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Corporate Bond Pricing: A Systematic Literature Review on Influential Factors

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ABSTRACT

A systematic literature review on the pricing of corporate bonds worldwide is provided. Bonds are essential financing mechanisms for companies and are vital to transfer resources and catalyze economic growth. The democratizing potential of capital markets is highlighted, emphasizing that anyone can become an investor, facilitating wealth creation and boosting national economy. The main exploration of the study is bond pricing process in financial markets, focusing on the determinant factors of the price of these securities. Through a systematic literature review (SLR), the research elucidates complex relationships between bond valuation, credit characteristics and macroeconomic indicators. The greatest contribution is a final categorization into corporate, issuance, liquidity and macroeconomic/market based on 40 selected articles. This categorization is important as a guide for future works. The existing literature lacks comprehensive reviews on the factors influencing corporate bond prices, and there is a notable absence of categorizations of these factors.

KEYWORDS: Corporate Bond Pricing; Credit Spreads; Factor Analysis;

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1. Introduction

The financial and capital markets operate as an important financing tool for companies and entrepreneurs worldwide. The capital market allows companies to issue bonds to obtain the necessary resources to carry out their activities. Due to this characteristic, corporate bonds can be considered true corporate debt instruments [HECK 2022].

Compared to equity issuance by companies, corporate debt securities have the benefit that they do not impact ownership or control of the companies' activities. However, corporate debt contracts generally include covenants that must be complied with over the term of the debt and can interfere in the company's decisions even without changing its ownership control [KONRAHT e SOARES 2020]. Additionally, companies have a variety of types of debt securities to offer investors according to the their demand [HECK 2022]. Nevertheless, despite the relevance of corporate debt securities and their close relationship with the real economy, in equity markets, hundreds of factors have been proposed to explain the return of those assets, while factor investing in corporate bonds, is a relatively unexplored field [DANG et al. 2023].

The fundamental component of corporate bond prices is the credit risk associated with the issuer. This implies that, as issuing companies of the bonds have a non-zero probability of not being able to repay investors, these investors receive compensation in the form of risk premium, commonly referred as default spread [HECK 2022]. However, it is not only credit risk that influences corporate bond prices. There are other components that concern market participants and directly influence asset pricing, such as the illiquidity of corporate bonds [GOLDSTEIN e NAMIN 2023], exchange-rate risk, duration, equity momentum and others [DANG et al 2023].

The analysis of the components of bond prices is crucial as it seeks to explain the yields of corporate debt [DRIESSEN 2005]. Therefore, this study aims to perform a systematic literature review to investigate the pricing process of corporate debt assets in the financial market, specifically focusing on factors that are determinant for the composition of the final price.

A systematic literature review (SLR) stands as significant research undertaking in its own right, distinct from a mere recapitulation of prior writings. It addresses specific research questions (RQs) and constitutes a methodology that systematically identifies existing studies, meticulously chooses and assesses their contributions, analyzes and synthesizes data, and presents the evidence in a manner conducive to drawing reasonably clear conclusions about the known and unknown aspects within the subject matter [THOMÉ e SCAVARDA 2016]. In the present study we aim to analyze economic factors and market conditions that impact on the risk premiums accepted by investors and that will ultimately define the price of securities. We aim to answer two research questions: "Which factors influence the price of corporate bonds?" and "How can these factors be grouped into "macro factors", such as macroeconomic or market factors, liquidity factors, issuance factors and corporate factors?" This review contributes significantly to the literature, as it provides a summary of articles about corporate debt prices and makes a correlation between them, in addition to providing a detailed view of the factors studied and also providing a categorization and summary of these analyzed factors.

The study is structured as follows. In Section 2 a theoretical background is presented; Section 3 presents the materials and methods used; Section 4 brings the results, divided into bibliometric analysis, descriptive analysis and content analysis; and Section 5 presents the discussion, summarizing the studies and categorizing the factor into "macro factors".

2. Theoretical background

Before delving into the actual presentation and explanation of the results of our studies, it is important to provide a theoretical introduction regarding the main concepts addressed in this work.

The most relevant and foundational term is "corporate bond". A corporate bond is a type of debt instrument, issued by a company and sold to investors [HECK 2022]. It means that investors lend money to companies, and, in return, the company has a debt obligation to pay interest accrued on the principal and to return the principal when the bond comes due [US SECURITY 2024]. The corporate bonds are one of the most important components of the bond market.

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Bonds can be divided into various categories. In terms of the type of issuer, bonds can be corporate or public. For instance, there are government debt securities for each country within the bond markets, and there are those issued by companies, known as corporate bonds, which are the focus of this study. Bonds can also be classified based on its maturity, which is the date when firms are obligated to return the principal to investors. Lastly, bonds can be divided according to the type of interest payment. There are bonds that pay a fixed rate of interest, meaning the payments remain constant regardless of changes in market interest rates. There are also bonds that adjust their interest payments periodically and are subject to changes in market interest rates — these are known as "floating rate" bonds [US SECURITY 2024].

A corporate bond is issued when a company needs to raise funds. During the bond issuance, parameters such as maturity, volume, interest rate, and guarantees are defined. Once issued, the bond can be acquired by investors and subsequently sold on a secondary market. The larger the company and the better the credit characteristics of the issuance, the more liquidity the bond will have — making it easier to convert the bond into cash. Liquidity will be a frequently discussed term in this study, typically referring to the cost and time it takes to buy or sell securities. Another commonly used term in the credit market is default risk (or credit risk), which is the risk that the issuer is unable to pay the total agreed-upon coupons and the principal during the lifetime or at the maturity of the bond.

3. Materials and Methods

The data and methods used are detailed in the following sections (search strategy, eligibility criteria for selection of articles and data extraction). The systematic literature review was conducted and reported according to the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [LIBERATI et al. 2009; MOHER et al. 2009].

3.1. Search strategy

From inception to June 2023, we searched Scopus database. Even though alternative databases are available, considering that Scopus is currently the largest existing multidisciplinary one, we believe that it will not be detrimental to the final result. Several combinations of inclusion and exclusion criteria of articles were tested in order to find the one that would best retrieve the desired documents and that would contribute to the proposed review.

In the initial search, articles were identified using keywords, title and abstract. At this preliminary phase, it is crucial to ensure that potentially relevant articles are not overlooked; hence, the selection criteria must be judiciously balanced. Therefore, we used English as the language filter and also the combination of the words "bond*", "credit spread*", "pric*", "spread*", "yield*", "corporate*", "model*", "estim*" and "factor*". For the exclusion criteria, any articles with the terms "CDS*", "Swap*", or "Derivative*" in their titles, abstracts, or keywords were systematically excluded. This decision was based on the fact that the pricing of assets with any form of attached option or swap is highly specific and is conducted in a different approach of the one proposed in this work.

3.2. Selection of articles

The selection of articles consisted of three stages: (i) formulation of eligibility criteria; (ii) reading articles title and abstract; (iii) selection of articles for the full text reading [PERES et al. 2020; THOMÉ e SCAVARDA 2016].

To define and refine the eligibility criteria, it was essential to review some of the articles identified in the preliminary phase by assessing the title and abstract of selected articles. For an article to advance to the subsequent stage of this investigation, it needed to be aligned with the overarching theme; that is, it should focus on the pricing of corporate securities. Based on the above considerations, we established the following eligibility criteria: (i) articles that propose a pricing model for securities; and (ii) articles that solely focus on corporate debt securities. Exclusion criteria included: (i) articles unrelated to the proposed topic; (ii) articles not about pricing or credit; (iii) articles that study other types of bonds such as convertible bonds, green bonds and others; (iv)

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articles that focus on other themes such as risk of default, liquidity, equity and, lastly, (v) articles that study derivatives.

3.3. Data extraction

Data extraction and synthesis are crucial components of systematic review efforts, integral for facilitating a clear and structured comparison among the studies under examination, with the goal of presenting a comprehensive narrative that goes beyond mere aggregation to weave together a cohesive story elucidating differences, similarities, and emerging patterns. In our present undertaking, we constructed an initial table by analyzing ten articles, thereby pinpointing the variables for collection. Recorded data encompassed year, authorship, methodology, study location, utilized databases, data analysis timeframe, study variables, and specific considerations.

3.4. Literature analysis

The following work encompasses a comprehensive research approach, employing bibliometric analysis, descriptive analysis, and content analysis.

The bibliometric analysis involves the quantitative examination of scholarly publications, citations, and related bibliographical data to discern patterns and trends within the research field. It was done using “Bibliometrix”, a statistical package written in the open-source R language, encompassing statistical algorithms, mathematical functionality, and visualization features, to make a bibliometric compilation of the scientific works identified in the initial research [ARIA e CUCCURULLO 2017].

The descriptive analysis focuses on providing a detailed examination and summary of the characteristics, trends, and key features present in the selected studies. This type of analysis aims to provide a comprehensive overview of the existing literature relevant to the topic of interest. The descriptive analysis includes a synthesis of each study characteristics. Lastly, the content analysis delves into the qualitative exploration of textual materials, scrutinizing themes, patterns, and, mainly, the factors involved in pricing corporate bonds.

4. Results

4.1. Selection of studies

The initial research retrieved 857 articles. After the removal of articles that did not follow the eligibility criteria, 147 articles were selected for full text analysis. Reading all the 147 articles, 40 were selected to compose the present literature review. The article inclusion diagram can be seen in Figure 1.

The studies in the first sample share common research objectives, aiming to analyze the pricing of fixed-income corporate securities. Articles that proposed pricing of assets other than bonds themselves were excluded. This includes studies that price factors such as a company's default risk, liquidity risk or the ones that discuss companies’ share prices. Most of the studies introduce a proposed methodology, encompassing various modeling approaches or empirical reviews. Initially, this review did not apply any filters to the factors identified in the analyses, allowing studies that examine the relationship of a single factor to bond pricing or even multiple factors. In the second stage of the process, when reading these articles, it was found that single factor studies would add little to the discussion and, therefore, they were excluded.

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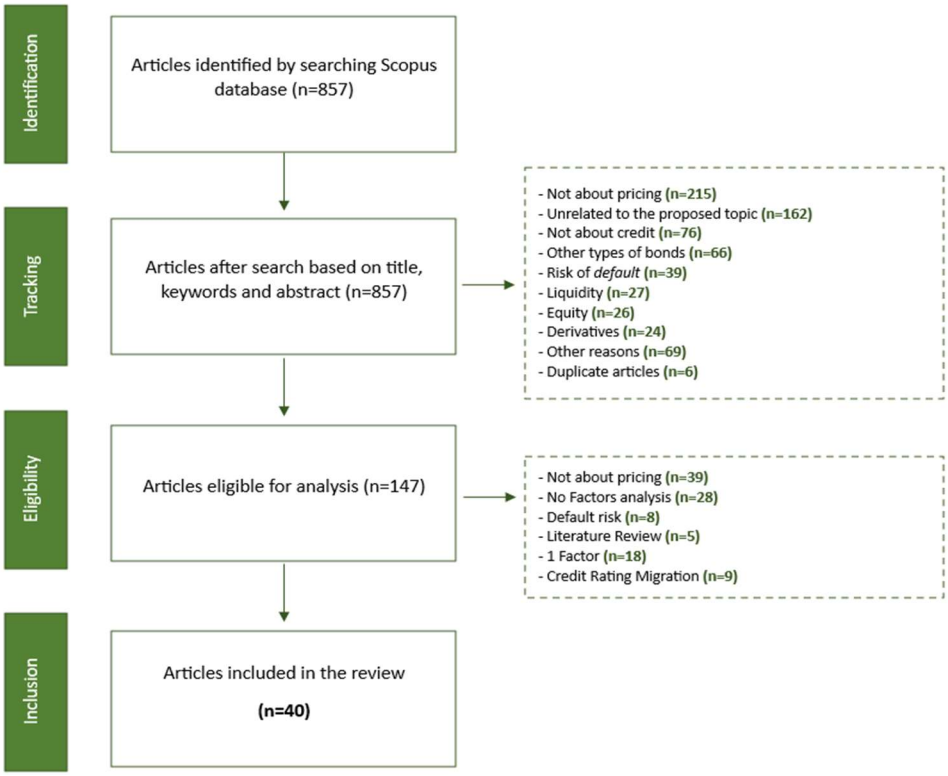


Figure 1: Article Inclusion Diagram

4.2. Bibliometric analysis

We performed a bibliometric analysis of the 40 articles included in the initial search. Examining the content of the articles, we can see a word cloud based on the abstract of the 40 articles (Figure 2). In summary, word clouds are used for information visualization, offering a quick and intuitive way to understand, summarize, and communicate textual data. Their simplicity and effectiveness make them valuable tools. As expected, the words “Corporate Bond”, “Credit Risk”, and “Credit Spread” (and other related) are the more relevant ones.



Figure 2: Word cloud using Keywords

Then, thematic map (figure 3) is a very intuitive plot and is used to analyze themes according to the quadrant in which they are placed. Upper-right quadrant is motor themes, lower-right quadrant is basic themes, lower-left quadrant is emerging or disappearing themes, upper-left quadrant is very specialized/niche themes. Themes in_the upper-right quadrant are both well developed and important for the structuring of a research field. Themes in the lower-right quadrant

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are “important for a research field but are not developed” [ESFAHANI 2019]. As we can see in Figure 4, “Corporate Bond” and “Credit Risk” appears in the middle of these quadrants, which means that, in the sample used, they are relevant, well developed and able to structure the research field. Themes in the upper-left quadrant have well developed internal ties but lack external connections. They have marginal importance for the field such as “ratings”. Themes in the lower-left quadrant are both “weakly developed and marginal”, mainly representing either emerging or disappearing themes, such as “default risk” and “equity market”. It is important to mention that the analysis above is based on a sample of the 40 articles considered on this study. “Default Risk”, for example, is a theme well developed, but in the sample of the present SLR, it remained in the “Emerging or Declining Theme” quadrant.

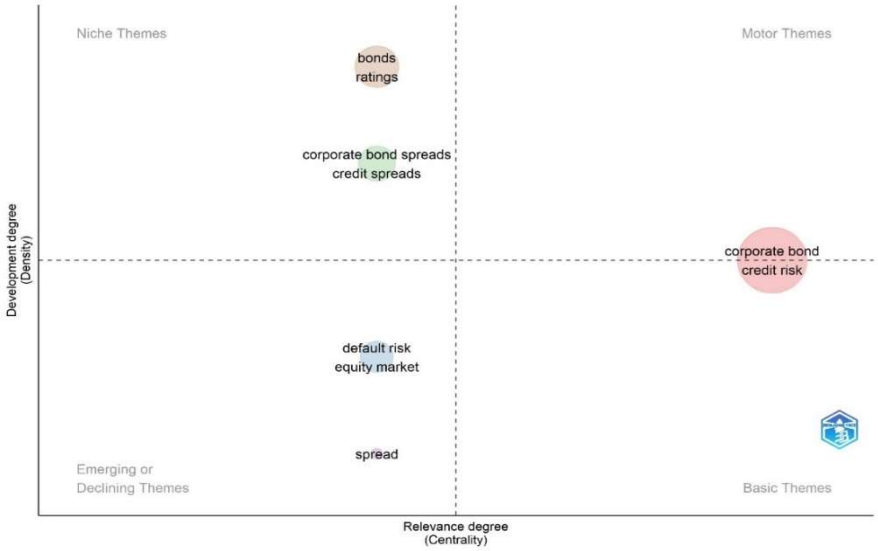


Figure 3: Thematic Map

Through this simple bibliometric analysis, it is possible to conclude that we are on the right path and have a broad selection of articles on the chosen topic to advance to our systematic literature review.

4.3. Descriptive analysis

Through the previously mentioned criteria, valuable data were extracted from the articles included in the systematic review. As there are numerous articles and a wealth of information, in order to facilitate the comparison and understanding of these studies, an auxiliar table was constructed, presenting the main information from the studies, such as author and year, country, methodology, database used, period of analysis, dependent variable, and number of factors. From this table, it is possible to have a first and more general overview of the articles included in the review.

In relation the addressed countries, United States are the most studied country, with a total of 19 works, followed by China with 9. Europe and other countries, such as Australia, India, Brazil, Turkey and Indonesia, appear sporadically.

Regarding the variables analyzed, the focus is always on the price (spread, return, yield) that we are seeking to explain. As for the method, given the scope of this study, regression is the method that is predominantly observed in this review. The number of factors analyzed is quite volatile, from 4 to 24 factors depending on the paper, and the main idea of the next sections is precisely to better understand these factors to determine which ones are more relevant and sensitive to asset pricing.

Furthermore, upon examining the publication years of the research, it becomes evident that this subject has been under investigation for an extended period. Nevertheless, the current topic

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still presents itself as a substantial challenge, and undoubtedly additional academic contributions on the pricing bond will occur in the future.

4.4. Content Analysis - Key Factors Affecting Bond Pricing

To provide a clear understanding of each author's findings, a second auxiliar table was done, with the main factors studied during the review. The table differentiates factors that were found to be significant and those that were not, aiming to guide and simplify the interpretation.

A comprehensive analysis of the diverse studies on corporate bonds reveals recurring themes and shared insights across various dimensions. Several authors focus on the correlation between credit spreads and interest rates, emphasizing the importance of interest rate variations in determining corporate bond spreads. Dupoyet et al. (2023), Lee (2022), and Garay et al. (2019) highlight the negative correlation between credit spreads and interest rates, with Lee (2022) specifically drawing attention to the tax policy uncertainty as a significant driver.

The comparison of the risk factors impact is another common thread. Özdemir-Dilidüzgün et al. (2022) found that liquidity risk plays a more substantial role than market risk in influencing Turkish and Eurozone bonds. On the other hand, Covitz and Downing (2007) concluded that liquidity is a key factor in determining commercial paper spreads in the United States; nonetheless, credit risk dominates, impacting spreads significantly. Fischer and Stolper (2019) concluded that liquidity has the largest effect on the credit spreads during high volatility markets. Simu (2017), in Indonesia, established that liquidity, maturity, coupon, and rating altogether contribute to the variation occurring in the bond yield is amounting to 80.7%, while the remaining 19.3% is influenced by other variables. Chen et al. (2011) analyzed many factors, but the fundamental contribution was that corporate internal liquidity risk has a robust and positive impact on bond yield spreads, persisting even after accounting for established determinants. The findings highlight the imperative to integrate internal liquidity risk into bond yield spread modeling for enhanced predictive accuracy in assessing corporate credit risk, particularly in post-financial crisis contexts.

In line with Chen et al. (2011), some other studies, such as Jiemin (2022), delved into the well-known Fama-French factors, emphasizing the role of risk factors, company size, book-to-market ratio, and credit ratings in shaping bond spreads. Wang et al. (2013) concluded that smaller firms with higher risk, lower book-to-market ratios, and increased default risk are associated with higher bond spreads. Credit ratings also play a crucial role, with AAA-rated bonds presenting lower spreads. Liu et al. (2009) mentioned that, not only the Fama–French three factors significantly impact yields, but also default risk and taxes. King and Khang (2005) noted that, despite the relevance of bond betas to equity market factors, they have limited explanatory power for corporate bond yield spreads. Structural model variables such as asset volatility, leverage, rating, coupon rate, bond size, and age are identified as more significant determinants, emphasizing their importance in explaining cross-sectional variation in yield spreads.

Gao et al. (2019) contributed with a different approach, showing that substantial risk warnings in annual reports significantly increase credit spreads, particularly in non-state-owned enterprises. Garay et al. (2019) analyzed emerging market and concluded that country and industry-specific factors significantly influence the net spread. Zhang and Li (2020) proposed an Autoregressive Model and contribute with valuable insights by highlighting the superior predictive ability of linear models in forecasting corporate bond yields.

Studies like Megananda et al. (2021) address the multifaceted nature of yield determinants, considering factors such as interest rates, exchange rates, coupon rates, and inflation. The authors suggested that these factors collectively contribute to 51% of yield variations, leaving 49% influenced by other variables.

Risk factors are not limited to corporate or liquidity indicators. Huang et al. (2019) brought a unique perspective, revealing correlations between economic indicators and credit spreads in Chinese and American corporate bonds. They emphasize the predictive potential of credit spreads over economic determinants.

Several studies delve into the influence of macroeconomic factors on credit spreads. Thakur et al. (2018) showed that the level of the yield curve, inflation, and stock market returns

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significantly impact corporate credit spreads in the Indian bond market. Similarly, Zhou et al. (2019) identified negative links between Chinese bond spreads and GDP (gross domestic product), contrasting with positive associations for American bonds with stock market volatility. In addition, Xie et al. (2018) mentioned that macro conditions undergo substantial structural changes, particularly impacting bond spreads as ratings declines. Liang and Zhu (2017) realized that interest rate risk and credit spreads were significantly negatively correlated while Treasury yield curve slope and volatility of the stock market were significantly positive. The impact of macroeconomic variables on credit spreads for corporate bonds with different credit ratings is different. For example, in terms of the credit spreads of AAA corporate bonds, the effect of inflation is not significant. In the other hand, for AA grade corporate bonds, inflation has a significant effect on its credit spreads. Talking about economic growth, it is more significant in the AAA bonds, but have greater impact in the AA ones.

Regarding politics, Qi et al. (2010) considered more than 35 countries and realized that higher political rights lead to significantly lower yield spreads and higher credit ratings in international debt markets, with a one-standard deviation increase associated with an 18.6% decline in spreads. Freedom of the press plays a crucial role, suggesting that improved information availability contributes to the positive impact of political freedom on credit markets. Beckworth et al. (2010) noted that monetary policy shocks significantly influence corporate bond yield spreads in the U.S., with positive shocks leading to notable reductions in these spreads.

In the Brazilian market, Paiva and Savoia (2009) concluded that the bond price index is more important than credit risk as a variable to explain the spread. This fact is due to investors' expectations, more oriented to protection against inflation, a consequence of the relative new period of stabilization in the country. Ex-post analysis shows that bonds linked to inflation tend to have higher returns than bonds linked to interest rates. Choices of long-term bonds have strong association with better ratings, and investors accept low credit bonds only for very short listings. Guimarães et al. (2021) proposed a final model with spread over the inflation-indexed government bond as the dependent variable. Credit rating, maturity, industrial classification, tax exemption, coupon frequency, and the number of days since going public were statistically significant at a 5% alpha level.

While each study provides unique insights into the complex world of corporate bonds, the collective body of research reveals consistent themes. Market risk factors, corporate risk factors, macroeconomic indicators, and non-financial influences emerge as critical determinants in shaping credit spreads, yields, and bond prices.

Examining all the points presented and the analyzed works, it is evident that the factors scrutinized and deemed significant synergies and commonalities. Factors such as rating, interest rate, and maturity are analyzed and considered significant in nearly all studies. Nevertheless, there are other factors, such as tax policy, revenue and accounting transparency for example, under investigation, leading to a lack of quantitative "convergence" and a conclusive statement regarding all the factors influencing the price of a debt security.

5. Discussion

In the current investigation, we conducted a comprehensive systematic literature review aiming to scrutinize the principal determinants influencing corporate bond prices. This research delves into the intricate processes that govern the valuation of these financial instruments, revealing a diverse array of determinant factors that significantly impact the pricing dynamics of these assets.

The final objective of the review was the categorization of these influential factors. The factors under examination predominantly encompass corporate, issuance, liquidity, and macroeconomic and market factors. To systematically categorize each identified factor across the 40 studies, a final auxiliar table was done. This analytical approach enhances our understanding of the multifaceted landscape influencing corporate bond prices.

Going through corporate factors, they are those that pertain to the company itself, specifically its financial health and default risk. For this reason, the factors typically considered are

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balance sheet indicators such as leverage, sector, and credit rating. 19 of the 40 selected articles took into account factors considered as corporate factors.

On the other hand, issuance factors are those related to the characteristics of the bond and play a fundamental role in its price, as they directly impact the issuance risk. For this reason, the most studied and relevant factors include the bond's issuance rating (which may differ from the company's rating, as it considers information such as guarantees and maturity), maturity and coupon. 23 of the 40 selected articles considered those type of factor.

Regarding liquidity factors, these are the elements that will determine the liquidity risk of bonds, meaning how easily the bond can be sold if an immediate conversion to cash is necessary. Liquidity is one of the most challenging factors to quantify and is extensively studied in the literature. For this segment, there were 19 studies and various proxies were considered, such as the issuance volume (which is an issuance characteristic, and could be classified as an "issuer factor," but is used as a metric to quantify liquidity), trading volume and volume outstanding.

Lastly, the risk of a debt issuance does not solely depend on the company, liquidity, or issuance characteristics, but also on market and macroeconomic factors. The vast majority of bond pricing studies consider macroeconomic and market factors as significant. Of the sample of 40 articles used, 33 articles considered variable of this category. Among these factors, the most studied ones are interest rates and stock price volatility.

6. Conclusion

Credit spread determinants have been a central theme in numerous studies, revealing a plethora of factors that influence bond valuations. These determinants are a blend of macroeconomic indicators, bond-specific attributes, market dynamics, company financial information, among others. The insufficiency of relying solely on credit ratings for bond valuation has been noted due to differences within the same rating class, influenced by aspects like liquidity, tax treatment, and bond age. While credit ratings remain universally important in bond pricing across various markets, a broader scope of information disclosure can lead to more accurate and lower credit spreads.

Liquidity risk is a standout factor in determining credit spreads, emphasized not just in specific markets but resonating across different studies and regions. Furthermore, the role of market risk, particularly equity market returns, significantly influences credit spreads, underscoring the intertwining nature of global financial markets. Different methodologies, from regression analyses to structure models, reveal the depth and complexity of understanding credit spread dynamics. Bond characteristics, such as bond age and coupon rates, are critical in shaping these spreads, especially in times of high equity volatility.

Furthermore, macroeconomic shifts, specifically interest rates, maintain a prominent position in the discourse, with the relationship between credit spreads and interest rates being particularly significant. However, it is essential to note regional variations: while some factors may be universally influential, the degree to which they affect credit spreads can differ based on regional contexts, from emerging markets to developed economies. In conclusion, bond valuation and credit spreads are influenced by a multifaceted mix of factors. As global markets continue to evolve, navigating this intricate landscape becomes imperative for both scholars and market professionals.

Moving forward, it is evident that the intricacies of bond valuation and credit spread dynamics merit further exploration. As possible limitation of the present work, and as a suggestion for future ones, we can mention the use of only one database and the low number of articles for bibliometric analysis. Also, the absence of the snowballing and meta-analysis procedure can be explored further.

Given the rapidly changing global economic landscape, future research might delve deeper into the temporal dynamics of credit spreads over different economic cycles. A concentrated focus on emerging markets could unearth unique determinants affecting bond valuations, often distinct from more mature markets. The burgeoning integration of technology in financial markets, from artificial intelligence to blockchain, also presents a fresh frontier. Analyzing their impact on traditional bond markets and their valuation dynamics can provide essential insights. Additionally,

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as global events like geopolitical shifts and technological advancements continue to shape financial landscapes, understanding their profound effects on credit spread variations remains crucial.

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