UNIVERSIDADE CATÓLICA PORTUGUESA

The pricing of ESG syndicated loans:

An empirical analysis of spread determinants

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Resumo

O financiamento sustentável, apesar de recente, tem demonstrado uma relevância crescente ao longo dos anos no mundo financeiro atual, a caminho de se tornar o novo standard no mundo corporativo. Esta dissertação tem como principal objetivo contribuir para a literatura teórica e empírica sobre empréstimos sindicados sustentáveis, um tema que tem escassez de trabalho empírico. Procede-se a uma análise desta tipologia de empréstimos, a nível do *spread* e dos seus determinantes, comparando-os com empréstimos sindicados convencionais.

Para a realização desta análise, investiga-se empiricamente as principais variáveis que impactam o *spread* destes empréstimos, através de análises estatísticas comparativas e de modelos de regressão, com vários testes de robustez.

A amostra analisada contém 17.232 tranches, dos quais 318 são empréstimos sustentáveis, fechados entre 2018 e 2022 em países pertencentes à OCDE. Os resultados desta análise demonstram que os empréstimos sindicados sustentáveis são, em média, mais baratos que os empréstimos sindicados convencionais. Adicionalmente, conclui-se que fatores comuns que determinam o *spread* destes empréstimos, têm um impacto diferente no *spread*, consoante o tipo de empréstimo, sustentável ou convencional.

Palavras-chave: ESG; syndicated loans; ESG syndicated loans; sustainable finance; environmental, social, and corporate governance

Nº de palavras: 8972

Abstract

Sustainable financing, although recent, has shown an increasing relevance over the years in today's financial world, on its way to becoming the new standard in the corporate world. The main objective of this dissertation is to contribute to the theoretical and empirical literature on Environmental, Social, and (Corporate) Governance (ESG) syndicated loans, a topic that lacks empirical work. An analysis is made of these loans, in terms of pricing and its determinants, comparing them to conventional syndicated loans.

In order to carry out these analyses, the main variables that impact the spread of these loans are empirically investigated, through comparison and regression analyses, with several robustness tests.

The analyzed sample contains 17,232 loan tranches, of which 318 are classified as sustainable loans, closed between 2018 and 2022 in OECD countries. Results demonstrate that ESG syndicated loans are, on average, cheaper than conventional syndicated loans. Additionally, we draw a second conclusion, in which common factors that determine the spread of these loans have a different impact on the spread, depending on the type of loan sustainable *vis-à-vis* conventional.

Keywords: ESG; syndicated loans; ESG syndicated loans; sustainable finance; environmental, social, and corporate governance

Word count: 8972

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Introduction

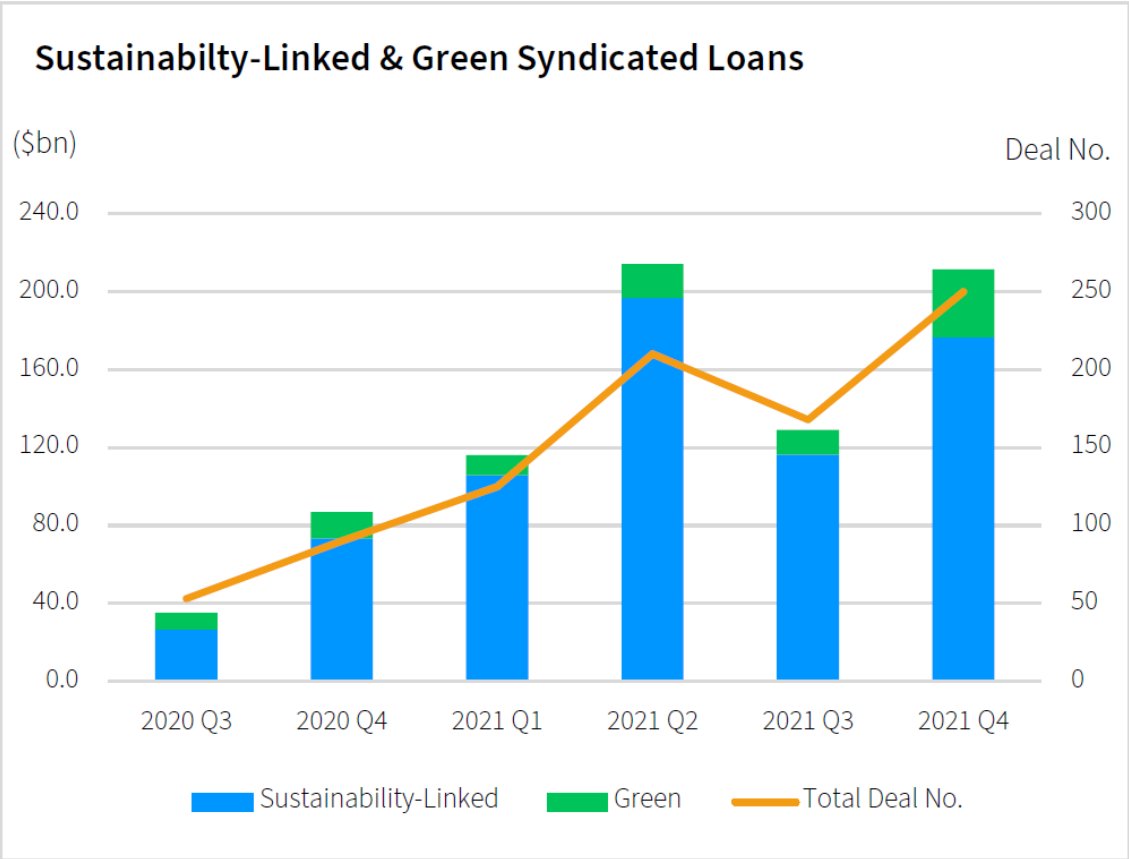
Environmental sustainability has become an increasingly more pertinent decision-making factor in large firms. Stakeholders' awareness of environmental, social, and governance (ESG) related issues is at an all-time high, and thus a response is warranted in the corporate and financial world. Sustainability has been a hot topic over the last decade, and it shows no signs of slowing down. According to the latest UN Global Compact – Accenture CEO Study (2021), 72 percent of the CEOs enquired believe that sustainability remains an immediate priority, even while dealing with the COVID-19 pandemic fallout. In addition, 79 percent of them argue that this pandemic has highlighted the urgent need to transition into sustainable business models[1]. To answer this demand, firms have been integrating ESG solutions into their policies, ranging from guaranteeing employees' social diversification, protecting of their workers' rights and welfare, as well as environmental measures. In the financial context, firms can resort to debt financing to ensure proactivity in sustainability matters, namely by raising capital with the aim of financing ESG initiatives.

According to Dealogic, the ESG lending market reached in 2021 a total of $670 billion, which represents 11.9% of the global lending volume. This was an impressive volume increase of 234% from the $200.5 billion raised in 2020, a growth that was mainly driven by Europe, the Middle East and Africa (EMEA),

[1] "Climate leadership in the eleventh hour. UN Global Compact-Accenture CEO Study 2021" last accessed January 13th, 2021 at: (https://ungc-communications-assets.s3.amazonaws.com/docs/publications/UNGC-Accenture-CEO-Study-Sustainability-2021-FINAL.pdf)

and the Americas. Figure 1 shows the breakdown of the $670 billion issued through sustainable financing, quarterly.

Figure 1 – Value and number of ESG syndicated loans closed between the 3rd quarter of 2020 and the 4th quarter of 2021 (provided by Dealogic)



To put it into perspective, we can compare the ESG syndicated loan market with the ESG bond market, a more consolidated one, by looking at figure 2. ESG bonds in 2021 had a total issuance of $841.2 billion in 2021, an increase of 59% from 2020.

Figure 2 – Value and number of ESG bonds closed between July 2020 and December 2021 (provided by Dealogic)

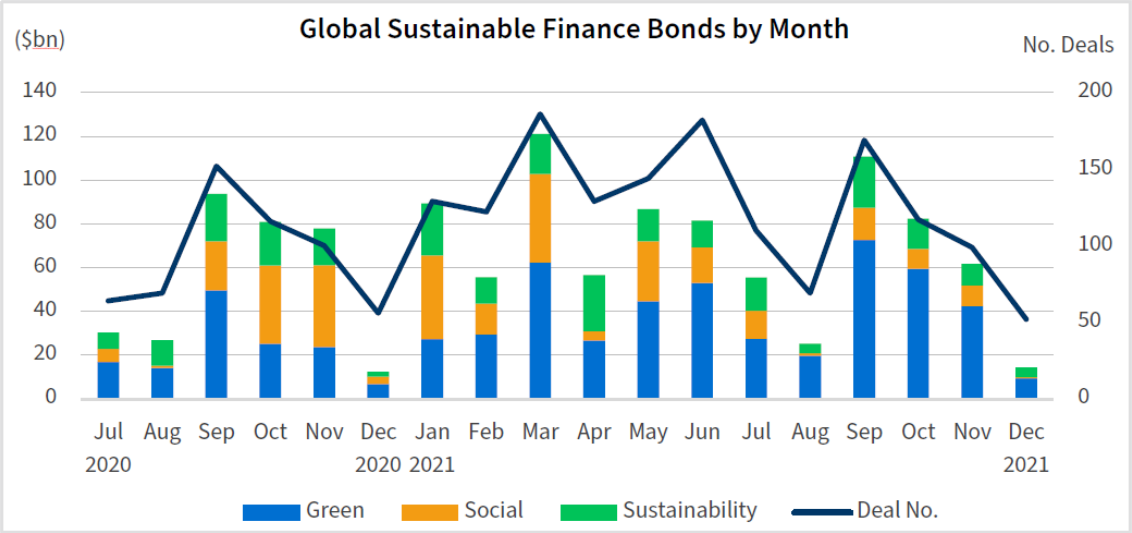


Figure 3 – Value and number of yearly ESG bonds emitted between 2013 and 2021 (provided by Dealogic)

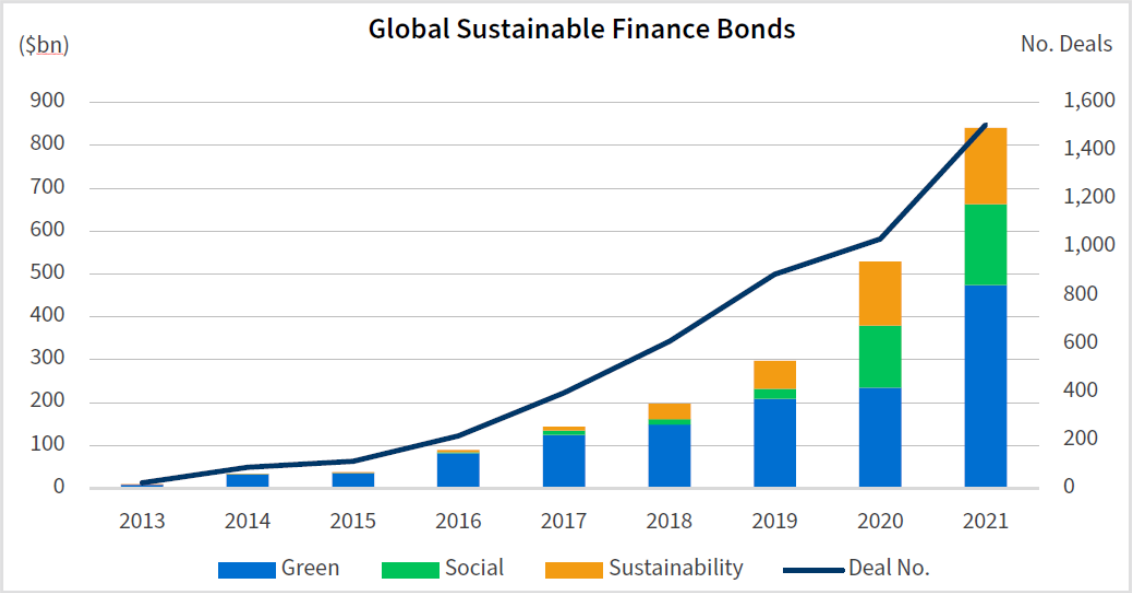


Figure 3 displays the growth of the sustainable bond market since 2013, from the $5 billion issued, to $841.2 billion issued in 2021. This exponential growth led to a significant increase in empirical research on green bonds (see Flammer 2021; Tang and Zhang 2020; Zerbib 2019). However, extant literature on ESG syndicated loans is scant.

Altunbaş et al. (2010) present syndicated loans as the main alternative to direct corporate bond financing, as both markets share similarities concerning both

debt intruments' and borrowing firms' characteristics. Henceforth, this dissertation includes a literature review on the impact of sustainability on the corporate world, and, more specifically, on external financing (by making a parallel with green bonds, using the Altunbaş et al. (2010) approach), as well as literature review on syndicated loans, as a means of contextualizing this instrument. In order to contribute to extant financing literature in the ESG syndicated loan field, we propose a study on the pricing of these sustainable instruments, and how they may differ from conventional syndicated loans.

We begin the analysis with a sample of loans closed in the 2018-2022 period, containing 17,232 loan tranches, extended to borrowers located in countries that belong to the Organisation for Economic Co-operation and Development (OECD). From these tranches, 318 are classified as ESG syndicated loans. After running several robustness tests, we answer the first research question "do spreads differ significantly between ESG and conventional syndicated loans?". Results show that, on average, ESG syndicated loans are significantly cheaper than conventional syndicated loans. The second research question is "do common pricing determinants impact ESG and conventional syndicated loans differently?". We find that there is a difference in the impact of common pricing determinants in both loan typologies, with a higher impact of maturity and currency risk (if the loan currency is local or foreign) on ESG syndicated loans, whereas the deal size and if the loan is leveraged (if the borrower has high debt levels or poor credit history) have a smaller and lesser significant impact.

This work is organized as follows. Chapter 1 reviews extant literature on syndicated loans, as well as on ESG, by reviewing corporate social responsibility, sustainable financing, and the pricing determinants of syndicated loans. Chapter 2 presents the hypothesis and the empirical model. Chapter 3 describes the sample used. Chapter 4 presents univariate analyses, as well as regression

analyses and robustness tests that were carried out to answer the questions. Lastly, a conclusion finalizes this work.

Chapter 1
Literature Review

1. Literature Review: Syndicated Loans and ESG

This chapter aims to consolidate the extant literature on syndicated loans as a debt choice and its pricing, as well as environmental, social, and governance (ESG), corporate social responsibility (CSR) literature, and its relation to corporate financial performance (CFP).

1.1. Syndicated Loans

A syndicated loan is described, by Dennis and Mullineaux (2000), as a hybrid of public and private debt when two or more banks (or other financial institutions) agree to collectively be lenders in a loan. In this context, there is one single loan agreement contract, where each lender has a stake in this direct loan. Typically, the lenders have similar funding conditions and are responsible for their part of the participation in the loan. Usually, one lender has the role of being the managing agent for this syndicate, in which they negotiate the loans' contract terms and oversee its documentation and administration, as well as provide borrower-specific information to the rest of the participants. In return, a fee is charged by the lead arranger for these services.

1.1.1. Syndicated loans as a debt choice

In this market, firms can seek to raise considerate amounts of medium to long-term funding (Altunbaş et al. 2010). Ivashina (2009) attests that syndicated loan prices are cheaper than bilateral loans (loans between one lender and one individual borrower) when all else is unchanged. Maskara and Mullineaux (2011) show that syndicated loans are a solution for highly leveraged small firms that seek mid-and long-term external financing, and who do not have access to the relationship loan market or bond market.

The factors that influence the capability of an individual loan to be syndicated are mainly due to the characteristics of the borrower, the managing agent, and the loan contract. According to Dennis and Mullineaux (2000), some of these factors are: the quality of information about the borrower, as firms with less information asymmetry, are more likely to syndicate a loan; the reputation of the managing agent and their relationship with the borrower, as it can diminish agency problems; the maturity of the loan, as a higher maturity means smaller secondary intermediation costs but higher risk premium maturity; having collateral, as it displays that the borrower might be more opaque than transparent about its information, and indicates a potential lack of relationship between the borrower and the managing agent.

For many years, in the choice of alternative debt instruments literature, public debt (such as corporate bonds) would be compared to bilateral loans, rather than syndicated loans. Altunbaş et al. (2010) take a distinctive approach between bilateral loans and syndicated loans, by stating that syndicated loans are a direct competitor to corporate bond financing when it comes to external financing choices. They find that in the euro area, there are different motivations and financial features for very large firms [2] to choose between these two debt

[2] Samples' mean asset size for firms issuing: 1) syndicated loans only: $2159M; 2) bonds only: $1427M; 3) both loan types, but in different years: $4239M; 4) both loan types during the same year: $9924M

instruments. Nonetheless, when a larger sample with smaller firms[3] is analyzed, the motivation for firms to seek external financing in these markets is similar. Firm variables that influence the choice of debt markets such as financial leverage, financial stress, liquidation value, sales growth, and technology expenditure do not have much variation between the firms seeking the bond and syndicated loan market. This distinction between syndicated and bilateral loans, as well as the convergence in firm debt choice between corporate bonds and syndicated loans, was driven by the regulation and development of secondary markets in the late 1990s, which brought increased liquidity to this market and an increase in the number of rated syndicated loans by independent rating agencies.

1.2. Corporate Environmental, Social, and Governance (ESG)

ESG's value to a firm has been a topic of great discussion among the finance community, and many are the reasons for its popularity. From the swift climate change in recent years, to the increase in public awareness about the prevalent ethical matters, the financial system is evolving to achieve higher standards at an ESG level.

1.2.1. Corporate Social Responsibility (CSR)

There is an abundance of empirical and theoretical work done that relates CSR with financial performance. Initial neoclassical economic literature claims that CSR comes with needless added costs that place the firm at a competitive disadvantage (Aupperle et al. 1985) or that corporate social performance is more

[3] Sample with a mean firm asset size of $791M

of a managerial tool for a desired corporate financial performance (Brammer and Millington 2008).

On the other hand, a view believes that CSR is a valuable resource to the firm, which is consistent with the resource-based view (Hart 1995), instrumental stakeholder theory (Jones 1995; Hillman and Keim 2001), and shared value concept (Kramer and Porter 2011). The recourse-based view theory tells us a firm can gain a competitive advantage by implementing the following 3 concepts in its strategy: pollution prevention, product stewardship, and sustainable development. According to this theory, there are two main sources of competitive advantage: the low-cost position, where a firm can practice aggressive pricing and high-volume sales, and the differentiated product, which builds brand loyalty and reputation, enabling higher pricing. To secure the competitive advantage, it is also pertinent for the decision to be taken at an appropriate timing (sooner rather than later in most cases) and commitment level. The instrumental stakeholder theory refers to attaining a competitive advantage generated by following ethical principles in the relationships between the firm and its stakeholders. In this context, problems related to opportunism in these relationships are solved by being trusting and cooperative. Shared value is a concept that is defined by policies and operating practices with the goal to increase a company's competitiveness while concurrently improving social and economic conditions. Value is created when the benefits outweigh the costs, which has long been recognized in the corporate world as profits, making social value a secondary matter. This argument states that by creating societal value through reconceptualizing products and markets, redefining productivity in the value chain, and building supportive industry clusters at the company's locations, a firm can generate economic value. Guenster et al. (2011) find economic value in Corporate Eco-Efficiency by documenting a positive correlation between a firms' eco-efficiency and Tobin's q. They suggest that there

is no trade-off between eco-efficiency and a firm's financial performance. Environmental leaders who make slow progress in socially responsible activities do show signs of underperformance, making environmental performance a possible indicator for financial decisions.

Consistently with this view, various academic authors state that CSR brings benefits to a firm. Flammer (2015) finds evidence that the adoption of CSR proposals leads to positive announcement returns, superior accounting performance as well as it being indicative of an increase in labor productivity and sales growth. CSR and CFP have a concave relationship, as the evidence suggests greater gains for firms with low prior CSR levels, as well as higher value creation for firms operating in "clean" industries. El Ghoul et al. (2011) find that firms with a higher CSR score have a cheaper equity capital cost, while firms that operate in "sin" industries (such as tobacco and nuclear power) have higher equity financing costs. Cheng et al. (2014) say that CSR has a positive impact by bettering capital constraints issues, as stakeholder involvement and transparency improve, facilitating access to valuable resources. Studies have shown that CSR initiatives have shown to improve firms' environmental performance, contradicting the "greenwashing" argument, which implies that firms would issue green bonds for the marketing benefit from it, as they would be portrayed as environmentally conscious, but without acting in that aspect. This argument is disproved, as firms are shown to improve environmental ratings and lower CO2 emissions after issuance (Azar et al. 2021, Flammer 2021). The "greenwashing" argument does come up because there is evidence that CSR information impacts a consumer's company evaluation, which has a similar effect to advertising due to its impact on demand and consumer price sensitivity (Sen and Bhattacharya 2001). Considering the stakeholder view, Hillman and Keim (2001) claim CSR enables firms to develop valuable intangible assets, and helps with decreasing the risk of negative fiscal, legislative, and regulatory

occurrences. Furthermore, CSR has been shown to attract socially conscious clients (Hillman and Keim 2001) and socially responsible investors (Tang and Zhang 2020).

1.2.2. Green financing

In recent years, academic literature has had a focus on the green bond market (see Flammer 2021; Tang and Zhang 2020; Zerbib 2019), due to the significant increase in its use and popularity over the last decade, however, literature is scant when it comes to ESG syndicated loans, and how ESG indicators interact with this type of debt financing. As a point of reference, literature about corporate green bonds was studied for this dissertation, as this debt instrument has been highly relevant in sustainable finance literature, and due to its similarity to ESG loans.

A green bond is a bond that raises capital that will finance environmental and climate-friendly projects. Flammer (2021) describes corporate green bonds as being a "relatively new instrument in sustainable finance" with a high rate of adhesion in recent years. Green bonds issuance values went from $ billionin 2013 to $841.2 billion in 2021 (see Figure 3), and they are more prevalent in industries where the environment is a key factor of operations.

The motivation behind the use of this green debt instrument has been a central point in recent finance literature, as firms who opt to use them have their capital raised by the bond locked to green projects, whereas in conventional bonds, the firm is free to allocate that capital. Furthermore, the process of certifying a bond to be green can be quite expensive, as it requires third-party verification, which can raise some administrative and compliance costs. Tang and Zhang (2020) studied the benefits of issuing green bonds to shareholders, and they found that the issuing company has a cumulative abnormal return (CAR) on its stock price of 1.4% in a 21-day event window after the issue day, which means there can be

firm value creation in the short-term. This effect is larger for first-time issuers than for repeated issuers, and stronger for corporate issuers rather than financial issuers. They find that the main potential cause for this positive announcement is the media exposure the firm gains from it, grabbing the attention of current and potential investors, which increases their stock shares' demand and pool of investors[4]. Their study was not conclusive about green bonds being cheaper or that they add more fundamental long-term value to the firm when compared to conventional bonds. Similarly, Flammer (2021) finds that there is no significant bond yield variation between green and conventional bonds, which means the cheaper cost of capital should not be a motive to use this instrument. Signaling to the market the commitment to going green seemingly is a motive, as Flammer (2021) too finds that there is an abnormal cumulative return post a green bond issuance, an effect that is higher for first-time issuers, as well as firms who seek to get their certifications from independent third parties. Zerbib (2019) proves there is a small premium of -2 basis points (bps) in green bonds when compared to conventional bonds, which is not deemed sufficiently impactful for investors to support their decisions.

1.3. Pricing determinants of a syndicated loan

To develop a framework to compare loan pricing between ESG syndicated loans and conventional syndicated loans, the underlying factors that impact the price of this instrument must be taken into consideration.

1.3.1. Borrowing firms' characteristics

Dennis and Mullineaux (2000) find that the syndication of a loan has a higher probability of occurring when a borrower is more transparent and has less risk.

[4] Empirical evidence from Tang and Zhang (2020) shows that after the announcement, institutional ownership grows by 7.9% in comparison to conventional bonds issued by the studied firms, with a slight home bias for domestic investors, which are more impacted by the attention-driven effect than foreign investors

The equilibrium syndicate structure and the loan spread are a resolute of the relation between the information asymmetry (which affects the participant's pricing) and the diversification effect of the lead's portfolios, which affect their pricing on the deal (Ivashina 2009).

Pinto and Santos (2020) results report that a firm's characteristics, such as size, profitability, leverage, asset tangibility, growth opportunities, and credit risk are important determinants for a firm to choose between structured or straight debt financing, with firms that are relatively smaller, less profitable, with lower asset tangibility, and seeking long-term financing being more likely to pick structured financing. Their findings suggest that informational asymmetry influences a firms' financing source, as structured finance mitigates costs that arise with asymmetric information frictions, and that more profitable firms are more likely to choose straight debt financing. They show that the pricing is also a determinant for debt choice between these two, as borrowing costs vary within structured financing[5]. There is an association between an arrangers' share in the loan and their credit-risk exposure to it, Ivashina (2009) shows that the information asymmetry inside the syndicate can be reduced by increasing the arranger's share of the loan, which makes the syndicate participants willing to lower the spread, and thus reduces the cost of borrowing.

1.3.2. Maturity

Literature on syndicated loans maturity and correlation spread seems to not be in accordance, as some authors present results that prove linear relationships, whilst others show empirical results of endogeneity in this relationship.

Bae and Goyal (2009) find evidence that supports a positive correlation between loan maturity and its spread, as the higher maturity risk implies a

[5] Pinto and Santos (2020) find that borrowing costs are lower for asset-backed deals when compared to bonds, but costlier for project finance deals

costlier spread premium, a result that's consistent with Maskara's (2010) empirical evidence. Syndicated loan literature suggests a positive correlation of a term structure's impact on the syndicated loan spreads, however, when studying specific cases, such as project financing, where a bank syndicate is usually an external source of debt, Sorge and Gadanecz (2008) show that there is a hump-shaped term structure of credit spread in this type of financing. They also suggest that a higher deal size indicates lower uncertainty due to higher liquidity. Marques and Pinto also find a non-linear relationship between maturity and spread for structured finance bonds.

1.3.3. Tranching

Tranches are referred to in the corporate world as segments of a pool of related securities, they are split up in characteristics such as risk or maturity, which together make up the deal's liability structure. DeMarzo (2005) states that three relevant market imperfections could explain the benefits of tranching: transaction costs, market incompleteness, and asymmetric information (claiming that the asymmetric information model is the most relevant one). Finance arrangers segment such characteristics to create a new asset, which satisfies different investors with different risk-reward profiles, making the market more complete. The traits of these underlying assets are considered to investors as public information, thus different investors will originate heterogeneous valuations of the assets due to the use of different valuation models. Tranching benefits investors with better valuation models, and intermediaries who design senior tranches accordingly to known information asymmetry. The market is more complete as lenders and borrowers with less risk tolerance have access to senior-level tranches, while the ones with higher risk tolerance have the junior tranches (Alves et al. 2021). Cumming et al. (2020) say that loan tranching aids banks with risk exposure, as usually they are large, and they find evidence that

creditor protection on loan tranching develops the financial markets. Tranching softens the financial development gap that exists in domestic and multinational companies in many countries, as when firms located in countries with good investor protection transfer to foreign countries with weaker law and finance tranching foundations, they provide liquidity to the market, easing debt financing. Maskara (2010) says borrower-specific risk gets diversified during the tranching process, finding that the probability of the loan being tranched is higher as the borrower and loan risk loan increases, presenting empirical evidence that the average credit spread on a tranched syndicated loan is higher 68 bps than that of a comparable non-tranched loan, and that the firms who benefit the most out of the tranching process are the ones with the more speculative debt ratings. Pinto and Santos (2020) state that it is expected that, for the most part, the higher number of tranches, the lower the loan risk, due to the spreading of risk caused by the loan segmentation. Marques and Pinto (2020) find that ratings are the most impactful pricing determinant for structured finance and corporate bonds at issuance, which corroborates the conclusion reached by Gabbi and Sironi (2005), where ratings are the most important determining factor on the spread. Sorge and Gadanecz (2008) say that the higher the deal size of a loan, the higher its liquidity. This higher level of liquidity suggests a lower level of uncertainty, for which a similar effect is expected on a loan tranche.

1.3.4. Macroeconomic Factors

Carey and Nini (2007) state that the corporate loan market is not globally integrated, by presenting evidence that interest rate spreads are smaller by 30 basis points on average in Europe than in the U.S. and with spreads in the European loans being 20 percent less than the U.S. ones. Qian and Strahan (2007) find that in countries with an English legal origin, interest rates are higher than countries of French or German legal origin. Bae and Goyal (2009) confirm a

significant difference in loan and borrower characteristics that varies by country, as well as better property rights protection leading to more efficient contracting. Regarding market volatility, Tampakoudis et al. (2022) find that there were significantly higher wealth gains throughout the COVID-19 pandemic period, in contrast to the pre-pandemic period by studying a sample of 637 syndicated loans. This indicates that market volatility should also be taken into consideration for recently issued loans.

Chapter 2
Hypotheses and Methodology

Based on the reviewed literature review presented previously in this work we raised two research questions.

When studying the pricing of green bonds, Tang and Zhang (2020) did not find conclusive evidence that they are cheaper than conventional bonds, additionally, Flammer (2021) also did not find a significant bond yield bond variation between these two types of bonds. Meanwhile, Zerbib (2019) finds a significant premium of -2 basis points in green bonds *vis-à-vis* conventional bonds. On the other hand, and to the best of our knowledge, there is no empirical literature studying if the spread of ESG syndicated loans differs significantly when compared to conventional syndicated. Therefore, in this dissertation, we intend to investigate ESG spreads are lower than comparable non-ESG syndicated loans. Under this framework we raise the following hypothesis:

*Hypothesis 1 (**H1**): ESG and conventional syndicated loans spreads differ significantly, and ESG loans have lower spreads than comparable traditional syndicated loans.*

In this framework, the sample will be filtered and cleaned, excluding outliers, and adjusting the conventional loan sample to the ESG loans, as the sustainable

loan market is only a fraction of the whole market. Additionally, the information available on this type of loan is also scarce, thus making the data cleaning a key step for this bodywork. The data will be analyzed after being cleaned, proceeding to make an analysis of the sample by loan type, geographical region, and industry sector, as well as a univariate analysis by loan type (ESG loan or conventional loan). Following the data analysis, OLS regression analyses are performed, using spread as the dependent variable, and a discrete variable for ESG syndicated loans as an independent variable, while controlling for contractual, borrowing firm, and macroeconomic factors. As Sorge and Gadanecz (2008) find that maturity and spread are determined simultaneously in some syndicated loans, additional two-stage least squares (2SLS) regression analyses will be carried out, with the purpose of tackling endogeneity issues that might arise in the OLS regressions.

As ESG syndicated loans have specific characteristics, such as having the capital raised be locked to ESG projects, third-party verification costs to certify the loan, or even firm specific factors, such as borrowing firms' that issue this type of debt having less capital constraint issues (Cheng et al. 2014) and better CSR scores (El Ghoul et al. 2011), we would expect that the pricing of such loans differs significantly from the pricing of traditional syndicated loans. Therefore, we raise second hypothesis:

*Hypothesis 2 (**H2**): Common pricing determinants impact differently ESG and conventional syndicated loans.*

For this second hypothesis, we will run the models presented to test H1' ESG and non-ESG loans samples separately.

Chapter 3
Data and Methodology

3. Overview

To validate the hypotheses presented in Chapter 2, data on ESG syndicated loans and conventional syndicated loans was collected and organized, as follows.

3.1. Sample Selection

The sample consists of loan tranches extracted from the Loan Analytics database. Available data on ESG syndicated loans is scarce. The data period ranges from the 1st of June 2018 until the 10th of March 2022, as Loan Analytics only recently started labeling loan tranches that follow the "Sustainability Linked Loan Principles" (SLLP). Consequently, this study is focused on recent years. The SLLP was created by a group of representatives from the predominant financial institutions that participate in the syndicated loans market, to create common identifying standards for ESG loans. Loan Analytics provides information on loan characteristics (e.g., tranche spread, maturity, number of tranches, tranche value, rating, currency) and on the borrowing firms (e.g., borrower, borrower industry, rating). Due to the relatively smaller number of ESG loans in the sample, the parameters of the whole sample were adjusted to other distinct variables. Loans with higher maturity than 15 years were excluded, as the ESG loan with the highest maturity is 15 years, while some conventional loans from

the original sample ranged from 15 until 60 years. Loans with no tranche spread details were excluded, as well as tranche loans that were canceled within 30 days post-issuance, and loans from countries and industries where there was no ESG loan data available. Macroeconomic data on volatility and the yield curve slope was obtained from Datastream. These macroeconomic factors were linked to the microeconomic characteristics of the loan based on the tranches' pricing date. After applying these, the final sample consists of 17,232 tranche loans, of which 318 are ESG loans. The data is presented in Euros and the spread in basis points (bps).

Table 1 presents the distribution of the full sample of syndicated loans by type, borrower's region, and industry. The sample contains 22 different countries that belong to the Organization for Economic Co-operation and Development (OECD), segmented into 5 separate continents[6]. Loan Analytics identified 24 different industries in this sample, which were divided into 9 separate sectors according to the Standard Industrial Classification (SIC) system.

In Panel A, we can see that the majority of the loans in the sample come from the United States (US), 13,940 out of 16,914 conventional syndicated loans representing 87.48% of the total value issued. Meanwhile, in terms of numeric count, ESG loans come mostly from Europe and the US, with a significant increase in the percent of the total value of European ESG loans in comparison with the conventional ones (7.40% to 28.53%). Despite these 2 regions having a similar number of ESG tranches and deals, loans from the US represents a higher percentage of the total size of ESG loans, which means the average tranche size is higher for the US ESG loans.

In the second panel (Panel B), regarding the industrial category of the borrowers, they are mostly well dispersed throughout the sectors in the sample,

[6]As the countries in the sample are solely from those where there is information available on ESG loans, some continents only include less than a handful of countries (e.g., South America is only composed of Chile, and Eastern Europe only has Russia)

but with a clear distinction for loans in the Manufacturing sector, representing almost one-third of the whole sample. The same can be said about the borrower industries from the ESG loans sample, however with a notable increase in percentual of the total value in the Utility and Energy, Auto/Truck, and Real Estate/Property industries, where sustainability is a rather popular and predominant factor, and a significant decrease in the Services sector. These distributions show signs that ESG loans are more relevant in some sectors than others.

Table 2 presents descriptive statistics of the loans in the sample, namely number, mean, median, standard deviation, minimum and maximum (continuous variables). The mean (median) loan has a spread of 284bpbs (250bps) with maturity a of 4.6 (5) years, and is part of a deal with 1.9 (2) loan tranches. An average loan has a BB (B+) credit rating and is issued by a BB (B+) rated firm, with the logarithm of the deal size being 19.47 (19.47) million Euros. Less than half of the loan tranches have a credit rating as well as information about the borrowers' rating: 46.60%, and 40.27%, respectively. 75,57% of the loans are leveraged, meaning that most of the firms in the sample have relatively high debt levels, or poor credit history - in line with Maskara and Mullineaux's (2011) description that firms who seek syndicated loans are highly leveraged. 7.17% of the loan tranches are closed with a foreign currency, and 20.36% have been canceled. Canceled loans include not only canceled/withdrawn loans but also loans that have been prematurely signed, amended, closed, prepaid, or refinanced.

In the appendix, Table A.1 includes a full description of all variables that are used in the model, as well as their source and their expected impact on the loan spread.

Table 1 – Regional and industrial distribution of the full sample of syndicated loans by type

Panel A: Geographic distribution of syndicated loans

	Conventional loans				ESG loans			
Geographic region of borrower	**Number of loans**	**Number of deals**	**Total Value (€ million)**	**% of Total Value**	**Number of loans**	**Number of deals**	**Total Value (€ million)**	**% of Total Value**
Asia	582	270	24,543	0.35%	25	15	5,390	2.12%
Australia	201	93	47,522	0.67%	3	1	867	0.34%
Europe	1,402	879	523,010	7.40%	148	86	72,404	28.53%
Eastern Europe	7	4	2,393	0.03%	1	1	1,026	0.40%
Western Europe	1,395	875	520,617	7.37%	147	85	71,378	28.12%
Spain	214	117	33,939	0.48%	63	28	13,094	5.16%
United Kingdom	264	170	111,187	1.57%	13	9	8,735	3.44%
North America	14,709	10,744	6,462,051	91.48%	140	112	174,813	68.87%
United States	13,940	10,209	6,179,494	87.48%	132	106	168,518	66.39%
South America	20	16	7,023	0.10%	2	2	351	0.14%
Total	**16,914**	**12,002**	**7,064,149**	**100.00%**	**318**	**216**	**253,826**	**100.00%**

Panel B: Distribution of syndicated loans by industrial category of borrower

	Conventional loans				ESG loans			
Industrial category of borrower	**Number of loans**	**Number of deals**	**Total Value (€ million)**	**% of Total Value**	**Number of loans**	**Number of deals**	**Total Value (€ million)**	**% of Total Value**
Agriculture, Forestry & Fishing	316	197	78,144	1.11%	9	6	2,875	1.13%
Mining	929	766	514,915	7.29%	12	8	18,314	7.22%
Oil & Gas	842	711	471,312	6.67%	11	7	15,766	6.21%
Construction	864	591	253,052	3.58%	13	9	9,063	3.57%
Manufacturing	5,461	3,785	2,314,580	32.77%	102	64	84,003	33.09%
Auto/Truck	487	324	205,622	2.91%	17	9	22,203	8.75%
Chemicals	572	398	277,503	3.93%	19	11	9,903	3.90%
Computers & Electronics	2,064	1,439	945,214	13.38%	19	11	33,715	13.28%
Food & Beverage	718	485	262,482	3.72%	19	12	7,196	2.84%
Transportation, Communications, Electric, Gas & Sanitary Service	1,950	1,441	1,032,219	14.61%	54	37	46,323	18.25%
Utility & Energy	868	697	460,487	6.52%	30	24	27,157	10.70%
Retail Trade	539	405	243,576	3.45%	10	9	8,366	3.30%
Finance, Insurance & Real Estate	3,667	2,706	1,267,891	17.95%	79	56	56,609	22.30%
Finance	1,131	895	645,339	9.14%	30	19	15,689	6.18%
Real Estate/Property	2,129	1,525	464,784	6.58%	47	35	36,240	14.28%
Services	3,061	2,028	1,266,694	17.93%	28	20	23,507	9.26%
Healthcare	1,403	937	754,805	10.69%	17	12	17,106	6.74%
Professional Services	1,198	786	319,506	4.52%	10	7	5,351	2.11%
Multiple	127	83	93,080	1.32%	11	7	4,767	1.88%
Total	**16,914**	**12,002**	**7,064,149**	**100.00%**	**318**	**216**	**253,826**	**100.00%**

Table 2 – Sample descriptive statistics

Variable of interest	Number	Mean	Median	Std. Dev.	Min.	Max.
Contractual characteristics						
Tranche all-in pricing (bps)	17,232	283.90	250.00	173.39	-100.00	3,464.00
Maturity	17,232	4.62	5.00	1.87	0.08	15.00
Number of tranches	17,232	1.89	2.00	1.18	1.00	14.00
Tranche rating	8,030	12.57	14.00	3.21	1.00	24.00
Tranche rating*rated	17,232	13.33	14.00	2.30	1.00	24.00
Log tranche value (€ million)	17,232	18.82	18.95	1.57	12.30	24.10
Log deal value (€ million)	17,232	19.47	19.47	1.34	13.66	24.23
Macroeconomic factors						
Country risk	17,232	1.45	1.00	1.65	0.00	15.00
5yTB-3mTB	17,232	39.00	32.20	48.11	-64.70	127.90
Volatility	17,232	19.78	17.29	8.68	10.85	82.69
Firms' characteristics						
Borrower rating	6,939	12.65	14.00	3.20	1.00	22.00
Borrower rating*rated	17,232	13.46	14.00	2.13	1.00	22.00

Panel B: Dummy variables

	N. of issues with data available	% of total available data	Std. Dev.
ESG	17,232	1.85%	13.46%
Rated tranche	17,232	46.60%	49.89%
Leveraged	17,232	75.57%	42.97%
Currency risk	17,232	7.17%	25.80%
Tranche canceled	17,232	20.36%	40.27%
Rated borrower	17,232	40.27%	49.05%
Asia	17,232	3.52%	18.44%
Australia	17,232	1.18%	10.82%
Europe	17,232	8.99%	28.61%
North America	17,232	86.17%	34.52%
South America	17,232	0.13%	2.57%
Agriculture, Forestry & Fishing	17,232	1.89%	13.60%
Mining	17,232	5.46%	22.72%
Construction	17,232	5.09%	21.98%
Manufacturing	17,232	32.28%	46.76%
Transportation, Communications, Electric, Gas, and Sanitary Service	17,232	11.63%	32.06%
Retail Trade	17,232	3.19%	17.56%
Finance, Insurance & Real Estate	17,232	21.74%	41.25%
Services	17,232	17.90%	38.33%
Multiple	17,232	0.80%	8.91%

3.2. Regression models and variables

To determine the main pricing determinants of loan tranche spreads, the model in equation (1) was used. Recognizing the differences in loan nature that arise with different deal regions and industry sectors, Standard Industrial Classification (SIC) dummies are applied. We adjust for heteroskedasticity, and standard errors are clustered by year and region. The OLS model is with the following form:

$$Spread_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 Contractual\ controls_{i,t} + \beta_3 Firm\ characteristics_{i,t} + \beta_4 Macroeconomic\ factors + \varepsilon_{i,t} \quad (1)$$

where the subscripts refer to syndicated loan *i* at time *t*. To tackle endogeneity issues that might arise with the interaction between spread and maturity, due to their possible simultaneous determination (Sorge and Gadanecz 2008), the following 2SLS regression model is estimated:

$$Spread_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 Contractual\ controls_{i,t} + \beta_3 Firm\ characteristics_{i,t} + \beta_4 Macroeconomic\ factors + \varepsilon_{i,t} \quad (2)$$

$$\widehat{Maturity}_{i,t} = \alpha_0 + \alpha_1 Tranche\ size_{i,t} + \alpha_2 Leveraged + u_{i,t}$$

where the subscripts refer to syndicated loan *i* at time *t*. As displayed in table 2, less than half of the sample contains loans and firms that have a rating (46.60% of tranches and 40.27% of borrowers). To adjust to this sample characteristic, additional regression models will be carried out to compare different results. Some models will only include variables where the loan and the firm are rated, decreasing the number of observations to the number of available data on these variables.

3.2.1. Dependent variable

The *Spread* corresponds to the credit spread premium associated with the risk that comes with the syndicated loan at closing, defined as the all-in-spread-drawn (AISD) above a corresponding treasury benchmark with a similar maturity (Marques and Pinto, 2020). The AISD is the interest rate the borrower pays to the lender on the amount issued for the loan, measured as the premium above the benchmark.

3.2.2. Independent variables

To assess the difference in the spread of an ESG syndicated loan to that of a conventional one, a dummy variable *ESG* is included. The variable takes the value of 1 when the loan in question is considered as ESG, and 0 otherwise.

Regarding the contractual controls, *maturity* is one of the most pertinent pricing determinants for financial instruments, and the higher it is, the higher the intrinsic loan risk. Despite the higher risk, Sorge and Gadanecz (2008) find a hump-shaped correlation between spread and maturity for some debt instruments, meaning spread and maturity can be determined simultaneously. Therefore, in attempting to resolve maturity endogeneity issues, we use 2SLS methodology in the study.

As mentioned previously, ratings are the most impactful debt pricing determinant (Marques and Pinto, 2020). *Tranche rating* and *borrower rating* are continuous variables that go from 1 (AAA=1) to 24 (D=24) and 22 (D=22)[7], respectively. As a consequence, it is expected for the spread to increase with these variables, as a higher value on them represents a lower credit rating, hence a higher risk.

[7] *Tranche rating* includes 2 additional ratings (DDD=22 and DD=23) that *borrower rating* does not.

As observed in table 2, less than half of the sample has rated tranches and borrowers. Thus, *tranche rating*rated* and *borrower rating*rated* were created, as a way to use the full sample in the regression models. For the *tranche rating*rated* and the *borrower rating*rated* variables, the observations that had missing values on the rating variables were replaced with the median of the original sample of the *tranche rating* and the *borrower rating* variables (14 for both). This way, dummy variables *rated tranched* and *rated borrower* (1 if rated, 0 otherwise) can be incorporated into the model, while avoiding correlation and multicollinearity issues, while keeping these crucial variables[8].

The *number of tranches* is also controlled, as it is expected to have a negative correlation with the loan spread (Pinto and Santos, 2020) since most of the sample is composed of corporate loans. According to Sorge and Gadanecz (2008), the deal size is an indicator of higher liquidity and smaller uncertainty, hence it is expected for *log deal size* to have a negative impact on the spread. *Leveraged* dummy is 1 if the deal is leveraged, 0 if it is investment grade, and finally, *tranche canceled* if the loan was canceled, and 0 otherwise (check Table A.1 in the appendix for a detailed description of these variables).

In respect of the macroeconomic factors, the *country risk* is controlled by adding a numerical scale for the S&P rating of the country, matching it with the pricing date for the loan. Since the model is mostly composed of US loans, the yield curve slope *5yTB-3mTB* is used in the models, computed by the difference between the USA 5-year Treasury Bond rate and the USA 3-month Treasury Bill rate. Lastly, *volatility* controls for market volatility, measured by the Chicago Board Options Exchange Volatility Index. As previously mentioned, continent and SIC dummies are used to control for unexpected macroeconomic swings, as well as for industry-specific tendencies (Pinto et al., 2019).

[8] 0, 22 and 24 were tested for the missing values in different models, however the median (14) ended up being the chosen value to represent the missing values in the variables *rating*rated*, as it showed the best results for correlation, Variance Inflation Factor tests and regression quality

3.2.3. Instrumental variable

Syndicated loans are characterized as being deals where firms seek to raise considerate amounts of funding for medium to long term periods (Altunbaş et al. 2010), thus making maturity an impactful variant on the spread premium on the loans in the sample (Sorge and Gadanecz 2008, Bae and Goyal 2009, Maskara 2010).

To overcome the simultaneous determination of maturity and spreads creating an endogeneity issue in the regression analysis, an instrumental approach is used, using the tranche size and if the loan is tranched as instruments for maturity. Larger tranches might suggest a smaller maturity, as they are a bigger portion of a lender's portfolio (Alves et al. 2021), hence using *log tranche size* as an IV, which refers to the log size of the loan tranche. Tranching a loan increases a loans' maturity by reducing costs via lower information asymmetry (DeMarzo 2005), which is an important determinant for debt maturity. Consequently, *tranched* corresponds to a discrete variable that takes the value of 1 if the loan is tranched, and 0 otherwise.

Table 2 details the statistics of all the variables used in the thesis, and Appendix A includes their description as well as their expected impact on the spread.

Chapter 4
Results

4. Main Results

In this chapter, a univariate analysis for conventional loans and ESG will be carried out, as well as OLS and 2SLS regression analysis models. The specifications for the analysis will be stated, and the results interpreted.

4.1. Univariate Analysis

This univariate analysis shows the descriptive statistics of the contractual characteristics by loan type, whether it is a conventional or an ESG loan. Table 3 incorporates Wilcoxon z-tests for the continuous variables and Fisher's exact tests for the dummy variables.

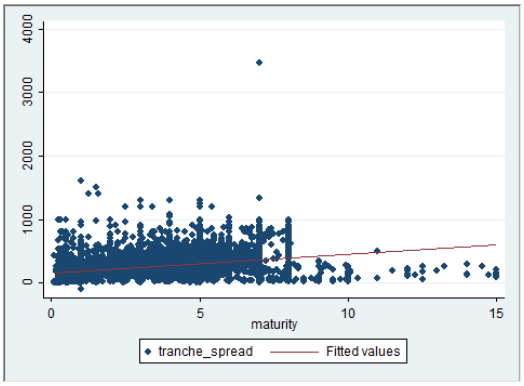
For the tranche pricing of conventional bonds and ESG bonds, the univariate analysis presents that the spread for ESG loans in the sample, is on average, 205.05 bps, while the average for conventional loans is 285.38 bps. ESG loans are, on average, 80.33 bps cheaper, at a 1% significance level.

For maturity, the mean value for conventional bonds is 4.62 years, while it is 4.83 years for ESG bonds. It is expected for the maturity in ESG loans to be higher, as sustainable debt usually funds in the long-term. However, this is the only

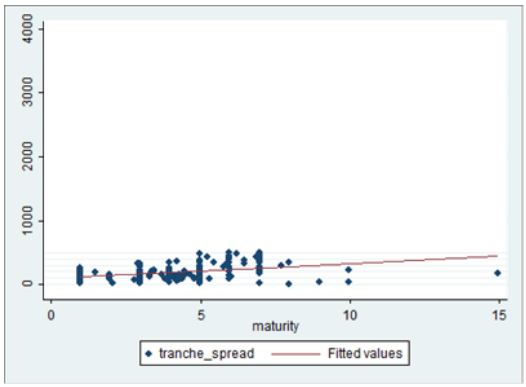
contractual characteristic that does not differ significantly between ESG and non-ESG loans at 1% significance level (not even at a 10% significance level). Figure 1 shows the term structure of the credit spreads by loan type.

Figure 4 – Term structure of credit spread in the sample, by loan type

Graph A (conventional loans)



Graph B (ESG loans)



An ESG loan has, on average, 2.15 tranches per deal, which is higher than the 1.89 tranches per deal for conventional loans. The median rating of an ESG loan is significantly higher than that of a conventional one, with an average rating of 10.88 (BBB-), while it is 12.61 (BB) for a conventional loan. The deal size for ESG loans is higher than that of a conventional loan, with an average natural logarithm of 20.31 million Euros vis-à-vis 18.8 million Euros.

For the dummy variables in the sample, 64.47% of ESG loans are rated, while for conventional loans 42.26% are rated. 76.10% of conventional loans are considered leveraged, while only 47.17% of the ESG loans are classified as leveraged, which implies that firms with a better credit history and lower levels of debt are more likely to resort to ESG. Maskara and Mullineaux (2011) also refer that, generally, syndicated loans are sought by highly leveraged firms, however, in our sample of ESG loans, we can see that this statement does not hold. This can be an indication that sustainable loans bring into the syndicated loan market firms with a better credit history and relatively lower levels of debt. 20.44% of

ESG loans are traded in a foreign currency, whilst solely 6.92% for conventional loans, possibly meaning that ESG has a higher and/or easier access to international markets than conventional loans. Finally, conventional loans are significantly more canceled than ESG loans, as 20.68% of such loans are canceled *vis-à-vis* 3.46%. While the variable *tranche canceled* includes loans that have been prematurely signed, closed, prepaid, refinanced, amended, or withdrawn/canceled, loan tranches in the ESG sample, when this dummy takes the value of 1, have only either been amended, refinanced, or signed. This might be the case because when firms seek green financing, they're signaling to the market their commitment to sustainability (Tang and Zhang 2020; Flammer 2021), hence canceling such a loan could be perceived as contradictory. It could also be argued that borrowers who have consideration for sustainability have better quality management, hence making fewer mistakes when issuing a loan, without needing to correct them post-issuance, a view that is in accordance with Guenster et al. (2011) in which being an environmental leader can be an indicator for better financial decision making. This theory could also explain the lower level of leveraged loans in the ESG sample, as well as the higher average rating for tranches in that sample.

Table 3 – Univariate Analysis

Variable of interest		**All loans**	**Conventional**	**ESG**	
Continuous variables					
Tranche all-in pricing (bps)	Mean	284.09	285.38	205.05	***
	Median	250.00	250.00	175.00	
	Number	17,232	16,914	318	
Maturity	Mean	4.66	4.62	4.83	
	Median	5	5	5	
	Number	17232	16914	318	
Number of tranches	Mean	1.89	1.89	2.15	***
	Median	2	2	2	
	Number	17232	16914	318	
Tranche rating	Mean	12.57	12.61	10.88	***
	Median	14	14	11	
	Number	8030	7825	205	
Tranche rating*rated	Mean	13.3338	13.35	11.99	***
	Median	14	14	14	
	Number	17232	16914	318	
Log deal value (€ million)	Mean	19.47	19.45	20.31	***
	Median	19.49	19.47	20.49	
	Number	16676	16361	315	
Log tranche value (€ million)	Mean	18.82	18.8	19.61	***
	Median	18.95	18.93	19.73	
	Number	17,232	16,914	318	
Dummy variables					
Rated tranche	% of d=1	46.43%	46.26%	64.47%	***
	Median	0	0	1	
	Number	17,232	16,914	318	
Leveraged	% of d=1	0.7531	0.761	0.4717	***
	Median	1	1	0	
	Number	17232	16914	318	
Currency risk	% of d=1	0.0714	0.0692	0.2044	***
	Median	0	0	0	
	Number	17232	16914	318	
Tranche canceled	% of d=1	20.59%	20.68%	3.46%	***
	Median	0	0	0	
	Number	17,232	16,914	318	

4.2. Regression Results

For the following regressions, some adjustments and specifications were made, in order to improve the overall quality of the regression analysis.

Initially, additional variables such as if a loan is *tranched* or the *tranche size* were intended to be added to the models. However after running correlation matrixes between these variables, and later after running robustness tests with regression models, and measuring the Variance Inflation Factor (VIF) to check for multicollinearity, these variables were dropped. Testing showed that these variables have high correlation values with the variables for the *number of tranches* and *deal size*, consequently, meaning that keeping them would lower the quality of the results. The correlation matrix also indicates a high correlation between the *tranche rating* and the *borrower rating*. Acknowledging this observation, separate OLS regressions models are implemented in Table 6 and Table 7, one where the *borrower rating* is not included, and another one where it is (check Appendix B for a table of the highly correlated variables in the sample).

4.2.1. Do ESG loans have lower spreads than conventional loans?

Tables 4 and 5 present the results of the OLS regression detailed in equation (1), described in section 3.2. The regression in Table 4 uses the full sample reported in section 3. For this regression, continuous variables *tranche rating*rated* and *company rating** *rated* and discrete variables *rated tranche* and *rated borrower* are used, making 17,232 the number of observations in the sample, of which 318 are ESG loans and 16,914 conventional loans. In models [1] to [3] the dummy variable *ESG* is used, which takes the value of 1 when a loan is considered ESG, and 0 otherwise. Table 4 contains 3 models: model [1] without both borrowing

firms' rating controls, and region and industry fixed effects; model [2] without borrowing firms' rating controls, but with region and industry fixed effects; and model [3] with borrowing firms' rating controls as well as region and industry fixed effects. We adjust for heteroskedasticity and standard errors are clustered by region and industry. The 3 models present similar results: spreads do not differ significantly between ESG and conventional syndicated loans when focusing on the full sample. Maturity and spreads seem to have a significant and positive correlation, a result to be confirmed with the 2SLS regression results. Most of the values seem to have the expected impact on the loan pricing, with the exception of variables *rated tranche* and *number of tranches*. The outcome for the *rated tranche* might be explained by the inclusion of the interaction it has with the variable rating (*tranche rating*rated)*, as the missing values for the tranche ratings in the sample were replaced with the median value for the variable *tranche rating*.

In Table 5 we re-estimate the models presented in Table 4 by incorporating only rated tranches and rated borrowers. For this regression analyses, models [4] and [5] contain 8,030 observations, where 7,825 are conventional loans and 205 ESG loans. Model [6] includes 6,590 observations, of which 6,435 are conventional loans and 155 ESG loans. Once again, the 3 models present similar results in terms of coefficients' significance and sign. However, results show that for a sample with information on credit ratings, that ESG loans are cheaper than conventional loans, with a premium of -19.51bps in model [5]. When comparing model [3] with model [6], it is important to highlight that variables *number of tranches*, *leveraged*, *currency risk,* and *tranche canceled* become insignificant. On the other hand, *country risk* variable becomes affecting positively and significantly loan spreads in model [4]. In accordance with Gabbi and Sironi (2005), and Marques and Pinto (2020), which indicate that ratings are the most important pricing determinator in the models, we find that *tranche rating* and *borrower rating*

are 2 out of 4 variables that keep their 1% significance level value, and they are also the highest beta coefficients in Table 5. So far we corroborate H1 that ESG loan spreads are lower than comparable conventional loans in Table 5 only; i.e., for samples composed of bonds with available information on credit.

Taking into consideration the maturity endogeneity issue mentioned in sections 2 and 3, equation (2) (section 3.2) is estimated by using a 2SLS methodology. We use *tranched* and *log deal size* as instruments. Table 6 presents the results for this regression, where models [7] and [9] contain the full sample of 17,232 observations (16,914 conventional loans and 318 ESG loans), while models [8] and [10] include a sample with loans and borrowers for which there is information about credit ratings, with 6,590 observation (6,345 conventional loans and 155 ESG loans). Table 6 contains 4 models: model [7] uses the full sample without both borrowing firms' rating controls, and region and industry fixed effects; Model [8] uses the rated sample without both borrowing firms' rating controls, and region and industry fixed effects; Model [9] uses the full sample without borrowing firms' rating controls, but with region and industry fixed effects; Model [10] uses the rated sample, with borrowing firms' rating controls as well as region and industry fixed effects. Results are robust when using the 2SLS *vis-à-vis* OLS methodologies: ESG syndicated loans have lower spreads than conventional ones for the sample with available information on credit ratings.

Empirical work that compares the pricing between ESG syndicated loans and conventional loans is missing. Due to this scarcity, we compare this result with results from similar empirical work on green bonds, resorting to the Altunbaş et al. (2010) approach that syndicated loans are a direct competitor for bonds as an external financing source. In this perspective, our results do not corroborate Tang and Zhang (2020) and Flammers' (2021), whose studies show no significant yield variation between the green bonds *vis-à-vis* conventional bonds. Our results also

do not corroborate Zerbibs' (2019), who finds a significant spread premium of -2bps cheaper for green bonds than conventional bonds. Zerbib (2019) says that this result is not sufficient to impact an investor's decision, however, in our study, the spread premium for ESG syndicated loans in model [10] is -16.76bps cheaper than a conventional syndicated loan. Taking into consideration that the average tranche size for this sample is 425 million Euros, this premium difference for this value would equate to 712,300 Euros, *vis-à-vis* 85,000 when considering Zerbibs' -2bps premium value. Therefore, we corroborate H1 for the sample with tranches and borrowers with information on ratings only.

Notably, maturity maintains a positive influence on spreads 2SLS regressions. However, in samples used in Table 6, it has a bigger impact on the spread than in the equivalent models in Tables 4 and 5 (e.g., the maturity coefficient for Model [6] is 11.12bps, while it is 24.49bps for the equivalent IV model [10]).

Table 4 – OLS regression analysis of the full sample

Dependent variable:	**OLS**		
Spread (bps)	[1] Without FE and borrower rating controls	[2] With FE and without borrower rating controls	[3] With FE and without borrower rating controls
Independent variables:			
Core variables			
ESG	-3.73	-6.99	-5.72
	(0.690)	(0.574)	(0.638)
Maturity	10.65 ***	9.41 ***	8.96 ***
	(0.000)	(0.000)	(0.000)
Tranche rating*rated	16.40 ***	17.36 ***	12.71 ***
	(0.000)	(0.000)	(0.000)
Rated tranche	59.91 ***	57.86 ***	72.79 ***
	(0.000)	(0.000)	(0.000)
Log deal value	-19.04 ***	-20.19 ***	-19.69 ***
	(0.000)	(0.000)	(0.000)
Number of tranches	12.35 **	13.22 ***	13.14 ***
	(0.014)	(0.003)	(0.003)
Firms' characteristics controls			
Leveraged	126.44 ***	108.99 ***	104.29 ***
	(0.000)	(0.000)	(0.000)
Borrower rating*rated			6.30 ***
			(0.000)
Rated borrower			-20.44 ***
			(0.000)
Contractual controls			
Currency risk	23.87 **	21.67 **	20.62 **
	(0.010)	(0.016)	(0.015)
Tranche canceled	-10.38 **	-11.55 **	-11.88 **
	(0.035)	(0.020)	(0.017)
Macroeconomic controls			
Country risk	-5.65 ***	1.41	1.08
	(0.004)	(0.691)	(0.750)
5yTB-3mTB	-0.07	-0.08	-0.08
	(0.238)	(0.221)	(0.198)
Volatility	0.61 ***	0.50 ***	0.53 ***
	(0.001)	(0.001)	(0.000)
Geographic Region Fixed Effects	No	Yes	Yes
Industry Fixed Effects	No	Yes	Yes
Number of observations	17,232	17,232	17,232
Adjusted R^2	50.74	48.72	51.06

** All specifications include a constant term. Standard errors in parathesis. *** denote p-values <0.01, ** denote p-values <0.05, and * denote p-values <0.10. FE = Fixed Effects*

Table 5 – OLS regression analysis of the rated sample

Dependent variable:	**OLS**		
Spread (bps)	[4] Without FE and borrower rating controls	[5] With FE and without borrower rating controls	[6] With FE and borrower rating controls
Independent variables:			
Core variables			
ESG	-17.93 **	-19.51 ***	-15.12 *
	(0.017)	(0.004)	(0.069)
Maturity	13.09 ***	12.49 ***	11.12 ***
	(0.000)	(0.000)	(0.000)
Tranche rating	29.78 ***	29.72 ***	15.97 ***
	(0.000)	(0.000)	(0.000)
Log deal value	-12.11 ***	-12.40 ***	-10.17 ***
	(0.000)	(0.000)	(0.000)
Number of tranches	2.87 *	2.52	1.25
	(0.283)	(0.384)	(0.686)
Firms' characteristics controls			
Leveraged	16.01 **	15.47 **	9.16
	(0.029)	(0.024)	(0.155)
Borrower rating			17.60 ***
			(0.000)
Contractual controls			
Currency risk	12.27 ***	5.70	6.61
	(0.004)	(0.212)	(0.324)
Tranche canceled	-3.93	-2.85	1.47
	(0.596)	(0.699)	(0.859)
Macroeconomic controls			
Country risk	-1.50	-2.40	-2.82 *
	(0.255)	(0.153)	(0.063)
5yTB-3mTB	-0.07	-0.06	-0.03
	(0.249)	(0.248)	(0.598)
Volatility	0.85 ***	0.85 ***	0.98 ***
	(0.000)	(0.000)	(0.000)
Geographic Fixed Effects	No	Yes	Yes
Industry Fixed Effects	No	Yes	Yes
Number of observations	8,030	8,030	6,590
Adjusted R^2	66.36	66.73	68.33

** All specifications include a constant term. Standard errors in parathesis. *** denote p-values <0.01, ** denote p-values <0.05, and * denote p-values <0.10. FE = Fixed Effects*

Table 6 – 2SLS regression analysis of the full sample, and the rated sample

Dependent variable:	**2SLS**			
Spread (bps)	[7] Full sample without FE	[8] Rated sample without FE	[9] Full sample with FE	[10] Rated sample with FE
Independent variables:				
Core variables				
ESG	-2.79	-17.07 **	-1.96	-16.76 **
	(0.829)	(0.013)	(0.898)	(0.010)
Maturity	37.49 ***	25.34 ***	32.14 ***	24.49 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Tranche rating		16.69 ***		17.03 ***
		(0.000)		(0.000)
Tranche rating*rated	12.11 ***		12.71 ***	
	(0.000)		(0.000)	
Rated tranche	50.58 ***		58.21 ***	
	(0.000)		(0.000)	
Log deal value	-22.29 ***	-12.09 ***	-22.98 ***	-12.97 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Number of tranches	4.63	1.43	8.03	1.89
	(0.428)	(0.618)	(0.111)	(0.484)
Firms' characteristics controls				
Leveraged	103.76 ***	-23.25 ***	89.92 ***	-24.44 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Borrower rating		15.73 ***		15.07 ***
		(0.000)		(0.000)
Borrower rating*rated	1.96		3.27 **	
	(0.271)		(0.021)	
Rated borrower	-15.54 ***		-20.85 ***	
	(0.000)		(0.000)	
Contractual controls				
Currency risk	24.39 **	7.65	27.39 **	4.91
	(0.013)	(0.140)	(0.013)	(0.485)
Tranche canceled	5.24	6.30	1.02	5.81
	(0.217)	(0.326)	(0.801)	(0.373)
Macroeconomic controls				
Country risk	-7.99 ***	-1.23	2.20	-2.63 *
	(0.000)	(0.414)	(0.595)	(0.069)
5yTB-3mTB	-0.09	-0.05	-0.09	-0.05
	(0.173)	(0.425)	(0.208)	(0.457)
Volatility	1.32 ***	1.41 ***	1.11 ***	1.39 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Geographic Fixed Effects	No	No	Yes	Yes
Industry Fixed Effects	No	No	Yes	Yes
Number of observations	17,232	6,590	17,232	6,590
Instrument relevance	0.000 ***	0.000 ***	0.000 ***	0.000 ***

** All specifications include a constant term. Standard errors in parathesis. *** denote p-values <0.01, ** denote p-values <0.05, and * denote p-values <0.10. FE = Fixed Effects*

4.2.2. Do common pricing determinants affect differently ESG and conventional loans?

Table 7 presents the result of re-estimating models [7] to [10] by including *tranche rating*rated*¸ *rated tranche*, *borrower rating*rated* and *rated borrower* variables, and controlling by region and industry fixed effects, for each type of loan. Models [11] and [12] use the full conventional loan sample (16,914 observations), and models [13] and [14] use the full ESG loan sample (318 observations)[9].

As observed, maturity, a rated borrower, and currency risk have a significantly higher impact on the spread of ESG loans *vis-à-vis* conventional loans. In model [12], maturity has a positive impact on the spread of 14.89 bps, whilst it has an impact of 52.11 bps in model [14]. For the discrete variable *rated borrower*, it has an impact of -19.29 bps on a conventional loan when a firm is rated, and an impact of -79.29 bps for the ESG loan sample. The currency risk coefficient is significantly higher for ESG loans, as it has a positive impact of 36.69 bps in model [14], and only an impact of 18.16 bps in conventional loans model [12]. The coefficient values for *log deal value*, *number of tranches,* and *leveraged* are statistically significant, as independent variables for the conventional loans sample. In the ESG sample, *deal value* is lower and not significant, *number of tranches* has a negative correlation with spread (*vis-à-vis* a positive one in the conventional loan models), and the *leveraged* coefficient is considerably smaller (39.91 bps in the ESG sample, and 93.51 bps in the conventional sample). The difference in coefficient and significance values also support H2. Overall, evidence is found that common pricing determinants impact ESG and conventional syndicated loans differently, so therefore H2 is corroborated.

[9] Rated sample was not regressed, as it would reduce the ESG sample

The coefficient for the variable *tranche rating*rated* is slightly bigger for the conventional loans sample than for the ESG loans sample. Rated tranches were expected to have a negative impact on the spread, since having a rating is an indication of lower information asymmetry, which perceives less debt risk (DeMarzo 2005; Ivashina 2009). Despite this remark, rated tranches have a substantially high and positive impact on the loan spreads in the sample, that might be explained by its interaction with the variable *tranche rating*rated* (created by switching the missing values by the *tranche rating* median, which means unrated firms get a rating of 14 in the new variable). This interaction would also explain the not significant and low value for the coefficient *borrower rating*rated*, as it was created with an equal logic (see section 3.2). Separate robustness checks were run using the variables *rated tranche* and *tranche rating*rated* to test their interactions with the regression. When they were used separately, *rated tranche* was not significant, and *tranche rating*rated* had a low impact, which confirms that their simultaneity is important for the quality of the regression, as when it is the case, they become the most impactful contractual pricing determinator. Overall, we can say that the results corroborate Gabbi and Saroni (2005), and Marques and Pinto (2020) findings that the rating is the most important spread determinator, as the *rated tranche* variable has the highest impact on ESG loans (105.67 bps on model [14]), and the highest contractual characteristic impact on the conventional loan sample (87.14 bps on model [12]).

The deal value significantly impacts the conventional loans spread sample negatively, as expected, although the results show that it's not an impactful characteristic of the loans in the ESG sample. It was expected for the *number of tranches* to have a negative impact on the spread, due to the risk spreading caused by the debt segmentation (Pinto and Santos 2020), however, the coefficients in the model show that they have a significant positive impact on the spread for conventional loans, but a negative impact on ESG loans. *Volatility* is the only

macroeconomic variable that is consistently significant throughout all the models in Table 7, which remarks the importance of this variable - in accordance with Tampakoudis et al. (2022).

Table 7 – 2SLS regression analysis of the Conventional Loan (CL) sample, and the ESG sample

Dependent variable:	**2SLS**			
Spread (bps)	[11] CL sample without borrower rating controls	[12] CL sample with borrower rating controls	[13] ESG sample without borrower rating controls	[14] ESG sample with borrower rating controls
Independent variables:				
Core variables				
Maturity	16.53 ***	14.89 **	54.47 **	52.11 **
	(0.003)	(0.011)	(0.015)	(0.016)
Tranche rating*rated	22.39 ***	21.45 ***	17.10 ***	19.22 ***
	(0.000)	(0.000)	(0.008)	(0.001)
Rated tranche	87.14 ***	87.14 ***	56.00 *	105.67 ***
	(0.000)	(0.000)	(0.060)	(0.009)
Log deal value	-24.13 ***	-23.64 ***	-8.34	-4.57
	(0.000)	(0.000)	(0.174)	(0.508)
Number of tranches	9.39 **	9.58 **	-3.81	-4.54 *
	(0.032)	(0.029)	(0.112)	(0.071)
Firms' characteristics controls				
Leveraged	94.27 ***	93.51 ***	37.19	37.91 *
	(0.000)	(0.000)	(0.105)	(0.097)
Borrower rating*rated		1.43		-4.00
		(0.330)		(0.557)
Rated borrower		-19.29 ***		-79.29 ***
		(0.000)		(0.005)
Contractual controls				
Currency risk	19.00 **	18.16 **	47.01 *	36.69 *
	(0.031)	(0.031)	(0.053)	(0.066)
Tranche canceled	-8.06 **	-8.98 **	82.63 ***	56.53 **
	(0.037)	(0.017)	(0.000)	(0.010)
Macroeconomic controls				
Country risk	0.92	0.72	0.20	-0.13
	(0.796)	(0.830)	(0.977)	(0.984)
5yTB-3mTB	-0.06	-0.06	0.34	0.28
	(0.277)	(0.252)	(0.290)	(0.328)
Volatility	0.61 ***	0.59 ***	4.03 ***	3.56 ***
	(0.001)	(0.002)	(0.002)	(0.001)
Geographic Region Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Number of observations	16,914	16,914	318	318
Instrument relevance	0.000 ***	0.000 ***	0.042 **	0.054 *

** All specifications include a constant term. Standard errors in parathesis. *** denote p-values <0.01, ** denote p-values <0.05, and * denote p-values <0.10.*

Conclusion

In this dissertation, with the purpose of finding the main differences in pricing between ESG and conventional syndicated loans, two main questions were raised: (i) do ESG syndicated loans have lower spreads than comparable conventional loans?; and (ii) are ESG and conventional syndicated loans influenced differently by common (contractual, borrower, and macro) pricing factors? A sample of 17,232 tranches closed between 2018 and 2022 was used, from which, 318 are ESG loans and 16,914 conventional loans.

Our findings indicate that, on average, an ESG syndicated loan is cheaper than a conventional syndicated loan, namely when considering a sample of loans with available information on credit rating. Empirical work on ESG syndicated loans is scarce, however, a bulk of recent finance literature has focused on green bonds. As a means of comparison, we resort to Altunbaş' et al. (2010) approach, who argue that syndicated loans are a direct competitor to the bond instrument as an external financing source. Whereas authors, such as Zerbib (2019), Tang and Zhang (2020), and Flammer (2021), do not find a significant difference in spreads between conventional bonds and green bonds, we find a significant difference between the spreads in our loan sample. Our results corroborate literature that views Corporate Social Responsibility as a valuable resource to the firm, namely with the resource-based view (Hart 1995), instrumental stakeholder theory (Jones 1995; Hillman and Keim 2001), and the shared value concept (Kramer and Porter 2011).

We also find evidence that common pricing determinants have a different impact on ESG syndicated loans when compared to conventional syndicated loans. The most noticeable differences in our results are: (i) a higher impact of maturity and currency risk on the spread of ESG syndicated loans; (ii) other variables are not as impactful, such as the loan deal size and if a loan is leveraged.

This thesis contributes to expanding knowledge on the loan characteristics of ESG syndicated loans, by comparing them to conventional syndicated loans.

The principal limitation of this study emerges from the quality of the data. ESG syndicated loans are a particularly recent debt instrument (the first available documented loan on the Loan Analytics database was closed in 2018). Available data on these is scarce, as is some of their most relevant features (e.g., spread and tranche rating). Hence, these results appeal for future research, given that with time, the sample of this instrument will keep growing, allowing for additional studying using a larger sample and with better quality of information.

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Appendices

Appendix A: Variable Definitions.

Variable	Description	Source	Expected impact
Dependent variables:			
Tranche all-in pricing	Spread of the loan tranche (in bps) including margin and fees.	Loan Analytics	
Independent variables:			
Contractual characteristics			
ESG	Dummy equal to 1 if the loan is ESG-linked, and 0 otherwise.	Loan Analytics	?
Maturity	Maturity of loan, in years.	Loan Analytics	?
Number of tranches	Number of loans per deal.	Loan Analytics	-
Tranched	Dummy equal to 1 if the loan is tranched into two or more facilities, and 0 otherwise.	Loan Analytics	-
Rated tranche	Dummy equal to 1 if the loan tranche has a credit rating from Fitch, Moody's, and/or S&P, and 0 otherwise.	Loan Analytics	-
Tranche rating	The Fitch, S&P, and/or Moody's tranche rating at closing; the rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=24. If a tranche has more than one credit rating, the average is computed.	Loan Analytics	+
Tranche rating*rated	The Fitch, S&P, and/or Moody's tranche rating at closing; the rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=24. If a tranche has more than one credit rating, the average is computed. For the tranches that are not rated, they're assigned the median tranche rating of the sample, which is 14.	Loan Analytics	+
Log deal value	Natural logarithm of the loan deal size measured in € million.	Loan Analytics	-
Log tranche value	Natural logarithm of the loan tranche size measured in € million.	Loan Analytics	-
Currency risk	Dummy equal to 1 for loans that are denominated in a currency different from the currency in the borrower's home country.	Loan Analytics	+
Tranche canceled	Dummy equal to 1 if the loan tranche has been prematurely signed, amended, closed, prepaid, refinanced, or withdrawn/canceled.	Loan Analytics	?
Macroeconomic factors			
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	+

5yTB-3mTB	The yield curve slope. Obtained as the difference between the USA 5-year Treasury Bond rate and the USA 3-month Treasury Bill rate.	Datastream	-
Volatility	The Chicago Board Options Exchange Volatility Index (VIX). VIX reflects a market estimate of future volatility.	Datastream	+
Geographical region dummies	Geographical continent dummies where the borrower is located in.		
Asia	Dummy equal to 1 if the borrower belongs to the Asian continent, and 0 otherwise.	Loan Analytics	?
Australia	Dummy equal to 1 if the borrower belongs to the Australian continent, and 0 otherwise.	Loan Analytics	?
Europe	Dummy equal to 1 if the borrower belongs to the European continent, and 0 otherwise.	Loan Analytics	?
North America	Dummy equal to 1 if the borrower belongs to the North American continent, and 0 otherwise.	Loan Analytics	?
South America	Dummy equal to 1 if the borrower belongs to the South American continent, and 0 otherwise.	Loan Analytics	?
Firms' characteristics			
Leveraged	Dummy equal to 1 if the deal is leveraged, and 0 if it's an investment grade.	Loan Analytics	+
Rated borrower	Dummy equal to 1 if the borrower has a credit rating from Fitch, Moody's, and/or S&P, and 0 otherwise.	Loan Analytics	-
Borrower rating	The Fitch, S&P, and/or Moody's company rating at closing; the rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=24. If a company has more than one credit rating, the average is computed.	Loan Analytics	+
Borrower rating*rated	The Fitch, S&P, and/or Moody's tranche rating at closing; the rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=24. If a tranche has more than one credit rating, the average is computed. For the firms that are not rated, they're assigned the median borrower rating of the sample, which is 14.	Loan Analytics	+
Industry dummies	Borrower industry dummies accordingly to the Standard Industrial Classification (SIC) code system.	SIC	
Agriculture, Forestry & Fishing	Dummy equal to 1 if the borrower belongs to the Agriculture, Forestry & Fishing industry, and 0 otherwise.	Loan Analytics	?
Mining	Dummy equal to 1 if the borrower belongs to the Mining industry, and 0 otherwise.	Loan Analytics	?
Construction	Dummy equal to 1 if the borrower belongs to the Construction industry, and 0 otherwise.	Loan Analytics	?
Manufacturing	Dummy equal to 1 if the borrower belongs to the Manufacturing industry, and 0 otherwise.	Loan Analytics	?
Transportation, Communications, Electric, Gas, and Sanitary Service	Dummy equal to 1 if the borrower belongs to the Transportation, Communications, Electric, Gas, and Sanitary Service industry, and 0 otherwise.	Loan Analytics	?
Retail Trade	Dummy equal to 1 if the borrower belongs to the Retail Trade industry, and 0 otherwise.	Loan Analytics	?
Finance, Insurance & Real Estate	Dummy equal to 1 if the borrower belongs to the Finance, Insurance & Real Estate industry, and 0 otherwise.	Loan Analytics	?
Services	Dummy equal to 1 if the borrower belongs to the Services industry, and 0 otherwise.	Loan Analytics	?
Multiple	Dummy equal to 1 if the borrower belongs to multiple industries, and 0 otherwise.	Loan Analytics	?

? = sign cannot be determined clearly from either the theoretical or empirical literature; - = negative impact on the credit spread; + = positive impact on the credit spread; NA = information about this variable unavailable

Appendix B: Correlation table for variables with high correlation

Variable of interest	Log of deal value	Log of tranche value	Number of tranches	Tranched	Tranche rating*rated	Rated tranche	Borrower rating*rated	Rated borrower
Log of deal value	1.00							
Log of tranche value	0.83	1.00						
Number of tranches	0.11	-0.29	1.00					
Tranched	0.13	-0.25	0.70	1.00				
Tranche rating*rated	-0.36	-0.37	0.12	0.18	1.00			
Rated tranche	0.48	0.51	-0.15	-0.12	-0.31	1.00		
Borrower rating*rated	-0.31	-0.32	0.11	0.18	0.86	-0.27	1.00	
Rated borrower	0.42	0.44	-0.14	-0.11	-0.30	0.80	-0.31	1.00