate analysis - dummy variables*** | | | | | | | | | |
| **Subordinated** | | | | | **Callable** | | | | |
| Nr. of tranches | 38 | 31 | 7 | 0 | Nr. of tranches | 38 | 31 | 7 | 0 |
| Nr. of tranches with d=1 | 22 | 1 *** | 1 ** | 0 | Nr. of tranches with d=1 | 32 | 25 | 6 | 0 |
| % of total | 57,9% | 3,2% | 14,3% | 0,0% | % of total | 84,2% | 80,6% | 85,7% | 0,0% |
| **ABS** | | | | | **MBS** | | | | |
| Nr. of tranches | 38 | 31 | 7 | 0 | Nr. of tranches | 38 | 31 | 7 | 0 |
| Nr. of tranches with d=1 | 33 | 26 | 2 *** | 0 | Nr. of tranches with d=1 | 5 | 5 | 5 *** | 0 |
| % of total | 86,8% | 83,9% | 28,6% | 0,0% | % of total | 13,2% | 16,1% | 71,4% | 0,0% |
| **Fixed** | | | | | **COVID-19** | | | | |
| Nr. of tranches | 38 | 31 | 7 | 0 | Nr. of tranches | 38 | 31 | 7 | 0 |
| Nr. of tranches with d=1 | 0 | 3 * | 0 | 0 | Nr. of tranches with d=1 | 21 | 13 | 4 | 0 |
| % of total | 0,0% | 9,7% | 0,0% | 0,0% | % of total | 55,3% | 41,9% | 57,1% | 0,0% |
| **Currency Risk** | | | | | **Rating Discordance** | | | | |
| Nr. of tranches | 38 | 31 | 7 | 0 | Nr. of tranches | 38 | 31 | 7 | 0 |
| Nr. of tranches with d=1 | 14 | 0 *** | 0 | 0 | Nr. of tranches with d=1 | | | | |
| % of total | 36,8% | 0,9% | 0,3% | 0,0% | % of total | 0,0% | 0,0% | 0,0% | 0,0% |
| **Rated** | | | | | | | | | |
| Nr. of tranches | 38 | 31 | 7 | 0 | | | | | |
| Nr. of tranches with d=1 | 37 | 22 *** | 3 *** | 0 | | | | | |
| % of total | 97,4% | 71,0% | 42,9% | 0,0% | | | | | |

Note: This table reports summary statistics for a sample of conventional and sustainable securities, including green, social, and sustainability securities, issued between 2014 and 2024. The data used for this analysis was collected from DCM Analytics and Datastream. We test for differences in contractual characteristics using the Wilcoxon rank-sum test for continuous variables and Fisher's exact test for dummy variables. *** indicates significance at the 1% level, ** indicates significance between the 1% and 5% levels, * indicates significance at the 10% level. Securities ratings are based on S&P and Moody's ratings at the time of issuance, converted to a numeric scale where AAA = Aaa = 1, AA+ Aa1 = 2, and so on until D = 22. For detailed variable definitions, see Appendix A.