

Investors can be confident of high credit ratings furnished by credit rating agencies for green bonds



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ABSTRACT

The study's pertinence lies in its focus on the performance of green bond markets in addressing environmental concerns. The purpose of this study is to ascertain if current issuances of high credit ratings by credit rating agencies can be considered safe by investors, through the consideration of the margin of safety, amidst the prevailing high credit growth. A quantitative research methodology determining the margin of safety of issuers, using operating incomes and interest expense, derived from annual financial statements of 30 randomly selected companies, which are considered adequate for inferential purposes, from the Climate Bond Initiative database is undertaken. The decline in EBIT before the balance after interest expense is paid becomes zero is ascertained in conjunction with the allocated credit rating. A sampled mean of a margin of safety of 58.79 % leads to an estimated population mean results of a margin of safety above or equal 48% and below or equal to 68.41%, at 95% confidence level and a standard deviation of 27.41%. The corresponding investment credit ratings reflect a 77% in relative frequency of which 3.3% is assigned the highest AAA rating. The results demonstrate that it takes close to a minimum of 50% and a maximum of 68% deterioration in operating income before balances after interest expense are wiped out. Hence the study concludes that the prevailing credit ratings being issued by credit rating agencies can be trusted by green bond investors based on the substantive margin of safety figures of issuers.

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Introduction

Studying the safety of green bonds as an investment asset makes sense for various reasons. Proceeds of green bonds are critical in the efforts by all stakeholders to address waves of environmental degradation caused by greenhouse gas (GHG) emissions. Those who invest in the green bonds arena seek either to see meaningful environmental mitigations (non-pecuniary) or adequate capital returns (pecuniary) or both. Credit rating agencies (CRAs) play a crucial role, by indicating to the investor, the likelihood of achieving his desirable outcomes by offering credit ratings which are derived after due diligence activities. Investigating the alignment between credit ratings and the safety of green bonds to the global investors, given the exponential rise in green bonds issuances is thus an invaluable exercise aimed at assisting global investors to make sage investment decisions. The dissemination of inaccurate information is core to many criticisms that have been directed at the CRAs. History is awash with instances whereby CRAs have been at the center of issuing untimely and inaccurate risk evaluations.

Fast forward to the present day, it would seem that the CRAs are issuing mostly impressive ratings in the green bond markets. Such views are supported by the case of the Chinese markets being awash with AA+ and AAA ratings (Lin and Hong, 2022). Notably, the phenomenal rise in credit ratings coincides with the remarkable growth of the green bond markets. However, credit booms are inextricably woven with substantial capital inflows and are usually followed by some sort of crisis, be it banking, currency or abrupt halts in capital flows (Mendoza and Terrones, 2012). Stating it differently, credit booms usually lead to financial distress (Castro and Martins, 2021).

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Therefore, given the rise in the issuance of green bonds, the commensurate high quality credit ratings and the historic disastrous results of a similar combination, it begs the question as to how safe these bonds as investment assets are.

The study is structured as follows: Section 1 refers to related literature reviewed and section 2 dwells on the study's methodology. Section 3 provides the results whilst section 4 discusses the results. The last section (5) furnishes derived conclusions from the results.

Literature Review

Various authors have highlighted the phenomenal growth of green bond market since its inception in 2007 (Li et al, 2020; Ehlers, et al, 2020; Baker et al, 2022; Su, Guo and Dai, 2023). Baker et al (2022) highlighted the manifestation of a variety of issuers in the form of municipalities, corporations and those that transcend national geographies otherwise known as supranational. Li et al (2020) singled out China as a key player in the growth of green bonds in the emerging economies, whilst empirical studies by Ehlers et al (2020) showed that approximately 3.5% of the aggregate bond issuance in the world amounting to \$ 7.15 trillion constituted green bonds by 2019. China has moved in leaps and bounds with green bond issuances rising to a staggering 15.9 trillion Yuan by 2021, of which RMB 2 trillion was attributed to the period 2016 to 2021 (Su, Guo and Dai, 2023). A report by The International Finance Corporation (2024) reflects a staggering rise to US1 trillion dollars of issuances encompassing green related bonds.

It is significant to note that most of these issues are accompanied by either green bond ratings or credit ratings or both, provided by various credit rating agencies (CRAs) including the three big ones, S&P 500, Fitch and Moody's. There is a marked difference in the nature and purpose of the two ratings (green bond rating and credit rating). The green rating focuses more on the quantitative aspect of activities, from an issuer's perspective, that impact the environment (Dorfleitner, Utz and Zhang, 2022). In addition, the green rating takes into consideration the evaluation of the probability that bond proceeds will indeed be channeled towards green projects (Ehlers et al, 2020)). In contrast, a credit rating signals a view on the creditworthiness of the issuer as evaluated by the agency (Ubarhande and Chandani, 2021). Credit ratings are not facts but rather opinions, anchored on the future and concerning an issuer's creditworthiness (S&P, 2025). Simply put, the CRAs help the investor to determine if the issuer can meet his obligation to pay back the funds.

The CRAs, for long, have been involved in the business of providing the markets with credit ratings. The subjective qualitative and objective quantitative nature of due diligence carried out by the CRAs result in the attainment of vital information pertaining to an issuer's financial position (Liu and Jiraporn, 2010). All being equal, the credit rating agencies are central to how bond markets function (Li et al 2020). The dissemination of inaccurate information, argued Spiegel, Chowla, Ng and Erfurth (2022), is central to various criticisms that have been targeted at the CRAs.

In some historical moments CRAs have been at the center of furnishing untimely and inaccurate risk evaluations (Bonsall et al, 2023). Those misguided risk assessments bring back the harrowing memories of the global financial crisis. Indeed, rating agencies were not spared harsh criticisms, at times widespread condemnation, that followed the global crisis. Instead of mitigating the risks, the CRAs exacerbated them through general imprudence in their various assessment undertakings (Camanho, Deb and Liu, 2022). Host, Cvečić and Zaninović (2012) cited a lack of expertise in determining the medium to long investment risks, posing an unfair disadvantage to investors.

CRAs are at the epicenter of financial markets (Machado and Paula, 2023). Most prominently, credit ratings find use in portfolio allocation decisions, for regulatory capital allocation in insurance companies, as yardsticks in the quality of collateral by central banks, and in policy formulation by the corporate sector (Hilscher and Wilson, 2017). However, this study is focused on the aspect of investors' usage of credit ratings for capital allocations. Just like (Rafailov, 2011; Gupta, Mittal and Bhalla, 2010), Camanho, Deb and Liu (2022) reiterated that the CRAs fueled the financial crisis through sheer disregard of prudent risk assessments and unethical conduct, such as deliberately inflating credit ratings on structured finance products. Camanho, Deb and Liu (2022) as well as Goldstein and Huang (2020) reflected upon the Enron and Worldcom sagas of 2001 as well as the financial crisis covering the period between 2007 and 2008. The most egregious failure by the CRAs came about in 2007 through the mortgage-backed securities (Rafailov, 2011).

The work CRAs do in credit risk assessments does not come for free. Issuers pay the fees. This kind of model which was referred to as an issuer-paid model by Lee et al (2021), has been fraught with challenges such as conflicts of interest. For example, the possibility of dishonesty and inflated ratings favoring issuers has been a subject of concern (Goldstein and Huang 2020). A corollary to these concerns is that financial incentives contributed to the bias. Nonetheless, a financial crisis whose magnitude was so profound ensued.

A common contention attributed to the compromised position of the CRAs, spawning the global crisis, has been the existential model whereby issuers of bonds pay for receiving credit ratings, a situation that manifested in substantial level of inflated ratings (Bush, 2022). Essentially, highest investment grades such as AAA were assigned to non-qualifying investment projects of which 56% of them got downgraded upon further analysis (Gupta, Mittal and Bhalla, 2010). Hilscher and Wilson (2017) provided a chilling conclusion, suggesting that the ratings themselves were not in sync with a proper determination of the likelihood of corporate failure.

Indeed, especially immediately after the financial crisis, the reputation of CRAs took a knock. They were therefore regarded as obstreperous. Reports indicating the CRAs imperfections are many including those by Piccolo and Shapiro (2022), and Hilscher and

Wilson (2017). Despite this unforgettable past, Credit rating agencies continue to be relied upon by the markets (Mennillo and Sinclair, 2019), more so in the green bond markets.

The current growth in green bond markets is phenomenal. Looking back, credit booms of the past could not be separated from the CRAs. The current green bond market seems to be no different. Amongst other shenanigans, the green bond market is immersed in inflated credit ratings which are a potential source of default risk (Zhao et al, 2023). Within a period of 6 years from 2016 to 2022 close to 100% of corporate green bonds issued received an astounding AA or greater with a stupendous 89% of the 2021 issuances furnished with AAA (Zhao et al, 2023). Consequently, as history has revealed, the credit ratings cannot always be taken at face value. If this credit growth is unchecked, it may have serious economic and financial consequences at some point in the near future. In Dell'Ariccia et al (2020) account, the majority of all credit booms lead to a financial crisis. Credit booms are viewed as a source of capital misallocation, unjustified and escalated asset prices, loosening of risk measures in lending activities leading to the flow of funds towards financially unfeasible projects (Gopinath et al, 2017). Apparently, it is in the financial feasibility of projects that CRAs play an important role. Tied to this is the suggestion that the issuer's repayment ability which in a way translate to the investor's financial recourse, is not only hinged on the performance of the financed green project but on the entire financial strength of the issuer (Maltais and Nykvist, 2020). In effect, green bonds are exposed to potential default risks by issuers (Cheong and Choi, 2020) and green bond markets can bust (Su, Guo and Dai, 2023). Hence, the rapid growth should be viewed suspiciously (Laeven, Martin and Asriyan, 2018). The establishment of the state of the green bond markets in the wake of its phenomenal growth, backed by high quality CRA ratings, is therefore considered invaluable.

On the other hand, one of the factors that indicate the company's credit worthiness is the Interest Coverage Ratio (ICR). The ICR is one of the financial ratios that indicate how many times a company can pay its current interest expenses with its available earnings (McCoy et al, 2020). The higher the ICR, the lower the probability of default; thus, the company's debt securities are less likely to default. A relatively higher interest expense may lead to firm capitulation in debt repayment. (Brauning, Joaquim and Stein, 2023). A more pragmatic way to determine the credit quality is by using the margin of safety measure which is merely the flip side of the ICR. Instead of giving the number of times interest expense is covered, it furnishes the investment public with the degree to which the earnings can fall (in percentage terms) before they equate to the interest expense values. The higher it is the better. This measurement and extent of it is determined by the deployment of the methodology that follows in the next sub-section.

Based on the literature reviewed, it is evident that there has been a timid stance by regulators and an apparent continuity in the pre-crisis systematic approaches by the CRAs (Stellinga, 2019). The reputation of CRAs remains sullied. Despite the continued pre-crisis modus operandi, there is unwavering faith in the utilization of the CRAs by the markets (Mennillo and Sinclair, 2019), more so in the green bond markets. However, the conclusions by Zhao et al (2023) that the green bond market is immersed in inflated credit ratings which are a potential source of default risk and the admonition by Cheong and Choi (2020) that green bonds are exposed to potential default risks by issuers should be taken to heart. Therefore, given the sullied reputation of CRAs in the aftermath of the financial crisis (Piccolo and Shapiro, 2022) and faced with current credit issuance dynamics playing out in the green bond markets, there is a need to independently establish the financial safety of the green bond markets. Instead of taking the CRAs word at face value, investors should ascertain the margin of safety in the green bond markets. Consequently, the purpose of this study is to establish the alignment between credit ratings and the safety of green bonds for the global investors to make prudent investment decisions, particularly in the wake of high credit growth and substantive increases in high grades of credit ratings being availed by the CRAs.

Research and Methodology

Research Approach

In order to answer the research question, this study utilizes a quantitative methodology involving the income statements of profitable organizations that issued green bonds in the first quarter of 2025.

Population and Sampling

The sample frame from which data is collected is the data base from the website <https://www.climatebonds.net> by The Climate Bond Initiative (CBI) which is a registered charity in England and Wales. A simple random sample selection of 30 organisations was done out of a target population of about 500 accessible data to allow for inference. A sample is considered large for inference purposes if $n \geq 30$ (Diamantopoulos and Schlegelmilch, 2000). The elements in target population consisted of profitable organisations that issued green bonds in the first 3 months of 2025 according to the listing. Therefore, the sampling units were the income statements from the sampled company websites for the period ended December 2024. Hence, the population is the totality of profit seeking entities which issued green bonds in the first quarter of 2025 as displayed by the CBI.

Study Variables

The variables of interest are Earnings before interest and tax (EBIT) denoting operational profits together with the interest expense. The values are the computed individual margin of safety derived from EBIT and corresponding interest expenses from each income statement. EBITDA was not considered because the researchers believe that depreciation and amortization expenses cannot be excluded in the profitability measure as these are real expenses with huge impacts on the economic dynamics of the business.

Sovereigns were also not considered since the research aimed at profitable business entities. It is assumed that all investments were made on a pecuniary basis, i.e., on risk and return fundamentals.

Research Methods

The margin of safety attempts to show the percentage decline in EBIT before the balance after interest expense is paid becomes zero. The number of times basically is found by dividing the total fixed charges into the earnings available before deducting income taxes (in this case) or one can consider it after tax deductions.

$$\text{Margin of safety} = \frac{\text{Earnings before taxes}}{\text{Fixed charges}}$$

Hence, the margin of safety is derived as follows, by way of an example:

If earnings are \$500 and fixed charges are \$400, then the margin of safety is deduced from $\frac{500}{400}$. Which means 500 has to be reduced by 20% (that is \$100) in order for earnings to equate fixed charges. Any further reductions (more than 20%) means that earnings are no longer sufficient to cover interest charges.

This narration can be simplified by simply adopting the following approach using the same example:

If interest coverage is $1\frac{1}{4}$, as in this example, then the margin of safety becomes:

$$\frac{1}{4} \div 1\frac{1}{4} = 20\%$$

In order to estimate the population average margin of safety, the researchers initially assumed a normal distribution of the sample margin of safety. A normal distribution was then tested using the sample Kurtosis. After confirming a mesoplatykurtic state of the distribution, estimation of the population parameter became permissible. Firstly, the mean of the sample and its standard deviation were computed. This was followed by the computation of the sample standard error which was then used at 95% confidence level to establish the population margin of safety. The determination of the population mean was followed through the application of the following formula:

$$\bar{x} - k_c s_{\bar{x}} \leq \mu \leq \bar{x} + k_c s_{\bar{x}}$$

With $\bar{x}$ being the sample mean

k_c is the critical value

$s_{\bar{x}}$ is the standard error

μ being the margin of safety of the population mean.

In the following table, credit ratings by the 3 biggest rating agencies (from <https://www.spglobal.com>, <https://www.moody's.com>, and <https://www.fitchratings.com>) are displayed with each row showing equivalent credit ratings. The S & P credit ratings were used to indicate the credit ratings of the researched entities. The investment grade ranges from low risk to moderate risk and is denoted by AAA to BBB-. Speculative grade is commensurate with a high level of risk and is denoted by BB to D. Table 1 displays the credit ratings for each CRA.

Table 1: The Equivalence of Credit Ratings by the Three (3) Biggest Rating Agencies

Moody's	S & P	Fitch
Aaa	AAA	AAA
Aa1	AA+	AA+
Aa2	AA	AA
Aa3	AA-	AA-
A1	A+	A+
A2	A	A
A3	A-	A-
Baa1	BBB	BBB
Baa2	BBB+	BBB+
Baa3	BBB-	BBB-
Ba1	BB+	BB+
Ba2	BB	BB
Ba3	BB-	BB-
B1	B+	B+
B2	B	B

B3	B-	B-
Caa	CCC	CCC
Ca	CC	CC
C	C	C
	D	D

In table 1, it can be see that investment grades range from Aaa to Baa3 for Moody's and AAA to BBB- for both S & P and Fitch.

Findings and Discussion

Distributed Credit Ratings and Relative Frequencies

This section provides the findings around the credit ratings issued to all the studied entities and their relative frequencies. Table 2 is a display of the distribution in terms of the credit ratings allotted to each entity using the S & P standard.

Table 2: A Distribution of Credit Ratings Amongst the Researched Entities

Entity	Credit Rating
Alpha Trans	AAA
Korean Midland Power	AA
Honda Finance	A+
Electricity Supply Board	A
Mitsui Fudosan	A
Central Nippon Express	A
Mitsui Fudosan	A
Agder Energi	A-
Bangkok Mass Transit	BBB
Asahi Holdings	BBB
Energy Dev Corp	BBB
EDF	BBB+
Hera	BBB+
EON	BBB+
ACEA SPS	BBB+
Fabeche	BBB+
Fortume Vamre	BBB+
Latvenergro	BBB+
Kojamo PLC	BBB+
Hanwha	BBB-
Hysan	BBB-
First REIT	BBB-
Mowi ASA	BBB-
Klabin S.A	BB+
Adani Green Energy	BB+
Novelis Inc	BB
Ana holdings	BB-
AEDAS HOMES	B+
Autowallis NYRT	B+
Grupo Pestana	B+

As is reflected in table 2, Investment grades are from 1 to 23 and non-investment grades are from 24 to 30, an indication that the majority of entities received investment grades.

The number of times each rating was issued by the 3 rating agencies in both the absolute terms and relative frequency is manifested in table 3 below.

Table 3: Absolute and Relative Frequencies of Rating Grades

Variable	Values	Absolute Frequency(%)	Relative Frequency (%)
Rating	AAA	1	3.3%
Rating	AA	1	3.3%
Rating	A+	1	3.3%
Rating	A	4	13.3%
Rating	A-	1	3.3%
Rating	BBB	3	10%
Rating	BBB+	8	26.7%
Rating	BBB-	4	13.3 (77%)
Rating	BB+	2	6.7%
Rating	BB	1	3.3%
Rating	BB-	1	3.3%
Rating	B+	3	10% (23.%)
Total	N/A	30	N/A

Table 3 displays an array of Investment grades that reflect a 77% relative frequency, yet only 3.3% is attributed to the highest AAA rating. Most of the investment grade ratings are in the medium range. However, the overall picture paints an approval of the credit risk configurations manifested by the studied entities.

Margin of Safety Statistical Findings

This section centers on the calculated values of margin of safety for different variables of measure. The next table display the statistical components based on the mean of the margin of safety.

Table 4: Statistical Displays of Research Variables

Variable	Value
Sample mean $\bar{x}$	58.60
Sample std deviation	27.41
Coefficient of Kurtosis	-0.05
Standard error ($s_{\bar{x}}$)	5.00
Critical value at 95%	1.96
Estimated Population margin of safety (μ)	$48.79\% \leq \mu \leq 68.41\%$

Table 4 depicts a sample mean of 58.60% and an estimated population safe margin above or equal to 48.79% and below or equal to 68.41%, proving that it can take drastic levels of reductions in margins before the entities can fail to cover obligated interest rates. A corollary to this display is that it is safe to invest in these markets based on the derived results as shown.

Findings and Discussion

Meanings Attached to Key Findings

The sample mean of 58.60% and estimated margin of safety of between 48.79% and 68.41% demonstrate a good buffer that is available in the green bonds markets. This implies that on average the diversified range of profitable organisations can repay their debt obligations (interest expenses) 3.2 times using the available operating profits. It also means that the current credit ratings of high quality grades are commensurate with the financial strengths that are being displayed by the issuers. This is so, because the higher the margin of safety, the lower the probability of default. Using the sample mean and using the properties of a normal distribution (Coefficient of Kurtosis -0.05), at 95% confidence levels, the population mean was between 48.79% and 68.41% meaning it should take an average of 58.60% or a drastic decline of between 48.79% and 68.41% before operating profits could no longer cover interest expenses. It is however important to pinpoint those different jurisdictions, regional or sectoral may be subjected to their own ranges in margin of safety due to heterogeneity factors such as economic well-being of the country and financial and economic prudence of sectoral managers. However, based on the margins of safety and most of the entities which have an investment grade ranging from AAA to BBB-, there is no capital misallocation or a flow of funds towards financially unfeasible projects that are normally synonymous with credit booms. The deterioration to non-investment grades BB+ to B+, by a few entities displays the active monitoring of the financial health by the CRAs and the willingness to degrade where negative deviations have occurred. The highest quality ratings AAA (3.3%), the bottom investment grade of BBB+ (26.7%) and non-investment grades (23%) prove that the CRAs are not issuing mostly high credit ratings (AAA) to the bond issuers. Therefore, the credit ratings are accurate. It would seem also that revised credit ratings are issued timely to align with the current financial results as reflected by the appearance of non-investment

grades. There are no exaggerations or inflations in the current green credit boom as was witnessed in the period leading to the financial crisis of 2007/08.

Conclusion

The purpose of the study was to investigate the general safety of green bond markets, taking into account the present phenomenal credit growth which is supported by an equally substantial increase in high quality credit ratings issuances by the CRAs. A sensible conclusion drawn from the results is that it will take on average, a substantial decline in operating results (58.60%) for companies to fail to cover green bond interest obligations. The study is a reflection on the good work that credit rating agencies are doing despite previous well-documented glitches. Organisations issuing green bonds are not getting any favors from CRAs, and not because of their good intentions but their margins of safety make them good candidates for investments. This is a comforting outcome since the need to halt environmental degradation through green bonds is vital. Caution needs to be taken though with regards the aforementioned conclusion. Credit rating agencies have deviated from ethical standards before and therefore investors need not lose sight of a possible recurrence. This risk is residual. Moreover, markets may go through sudden turmoil that could result in decreased margins of safety. Hence investors should also keep an eye on such a possibility which can really hurt their interests in the medium to long term. However, the study did not investigate the sustainability of the margins of safety in terms of the average periods in which the investigated companies could comfortably cover interest payments using operating profits. Further studies should therefore be carried out to determine if the margins of safety can be sustained or even grow exponentially rather than becoming volatile, a scenario that could be challenging for investors since bonds are generally issued for long terms. However, such determination should be commensurate with inclusions in the methodology of the CRAs of transparently assessing qualitative aspects such as leadership quality and ethical conduct of management of the measured entities. Such a policy would provide further comfort to investors as the quality and ethical conduct of management would serve as a back-up to the sustainability of the quantitatively determined safety of margin figures.

Potential Limitations on Interpretations

Whilst the margins of safety confirm the integrity of the CRAs, they are based on statements of financial analysis which represents a static view of a financial situation. The margins of safety can change on a daily basis. Therefore, for a correct position to be taken by investors, the margin of safety should be tracked on a yearly basis for as long as investments are committed or are to be committed. Hence, the computed margins of safety should not be taken as long-term indications of safety but should be continuously analyzed for sustainability. Resultantly, the challenge of ascertaining the integrity of CRAs in issuing credit ratings should be taken as dynamic, with yearly updates based on renewed derivations of margin of safety figures and the subsequent alignments to up-to-date credit rating issuances. Even though a sample size of 30 or more is deemed appropriate for inference by Diamantopoulos and Schlegelmich (2000), a much larger sample considering the wider generalization of results to a global context, should have been more appropriate. This could be a potential limiting factor. However, the sample is drawn from organisations that issued green bonds but which are scattered across the globe.

Relationship to Prior Research

The results contradict the findings by Lin and Hong (2022) which demonstrated that mostly AAA ratings were in issue. Furthermore, the risk evaluations based on the derived positive margin of safety figures, are not in sync with the results established by Bonsall et al (2023) which highlighted the dominance of inaccurate credit risk evaluations. Whilst the study's results confirm the integrity of the CRAs through the alignment of the margin of safety results and the ratings furnished, they contradict the suspicious shenanigans and imprudence in credit rating issuances, which was established by Livingstone and Zhou (2020) and observed by Camanho, Deb and Liu (2022) for the period leading to the financial crisis.

Furthermore, the study contributes significantly in mitigating the green bond risk, particularly through the trustworthy credit ratings and leaves investors only to be concerned by the actual performances of the green project. This assertion aligns with Maltais and Nykvist (2020) when they positioned the repayment ability or financial recourse of issuers to be dependent upon financial strength as indicated by the credit rating as well as green project performance.

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Conflicts of Interest: The authors declare no conflict of interest.

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