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Does Split Rating Affect Corporate Bond Yields? Evidence from North America and Europe

Abstract

The paper aims to determine the effect of split ratings on corporate bond yields. A Two-Sample t-Test was conducted for each risk category of bonds to assess the impact of split ratings. Using a sample of corporate bonds issued between January 2000 and May 2023, the study finds evidence that split-rated bonds exhibit higher yields. This suggests that investors demand greater compensation for the risk associated with split ratings, which stems from the informational opaqueness and uncertainty surrounding these instruments. The research also reveals that the magnitude of the difference between split ratings affects bond yields, with larger gaps leading to higher yields. The findings have significant implications for investors and issuers, emphasising the need to carefully evaluate split-rated bonds and consistent credit ratings. By enhancing our understanding of the relationship between split ratings and bond yields, this research promotes transparency and informed decision-making in the corporate bond market.

Keywords

split rating | bond yields | credit rating adjustments | solicit multiple ratings | credit rating agency (CRA)

JEL Codes

G10, G12, G14

1. Introduction

Information asymmetry in the financial market is one of the main causes of unbalanced investment and financial decisions. Even though corporate bonds are less risky than stocks, investment in corporate bonds can be complicated due to split ratings. Many organizations that create an institutional financial market framework can help decrease information asymmetry, which is not true with the split ratings assigned by credit rating agencies (CRAs).

CRAs assign credit ratings to evaluate the credit risk of debt instruments, which provides useful information to issuers, investors, and market regulators. Credit ratings do not perform advisory functions and do not give recommendations on whether to acquire or trade a debt instrument. Instead, they perform informational functions by providing credit analysis to stakeholders (Gonzalez et al., 2004).

Recent trends show that the companies with more information disclosure in the income statement are more likely to substitute bank loans with bond issue (Bialek-Jaworska & Krawczyk, 2019). Therefore, credit rating analysis has become vital. It is not rare when fixed-income issuers acquire additional credit ratings from other rating agencies. Requesting an additional rating might maintain the rating level of the issuer and prevent negative rating change. Investors also require multiple ratings, as some institutions cannot invest in securities with less than two credit ratings. Additional ratings are especially important for firms with ratings near the investment grade. As some organisations might be restricted from acquiring instruments with poorer ratings, a downgrade might affect the issuers negatively (Chen, 2011).

However, multiple credit ratings do not always coincide. Rating disagreements about the default risk among rating agencies might lead to split ratings

(Hasan et al., 2021). For instance, the two major rating agencies, Moody's and Standard and Poor's (S&P), disagree on credit ratings at least a notch in half of the cases (Livingston & Zhou, 2010). Split ratings bring additional information to the financial stakeholders about the debt instruments. Furthermore, rating difference affects investors' behaviour (Vu et al., 2017).

While there is a considerable body of literature on the causes of split ratings (Dandapani, 2007; Ederington, 1986; Jiang & Packer, 2017; Livingston et al., 2007; Tewari, 2018), little recent research has been focused mainly on the effect of split ratings on bond yields. Previous studies have demonstrated that the bond yield is higher for split-rated bonds than for non-split-rated bonds (Jung & Park, 2018; Livingston & Zhou, 2010; Michael, 2009). The informational opaqueness of split-rated bonds explains this effect. In other words, investors price information uncertainty in the market (Livingston et al., 2010). Split-rated bonds are associated with greater borrowing risk (Jones et al., 2022; Tanaka, 2024).

Given the lack of recent research on the effect of split ratings on bond yields, it is essential to estimate whether rating disagreement leads to increased bond yields. The paper aims to determine the effect of split ratings on corporate bond yields. The effect of rating disagreement on bond yields is evaluated by performing the Two-Sample t-Test.

This paper consists of five parts. The chapter on literature review follows the introduction. The following topics are covered in the chapter on review of previous research: credit ratings and their role in financial markets, the definition of split ratings and their causes, the market response to split ratings, and the relations between split ratings and bond yields. The following section describes the methodology used to evaluate the effect of split ratings on corporate bond yields, including the research design, the sample, the measurement, and the procedure. Chapter four demonstrates the findings of the study and includes a discussion. Finally, the paper ends with the conclusion on the performed analysis, including limitations of the study and implications for future research.

The paper contributes to the literature regarding the effects of split ratings on yield and information asymmetry in financial markets.

2. Literature Review

2.1. Credit Ratings and their Role in Financial Markets

Credit ratings reflect the judgment of credit rating agencies about the creditworthiness of fixed-income issuers (Caridad et al., 2020). CRAs serve as an intermediate link between investors and issuers of debt instruments. They alleviate the imbalance of information between the two sides (Ismail et al., 2015). Additionally, CRAs relieve investors from the additional work of analysing the financial performance of debt issuers (Badoer et al., 2019). By providing risk assessment, CRAs improve the transparency of the market. Assigned credit ratings affect bond pricing, investment, and regulatory decisions (Miglioni, 2019).

CRAs assess the credit risk of different instruments, such as bonds issued by firms, states, local governments, asset-backed securities, and mortgage-backed securities. With the higher rating, the default risk of the issuer is lower. Low-risk bonds have a rating of BBB or higher and are known as "investment-grade" bonds. Bonds with a rating lower than BBB are known as "junk bonds." It is riskier to invest in the latter ones (Livingston & Zhou, 2020).

Credit ratings can be solicited by issuers or unsolicited. Regarding solicited ratings, the issuers pay CRAs for the service. In the case of unsolicited ratings, CRAs assign ratings using open information and receive no payment for the service (Miglioni, 2019). When it comes to solicited ratings, Sangiorgi and Spatt (2017) indicate that fixed-income issuers are inclined to purchase a better rating. This phenomenon is known as "rating shopping." This effect is explained by issuers benefiting from a higher rating, as the worth of instruments increases with a higher rating. The authors find that CRAs that do not rate issuers officially evaluate the firm's credit risk higher than CRAs that rate the issuer officially. According to Morkoetter et al. (2017), debt issuers that receive split ratings are motivated to purchase an additional rating from other rating agencies that would be more positive than the initial ratings.

One of the users of credit ratings is institutional investors, including insurance firms, investment funds for retirement schemes, and mutual funds. Usually, these structures can only invest in low-risk debt instruments (Livingston & Zhou, 2020). Therefore,

credit rating is crucial for them when making an investment decision.

Three leading credit rating agencies provide credit assessments in the United States and Europe: Moody's, Standard and Poor's (S&P), and Fitch. Apart from the three primary CRAs, rating agencies with a smaller market share provide similar services worldwide. Some firms are not recognised as rating agencies, but their services are the same as CRAs. The official count of rating agencies globally does not exist. However, by estimations, the total number of CRAs in the world exceeds one hundred (White, 2018).

The establishment of new CRAs positively affects the financial markets of emerging countries. New CRAs provide additional information on debt issuers limited in developing markets. The CRA's emergence triggers the flow of new investments, and consequently, the bond market of emerging countries expands (Marandola, 2021).

The financial crisis of 2007-2009 revealed CRAs' significant role in the financial market. Rating agencies were blamed for aggravating the crisis by assigning overstated ratings to mortgage-backed debt instruments. Later, CRAs were accused of lowering the ratings of European countries (Portuguese Republic, The Republic of Ireland, Hellenic Republic) and escalating the European debt crisis by releasing the ratings too early (Ryan, 2012).

The financial crises and the CRA's role led to increased CRA activity regulations. For instance, the Dodd-Frank Act was introduced in 2010 in the United States (White, 2013). The new regulation obliged rating agencies to disclose rating methodologies, follow established policies and processes, and do internal checks (Bayar, 2014). Though the purpose of the Dodd-Frank Act was to make rating agencies responsible for assigning incorrect ratings, adhering to the new regulation made CRAs cautious. Rating agencies started to understate credit ratings to protect their public image (Dimitrov et al., 2015).

The image of rating agencies depends on the correctness of the assigned ratings. However, there are situations when rating incorrectness might occur. Among those are "conflict of interest", absence of competitors, and information imbalance between lenders and borrowers. Conflict of interest appears when CRAs receive payment for solicited ratings from fixed-income issuers. CRAs might be inclined to overestimate issuers' creditworthiness to receive remuneration. Another reason – the absence of competitors, lies in the market dominance of the

Big Three. Lenders put a high value on ratings assigned by the Big Three credit rating agencies. A lack of perspectives and opinions can lead to rating incorrectness. Finally, information imbalance is another cause of rating imprecision. CRAs might not reveal necessary information. Borrowers might possess more information about debt than lenders (Miglionico, 2019).

The importance of credit ratings continues to grow as, in many cases, debt rating assignment is a prerequisite for stakeholders to get engaged in financial activities (Caridad et al., 2020). Bevilaqua et al. (2020) note that investors rely on corporate credit ratings in world markets when it is difficult to gather data on corporate debt issuers due to issuers' remoteness, communication challenges, and other factors. Moreira and Zhao (2018) while exploring the asset-backed securities market emphasises the greater impact of credit ratings on newly issued instruments than on trading instruments. Lenders depend on CRAs' ratings of new instruments as there is insufficient data on newly issued debt securities. Therefore, the yield increases for newly issued high-risk instruments. However, the study finds a weak effect of ratings on yields of trading asset-backed securities.

Several studies explore the effect of rating changes on the financial market. For instance, May (2010) suggests that a negative rating adjustment brings a negative return on the debt instrument. Accordingly, a rating upgrade leads to a positive debt return (Grothe, 2013). This finding is similar to May's (2010). Bond pricing is significantly affected by rating decreases. The yield spread grows on downgraded bonds. However, the market reaction changes depending on the current economic environment. The market is more sensitive to a negative rating adjustment during economic decline.

Mokoaleli-Mokoteli (2019) explores the response of the market of transitional states to credit rating adjustments using the example of South Africa. The author finds that a negative market reaction follows a rating downgrade. Consequently, a rating downgrade can result in the withdrawal of capital investments and a drop in stock prices. The rating downgrade might drive economic uncertainty in the emerging economy. On the other side, rating improvements do not significantly affect the market.

The literature review shows that a rating decrease induces a stronger market response than a rating increase (Fedat, 2020; Grothe, 2013; May, 2010; Mokoaleli-Mokoteli, 2019). A possible explanation is

that rating improvements do not provide significant information on the issuer, unlike rating downgrades (Mokoaleli-Mokoteli, 2019).

Regarding the effect of credit ratings on firms' capital structure, Feda (2020) shows that a rating downgrade results in a decrease in bond issuance and a rise in equity capital. In the case of a rating upgrade, the improvement does not influence the structure of the capital significantly. On the contrary, Kisgen (2019) states that a firm's new debt issuance tends to increase with rating upgrades.

Finally, a recent study by Basu et al. (2020) shows that credit rating adjustment triggers changes in firms' policies on information disclosure. The research points out that with rating improvement, corporations tend to report less information. The opposite happens when there is a rating downgrade: firms are likely to enhance reporting.

Apart from the economic effect of credit ratings, Cunha et al. (2022) find that credit ratings might also impact political activities. The research shows that improving the ratings of US municipal bonds contributes to the growth of the reputation of the current local governing office. The effect is explained by a prosperous economic environment inclining the electorate to vote for the current governing officials.

Overall, previous research has shown that credit rating releases and credit rating adjustments influence the financial market. Specifically, certain institutional investors can only engage in financial transactions when the instruments are rated (Caridad et al., 2020), or they avoid investing in instruments with an assessment of high credit risk (Livingston & Zhou, 2020). Additionally, the market might rely on credit ratings of newly issued instruments when there is not enough information on the new instruments (Moreira & Zhao, 2018). When it comes to rating adjustments, a rating downgrade can result in the withdrawal of investments (Mokoaleli-Mokoteli, 2019), while in the case of a rating upgrade, the return on debt might increase (May, 2010). Rating change also affects corporation capital structure (Feda, 2020), with a decrease or increase in debt issuance depending on the rating adjustment. Therefore, credit ratings are important for both issuers and investors.

2.2. Why Split Ratings Occur

It is a common practice for corporations to request multiple ratings for new debt instruments from

different credit rating agencies (CRAs). This strategy aims to enhance the credibility of their debt offerings and reduce the probability of a rating downgrade, providing corporations with a firmer stance in financial markets (Chen & Wang, 2021). Additionally, investors demonstrate a preference for issues with multiple ratings, as these are often perceived as a signal of reliability and reduced uncertainty (Shimizu et al., 2013).

While many debt issuances receive consistent ratings across CRAs, a notable divergence, termed "split ratings", occasionally arises (Cantor et al., 1997). Split ratings occur when two or more CRAs assign different credit ratings to the same debt issuer, reflecting disagreements in their evaluation of creditworthiness. Such splits are uncommon and often persistent; for example, Livingston et al. (2007) note that splits rarely converge in the short term, typically persisting for several years. However, the frequency and persistence of splits can vary depending on the nature of the bond being rated. For instance, Elkhoury (2007) observes that rating disagreements are more frequent for high-risk sovereign bonds than high-risk corporate bonds, illustrating that the context and type of debt play a role in splits.

The literature on split ratings also examines differences in CRA methodologies and their relative conservatism. For example, studies by Bowe and Larik (2014) and Livingston et al. (2010) suggest that Moody's is generally more stringent than Standard & Poor's (S&P) in assigning ratings, reflecting a higher conservatism. In contrast, Vu et al. (2017) find that S&P demonstrates greater conservatism when rating sovereign bonds, particularly during periods of heightened economic risk. Rowe (2020) reconciles these findings by suggesting that CRA conservatism is dynamic and context-dependent, with S&P adopting a stricter stance during financial crises. These studies collectively reveal that the relative conservatism of CRAs is neither absolute nor uniform but varies across economic environments and types of debt instruments.

Divergent rating methodologies and criteria also contribute significantly to split ratings. Ederington (1986) highlights that CRAs might share similar views on a bond's overall credit quality but apply different criteria to arrive at a rating. This divergence is further explored by Dandapani and Lawrence (2007), who liken credit ratings to university grading scales, demonstrating that differences in grading methodologies can explain minor splits (e.g., one

notch). Larger splits, however, are attributed to factors such as information asymmetry, subjective judgment, or randomness. Jiang and Packer (2017) build on these findings, identifying discrepancies in rating scales and the differential weighting of credit risk drivers as key factors in rating disagreements between local Chinese and global CRAs. Similarly, Shimizu et al. (2013), in their study of the Japanese bond market, find that Japanese CRAs prioritize return on assets more than their US counterparts, resulting in systematic differences in ratings.

Firms' financial and managerial characteristics also influence the likelihood of split ratings. Bowe and Larik (2014) find that firms with greater financial strengths, such as larger size and higher profitability, are less likely to experience splits. Similarly, firms with autonomous board directors exhibit fewer disagreements in their ratings, reflecting the role of strong corporate governance in reducing uncertainty. By contrast, asset opacity has been consistently identified as a major driver of split ratings. Studies by Livingston et al. (2007), Livingston and Zhou (2016), and Tewari (2018) emphasize that opacity, or the difficulty in evaluating the credit risk of a debt instrument due to limited or ambiguous information, heightens the probability of rating splits. Hauck and Neyer (2014) adds that excessive opacity signals information uncertainty, leading CRAs to rely on industry trends rather than firm-specific data, thereby increasing the likelihood of disagreement. Kladakis et al. (2020) further demonstrate that greater opacity exacerbates the gap between split ratings, indicating that transparency is crucial in mitigating rating splits.

Sectoral and contextual factors also shape the occurrence of split ratings. For example, Iannotta (2006) and Rowe (2020) find that financial institutions, characterised by higher information uncertainty, are more prone to rating disagreements than non-financial firms. This tendency is particularly pronounced during financial crises, as Rowe (2020) shows that opacity in bank credit ratings increases during such periods. Alsakka and ap Gwilym (2010) explore sovereign ratings in emerging economies and identify three primary reasons for rating splits: higher asset uncertainty, uneven evaluation of macroeconomic indicators, and potential regional biases among CRAs. However, Bartels (2019) challenges the notion of regional favouritism, finding no evidence that CRAs systematically favour local entities, thereby providing a counterpoint to earlier findings.

Corporate transparency and disclosure practices emerge as critical factors in reducing rating disagreements. Akins (2013) and Bonsall and Miller (2017) argue that poor financial reporting increases uncertainty about default risk, which manifests as split ratings. Clear and reliable financial reporting mitigates rating splits and improves market confidence. Similarly, Bonsall et al. (2017) and Amstad and Packer (2015) link discrepancies in CRA methodologies to rating disagreements, particularly for sovereign bonds in developed European states. Park and Yoo (2019) further, a robust information environment, supported by active financial analyst monitoring, reduces rating splits. Complementing these findings, Kim and An (2021) demonstrate that voluntary information disclosure by firms decreases information asymmetry, lowers the probability of rating disagreements, and reduces borrowing costs.

Overall, the literature highlights the multifaceted nature of split ratings, driven by factors ranging from CRA methodologies and information opacity to corporate governance and sectoral differences. A consistent theme is the role of transparency in mitigating rating splits. Studies by Livingston et al. (2007), Livingston and Zhou (2016), and Rowe (2020) emphasize that rating disagreements often signal a lack of transparency or information ambiguity. This is further supported by Kim and An (2021), who show that proactive information disclosure can reduce split ratings by addressing information asymmetry. These findings suggest that while structural and contextual factors influence split ratings, improving information quality and transparency offers a tangible path to minimizing rating disagreements.

2.3. Market Reaction to Split Ratings

The occurrence of split ratings induces significant market response. Split ratings might cause concern among investors, particularly in cases when the rating difference is near the boundary between investment-grade bonds and high-risk bonds (Bartels, 2019). Split ratings indicate information uncertainty. Investors are more sensitive to the opaqueness of speculative bonds than to low-risk bonds (Abad et al., 2020).

According to Billingsley et al. (1985), investors rely on a lower credit rating of two split ratings. Therefore, greater importance is attached to the inferior rating. According to Cantor et al. (1997), it is more effective

to take the average basis of both split credit ratings than relying on one of the credit ratings when it comes to bond pricing. Estimating the average credit rating is a more impartial method, unlike relying on one of the two credit ratings. On the contrary, Reiter and Ziebart (1991) state that investors rely on a higher rating when pricing debt. Gilloon (2010) states that financial stakeholders consider the superior rating for shorter-period investments. However, the inferior rating is considered in the long run.

The incident of rating disagreements shows that market actors attach different levels of significance to ratings from various rating agencies (Allen & Dudney, 2008; Livingston et al., 2010). Livingston et al. (2010) suggest that lenders prefer a credit opinion of a stricter rating agency, Moody's, while Allen and Dudney (2008) state that the influence of major CRAs, Moody's and S&P, is equal.

Mählmann (2009) finds another market trend, noting that corporations that received split ratings from CRAs tend to request an alternative rating from another CRA to resolve the rating split. The study conducted by Bongaerts et al. (2012) supports these findings. If Moody's and S&P disagree on a rating, the issuers will likely solicit a rating from Fitch, especially when the two split ratings are in different grade categories (high risk and low risk).

Livingston et al. (2008) find that securities with rating disagreements have a higher chance of rating adjustment in the future. Rating agencies that assign lower-level ratings might raise the ratings. Accordingly, the initially higher ratings of another CRA would be downgraded. The study also reveals that rating disagreement disappears for one-third of bonds after four years from the bonds' issue date.

A consistent finding is demonstrated by Al-Sakka and ap Gwilym (2010). The authors state that the credit ratings of sovereign split-rated issues will likely change. Additionally, the bigger the rating split, the higher the chance of rating change.

Finally, Vu et al. (2017) explored the impact of rating disagreements on the sovereign bond market. The study suggests that the bond market responds stronger when the lower rating of two sovereign split ratings is downgraded, or the higher split rating is upgraded. The response is weaker when the higher rating of two split ratings is downgraded, or the lower rating is upgraded. Additionally, when the lower rating in the split pair decreases, the credit spread increases as the reaction to the negative rating changes.

Therefore, the existing literature shows that the financial market is sensitive to split ratings. The appearance of split ratings might cause issuers to request an additional rating to resolve rating disagreement (Bongaerts et al., 2012; Mählmann, 2009). Another effect of split ratings on the financial market is a higher chance of CRAs adjusting ratings in the future (Al-Sakka & ap Gwilym, 2010; Livingston et al., 2008). Additionally, the market's reaction might differ depending on two factors. The first factor is that rating agencies rated the instruments higher/lower (Livingston et al., 2010). The second factor is which of the two split ratings was adjusted (Vu et al., 2017).

2.4. Split Ratings and Bond Yields

Split-rated bonds are associated with elevated borrowing risks, leading to higher bond yields than securities with equivalent non-split ratings (Jones et al., 2022). Multiple studies have explored the relationship between split ratings and bond yields, consistently finding a dependence between these factors. The prevailing consensus in the literature suggests that split-rated bonds tend to have higher yields than bonds with uniform ratings, indicating a premium required by investors to compensate for perceived risks (Billingsley et al., 1985; Cantor et al., 1997; Jewell & Livingston, 1998; Jung & Park, 2018; Livingston et al., 2010; Livingston & Zhou, 2010; Michael, 2009; Perry et al., 1988). However, Baker and Mansi (2002) offer a contrasting perspective, asserting that the yields of split-rated debt instruments align with the average yields of the split pair ratings, suggesting a more balanced market perception of such instruments.

Michael (2009) provides evidence that split-rated bonds carry higher yields than instruments with comparable uniform ratings, emphasising that rating discrepancies significantly influence bond yields. Notably, the impact of split ratings is contingent upon which credit rating agency (CRA) assigns the superior rating, as investors may prioritize the assessment of one CRA over another. The study also reveals that the effect of split ratings on yields varies across risk categories; bonds in lower-risk categories are more sensitive to rating splits than those in higher-risk categories. This distinction underscores the nuanced role of risk perception in debt pricing.

Livingston and Zhou (2010) approach split ratings as an indicator of information asymmetry, arguing

that investors demand higher yields to mitigate the risks associated with the informational opaqueness of split-rated bonds. Their research compares yields of bonds with split ratings to two benchmarks: the yields of bonds with the middle rating of the split pair and the average yield derived from the higher and lower ratings of the split pair. The findings demonstrate that split-rated securities yield exceeds both benchmarks, indicating that investors perceive these instruments as riskier. Furthermore, the study examines bonds with varying degrees of rating divergence, finding that larger rating gaps correspond to higher bond yields. This outcome suggests that the disagreement between CRAs amplifies the market's risk perception, compelling issuers to offer greater compensation to attract investors.

Jung and Park's (2018) study of the Korean bond market corroborates Livingston and Zhou's (2010) findings. It reveals that rating disagreements, indicative of information imbalance, lead to higher bond yields. Moreover, the authors conclude that the inferior rating more strongly influences bond yields in the split pair, as investors adopt a conservative stance in pricing risk.

Hasan et al. (2021) reinforce the association between split ratings and elevated borrowing costs, noting that investors demand additional compensation when rating disagreements arise. Gilloon (2010) highlights the exacerbation of this effect during financial downturns when heightened economic uncertainty reduces investor tolerance for risk. This phenomenon underscores the contextual sensitivity of split ratings and their impact on bond pricing.

Allen and Dudley (2008) examine the differential influence of Moody's and Standard & Poor's (S&P) on the yields of split-rated bonds, positing that the yield is determined by the rating of the more influential CRA. Their findings indicate that Moody's historically held greater sway over bond yields than S&P, although this dynamic shifted after 1995, equalizing the influence of the two agencies. Additionally, the study finds that an extra superior rating from Fitch reduces the yield of bonds with matching ratings from Moody's and S&P, attributed to the additional informational value provided by Fitch. However, the limited sample size of this analysis warrants cautious interpretation.

Livingston et al. (2010) offer a contrasting perspective, demonstrating that the effect of split ratings on bond yields varies depending on which CRA assigns the higher rating. Bonds rated higher by

Moody's tend to exhibit lower yields than those rated higher by S&P. This finding suggests that investors prioritize the opinions of stricter CRAs, with Moody's generally perceived as more conservative.

Abad et al. (2020) delve into the interplay between rating disagreements, borrower opaqueness, and bond returns, identifying split ratings as a manifestation of informational opacity. The study observes that BBB- or higher bonds are less prone to split ratings than lower-rated bonds, reflecting the relative clarity of higher-rated instruments. Furthermore, the convergence of split ratings is interpreted as a decline in opacity, enhancing investor confidence. Conversely, rating downgrades following the resolution of split ratings provoke negative market reactions, particularly for lower-rated bonds, highlighting the heightened sensitivity of these instruments to changes in perceived risk.

Livingston and Zhou (2016) explore the role of additional Fitch ratings in mitigating the effects of split ratings. They find that a third rating reduces information asymmetry, lowering bond yields for split-rated instruments. This effect is more pronounced for split-rated bonds than uniformly rated bonds, emphasizing the value of supplementary credit assessments in reducing investor uncertainty and borrowing costs.

Collectively, the research underscores the robust relationship between split ratings and bond yields, with studies by Michael (2009), Livingston and Zhou (2010), Livingston et al. (2010), Jung and Park (2018), and Abad et al. (2020) consistently finding that split-rated bonds exhibit higher yields compared to non-split-rated counterparts. Moreover, the degree of rating divergence magnifies this effect, as investors demand higher compensation to offset the perceived risks associated with informational opacity. While additional ratings can mitigate these effects by reducing opacity, the overall premium required for split-rated bonds remains significant.

Based on this comprehensive analysis, two hypotheses are proposed:

- Hypothesis 0: The bond yield is the same for split-rated and non-split-rated corporate bonds within the same credit risk category.
- Hypothesis 1: The bond yield is higher for split-rated corporate bonds than non-split-rated corporate bonds within the same credit risk category.

The subsequent chapter details the methodology employed to test these hypotheses.

3. Methodology

3.1. Research Design

section describes the methodological framework to examine the impact of split ratings on corporate bond yields. The study adopts a deductive approach and a quantitative research method. The deductive approach involves testing a hypothesis derived from a theory (Woiceshyn & Daellenbach, 2018). Specifically, this paper assesses whether split credit ratings assigned to corporate bonds result in higher yields when compared to yields of equivalently rated bonds. The quantitative technique applies numerical data analysis by performing a Two-Sample t-Test. Further, quantitative research suggests verification of outcomes (Soiferman, 2010).

Livingston and Zhou's (2010) work influenced the research method, which provided a foundation for this study's methodological approach. Particularly, the measure of the effect of split ratings on bond yields and some sample characteristics and classifications were adopted.

3.2. Sample Characteristics

Data was collected from Bloomberg Terminal. The sample comprised 1497 active corporate bonds at the time of data extraction. The sample covered January 1st, 2000, and May 31st, 2023. The characteristics of selected bonds were set to "fixed" coupon type and USD currency. Additionally, the characteristics of the bond must have included the issue date, maturity date, coupon rate, spread to benchmark index at the issue date, and the country of issuance. As for the latter parameter, the bonds were issued in North American and European countries. The bonds lacking any listed parameters were excluded from the analysis.

The sample included two groups of corporate bonds with credit ratings at issue date from two credit rating agencies – Moody's and Standard & Poor's. The bonds in the first group were selected based on the availability of split ratings. These bonds received ratings with two notches split at the issue date from two CRAs. The split pair consisted of a superior S&P

rating and an inferior Moody's rating. The second group included bonds with equivalent middle ratings of split pair from two CRAs on the issue date. Following Livingston and Zhou (2010), the bond ratings were gathered at the issue date and not at the time of data extraction to avoid external influences on bond yields after issuance, such as rating adjustment, rating alignment, and others. While Livingston and Zhou (2010) focused primarily on U.S. corporate bonds, we expanded the analysis to include European corporate bonds, offering a broader comparative perspective on the phenomenon of split ratings. Bonds were selected based on similar criteria, such as split ratings assigned by major CRAs (e.g., Moody's, S&P, and Fitch). However, we introduced additional filtering criteria to account for differences in credit risk categories and economic environments. The sample comprised 49% of split-rated corporate bonds and 51% with similar ratings. The analysis did not include split-rated bonds with Moody's higher rating and S&P's lower rating due to a lack of samples for some rating categories.

The "Spread to benchmark" index at the issue date served as a measure to assess the difference between split-rated and equivalently rated corporate bond yields. "Spread to benchmark at issue" is a parameter from Bloomberg that measures the variation in basis points between the yield of a specific bond against the yield of a bond with similar characteristics (the benchmark bond). A US Treasury bond often serves as the benchmark bond (Bloomberg, 2023). Livingston and Zhou (2010) use "Treasury spread" to measure their research.

Following Livingston and Zhou (2010), the sample with two groups (split-rated and non-split-rated bonds) was divided into ten risk categories to compare bond yields of the same rating grade. This study did not implement the categorisation of bonds at the boundary of high-risk and low-risk bonds, as the bonds belong to different risk grades and are not comparable. Moreover, bonds with rating grades near default were omitted from this research.

Table 1 shows bond classification by risk type. The first column, "Category", defines the risk grade equivalent to S&P grading. The second column shows a rating split pair of two notches with an S&P superior rating. The third column lists each category's middle rating in the split pair. The equivalence of Moody's and S&P ratings was retrieved from the study of Calabria and Ekins (2012). Finally, the last column, "Risk", differentiates low-risk and high-risk bonds.

Table 1. Categorisation of Bonds by Risk Grade

Category (equivalent to S&P ratings)	Pair of split ratings with a two- notches difference Moody's / S&P	Middle rating of the split pair Moody's / S&P	Risk
"AA+"	Aa2 / AAA	Aa1 / AA+	Investment-grade bonds
"AA"	Aa3 / AA+	Aa2 / AA	
"AA-"	A1 / AA	Aa3 / AA-	
"A+"	A2 / AA-	A1 / A+	
"A"	A3 / A+	A2 / A	
"A-"	Baa1 / A	A3 / A-	
"BBB+"	Baa2 / A-	Baa1 / BBB+	
"BBB"	Baa3 / BBB+	Baa2 / BBB	Speculative bonds
"BB"	Ba3 / BB+	Ba2 / BB	
"BB-"	B1 / BB	Ba3 / BB-	
"B+"	B2 / BB-	B1 / B+	
"B"	B3 / B+	B2 / B	

Ten of the twelve risk classifications were studied. Groups "AA+" and "AA" were not analyzed due to a lack of data. The index "spread to benchmark at issue" (spread) of split-rated and non-split-rated corporate bonds was compared in each risk group. For example, for category "A", spreads of split-rated bonds A3/A+ (Moody's/S&P) were evaluated against spreads of debt instruments with the middle rating of the split pair A2/A (Moody's/S&P).

3.3. Procedure

To test the hypothesis that split-rated corporate bonds have higher yields than non-split-rated debt instruments, a Two-Sample t-Test was conducted using the statistical software SPSS. The Two-Sample t-Test was done individually for each of the risk categories. The Two-Sample t-Test is commonly applied in research to evaluate if there is a statistically significant difference between the means of two independent groups (Chieh, 2011). In the context of this study, the test assesses whether the means of bonds with split ratings are significantly different compared to means of bonds with matching ratings. The test suggests two hypotheses. Under Hypothesis 0, the means of both independent groups are not significantly different. Under the alternative Hypothesis 1, the means of independent groups have statistically significant variation.

The significance level - α was set at 0.05. The p-value must be less than the established significance level to prove Hypothesis 1. In other cases, when the p-value exceeds α level, Hypothesis 0 is accepted. According to Ludbrook (2013), the one-sided p-value can be considered in t-tests when the alternative hypothesis indicates that the mean of one of the two test groups has a higher value.

Three assumptions must be verified to accept the results of the Two-Sample t-Test. The first assumption is a normal distribution of data. The second assumption is equality of variances. Finally, the third assumption is the independence of two groups (Sheng, 2008). The first assumption can be visually validated by examining a histogram or a normal quantile plot. Both were explored to search for anomalies. Outliers with extremely high or low values were removed from the sample. Apart from visual verification of data normality, the Shapiro-Wilk test and Kolmogorov-Smirnov test of normality can be performed. Both tests should result in the p-value greater than α level set at 0,05 to verify the normality of data (Nor Aishah Ahad et al., 2011). Both the Shapiro-Wilk test and the Kolmogorov-Smirnov test were run in SPSS for each of the risk categories.

Levene's test validates the second assumption of equality of variances. To verify this assumption, the p-value must be greater than α level set at 0,05. Levene's test was run for each of the rating groups.

The third assumption suggests that groups are independent from one another. Errors that occur should be independent of each other. No unusual observations were made.

In addition to three assumptions of the Two-Sample t-Test, other conditions must be followed: a dependent variable must be continuous, and data should be collected at random. A dependent variable in this study is spread to the benchmark index, which is continuous. The condition of a random collection of data was followed.

Therefore, the Two-Sample t-Test was run to test whether the means of split-rated bonds are higher than those of non-split-rated bonds. Three assumptions of the test were verified. The next section outlines the analysis's results and discusses them.

4. Results and Discussion

This section outlines the results of the analysis of the relationship between split credit ratings and corporate bond yields. The sample of 1497 corporate bonds included two groups: 1) initially rated with two notches split by Moody's and S&P; 2) initially rated equivalently by Moody's and S&P. The sample covered a period of January 1st, 2000 – May 31st, 2023.

To test the hypothesis that split-rated bonds have higher yields than equivalently rated bonds, the Two-Sample t-Test was performed in SPSS statistical software under three assumptions. The sample was

categorised by risk level to compare yields of bonds of the same risk type. The analysis was conducted individually for each risk category. The dependent continuous variable was spread to the benchmark index at the bond issuance date. Spread to benchmark is a measure that estimates the yield difference between a specific bond and a benchmark bond in basis points (Bloomberg, 2023). The Two-Sample t-Tests compared the means of spreads of two groups in each risk category. In total, ten tests were run.

The analysis revealed that the spread means of group 1 (split-rated bonds) were significantly higher than that of group 2 (equivalently rated bonds) for seven out of ten risk grades. The one-sided p-value was smaller than the established α level of 0,05 for these seven groups.

For category "B", the analysis demonstrated that the spread mean is significantly higher for group 1, with a one-sided p-value of 0,024. However, the distribution of the sample was not expected. The results of categories "BB-" and "B+" were insignificant, with a one-sided p-value exceeding the α level of 0,05. Hypothesis 1 could not be accepted for these groups.

Table 2 shows the summary of the results of the analysis. The first column categorises test groups by credit risk. Columns two and three provide each test group's overall count of bonds. Columns three and four show the spread mean of split-rated and non-split-rated bonds, followed by column five with the difference in mean spreads between the two test groups. The next columns show one-sided and two-sided p-values that demonstrate statistically significant results.

Table 2. Results of the Two-Sample t-Test

Cate- gory	Number of split rated bonds	Number of non- split rated bonds	Spread mean of split rated bonds	Spread mean of non-split rated bonds	Spread mean difference	One- sided p-value	Two- sided p-value	Levene's test for equality of variances (p-value)	Shapiro- Wilk test of normality (p-value)	Kolmogorov- Smirnov test of normality (p-value)
1	2	3	4	5	6	7	8	9	10	11
AA-	48	51	86.3	76.2	10.1	0.021	0.042	0.106	0.842	0.2
A+	26	36	115.5	96.7	18.8	0.024	0.048	0.952	0.218	0.2
A	84	87	125.5	109.5	16	0.017	0.033	0.543	0.067	0.088
A-	85	85	134.63	118.14	16.49	0.005	0.01	0.808	0.063	0.2
BBB+	133	140	146	134	12	0.011	0.021	0.561	0.124	0.07
BBB	84	92	184.3	162.2	22.1	0.002	0.005	0.883	0.082	0.2
BB	65	67	298.7	280.4	18.3	0.012	0.025	0.863	0.158	0.2
B	68	68	463.3	418	45.3	0.024	0.048	0.091	<0.05	<0.05

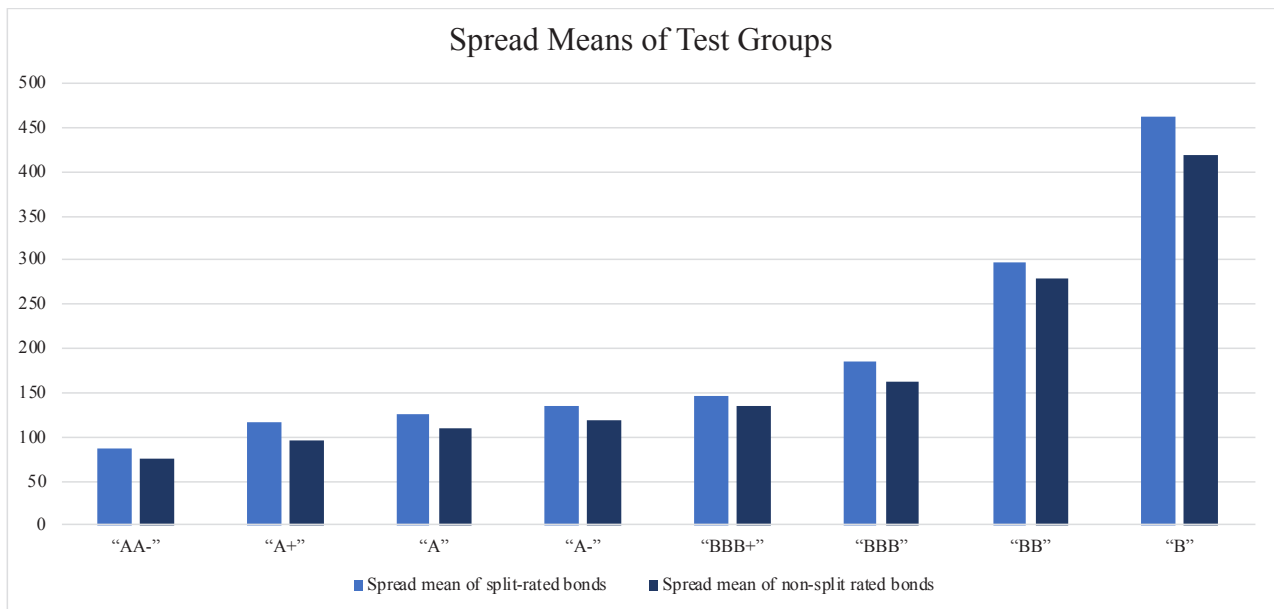


Figure 1. Spread Means of split-rated and non-split-rated corporate bonds

Categories "BB-" and "B+" are omitted from the table with results due to the inability to prove Hypothesis 1.

Three assumptions were checked to accept the results of the Two-Sample t-Test. The first assumption of the normal distribution of the sample was visually verified by examining histograms and normal quantile plots in SPSS. Extreme values were excluded from the sample. Additionally, two normality tests, the Shapiro-Wilk test and the Kolmogorov-Smirnov test, were performed. The two last columns (on the right) of Table 2 demonstrate the p-value for each risk category. The p-value must be higher than α level of 0.05 to indicate that the sample data is normally distributed. The p-value was greater than 0.05 for seven risk groups, suggesting a normal data distribution. Conversely, category "B" showed a p-value less than 0.05. Therefore, distribution was not normal for the last group, and the assumption of normal distribution was not verified in that case.

The second assumption of equal variances was verified with Levene's test. The results of the tests for each risk group are shown in column 9 in Table 2 (3d column from the right). Hypothesis 0 in Levene's test assumes equal variances, while Hypothesis 1 suggests unequal variances. With a p-value over 0,05 (α level), Hypothesis 0 is accepted. The p-value is greater for eight risk categories, including "B." Therefore, the second assumption of equal variances for the two groups was accepted.

The sample, which was collected at random, did not contain unusual observations. The groups were independent of one another. Therefore, three assumptions of the Two-Sample t-Test were confirmed for seven categories, suggesting the reliability of the research's outcome.

Figure 1 illustrates the results in a chart. The means of spread to benchmark index of split-rated bonds are greater than the means of spreads of equivalently rated bonds. Apart from showing the results for seven risk groups with normally distributed sample, the chart also visualizes the results for category "B" with non-normal distribution. Categories "BB-" and "B+" are excluded from visualization due to insignificant results.

The results indicate a positive relationship between split ratings and corporate bond yields. Rating disagreement among CRAs triggers a market reaction. Consequently, the yields of bonds with different ratings are higher than those of non-split-rated bonds. The findings support the suggested Hypothesis 1 and align with the expected outcome of the research.

The results might suggest that split-rated bonds are perceived as higher-risk investments than equivalently rated bonds. Based on previous research (Livingston et al., 2010; Abad et al., 2020), a plausible explanation is that there is more uncertainty around split-rated bonds. Uncertainty is associated with increased risk. Investors tend to be risk-averse and

require higher compensation for increased risk. Consequently, issuers incur higher borrowing costs. The results are consistent with the existing research on the topic (Michael, 2009; Livingston & Zhou, 2010; Jung & Park, 2018). Split ratings lead to increased bond yields.

The findings contribute to understanding the relationship between credit ratings and the bond market dynamics. The analysed data has a broader range of characteristics compared to prior studies: the sample covers almost 22.5 years, including the latest debt issuance (January 2000 – May 2023); regions of bond issuance include North America and Europe.

Several factors limit the generalization of the results. First, the research focused on bonds with a rating split of two notches to compare against the bonds with the middle rating. A bigger rating split was not the focus of this study. Second, the rating split between S&P's superior rating and Moody's inferior rating was under the scope of this study. The study does not consider the extent of the influence of one CRA over another. Third, the data sample in each risk category is relatively small.

The results should be taken into consideration by investors when making investment decisions. Split-rated bonds could diversify investment portfolios on the high-risk end. At the same time, more risk-averse investors should be aware of the greater risk associated with split-rated corporate bonds. For issuers, split ratings are a determinant of increased borrowing costs. To avoid such, the issuer might release additional information on securities to decrease the level of uncertainty or to request an additional credit opinion from a third party. Split ratings might be of interest to CRAs' regulators. A legal framework and new regulatory acts should be implemented to avoid rating inconsistency and make the rating process more transparent.

5. Conclusion

This study examined the impact of split ratings on corporate bond yields and provided insights into the relationship between rating disagreement and bond market perceptions. The analysis focused on two hypotheses: Hypothesis 0 stated that the bond yield is the same for split-rated and non-split-rated corporate bonds of the same credit risk category, while Hypothesis 1 proposed that the bond yield is higher

for split-rated corporate bonds than for non-split-rated corporate bonds in the same credit risk category.

The findings of this study support Hypothesis 1, indicating that split-rated corporate bonds have higher yields than non-split-rated corporate bonds. The analysis revealed that investors demand higher compensation for the risk associated with split-rated bonds, which stems from the informational opaqueness and uncertainty surrounding these instruments. This aligns with previous research by Michael (2009), Livingston and Zhou (2010), and Jung and Park (2018), who also found a positive relationship between bond yields and split ratings.

Furthermore, the study discovered that the magnitude of the rating difference between split-rated bonds influences their yield. Bonds with a larger gap between two split ratings exhibit higher yields, emphasising that rating discrepancies exacerbate the market's perception of risk and information asymmetry. These findings reinforce the importance of accurate and consistent credit ratings to facilitate informed investment decisions and reduce information asymmetry among market participants.

The results of this study have implications for both investors and issuers of corporate bonds. Investors should be cautious when investing in split-rated bonds, as these instruments carry higher yields and greater risk. It is crucial for investors to thoroughly evaluate the informational opaqueness associated with split-rated bonds and price in the additional risk accordingly. On the other hand, issuers should consider the potential cost implications of split ratings and strive to obtain consistent ratings from reputable agencies to minimise the negative impact on their borrowing costs.

It is important to note that this study has certain limitations. The analysis focused on a specific sample of corporate bonds issued between January 2000 – May 2023, limiting the generalizability of the findings. Additionally, the study only considered split ratings with a difference of two notches and did not explore other rating discrepancies. Future research could expand the sample size, examine different rating gaps, and explore the impact of split ratings on other financial instruments.

This study contributes to the existing literature by providing empirical evidence on the relationship between split ratings and corporate bond yields. The findings highlight the importance of considering rating disagreement and its implications for investors

and issuers. By enhancing our understanding of the effects of split ratings, this research can help inform investment decisions and promote transparency and efficiency in the corporate bond market.

Future studies might be conducted on the effect of the emergence of rating splits for outstanding bonds, as this research focused only on rating splits at the bond issue date. The effect of rating change on split-rated bond yields can be explored. Future research can also focus on the effect of split ratings on sovereign and financial institution bond yields.

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