



Article

Green Bond Yield Determinants in Indonesia: The Moderating Role of Bond Ratings

Mutia Wahyuningsih , Wiwik Utami , Augustina Kurniasih and Endri Endri *

Faculty of Economics and Business, Universitas Mercu Buana, Jakarta 11650, Indonesia;
mutiafinance92@gmail.com (M.W.); wiwik.utami@mercubuana.ac.id (W.U.);
augustina.kurniasih@mercubuana.ac.id (A.K.)

* Correspondence: endri@mercubuana.ac.id

Abstract: This study investigates the relationship between bond-specific factors, macroeconomic variables, and green bond (GB) yields issued in the Indonesian bond market. The study sample includes 468 GBs issued by 30 issuers from both corporate and government entities from 2018 to 2023. This research method uses panel regression techniques with the random effects models to test hypotheses on two estimation model specifications. The study results reveal that interest, inflation, and exchange rates are significantly and positively related to GB yields. Bond-specific factors have different impacts, where coupons and maturity have a positive relationship with GB yields, while bond issuers have an adverse effect. Bond rating and issuance size as specific factors are shown to have no impact on GB yields. In the model with the moderating role of rating, the study's results show that coupons still directly impact GB yields positively, while the influence of maturity is negative. The interaction of maturity and rating positively impacts GB yield. Different findings suggest that interactions with coupons weaken the impact of ratings on GB yields. The results of this study contribute to the financial literature on the determinants of the GB market and the role of bond ratings as a moderator. The study also provides new insights into Indonesia's GB market, which includes developing countries. The findings can also help companies, investors, regulators, and researchers better understand the GB market.



Academic Editors: Muhammad Atif and Thanasis Stengos

Received: 24 February 2025

Revised: 9 April 2025

Accepted: 11 April 2025

Published: 13 April 2025

Citation: Wahyuningsih, M., Utami, W., Kurniasih, A., & Endri, E. (2025). Green Bond Yield Determinants in Indonesia: The Moderating Role of Bond Ratings. *Journal of Risk and Financial Management*, 18(4), 210. <https://doi.org/10.3390/jrfm18040210>

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Keywords: green bonds; bond yields; bonds specific factor; macroeconomics variables; Indonesia

1. Introduction

The green bond (GB) market is a new alternative financial resource for sustainable investment. GBs are financial instruments specifically designed to raise money to finance environmentally friendly projects. GB instruments are an alternative to catalyze cash flow towards a low-carbon economy. Barua and Chiesa (2019) revealed that the rapid development of the GB market in recent years has been supported mainly by greater market participation rather than an increase in issuance size. The global GB market is a promising option for financing the transition to a low-carbon economy (Banga, 2019). The government's revenue from issuing GBs is allocated to fund projects with environmental benefits, encouraging the transition to a low-carbon and climate-resilient economy, such as renewable energy infrastructure, sustainable transportation, or conservation initiatives. Corporations also issue GBs, which help finance environmentally and climate-friendly projects, such as renewable energy, green buildings, or resource conservation (Flammer, 2021). For investors, investing in GBs can protect portfolios from business cycle fluctuations and stabilize returns and volatility (Lichtenberger et al., 2022).

The Indonesian government has begun to focus its development goals on environmental sustainability through innovative, environmentally friendly financing. One of the existing financial instruments is the issuing of a framework related to GBs and Green Sukuk supervised by the Center for International Climate Research (CICERO) (Wijaya et al., 2024). According to data from the Asian Development Bank (ADB), green bond issuance in Indonesia has grown rapidly in recent years. In 2017, the value of GBs issued domestically was only US \$49 million, all of which came from corporations. Then, in 2018, the value jumped to US \$1.8 billion, originating from the issuance of GBs from the government of US \$1.25 billion and corporations of US \$653 million. In 2018, the Indonesian government issued a Sharia-based GB for the first time by issuing a Global Green Sukuk of US \$3 billion. Then, in the following years, the issuance of similar debt securities continued to increase until March 2022, when the total value reached US \$7 billion, with details from the government of US \$4.05 billion and corporations of US \$3 billion (ADB, 2022). Guild (2020) said that Indonesia has excellent green financing potential to ensure the development of renewable energy. The demand for GBs in the Indonesian capital market is high for financing clean energy projects. The GB yield in Indonesia is more profitable than that of conventional bonds. Haddad and Rokhim (2022) stated that the yield of GBs is slightly higher than conventional bonds. Bachelet et al. (2019) found that GBs provide higher yields, lower variance, and is more liquid. Kanamura (2020) also supports positive yields for green bonds. In contrast, Gianfrate and Peri (2019), Febi et al. (2018), and Zerbib (2019) reveal a negative GB premium, indicating that GB investors are willing to compensate for the environmental benefits of GBs by accepting lower yields. Tomczak (2024) examined the yield of GBs issued by 13 governments from Egypt, Nigeria, Chile, the UK, Belgium, Spain, France, Poland, Germany, Italy, Lithuania, the Netherlands, and Serbia. GB issuance by governments is intended to finance environmental and social projects and represents a relatively new and developing asset class. The study's results found a relationship between the yield of sovereign GBs and conventional bonds.

The research on GB yield's determinants can be grouped into three main focuses: GB issuance, greenium or yield premium, or GB Premium, and GB yield. GB issuance measurements were found to be different, including the amount of funds raised (Mertzanis, 2023; Dan & Tiron-Tudor, 2021; Tolliver et al., 2020; Lebellet et al., 2020), labeling (García et al., 2023; Hyun et al., 2020), effectiveness and efficiency (Czech et al., 2023; Flammer, 2020) and green technology innovation (Ren et al., 2024; Zhang et al., 2024). Greenium or yield premium or GB Premium refers to the difference between GB yield and conventional bonds, usually using basis point (bps) measurements (Grishunin et al., 2024; Fandella & Cociancich, 2024; Arat et al., 2023; Agliardi & Agliardi, 2021). Darmia and Kim (2024) examined the determinants of sustainable corporate bond premiums in Indonesia. The study results show that ratings, Environmental, Social, and Governance (ESG), Gross Domestic Product (GDP), inflation, and bond types affect GB premiums. At the same time, modifications do not affect the duration and term of issuance. Several studies have also found a relationship between the COVID-19 pandemic and GB issuance. Taghizadeh-Hesary et al. (2021b) analyzed the characteristics of the GB market in Asia and the Pacific in the post-COVID-19 pandemic period. Oktavio and Riyanti (2021) linked the COVID-19 pandemic to GB premiums issued in Southeast Asia. The study results revealed that GB premiums were favorable before the COVID-19 pandemic and negative during the pandemic. Ratings, currency, number of issuances, and maturity significantly influenced the determining factors for GB premiums.

This study investigates the main factors determining the yield of GB issuance in Indonesia. The determinants of GB yield can be divided into two groups, namely micro factors, which consist of bond and company specifics, and macroeconomic factors. Specific research on GB yield determinants has not been widely found (Q. Wang et al., 2019;

Abhilash et al., 2023; Abhilash et al., 2024; Baldi & Pandimiglio, 2022), especially in the context of the Indonesian bond market (Andi & Nainggolan, 2024). Q. Wang et al. (2019) examined the determinants of GB issuance risk premium in China. They found that credit rating, issuance period, and issuance size, as micro factors, tend to reduce GB yields. Interest rates are also macro factors that determine GB risk premiums. Abhilash et al. (2023) examined the effect of bond attributes on GB yields in India. The study found that bond ratings positively affected yields, while bond labels and maturity had an adverse effect. Abhilash et al. (2024) investigated the effect of bond-specific and macroeconomic factors on GB yields in Asia and Latin America. The research findings showed that coupons were the only factor determining GB yields in Asia. For GBs in Latin America, they found that coupon, maturity, ESG disclosure, and interest rate positively affect GB yields. In contrast, issuance size and GDP have an adverse effect. Baldi and Pandimiglio (2022) examined the main factors of GB yields of public and corporate GBs at the global level, and their main findings revealed that a higher ESG score lowers GB yields, indicating investor confidence in the credibility of GBs. However, the risk of greenwashing weakens this relationship. Grishunin et al. (2023) found that the determinants of GB yields are rating, coupon, maturity, market liquidity, and macroeconomic variables. Li et al. (2020) proved that rating, CSR, and green certification significantly impact GB yield spreads in China. Andi and Nainggolan (2024) examined the determinants of sustainable bond yields in Indonesia using bond and issuing company characteristic variables. The study found that companies supporting Sustainable Development Goals (SDG) and ESG risk ratings affect GB returns. In contrast, Corporate Social Responsibility (CSR) funds and Greenhouse Gas (GHG) emissions have the opposite effect. Empirical evidence shows that various factors and findings are still different. Frecautan and Ivashkovskaya (2024) examine the relationship between corporate governance mechanisms and corporate GB yield spreads in emerging capital markets. The study found that corporate governance significantly affects GB yield spreads. In addition, other findings prove that issuers with higher CEO power will enjoy higher GB yields and the size of the board of directors has a negative impact on yield spreads.

This study also aims to examine the role of bond ratings that moderate the driving factors of GB yield, which may be the first study to do so. Previous studies are also still limited regarding the role of moderator variables in GB issuance, including determinants of GB yield. Biju et al. (2024) used board characteristics and ESG performance as moderating variables for determining GB issuance. Cheng et al. (2022) proved a positive relationship between ESG disclosure scores and GB issuance moderated by brand reputation. F. Wang and Liu (2024) revealed that environmental concerns moderate the relationship between GB and corporate environmental investment. J. Lu and Easton (2022) tested the relationship between GB issuance and corporate performance by developing a mediation model moderated by financial constraints. Shah et al. (2025) investigated the relationship between green growth, clean energy capacity, and GBs with the moderating role of political stability of the GB-issuing country. Giri et al. (2024) examined the relationship between blockchain-backed GB issuance and investment intention through perceived behavioral control and the moderating role of financial literacy.

This study bridges the research gap by investigating the impact of bond-specific factors and macroeconomic indicators on GB yields using bond ratings as a moderator variable. The study sample includes 30 GBs and 468 series issued by the government and corporations from 2018 to 2023. This is the first study on the key factors determining government and corporate GB yields by including bond ratings as a moderator variable. This study contributes to the development of academic literature in several ways. First, studies conducted so far have been more in developed markets, while emerging markets

are limited. Indonesia, a developing country, has recently experienced rapid growth in GB issuance, and it is undoubtedly interesting to reveal the yield given by GB issuers and its potential determinants. Second, this study is the first to examine the role of ratings as a moderator variable of bond-specific factors, namely coupons and maturity, in determining GB yields. In previous studies, bond ratings were found to be a factor that directly determines bond yields (Q. Wang et al., 2019; Chiesa & Barua, 2019; Bastida et al., 2017; Sheng et al., 2021; Li et al., 2020; Darmia & Kim, 2024). In addition, bond ratings are also used as dependent variables to investigate their determinants (Soudis, 2017; Santoso et al., 2022; Sehgal et al., 2023). A comprehensive approach that considers the moderating role of bond ratings in the Indonesian green bond market context can provide important contributions to understanding the determinants of green bond yields and supporting the development of sustainable finance markets. Third, this study offers actionable insights in the form of practical implications for policymakers, companies, and investors interested in improving sustainable finance by providing evidence on the impact of bond-specific factors and macroeconomic variables on GB yields. In addition, the expected contributions can update the understanding of the dynamics of sustainable finance, inform investment decisions, and support the development of policies that promote green investment.

The remainder of this paper is presented as follows: Section 2 reviews the theoretical and empirical literature for hypothesis development. Section 3 discusses the data and methodology used in this study. Section 4 analyzes the research findings and discusses them in depth. Conclusions are presented in Section 5.

2. Literature Review

2.1. Theoretical Underpinning

Green bonds (GBs), also called “climate bonds” or “sustainable bonds”, are one of the most appropriate sustainable investment instruments to combat climate change while supporting the stability of the financial system because the funds are directed to environmentally friendly projects (Wu, 2022). Governments and corporations are increasingly interested in issuing GBs as a source of long-term financing because they want to show their commitment to sustainability (Gabr & Elbannan, 2024). In addition, GB issuance can provide benefits to the issuer in the form of lower capital costs in the primary market due to the positive impact of green projects on sustainability, low-carbon development, and environmental risk management. Besides GB issuers, institutional and retail investors are intensely interested in green bonds (Dorfleitner et al., 2022).

Signaling theory explains how companies use information to signal investors about their financial condition and prospects, especially in the context of bonds. Investors often do not have sufficient information to evaluate a company’s commitment to the environment (Endri et al., 2022). Signaling theory can be applied to explain that GBs generate market appreciation for their issuers (Biju et al., 2024). Flammer (2021) revealed that by issuing GBs, issuers credibly signal their commitment to the environment. When this commitment is realized, GB issuers will achieve better environmental performance and be attractive to environmentally sensitive investor clients. Bachelet et al. (2019) found that GBs provide higher returns, lower variance, and are more liquid.

Another reason for issuing GBs can be explained through the cost of capital. GB investors are willing to accept lower returns for the greater good of combating climate change. For issuers, GBs are a cheaper source of financing. Tang and Zhang (2020) stated that issuing GBs can lower the cost of capital and improve the company’s reputation. Teti et al. (2022) stated that GBs are an effective instrument for issuers to reduce the cost of debt in financing green projects and for investors to have the opportunity to support the transition to a greener and more sustainable economy. Agliardi and Agliardi (2019)

stated that issuing GBs can lower the cost of capital by improving credit quality, tax-based incentives, and green awareness.

Agency theory is the following theoretical basis for explaining the issuance of GBs. [Glavas \(2022\)](#) revealed that agency motives are the main factor in the decision to issue GBs. Managers can overcome agency problems by issuing GBs, which shows their commitment to combat global warming and strengthens the company's image of caring about environmental issues. The issuance of GBs by the company shows that management wants to convince investors about the allocation of funds and its desire to align itself with their interests, despite the additional costs involved in issuing GBs. In this case, the issuance of GBs partially solves the agency's problem.

Stakeholder theory plays an important role in understanding how the expectations and interests of various parties can influence investment decisions and a company's financial results, including in the context of bond yields. From this perspective, companies are not only oriented toward the interests of shareholders. However, they must also consider their impact on other stakeholders, such as bond investors, regulators, local communities, and the environment. GB issuance is a manager's choice to prove their intention to contribute to combating climate change and increasing shareholder value to stakeholders. In addition, GB issuance can signal good CSR practices for investors and stakeholders. The results are shown by the company's ability to integrate into social investment policies and respond to its central concerns for its stakeholders. Socially responsible companies are expected to record above-average profits ([Khiari et al., 2024](#)). [Abdullah and Keshminder \(2022\)](#) found that legitimacy and ecological responsibility affect the issuance of Green Sukuk. [Dbouk et al. \(2018\)](#) found that CSR practices determine the yield spread of bonds issued. Companies with a high commitment to sustainability tend to offer lower yields because investors believe they can control their investment risks.

2.2. Empirical Literature and Hypothesis Development

Based on the perspectives of several theories above, this study investigates the potential determinants of GB yield, which consist of two groups of factors: bond-specific and macroeconomic variables. [Grishunin et al. \(2023\)](#) revealed three GB yield determinants: individual bond characteristics, issuer financial characteristics, and macroeconomic variables. [Broadstock and Cheng \(2019\)](#) found that macroeconomic conditions impact the development and stabilization of the GB market. [Tolliver et al. \(2020\)](#) also support that macroeconomic and institutional variables drive the GB market. [Barua and Chiesa \(2019\)](#) identified the impact of three-dimensional factors: bond characteristics, issuer characteristics, and market characteristics on the size of GB issuance.

2.2.1. Coupons and GB Yields

Bond coupons are fixed income received by bondholders and can determine bond yields. Higher coupon rates impact bond prices by increasing investors' profits. [W. C. Lu et al. \(2010\)](#) revealed that bondholders with large coupon payments get high returns. [Birzhanova et al. \(2024\)](#) revealed that the coupon rate is the most important thing for GB investors. High coupon rates are attractive to investors because they provide high yields. [Abhilash et al. \(2024\)](#) found that coupons positively affect GB yields. [Grishunin et al. \(2023\)](#) revealed that only coupon size drives yields in the German GB market. Bonds with high coupon rates are likely to provide better yields for bondholders. Therefore, the first hypothesis is formulated as follows:

H1. *Coupons have a positive impact on GB yields.*

2.2.2. Issue Size and GB Yield

The size of the GB issuance determines the yield received by investors. The larger size of bond issuance causes bond trading to become more active and liquid so that the level of investor recognition of bonds increases (Campello et al., 2008; Tang & Yan, 2010). Calomiris et al. (2022) found that more significant bond issuances tend to be more liquid and have lower risks, which implies lower yields. Chiesa and Barua (2019) proved that the issuance size positively relates to bond yields as compensation for investors for potential liquidity losses. Crabbe and Turner (1995) revealed that larger bond issuance sizes result in investors having more bonds and collecting information about the underlying company, resulting in higher bond liquidity. Kapraun et al. (2021) revealed that the yield premium of GBs issued by governments or supranationals is much larger than that of companies. Löffler et al. (2021) proved that green bonds have larger issuance sizes than conventional ones. Next, the second hypothesis is formulated as follows:

H2. *Issue size has a positive effect on GB yields.*

2.2.3. Maturity and GB Yield

The maturity of the GBs determines the bond yield received by investors. Investors take more risk on green bonds with longer maturities because they provide a wider yield spread. Investors in portfolio management should select green bonds with specific maturities, considering their risk profiles and investment objectives (Bachelet et al., 2019). The structure of interest rate theory explains that the maturity of a bond determines the interest rate and liquidity risks faced by the bond (Q. Wang et al., 2019). Furthermore, traditional theories of term structure propose a different path for long-term returns. Keynesian liquidity preference theory states that short-term returns are lower than long-term returns because compensation for the risk taken is higher with longer time horizons (Zhou, 2021). Amihud and Mendelson (1991) proved that short-term bond yields are lower than long-term bonds, and the difference between the two maturity yields is a decreasing function of the maturity period. Dick-Nielsen et al. (2012) revealed a typical pattern across corporate bond regimes: the liquidity component in the yield spread increases with increasing maturity. Bruche and Segura (2017) confirmed the definite role of maturity in the liquidity of secondary market bonds. Abhilash et al. (2024) and Taghizadeh-Hesary et al. (2021a) revealed that maturity is positively and significantly related to GB yields. Based on the literature, the third hypothesis is formulated as follows:

H3. *Maturity has a positive impact on GB yields.*

2.2.4. Issuers and GB Yields

A bond issuer is an entity that issues bonds as a form of debt to obtain funds from investors. The bond issuer can be a government or a corporation. The issuer must pay interest periodically and repay the principal by the agreed provisions within a specific period. The government's issuance of GBs shows a high dedication to green initiatives and encourages private investment in environmentally friendly sectors. Government GBs are also a state financial instrument that advances the public green agenda (Bhutta et al., 2022). In addition to the government, corporations also issue GBs, which serve as a credible signal of the company's commitment to the environment. Companies can issue GBs to obtain cheaper financing if GB investors sacrifice financial benefits for social benefits (Flammer, 2021). Bachelet et al. (2019) revealed that institutional issuers' GBs have higher liquidity, while private issuers have less favorable characteristics. Löffler et al. (2021) highlight that when the same issuer issues bonds, there is a yield difference, called greenium, between

GBs and conventional bonds. [Zerbib \(2019\)](#) finds that the yield on conventional bonds is higher than GBs. This is the basis for the fourth hypothesis:

H4. *The issuer has a positive impact on GB yields.*

2.2.5. Ratings and GB Yields

Bond ratings play an important role in bond yields because they provide helpful information about the quality of the bond and its issuer. GB ratings also provide additional information about the “greenness” of the funded projects, as well as the environmental costs of the issuer. Bond ratings issued by independent third parties reflect the company’s financial credibility, which can overcome asymmetric information for investors ([Sabrina & Lawita, 2019](#)). Bond ratings are a consideration in investment decisions in GB, and issuers can attract more investors with high ratings ([Prajapati et al., 2021](#)). Investors rely on ratings to evaluate the default risk of an issuer. Better creditworthiness of an issuer, as indicated by a higher rating, can attract more financing. [Q. Wang et al. \(2019\)](#) revealed that high bond ratings can reduce GB risk premiums. [Sorensen \(1979\)](#) and [Ziebart and Reiter \(1992\)](#) found that bonds with higher yields are rated lower. [Chiesa and Barua \(2019\)](#) and [Bastida et al. \(2017\)](#) evidenced the positive impact of ratings on GB issuance. [Sheng et al. \(2021\)](#) and [Li et al. \(2020\)](#) revealed that ratings affect GB spreads and yields. [Darmia and Kim \(2024\)](#) found that bond ratings positively relate to bond yields because they can increase investor confidence. Higher funding costs with lower bond ratings mean a lower ability of the issuer to service debt and access capital markets ([Endri et al., 2019](#); [Benito et al., 2016](#)). Therefore, the fifth hypothesis tested is:

H5. *The bond rating has a positive impact on GB yields.*

2.2.6. Interest Rate and GB Yield

Interest rates are linked to the risk of default on bonds issued and the returns received by bondholders. If interest rates increase, the bond issuer has a high burden for payment of obligations, which increases the probability of high default. As a result, bondholders demand higher bond yields ([Abhilash et al., 2024](#)). [Fatmawatie et al. \(2024\)](#), [Zhou \(2021\)](#), and [Akram and Das \(2019\)](#) proved that short-term interest rates are a significant factor in long-term government bond yields. [Koroleva and Kopeykin \(2022\)](#), [Trinh et al. \(2020\)](#), and [Santosa \(2021\)](#) found that an increase in the benchmark interest rate resulted in higher government bond yields. [Kovačević \(2023\)](#) and [Tu et al. \(2020\)](#) revealed that interest rates positively and significantly impact government bond yields. Therefore, the sixth hypothesis is formulated as follows:

H6. *Interest rate has a positive impact on GB yields.*

2.2.7. Inflation and GB Yields

The inflation rate is a macroeconomic indicator that shows the quality of economic management that directly affects the risk of default. [Presbitero et al. \(2016\)](#) proved that higher inflation leads to lower bond issuance and borrowing costs. [Nickel et al. \(2011\)](#) revealed that an increase in the inflation rate causes macroeconomic instability, which reduces creditworthiness. Higher inflation rates negatively impact investor decisions ([Tu et al., 2020](#)). GB yields increase if inflation increases because investors demand higher returns to offset declining purchasing power ([Chen, 2023](#); [Tarigan, 2024](#)). [Dan and Tiron-Tudor \(2021\)](#) proved that the inflation rate positively relates to GB issuance. [Afonso and Rault \(2015\)](#) showed that high inflation lowers long-term bond yields. [Darmia and Kim](#)

(2024) found that inflation significantly affects bond yields. Therefore, the formulation of the seventh hypothesis tested is:

H7. *Inflation has a positive impact on GB yields.*

2.2.8. Exchange Rate and GB Yield

Interest Rate Parity is a theory that explains the relationship between bond yields and exchange rates. Domestic interest rates are the sum of international and exchange rate expectations and impact increasing bond yields. [Gadanecz et al. \(2014\)](#) revealed that investors require more excellent yield compensation from bonds when exchange rate volatility increases. [Pramana and Nachrowi \(2016\)](#), [Fatmawatie et al. \(2024\)](#), and [Megananda et al. \(2021\)](#) proved that exchange rates have a positive impact on government bond yields. [Arshad et al. \(2018\)](#) and [Santosa \(2021\)](#) found that strengthening foreign exchange rates increases bond yields in the long run. [Reboredo and Ugolini \(2020\)](#) revealed that the GB market is closely related to currencies. [Kocaarslan \(2021\)](#) documented that US dollar appreciation increases the diversification capacity of GB investments. Based on the literature, the eighth hypothesis is:

H8. *The exchange rate has a positive impact on GB yields.*

2.2.9. The Moderating Role of Ratings and GB Yields

Companies that issue green bonds with longer maturities tend to have higher yields. However, bonds with higher ratings may show a more minor increase in yield as the bond ages. Higher ratings can increase investor confidence, so longer maturities can lower bond yields. [Li et al. \(2020\)](#) revealed that bonds with longer maturities and rated AAA provide high yields. [Chang et al. \(2021\)](#) proved that ratings have a more significant difference in determining the yields of green corporate bonds with different issuance maturities. The rating reflects the probability of investors receiving coupons at the specified time and the probability of default. The better the bond rating, the safer the bond. Bonds with higher coupons usually have lower yields because they offer large payments periodically. However, bonds with higher ratings generally have lower yields, regardless of the coupon size, because they are low risk. [Li et al. \(2020\)](#) proved that higher credit ratings can reduce borrowing costs for borrowers and lower yields for investors. [Zenno and Aruga \(2023\)](#) revealed that higher bond ratings tend to increase investors' willingness to pay for GB, and increased demand usually leads to decreased coupon rates. Therefore, hypotheses 9 and 10 have been formulated.

H9. *Bond rating moderates the effect of coupons on GB yields.*

H10. *Bond rating moderates the effect of maturity on GB yields.*

3. Methodology

Green bonds in Indonesia are also known as sustainable environmental bonds. The primary purpose of issuing GBs is to mobilize funds from environmentally conscious investors to support the financing of sustainable projects, including developing renewable energy, such as solar or wind power plants, energy efficiency projects, waste and clean water management, sustainable transportation, and green infrastructure development. The issuance of GBs in Indonesia also refers to the Green Bond Principles (GBPs) guidelines set by the International Capital Market Association (ICMA), which is recognized as the first international standard in GB labeling. In addition, the issuance of GBs is also supervised by the Center for International Climate Research (CICERO). The research sample includes

468 GBs issued by 30 corporate and Indonesian government issuers listed on the Indonesia Stock Exchange (IDX) from 2018 to 2023. The selection of the research period is because the issuance of GBs in Indonesia only started in 2018 after the Financial Services Authority (OJK) issued regulations on the Issuance and Requirements of Environmentally Friendly Debt Securities in 2017. So, the issuance of Indonesian GBs follows a unique process that meets GBPs. The research data, including GB yield as the dependent variable and its determinants, are sourced from the Indonesian Bond Market Directory published by the IDX, Bank Indonesia, and the Indonesian Central Statistics Agency. With 468 confirmed observations from GB issuance and a time period of six years, the research dataset contains unbalanced panel data for analysis.

The determinants of GB yield are specified in the estimation equation of the panel data regression model. The research model specifications have been designed based on the characteristics of GB issuance, the regulations in force in Indonesia, and the availability of supporting data. GB issuance in Indonesia refers to the OJK regulation, which states that at least 70 percent of GB funds from public offerings are allocated to finance environmentally friendly business activities (Haddad & Rokhim, 2022). Environmental experts verify the mechanism for selecting environmentally friendly business activities. Thus, the calculation of yield and specific bond factors is based on the characteristics of GB issuance in Indonesia. The factors determining GB yield are coupon, maturity, issue size, rating, and issuer. External factors refer to macroeconomic indicators published by Bank Indonesia and the Central Bureau of Statistics of Indonesia: interest rate, exchange rate, and inflation. Macroeconomic variables generally apply to all financial instruments, including GB instruments. Each country's specific bond factors and macroeconomic variables determine GB yield differences. Therefore, this study considers the specifications of the two estimation models: model 1 without moderator variables and model 2 with the role of bond ratings as a moderator.

Model 1

$$Yield_{it} = \alpha + \beta_1 Coupon_{it} + \beta_2 Issue\ Size_{it} + \beta_3 Maturity_{it} + \beta_4 Rating_{it} + \beta_5 Issuer_{it} + \beta_6 Interest\ Rate_{it} + \beta_7 Inflation_{it} + \beta_8 Exchange\ Rate_{it} + \varepsilon_{it} \quad (1)$$

Model 2

$$Yield_{it} = \alpha + \beta_1 Coupon_{it} + \beta_2 Issue\ Size_{it} + \beta_3 Maturity_{it} + \beta_4 Issuer_{it} + \beta_5 Interest\ Rate_{it} + \beta_6 Inflation_{it} + \beta_7 Exchange\ Rate_{it} + \beta_8 Coupon_{it} \times Rating_{it} + \beta_9 Maturity_{it} \times Rating_{it} + \varepsilon_{it} \quad (2)$$

where α is a constant, β_i are the regression coefficients for all explanatory variables, and μ is the error term. Yield is the dependent variable, where i represents the GB-issued series and t indicates the issuance period. The explanatory variables are the coupon, issuance size, maturity, bond rating, issuer, interest rate, inflation, and exchange rate (Table 1).

In the research model specification, bond rating is a moderator variable for coupon and maturity. The interaction of coupon and bond rating can strengthen its influence on GB yield and the interaction of maturity and bond rating. The issuers who issued GBs in this study include the government and corporations. Government GBs (1) are considered safer and have lower risk, providing a higher yield than corporations (0).

Table 1. Variable description.

Variable	Description
<i>Yield</i>	Long-term yield to maturity of GBs from the date of issuance to maturity.
<i>Coupon</i>	Fixed rate of return for every GB issued by the government or corporations.
<i>Issue Size</i>	Natural logarithm of the number of GB issuances on the issuance date.
<i>Maturity</i>	The bond issuer must repay the principal amount borrowed and the interest owed to the bondholder.
<i>Rating</i>	This is a dummy variable, where GBs with AAA ratings are given a value of 1, and others are given a value of 0.
<i>Issuer</i>	Entity or institution that issues GBs, if government the number 1, and 0 for corporations.
<i>Interest Rate</i>	The official reference interest rate set by Bank Indonesia.
<i>Inflation</i>	The inflation rate is calculated from changes in the Consumer Price Index.
<i>Exchange Rate</i>	Bank Indonesia determines the rupiah exchange rate against the US dollar.

The estimation method for hypothesis testing uses unbalanced panel data regression models, including Pooled Ordinary Least Squares (Pooled OLS) and the Random Effect Model (REM). Panel data analysis is a popular form of longitudinal data in finance that investigates the determinants of GB yields. This model has also been applied in the literature to investigate the determinants of bond yields. Panel data regression models offer a comprehensive framework for analyzing data with cross-sectional and time-series dimensions, providing insights into individual-specific effects, trends, and dynamic relationships between variables. In this model, the dependent variable is the yield to maturity of green bonds issued by the Government and Corporations. The Breusch–Pagan LM test is used to select the pooled OLS and REM models that are more effective in testing the research hypothesis. The REM can help estimate the impact of each specific interest that cannot be measured. In addition, the REM can control the unobserved heterogeneity of the data that occurs over time, which overcomes the problem of no correlation with the independent variable (Alam et al., 2022).

4. Results

4.1. Statistical Data Description

Table 2 presents a summary of statistics based on the indicators of mean, maximum, minimum, standard deviation, skewness, and kurtosis values for the variables analyzed to test the impact of coupon, issue size, maturity, issuer, interest rate, inflation, and exchange rate on GB yield moderated by the bond rating variable. The average yield of green bonds is 5.23%, with a range of values from 5.49% to 11.39%, which is relatively large. The average coupon of GB is 5.50%, with a range of values from 5.75% to 11.00%, which is also relatively large. Issue size shows an average value of 7.55×10^{11} , with a range of values from 7.50×10^8 to 4.40×10^{12} , which has the most significant difference in value. Maturity shows an average value of 6.485 times, with a minimum value of 1 and a maximum of 30. The issuer has an average value of 0.515, with a minimum value of 0 and a maximum of 1. Bond rating averages 0.6453, with a minimum value of 0 and a maximum of 1. Interest rates have an average value of 4.95%, with a range of values from 3.5% to 6%. Inflation has an average value of 3.28%, with a range of values from 1.32% to 5.95%. The Rupiah exchange rate against the United States Dollar (USD) shows an average value of Rp. 14.896/USD, with a range of values from Rp. 13.662/USD to Rp. 16.367/USD.

Table 2. Description Statistics.

Variables	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis
YIELD	0.0523	0.0549	0.1139	0.0051	0.0232	−0.2051	2.5907
COUPON	0.0550	0.0575	0.1100	0.0230	0.0205	0.2374	2.2162
ISSUE SIZE	7.55×10^{11}	2.49×10^{11}	4.40×10^{12}	7.50×10^8	1.26×10^{12}	1.7886	4.9602
MATURITY	6.4850	5.0000	30,000	1.0000	6.5092	3.0775	11,374
ISSUER	0.5150	1.0000	1.0000	0.0000	0.5003	−0.0599	1.0035
RATING	0.6453	1.0000	1.0000	0.0000	0.4789	−0.6074	1.3689
INTEREST RATE	0.0495	0.0550	0.0600	0.0350	1.0046	−0.4185	1.4508
INFLATION	0.0328	0.0300	0.0595	0.0132	0.0137	0.4341	2.0434
EXCHANGE RATE	14,896	14,924	16,367	13,662	565.8507	0.1110	2.1220

Issue size has the highest standard deviation value, which implies that the value of GBs from each series issued in the research sample has a different size. Inflation has the most minor standard deviation, which means its volatility is relatively low. The slope results show a positive slope for coupon, issue size, maturity, inflation, and exchange rate, indicating that upward movements occur more often than downward ones. Conversely, yield, issuer, rating, and interest rate show negative slope coefficients, which imply that downward movements occur more often than upward movements. Kurtosis statistics show that issue size and maturity display a leptokurtic distribution with a value greater than 3, which means a normal data distribution. At the same time, yield, coupon, issuer, rating, interest rate, inflation, and exchange rate have flat data distributions (platykurtic) with values less than 3.

4.2. Correlation Matrix Analysis

Table 3 presents the correlation matrix between variables in pairs for both dependent and independent variables. The strongest correlation between coupon and yield variables is 77.95% with a positive direction, while issuer and coupon also have a strong relationship of 74.86% with a negative direction. The weakest correlation between inflation and coupon variables is 0.04%, with a negative sign, and between interest rate and bond rating it is 0.78%, also with a negative direction.

Table 3. Correlation Matrix.

	Yield	Coupon	Issue Size	Maturity	Issuer	Rating	Interest Rate	Inflation	Exchange Rate
Yield	1.0000								
Coupon	0.7795	1.0000							
Issue Size	0.3386	0.2551	1.0000						
Maturity	−0.1026	−0.2720	−0.1921	1.0000					
Issuer	−0.6845	−0.7486	−0.2633	0.3972	1.0000				
Rating	0.2998	0.1174	0.0521	0.1398	−0.5229	1.0000			
Interest Rate	0.6214	0.2846	0.2942	−0.0960	−0.2179	−0.0078	1.0000		
Inflation	0.2928	−0.0004	0.2883	0.0496	−0.0474	0.1047	0.2835	1.0000	
Exchange Rate	0.4568	0.1668	0.3617	0.0099	−0.1477	0.0498	0.4683	0.4118	1.0000

4.3. Panel Regression Model Analysis

Panel data regression model is applied to estimate and analyze the determinants of GB yield. The panel data regression model offers a comprehensive framework for analyzing data with cross-sectional and time-series dimensions, providing insights into individual-specific effects, trends over time, and dynamic relationships between variables. In this model, the dependent variable is the yield to maturity of GBs issued by the government and

corporations. The panel data regression method tests the factors influencing GB yields into two models: without a moderator and with the role of moderating variables, bond ratings.

4.3.1. Model Without the Role of Moderator Variables

Table 4 presents the results of the Breusch test and Pagan (BP) Lagrange multiplier to determine the Pooled OLS or Random Effects (RE) model selection. The test results show a chi-square value of 93.6536 with a probability value of less than 5%, so the selected model is RE.

Table 4. Test for panel effect without moderation.

Breusch and Pagan Lagrange multiplier test for random effects	
Chi-square value	93.6536
<i>p</i> -Value and Prob > chi ²	0.0000

Source: Author's computation.

Table 5 presents the estimation results of the model without moderator variables from Pooled OLS and RE. The RE model was selected to analyze the factors determining GB yield. The results of statistical tests for each coefficient prove that six out of eight variables affect GB yield. Bond coupon, maturity, interest rate, inflation, and exchange rate positively affect GB yield, with significance at the 1% level. GB issuers show inverse results for yields, with significance at the 5% level. Issue size and bond rating do not affect the yield of GB. The coupon is the variable that has the most potent effect on the yield of GBs, with a coefficient of 0.662, indicating that a 1% increase in coupon causes a 0.66% increase in the yield of GBs. Overall, the adjusted R² value is 0.72, meaning that 72% of the variation in the yield of Indonesian GBs can be explained by the variables considered in the study, namely bond-specific factors and macroeconomic variables.

Table 5. Regression analysis without moderator variables.

Variable	Pooled OLS Model				Random Effects Model			
	Coefficients	Std. Error	<i>t</i> -Statistic	Prob	Coefficients	Std. Error	<i>t</i> -Statistic	Prob
(Constant)	−0.754 ***	0.117	−3.978	0.000	−0.612 ***	0.122	−5.004	0.000
Coupon	0.670 ***	0.037	18.118	0.000	0.662 ***	0.069	9.643	0.000
Issue Size	−0.000	0.000	−0.598	0.550	−0.000	0.000	−0.670	0.503
Maturity	0.004 ***	0.000	4.994	0.000	0.001 ***	0.000	2.816	0.005
Issuer	−0.001 ***	0.002	−3.001	0.003	−0.011 **	0.004	−3.099	0.002
Rating	0.007 ***	0.001	5.261	0.000	0.001	0.003	0.233	0.816
Interest Rate	0.008 ***	0.000	18.015	0.000	0.008 ***	0.000	18.873	0.000
Inflation	0.203 ***	0.032	6.343	0.000	0.240 ***	0.031	7.645	0.000
Exchange Rate	0.075 ***	0.012	6.085	0.000	0.061 ***	0.013	4.782	0.000
R-squared	0.875				0.724			
Adjusted R-squared	0.873				0.719			
<i>F</i> -Statistic	401.245				150.688			
Prob (<i>F</i> -statistic)	0.000 ***				0.000 ***			

*** and **, indicate significance at the 1%, and 5%, levels, respectively.

4.3.2. Model with the Role of Moderator Variables

Table 6 presents the results of the Breusch test and Pagan (BP) Lagrange multiplier to determine the Pooled OLS or Random Effects (RE) model selection. The test results show a chi-square value of 44.3197 with a probability value of less than 5 percent, so the selected model is RE.

Table 6. Test for panel effect with moderator variables.

Breusch and Pagan Lagrange multiplier test for random effects	
Chi-square value	44.3197
<i>p</i> -Value and Prob > chi ²	0.0000

Source: Author's computation.

Table 7 presents the estimation results of the model with moderator variables from Pooled OLS and RE. The RE model was selected to analyze the factors that determine the yield of GBs. The results of statistical tests for each coefficient prove that eight of the nine variables affect the yield of GBs. Bond coupons, interest rates, inflation, exchange rates, and the interaction of bond ratings and maturity positively affect the yield of GBs with significance at the 1% level. Maturity and the interaction between rating and bond coupon decrease GB yields, with significance at the 1% level.

Table 7. Regression analysis with moderation.

Variable	Pooled OLS Model				Random Effects Model			
	Coefficients	Std. Error	<i>t</i> -Statistic	Prob	Coefficients	Std. Error	<i>t</i> -Statistic	Prob
(Constant)	−0.478 ***	0.120	−3.978	0.000	−0.557 ***	0.166	−3.349	0.001
Coupon	0.792 ***	0.041	19.081	0.000	0.731 ***	0.054	13.483	0.000
Issue Size	0.001 ***	0.000	3.200	0.002	0.000	0.000	1.541	0.128
Maturity	−0.003 ***	0.000	−6.573	0.000	−0.002 ***	0.001	−3.134	0.003
Issuer	−0.001	0.002	−0.337	0.737	−0.006 **	0.002	−2.431	0.018
Rating Coupon	−0.195 ***	0.035	−5.647	0.000	−0.154 ***	0.051	−3.049	0.000
Rating Maturity	0.003 ***	0.000	7.942	0.000	0.002 ***	0.001	3.955	0.000
Interest Rate	0.008 ***	0.000	18.069	0.000	0.008 ***	0.001	12.592	0.000
Inflation	0.229 ***	0.031	7.350	0.000	0.244 ***	0.053	4.599	0.000
Exchange Rate	0.045 ***	0.013	3.553	0.002	0.054 ***	0.018	3.069	0.003
R-squared	0.884				0.773			
Adjusted R-squared	0.881				0.768			
<i>F</i> -Statistic	386.238				173.104			
Prob (<i>F</i> -statistic)	0.000 ***				0.000 ***			

*** and **, indicate significance at the 1%, and 5%, levels, respectively.

In comparison, the issuer also has an adverse effect, with significance at the 5% level. Issue size does not affect the yield of GBs. This finding also shows that bond ratings can positively and negatively moderate the effect of maturity with coupons in terms of the yield of GBs. In contrast, the bond rating has no impact on the yield of GBs. Overall, the adjusted R² value shows 0.77, which means that 77% of the variation in Indonesian GB yields can be explained by the variables considered in the study, namely bond-specific factors, macroeconomic variables, and the role of bond rating moderator variables.

The coupon is the variable that has the most decisive influence on GB yield, with a coefficient of 0.731, indicating that a 1% increase in coupon causes a 0.73% increase in GB yield. The interaction of coupon with bond rating weakens and has an opposite relationship with GB yield, with a negative coefficient of 0.154, meaning that a 10% increase in bond rating moderates the coupon impact on a decrease in GB yield by 1.54%. Bond maturity directly has a negative impact, with a coefficient of 0.002 on GB yield, indicating that every 10% increase in maturity causes the yield to decrease by 0.02%. Different results reveal that, if the maturity factor is moderated by rating, its impact strengthens its relationship with GB yield with a positive coefficient (0.002), meaning that a 1% increase in the interaction of maturity and rating causes an increase in bond yield of 0.02%.

5. Discussion

This study's results prove that coupons are positively related to bond yields and have the highest influence compared to other factors. The significant influence of the coupon rate can be caused by investors' increasing preference for coupon rates when investing in GBs (Birzhanova et al., 2024). These study results align with the findings of Abhilash et al. (2024), who proved that the coupon rate substantially positively impacts GB yields. Chiesa and Barua (2019) revealed that the coupon rate affects green bond issuance, which has a positive effect in emerging markets and an adverse effect in non-emerging markets.

The issue size factor in this study was confirmed to have no impact on GB yields. This can be interpreted as a change in the bond issuance volume, not changing the yield of GBs. The significant disparity in the nominal value of each series of GBs issued by both governments is different from the range of bond yields, which makes these two variables unrelated. The study results align with the findings of Abhilash et al. (2024), who revealed that the issuance size has no impact on the yield of GBs. Different findings were revealed by Q. Wang et al. (2019), who confirmed the negative impact of the size of the issuance on the risk premium of GB issuance. This finding indicates that the larger the scale of GB issuance, the stronger the liquidity of the GBs and the higher the level of recognition of bond investors. Oktavio and Riyanti (2021) also revealed that increasing issuances impacted decreasing GB premiums. Dan and Tiron-Tudor (2021) showed that countries with higher levels of GB issuance, mainly characterized by good ratings, can increase investor confidence. Biju et al. (2024) proved that company size positively impacts GB issuance. Berg et al. (2022) stated that there is more significant pressure and supervision from regulators, investors, and the public on large companies to improve sustainable practices.

The research findings for the model without the role of moderator variables show that maturity has a positive impact on GB yields, while, in contrast, it has a negative impact in the model with the role of bond ratings as a moderator variable. The interaction of maturity and ratings positively impacts GB yields. The positive relationship between maturity and GB yields indicates that bonds with longer maturities have high yields. According to signaling theory, companies that issue GBs with longer maturities convey the confidence needed for bond financing, which reflects a better corporate credit and business environment. Conversely, the shorter the term, the more likely market players are to generate GB yield movements. The interest rate structure theory explains that bond maturity determines the interest rate and liquidity risks bonds face (Suryadi et al., 2021). The longer the maturity of GB, the higher the systemic and non-systematic risks GB faces and the uncertainty of maturity payments. Amihud and Mendelson (1991) revealed that the yield of medium-term bonds is higher than that of short-term bonds, and the difference between the yields of the two is a decreasing function of the maturity period. Therefore, longer bond maturities are expected to affect investor subscription sentiment and increase the cost of issuing GBs.

Q. Wang et al. (2019) proved that bond maturity is negatively related to the risk premium of GB issuance. This finding indicates that long green bond maturity indicates a company's confidence in the sale and payment of GBs at maturity and indicates high quality. Febi et al. (2018) show that maturity is inversely related to GB yield spread and positively affects conventional bonds. Chang et al. (2021) prove that shorter issuance ages cause the yield spread between ordinary corporate bonds and green corporate bonds to widen. Abhilash et al. (2024) revealed that bond maturity does not affect GB yields in Asia, while in Latin America it has a positive effect.

In contrast, Abhilash et al. (2023) found a significant negative impact of bond maturity on GB yields in India. Long maturity ensures green project development for extended periods, resulting in lower bond values. Baldi and Pandimiglio (2022) revealed that GB

investors are willing to accept lower yields due to their increasing concerns about green project development for extended periods. Since GB proceeds are limited to green project development, such as renewable energy, energy efficiency, and many others, bond maturity tends to align with the green project development period.

The findings confirm that the issuing of bonds between the government and the issuer hurt the yield of GBs. This shows that green bonds issued by the government have lower yields than those issued by companies with higher yields. GBs issued by the government have an implicit guarantee that the probability of default is relatively low. Therefore, government GB has lower risk premiums and yields. [Hadaś-Dyduch et al. \(2022\)](#) revealed that issuing government GBs could encourage capital mobilization, spur the development of the green financial market, and increase investors' demand and reputational interests. [Q. Wang et al. \(2019\)](#) proved the difference in the risk premium of GB issuance between state-owned enterprises and non-state enterprises. State-owned enterprises can significantly reduce the risk premium of GB issuance. State-owned enterprises usually have higher environmental risk management and control, project management capabilities, better information disclosure mechanisms, and relatively low moral hazard from subjective "greenwashing".

In addition to the differences in GB issuance by government companies, the issuance of GBs can also be compared with conventional bonds. Government companies can issue both green and conventional bonds. Several previous studies have shown a difference in yield, called greenium, between green and conventional bonds ([Löffler et al., 2021](#); [Hyun et al., 2021](#); [Teti et al., 2022](#)). [Karpf and Mandel \(2018\)](#) revealed that the yield on GBs in the United States is lower than that of conventional bonds. [Zerbib \(2019\)](#) confirmed that the yield on GBs is lower than that of conventional bonds if the negative premium is negligible. [Koziol et al. \(2022\)](#) confirmed that German government GBs provides lower yields than conventional bonds with the same coupon and maturity. [Fatica et al. \(2021\)](#) revealed that GBs issued by non-financial companies have a higher premium than ordinary bonds, meaning green transformation companies have lower bond issuance costs.

The research findings show that bond ratings do not directly affect GB yields. Bond ratings integrate unmeasured information, mainly when a serious information asymmetry problem exists in the financial market. The GB market is still immature, and investors lack good evaluation tools. However, credit ratings act as a low-cost leading indicator of potential risks. Openness and transparency are essential to investors. However, due to the lack of investor expertise in assessing green projects, bond ratings become their primary source of information in making bond selection decisions. GB credit ratings mainly assess GBs' overall solvency.

In the GB issuance process, GBs with higher debt credit ratings indicate a more controlled level of credit risk and are easily recognized by market investors. [Abhilash et al. \(2023\)](#) revealed a substantial positive impact of bond rating on GB yields, indicating that well-rated bonds act as collateral in the securities market. [Ziebart and Reiter \(1992\)](#) revealed that bond rating directly affects bond yields, and financial information indirectly determines bond yields through its influence on bond ratings. [Baldi and Pandimiglio \(2022\)](#) found a direct impact of bond rating on bond yields. When rating agencies rate bonds, they continue to offer higher yields. A high bond rating positively impacts GB issuance, indicating increased creditworthiness and possibly lower financing costs for the issuer. With increasing issues, such as default risk, in the market, investors tend to focus on bond ratings as it is one of the key attributes used to assess security collateral. Furthermore, since the GB market is a new phenomenon in Indonesia, investors prioritize bond ratings due to the lack of appropriate proxy measures to decide the bonds' creditworthiness.

Furthermore, ratings act as a key assurance element regarding the timely provision of enhanced benefits to investors. [Oktavio and Riyanti \(2021\)](#) revealed that A-rated GBs offer lower yields than AAA-rated GBs. [Dorfleitner et al. \(2022\)](#) proved that GB investors prefer bonds with higher credit ratings. [Sheng et al. \(2021\)](#) and [Li et al. \(2020\)](#) found that credit rating significantly negatively affects GB yield spread. Conventional bonds with higher credit ratings have a relatively lower default risk, so investors usually charge a lower risk premium, which applies to GBs. A lower bond rating indicates a higher cost of capital because it reflects the perceived ability of the issuer to meet debt obligations and access capital markets ([Bastida et al., 2017](#); [Benito et al., 2016](#); [Y. Wang et al., 2020](#); [Dorothy & Endri, 2024](#)). [Q. Wang et al. \(2019\)](#) proved a significant negative impact of debt rating on the risk premium of GB issuance. In the process of GB issuance, the higher the credit rating of the debt, the lower the default risk and the lower the risk premium of GB issuance. [Chang et al. \(2021\)](#) also found a negative relationship between credit ratings and corporate green bond yield spreads.

The research findings show that interest rates positively affect GB yields. If interest rates increase, the yield of GBs their owners receive increases. The research results support the findings of [Bandholz et al. \(2009\)](#), which revealed that an increase in interest rates causes an increase in bond yields. This finding also indicates the role of monetary policy in influencing bond yields through the determination of interest rates by the Central Bank. Therefore, monetary policy on long-term interest rates determines the level of long-term bond yields. [Nguyen and Nguyen \(2022\)](#) found a positive impact of policy interest rates on government bond yields. [Zhou \(2021\)](#) found that short-term interest rates positively impact bond yields in both the short and long term. [Akram and Das \(2019\)](#) and [Akram and Li \(2017\)](#) confirmed that short-term interest rates are the main determinants of long-term bond yields and bond yield spreads. [Abhilash et al. \(2024\)](#) revealed different findings, proving that interest rates did not affect GB yields. [BM et al. \(2023\)](#) revealed that interest rates are important in determining government bond yields.

The research findings show that inflation positively affects GB yields. Increased inflation drives economic growth and impacts increasing capital investment so GB issuers can provide higher yields. [Dan and Tiron-Tudor \(2021\)](#) explain that the cost of implementing green projects increases with inflation, and more resources are needed to find these projects. The research results align with the findings of [Tjandrasa et al. \(2020\)](#), which revealed that inflation positively impacts changes in government bond yields. Increased inflation causes investors to demand a higher rate of return for bonds issued by the government. Investors consider the real rate of return, as stated in the Fisher Effect. [Koroleva and Kopeykin \(2022\)](#) also prove that growth in the inflation rate has a positive effect on government bond yields. [Zhou \(2021\)](#) revealed that the inflation rate positively impacts government bond yields in the short term, while the impact is the opposite in the long term. Monetary policy authorities must consider this asymmetry when estimating long-term returns at short-term interest rates. [BM et al. \(2023\)](#) stated that performance and inflation expectations may be the main factors determining bond yields in the long term.

[Grishunin et al. \(2023\)](#) revealed different findings that proved that rising inflation lowers bond yields. [Afonso and Jalles \(2019\)](#) proved that inflation shocks have an impact on reducing long-term bond yields. [Nguyen and Nguyen \(2022\)](#) found that inflation causes government bond yields to decline. In addition, inflation has a more substantial effect on changes in long-term government bond yields than short-term yields. [Nanayakkara and Colombage \(2019\)](#) also confirmed that corporate bonds provide lower credit spreads during periods of high inflation. Lower yields impact reducing investor interest in investing in GB so that green bond issuance decreases. This relationship can be attributed to the erosive

effect of inflation on the value of investments, increasing borrowing costs and potentially deterring issuers from entering the market (Melina & Endri, 2025).

The research findings show that the exchange rate positively affects GB yields. Strengthening the Rupiah exchange rate against the US Dollar, which represents the world currency, provides a higher GB yield. The research results align with the findings of Sawitri et al. (2022) and Francová (2017), proving that the exchange rate is positively related to bond yields. Different findings were revealed by Afonso and Rault (2015), who confirmed the negative impact of the exchange rate on short-term, medium-term, and long-term bond returns. Nguyen and Nguyen (2022) and Hsing (2015) proved that the nominal exchange rate negatively impacts government bond yields. Afonso and Nunes (2015) found that the real effective exchange rate negatively relates to government bond yields. Koroleva and Kopeykin (2022) revealed that the exchange rate does not impact government bond yields. Zhou (2021) found that the effective exchange rate significantly negatively affects bond yields in both the short and long term.

The research findings prove that the interaction between coupons and bond ratings is negatively affected by GB yields. The larger the coupon size and the lower the credit rating of the bond issuance, the higher the bond yield. Chiesa and Barua (2019) demonstrated that the size of GBs is positively related to the coupon rate and credit rating, indicating better payment reliability and more significant returns. These findings prove that the interaction of maturity and bond rating positively affects GB yields. The longer the bond maturity, the higher the bond issuance rating and yield. This result can be explained as a signal effect. Corporations issuing GBs with longer maturities signal confidence that bond financing indicates sound corporate credit and a better business environment. Fons (1994) stated that the bond yield is smaller with shorter maturity and lower ratings. Companies with higher ratings tend to have narrower credit spreads that widen with maturity. Duffee (1998) found a positive relationship between maturity spread and yield, which is usually expected for investment-grade bonds.

6. Conclusions

This study aims to identify the determinants of GB yields in Indonesia, moderated by bond ratings. The research sample covers 468 GBs from 30 publishers from government and corporations from 2018 to 2023. The study found that coupons are positively related to GB yields, and their effect is the highest compared to other factors. In contrast, GB yields negatively respond to the interaction between coupons and bond ratings. The maturity factor reveals different findings. The model without the role of moderator variables has a positive effect on GB yields; however, on the contrary, it has a negative impact on the model with bond ratings as a moderator variable. The interaction of maturity and ratings positively affects GB yields; conversely, the interaction with coupons is negatively related to GB yields. Macroeconomic variables, namely interest rates, inflation, and exchange rates, significantly impact GB yields.

Important implications of the study's findings are macroeconomic variables, bond-specific factors, and the role of bond ratings as important moderating variables in the development of GB. In addition, this study contributes to the development of the literature on the GBs market and its determinants. Knowledge of GB issuance can help market players make the right decisions when developing green financing. The research also provides valuable insights into GB issuance and key factors determining its yield that can help market participants make informed decisions when developing green finance. Recommendations for future study agendas include expanding the scope of the sample of GB issuers to a more extensive and diverse sample involving multiple countries, for example, countries in the ASEAN region, which could help in developing a more comprehensive understanding of

the green bond market. The research on the determinants of green bond yields provides a future research agenda by adding company-specific factors, industries, and government policies. The unique characteristics of green bonds that have not been identified also offer interesting opportunities for further research. Other issues that have developed regarding GB issuance are challenges for future research, including green investor behavior, green innovation, and green portfolio diversification. In addition, it is also interesting to have a future research agenda to analyze the behavior of green investors related to their responses and interpretations of GB issuance.

Author Contributions: Conceptualization, M.W. and E.E.; methodology, E.E. and A.K.; software, W.U. and M.W.; validation, A.K. and W.U.; formal analysis, E.E. and M.W.; investigation, M.W. and W.U.; resources, W.U. and A.K.; data curation, M.W. and A.K.; writing—original draft preparation, M.W. and A.K.; writing—review and editing, E.E. and W.U.; visualization, W.U. and A.K.; supervision, E.E. and W.U.; project administration, A.K. and M.W.; funding acquisition, M.W. and E.E. All authors have read and agreed to the published version of the manuscript.

Funding: No external funding was provided for this research.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The authors will make the raw data supporting this article's conclusions available upon request.

Conflicts of Interest: The authors declare no conflicts of interest related to this publication.

References

- Abdullah, M. S., & Keshminder, J. S. (2022). What drives green sukuk? A leader's perspective. *Journal of Sustainable Finance & Investment*, 12(3), 985–1005. [CrossRef]
- Abhilash, A., Shenoy, S. S., & Shetty, D. K. (2024). Factors influencing green bond yield: Evidence from Asia and Latin American countries. *Environmental Economics*, 15(1), 108–117. [CrossRef]
- Abhilash, A., Shenoy, S. S., Shetty, D. K., & Kamath, A. N. (2023). Do bond attributes affect green bond yield? Evidence from Indian green bonds. *Environmental Economics*, 14(2), 60–68. [CrossRef]
- ADB. (2022). *Green bond market survey for Indonesia: Insights on the perspectives of institutional investors and underwriters*. Asian Development Bank. Available online: <https://www.adb.org/publications/survey-green-bonds-sustainable-finance-asean> (accessed on 20 January 2025).
- Afonso, A., & Jalles, J. T. (2019). Quantitative easing and sovereign yield spreads: Euro-area time-varying evidence. *Journal of International Financial Markets, Institutions and Money*, 58, 208–224. [CrossRef]
- Afonso, A., & Nunes, A. S. (2015). Economic forecasts and sovereign yields. *Economic Modelling*, 44, 319–326. [CrossRef]
- Afonso, A., & Rault, C. (2015). Short-and long-run behaviour of long-term sovereign bond yields. *Applied Economics*, 47(37), 3971–3993. [CrossRef]
- Agliardi, E., & Agliardi, R. (2019). Financing environmentally sustainable projects with green bonds. *Environment and development economics*, 24(6), 608–623. [CrossRef]
- Agliardi, E., & Agliardi, R. (2021). Corporate green bonds: Understanding the greenium in a two-factor structural model. *Environmental and Resource Economics*, 80(2), 257–278. [CrossRef]
- Akram, T., & Das, A. (2019). The long-run determinants of Indian government bond yields. *Asian Development Review*, 36(1), 168–205. [CrossRef]
- Akram, T., & Li, H. (2017). What keeps long-term US interest rates so low? *Economic Modelling*, 60, 380–390. [CrossRef]
- Alam, T., Naeem, M., & Akhtar, P. (2022). The role of energy use and economic growth on environmental degradation: Evidence from selected Asian countries. *International Journal of Advanced Social Studies*, 2(1), 48–58. Available online: <https://explorescholar.org/journals/index.php/IJASS/article/view/12> (accessed on 15 March 2025).
- Amihud, Y., & Mendelson, H. (1991). Liquidity, maturity, and the yields on US Treasury securities. *The Journal of Finance*, 46(4), 1411–1425. [CrossRef]
- Andi, A. D., & Nainggolan, Y. A. (2024). Determinants of sustainable bond yield among IDX-listed companies. *International Journal of Current Science Research and Review*, 7(7), 5194–5205. [CrossRef]

- Arat, E., Hachenberg, B., Kiesel, F., & Schiereck, D. (2023). Greenium, credit rating, and the COVID-19 pandemic. *Journal of Asset Management*, 24(7), 547–557. [\[CrossRef\]](#)
- Arshad, H., Muda, R., & Ismah, O. (2018). Impact of exchange rate and oil price on the yield of sovereign bond and sukuk: Evidence from Malaysian capital market. *Journal of Emerging Economies & Islamic Research*, 5(4), 27–41.
- Bachelet, M. J., Becchetti, L., & Manfredonia, S. (2019). The green bonds premium puzzle: The role of issuer characteristics and third-party verification. *Sustainability*, 11(4), 1098. [\[CrossRef\]](#)
- Baldi, F., & Pandimiglio, A. (2022). The role of ESG scoring and greenwashing risk in explaining the yields of green bonds: A conceptual framework and an econometric analysis. *Global Finance Journal*, 52, 100711. [\[CrossRef\]](#)
- Bandholz, H., Clostermann, J., & Seitz, F. (2009). Explaining the US bond yield conundrum. *Applied Financial Economics*, 19(7), 539–550. [\[CrossRef\]](#)
- Banga, J. (2019). The green bond market: A potential source of climate finance for developing countries. *Journal of Sustainable Finance & Investment*, 9(1), 17–32. [\[CrossRef\]](#)
- Barua, S., & Chiesa, M. A. (2019). Sustainable financing practices through green bonds: What affects the funding size? *Business Strategy and the Environment*, 28(6), 1131–1147. [\[CrossRef\]](#)
- Bastida, F., Guillaumon, M. D., & Benito, B. (2017). Fiscal transparency and the cost of sovereign debt. *International Review of Administrative Sciences*, 83(1), 106–128. [\[CrossRef\]](#)
- Benito, B., Guillaumon, M. D., & Bastida, F. (2016). The impact of transparency on the cost of sovereign debt in times of economic crisis. *Financial Accountability & Management*, 32(3), 309–334. [\[CrossRef\]](#)
- Berg, F., Kölbel, J. F., & Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. *Review of Finance*, 26(6), 1315–1344. [\[CrossRef\]](#)
- Bhutta, U. S., Tariq, A., Farrukh, M., Raza, A., & Iqbal, M. K. (2022). Green bonds for sustainable development: Review of literature on development and impact of green bonds. *Technological Forecasting and Social Change*, 175, 121378. [\[CrossRef\]](#)
- Biju, A. V. N., Alora, A., Sasidharan, A., & Kallany, A. (2024). Investigating the factors determining green bond issuance in emerging markets: Emphasizing the direct and moderating role of board characteristics and ESG performance. *Corporate Ownership & Control*, 21(4), 60–74. [\[CrossRef\]](#)
- Birzhanova, A., Nurgaliyeva, A., Nurmagambetova, A., Dinçer, H., & Yüksel, S. (2024). Neuro quantum-inspired decision-making for investor perception in green and conventional bond investments. *Investment Management and Financial Innovations*, 21(1), 168–184. [\[CrossRef\]](#)
- BM, L., Chakraborty, S., Iyer, V., MN, N., & Ledwani, S. (2023). Modelling asymmetric sovereign bond yield volatility with univariate GARCH models: Evidence from India. *Cogent Economics & Finance*, 11(1), 2189589. [\[CrossRef\]](#)
- Broadstock, D. C., & Cheng, L. T. (2019). Time-varying relation between black and green bond price benchmarks: Macroeconomic determinants for the first decade. *Finance Research Letters*, 29, 17–22. [\[CrossRef\]](#)
- Bruche, M., & Segura, A. (2017). Debt maturity and the liquidity of secondary debt markets. *Journal of Financial Economics*, 124(3), 599–613. [\[CrossRef\]](#)
- Calomiris, C. W., Larrain, M., Schmukler, S. L., & Williams, T. (2022). Large international corporate bonds: Investor behavior and firm responses. *Journal of International Economics*, 137, 103624. [\[CrossRef\]](#)
- Campello, M., Chen, L., & Zhang, L. (2008). Expected returns, yield spreads, and asset pricing tests. *The Review of Financial Studies*, 21(3), 1297–1338. [\[CrossRef\]](#)
- Chang, K., Feng, Y. L., Liu, W., Lu, N., & Li, S. Z. (2021). The impacts of liquidity measures and credit rating on corporate bond yield spreads: Evidence from China's green bond market. *Applied Economics Letters*, 28(17), 1446–1457. [\[CrossRef\]](#)
- Chen, Y. F. (2023). Inflation, equity market volatility, and bond prices: Evidence from G7 Countries. *Risks*, 11(11), 191. [\[CrossRef\]](#)
- Cheng, L. T. W., Sharma, P., & Broadstock, D. C. (2022). Interactive effects of brand reputation and ESG on green bond issues: A sustainable development perspective. *Business Strategy and the Environment*, 32(1), 570–586. [\[CrossRef\]](#)
- Chiesa, M., & Barua, S. (2019). The surge of impact borrowing: The magnitude and determinants of green bond supply and its heterogeneity across markets. *Journal of Sustainable Finance & Investment*, 9(2), 138–161. [\[CrossRef\]](#)
- Crabbe, L. E., & Turner, C. M. (1995). Does the liquidity of a debt issue increase with its size? Evidence from the corporate bond and medium-term note markets. *The Journal of Finance*, 50(5), 1719–1734. [\[CrossRef\]](#)
- Czech, M., Hadaś-Dyduch, M., & Puszer, B. (2023). Effectiveness of green bonds in selected CEE countries: Analysis of similarities. *Risks*, 11(12), 214. [\[CrossRef\]](#)
- Dan, A., & Tiron-Tudor, A. (2021). The determinants of green bond issuance in the European Union. *Journal of Risk and Financial Management*, 14(9), 446. [\[CrossRef\]](#)
- Darmia, D., & Kim, S. S. (2024). Sustainable premium of sustainable corporate bonds in Indonesia. *Enrichment: Journal of Management*, 14(4), 712–721.
- Dbouk, W., Jin, D., Wang, H., & Wang, J. (2018). Corporate social responsibility and rule 144A debt offerings: Empirical evidence. *International Journal of Financial Studies*, 6(4), 94. [\[CrossRef\]](#)

- Dick-Nielsen, J., Feldhütter, P., & Lando, D. (2012). Corporate bond liquidity before and after the onset of the subprime crisis. *Journal of Financial Economics*, 103(3), 471–492. [\[CrossRef\]](#)
- Dorfleitner, G., Utz, S., & Zhang, R. (2022). The pricing of green bonds: External reviews and the shades of green. *Review of Managerial Science*, 1–38. [\[CrossRef\]](#)
- Dorothy, P., & Endri, E. (2024). Environmental, social and governance disclosure and firm value in the energy sector: The moderating role of profitability. *Problems and Perspectives in Management*, 22(4), 588–599. [\[CrossRef\]](#)
- Duffee, G. R. (1998). The relation between treasury yields and corporate bond yield spreads. *The Journal of Finance*, 53(6), 2225–2241. [\[CrossRef\]](#)
- Endri, E., Dermawan, D., Abidin, Z., & Riyanto, S. (2019). Effect of financial performance on stock return: Evidence from the food and beverages sector. *International Journal of Innovation, Creativity and Change*, 9(10), 335–350.
- Endri, E., Hania, B. T., & Ma'ruf, A. (2022). Corporate green Sukuk issuance for sustainable financing in Indonesia. *Environmental Economics*, 13(1), 38–49. [\[CrossRef\]](#)
- Fandella, P., & Cociancich, V. (2024). Uncovering the greenium: Investigating the yield spread between green and conventional bonds. *Investment Management and Financial Innovations*, 21(2), 56–69. [\[CrossRef\]](#)
- Fatica, S., Panzica, R., & Rancan, M. (2021). The pricing of green bonds: Are financial institutions special? *Journal of Financial Stability*, 54, 100873. [\[CrossRef\]](#)
- Fatmawatie, N., Endri, E., & Husein, D. (2024). Macroeconomic factors and government bond yield in Indonesia. *Public and Municipal Finance*, 13(1), 95–105. [\[CrossRef\]](#)
- Febi, W., Schäfer, D., Stephan, A., & Sun, C. (2018). The impact of liquidity risk on the yield spread of green bonds. *Finance Research Letters*, 27, 53–59. [\[CrossRef\]](#)
- Flammer, C. (2020). Green bonds: Effectiveness and implications for public policy. *Environmental and Energy Policy and the Economy*, 1(1), 95–128. [\[CrossRef\]](#)
- Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*, 142(2), 499–516. [\[CrossRef\]](#)
- Fons, J. S. (1994). Using default rates to model the term structure of credit risk. *Financial Analysts Journal*, 50(5), 25–32. [\[CrossRef\]](#)
- Francová, B. (2017). Valuation of government bonds: The exchange rate is an important aspect. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 65(6), 1911–1916. [\[CrossRef\]](#)
- Frecautan, I., & Ivashkovskaya, I. (2024). Is corporate governance important for green bond performance in emerging capital markets? *Eurasian Economic Review*, 14(1), 175–212. [\[CrossRef\]](#)
- Gabr, D. H., & Elbannan, M. A. (2024). Green finance insights: Evolution of the green bonds market. *Management & Sustainability: An Arab Review*, 3(3), 274–297. [\[CrossRef\]](#)
- Gadanecz, B., Miyajima, K., & Shu, C. (2014). *Exchange rate risk and local currency sovereign bond yields in emerging markets* (BIS Working Papers No 474). Bank for International Settlements.
- García, C. J., Herrero, B., Miralles-Quirós, J. L., & del Mar Miralles-Quirós, M. (2023). Exploring the determinants of corporate green bond issuance and its environmental implication: The role of corporate board. *Technological Forecasting and Social Change*, 189, 122379. [\[CrossRef\]](#)
- Gianfrate, G., & Peri, M. (2019). The green advantage: Exploring the convenience of issuing green bonds. *Journal of Cleaner Production*, 219, 127–135. [\[CrossRef\]](#)
- Giri, G., Nivedhitha, K. S., & Manohar, H. L. (2024). Can blockchain enabled green bond issuance lead to intent to invest? A moderated mediation model. *Applied Economics*, 56(18), 2191–2208. [\[CrossRef\]](#)
- Glavas, D. (2022). Do green bond issuers suffer from financial constraints? *Applied Economics Letters*, 30(14), 1887–1890. [\[CrossRef\]](#)
- Grishunin, S., Bukreeva, A., Suloeva, S., & Burova, E. (2023). Analysis of yields and their determinants in the European corporate green bond market. *Risks*, 11(1), 14. [\[CrossRef\]](#)
- Grishunin, S., Burova, E., Suloeva, S., Pishchalkin, D., Isroilov, B., & Doliev, S. (2024). Greenium and its determinants at various phases of life cycle of European green bond market. In *E3S Web of Conferences* (Vol. 574, p. 03005). EDP Sciences. [\[CrossRef\]](#)
- Guild, J. (2020). The political and institutional constraints on green finance in Indonesia. *Journal of Sustainable Finance & Investment*, 10(2), 157–170. [\[CrossRef\]](#)
- Hadaś-Dyduch, M., Puszer, B., Czech, M., & Cichy, J. (2022). Green bonds as an instrument for financing ecological investments in the V4 countries. *Sustainability*, 14(19), 12188. [\[CrossRef\]](#)
- Haddad, H. H., & Rokhim, R. (2022). The role of Indonesian investors in achieving SDGs through green bonds. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1111, No. 1, p. 012069). IOP Publishing. [\[CrossRef\]](#)
- Hsing, Y. (2015). Determinants of the government bond yield in Spain: A loanable funds model. *International Journal of Financial Studies*, 3(3), 342–350. [\[CrossRef\]](#)
- Hyun, S., Park, D., & Tian, S. (2020). The price of going green: The role of greenness in green bond markets. *Accounting & Finance*, 60(1), 73–95. [\[CrossRef\]](#)

- Hyun, S., Park, D., & Tian, S. (2021). Pricing of green labeling: A comparison of labeled and unlabeled green bonds. *Finance Research Letters*, 41, 1–5. [CrossRef]
- Kanamura, T. (2020). Are green bonds environmentally friendly and good-performing assets? *Energy Economics*, 88, 104767. [CrossRef]
- Kapraun, J., Latino, C., Scheins, C., & Schlag, C. (2021, December 19). (In-)credibly green: Which bonds trade at a green bond premium? Paris December 2019 Finance Meeting EUROFIDAI-ESSEC, Paris, France. [CrossRef]
- Karpf, A., & Mandel, A. (2018). The changing value of the ‘green’ label on the US municipal bond market. *Nature Climate Change*, 8, 161–168. [CrossRef]
- Khiari, W., Ben Flah, I., Lajmi, A., & Bouhleli, F. (2024). The stock market reaction to green bond issuance: A study based on a multidimensional scaling approach. *Journal of Risk and Financial Management*, 17(9), 408. [CrossRef]
- Kocaarslan, B. (2021). How does the reserve currency (US dollar) affect the diversification capacity of green bond investments? *Journal of Cleaner Production*, 307, 127275. [CrossRef]
- Koroleva, E., & Kopeykin, M. (2022). Understanding of macro factors that affect yield of government bonds. *Risks*, 10(8), 166. [CrossRef]
- Kovačević, V. (2023). Does transparency pay off for green bond issuers? Evidence from EU state agencies’ green bonds. *Ekonomika Poljoprivrede*, 70(4), 997–1007. [CrossRef]
- Kozioł, C., Proelss, J., Roßmann, P., & Schweizer, D. (2022). The price of being green. *Finance Research Letters*, 50, 103285. [CrossRef]
- Lebelle, M., Lajili Jarjir, S., & Sassi, S. (2020). Corporate green bond issuances: An international evidence. *Journal of Risk and Financial Management*, 13(2), 25. [CrossRef]
- Li, Z., Tang, Y., Wu, J., Zhang, J., & Lv, Q. (2020). The interest costs of green bonds: Credit ratings, corporate social responsibility, and certification. *Emerging Markets Finance and Trade*, 56(12), 2679–2692. [CrossRef]
- Lichtenberger, A., Braga, J. P., & Semmler, W. (2022). Green bonds for the transition to a low-carbon economy. *Econometrics*, 10(1), 11. [CrossRef]
- Löffler, K. U., Petreski, A., & Stephan, A. (2021). Drivers of green bond issuance and new evidence on the “greenium”. *Eurasian Economic Review*, 11(1), 1–24. [CrossRef]
- Lu, J., & Easton, J. (2022). Research on green bond financing and corporate performance: A moderated mediation model. In *International Conference on Management Science and Engineering Management* (pp. 113–127). Springer International Publishing. [CrossRef]
- Lu, W. C., Chen, K. T., & Liao, H. H. (2010). Information uncertainty, information asymmetry, and corporate bond yield spreads. *Journal of Banking and Finance*, 34(9), 2265–2279. [CrossRef]
- Megananda, D., Endri, E., Oemar, F., & Husna, A. (2021). Determinants of corporate bond yield: Empirical evidence from Indonesia. *Journal of Asian Finance, Economics, and Business*, 8(3), 1135–1142. [CrossRef]
- Melina, E., & Endri, E. (2025). Investment decisions and firm value: The moderating role of profitability. *International Journal of Economics and Financial Issues*, 15(1), 1–8. [CrossRef]
- Mertzanis, C. (2023). Energy policy diversity and green bond issuance around the world. *Energy Economics*, 128, 107116. [CrossRef]
- Nanayakkara, M., & Colombage, S. (2019). Do investors in the green bond market pay a premium? Global evidence. *Applied Economics*, 51(40), 4425–4437. [CrossRef]
- Nguyen, T. L., & Nguyen, P. A. (2022). The impacts of fiscal and macroeconomic factors on Vietnam government bond yield. *International Journal of Economics and Finance*, 14(8), 23. [CrossRef]
- Nickel, C., Rother, P., & Ruelke, J. C. (2011). Fiscal variables and bond spreads—evidence from Eastern European countries and Turkey. *Applied Financial Economics*, 21(17), 1291–1307. [CrossRef]
- Oktavio, L., & Riyanti, R. S. (2021). Determinants of green bond premium in the ASEAN market amidst the COVID-19 pandemic. *Jurnal Keuangan dan Perbankan*, 25(4), 734–753. [CrossRef]
- Prajapati, D., Dipen, P., Malik, S., & Mishra, D. K. (2021). Understanding the preference of individual retail investors on green bond in India: An empirical study. *Investment Management & Financial Innovations*, 18(1), 177. [CrossRef]
- Pramana, F. W., & Nachrowi, D. N. (2016). The effect of Indonesian macroeconomic condition and international interest rate on yield of government bond in US dollar. *Journal of Indonesian Applied Economics*, 6(1), 44–65. [CrossRef]
- Presbitero, A. F., Ghura, D., Adedeji, O. S., & Njie, L. (2016). Sovereign bonds in developing countries: Drivers of issuance and spreads. *Review of Development Finance*, 6(1), 1–15. Available online: <https://hdl.handle.net/10520/EJC193925> (accessed on 15 March 2025). [CrossRef]
- Reboredo, J. C., & Ugolini, A. (2020). Price connectedness between green bond and financial markets. *Economic Modelling*, 88, 25–38. [CrossRef]
- Ren, P., Cheng, Z., & Dai, Q. (2024). Can green bond issuance promote enterprise green technological innovation? *The North American Journal of Economics and Finance*, 69, 102021. [CrossRef]
- Sabrina, S., & Lawita, F. I. (2019). Analysis of the effect of corporate governance on yield to maturity through bond rating in Indonesian financial institutions. In *2019 International Conference on Organizational Innovation (ICOI 2019)* (pp. 121–125). Atlantis Press. [CrossRef]

- Santosa, P. W. (2021). Macroeconomic indicators and yield curve of Indonesian government bond. *Business, Management and Economics Engineering*, 19(1), 34–48. [\[CrossRef\]](#)
- Santoso, B., Widodo, W., Akbar, M. T., Ahmad, K., & Setianto, R. H. (2022). The determinant of sukuk rating: Agency theory and asymmetry theory perspectives. *Risks*, 10(8), 150. [\[CrossRef\]](#)
- Sawitri, G. S., Ansari, R., & Rasyimah, H. (2022). Exchange rate, stock return, and bond return in Indonesia: An ARDL approach. *Jurnal Keuangan dan Perbankan*, 26(4), 874–891.
- Sehgal, S., Vasishth, V., & Agrawal, T. J. (2023). Bond rating determinants and modeling: Evidence from India. *Managerial Finance*, 49(3), 529–554. [\[CrossRef\]](#)
- Shah, S. S., Murodova, G., & Khan, A. (2025). Contribution of green bonds and green growth in clean energy capacity under the moderating role of political stability. *Renewable Energy*, 122888. [\[CrossRef\]](#)
- Sheng, Q., Zheng, X., & Zhong, N. (2021). Financing for sustainability: Empirical analysis of green bond premium and issuer heterogeneity. *Natural Hazards*, 107(3), 2641–2651. [\[CrossRef\]](#)
- Sorensen, E. H. (1979). The impact of underwriting method and bidder competition upon corporate bond interest cost. *The Journal of Finance*, 34(4), 863–870. [\[CrossRef\]](#)
- Soudis, D. (2017). Determinants of sovereign bonds ratings: A robustness analysis. *Bulletin of Economic Research*, 69(2), 164–177. [\[CrossRef\]](#)
- Suryadi, S., Endri, E., & Yasid, M. (2021). Risk and return of Islamic and conventional indices on the Indonesia stock exchange. *Journal of Asian Finance, Economics, and Business*, 8(3), 23–30. [\[CrossRef\]](#)
- Taghizadeh-Hesary, F., Mortha, A., Yoshino, N., & Phoumin, H. (2021a). Utilizing green finance for sustainability: Empirical analysis of the characteristics of green bond markets. In H. Phoumin, F. Taghizadeh-Hesary, F. Kimura, & J. Arima (Eds.), *Energy sustainability and climate change in ASEAN* (pp. 169–194). Springer. [\[CrossRef\]](#)
- Taghizadeh-Hesary, F., Yoshino, N., & Phoumin, H. (2021b). Analyzing the characteristics of green bond markets to facilitate green finance in the post-COVID-19 world. *Sustainability*, 13(10), 5719. [\[CrossRef\]](#)
- Tang, D. Y., & Yan, H. (2010). Market conditions, default risk, and credit spreads. *Journal of Banking & Finance*, 34(4), 743–753. [\[CrossRef\]](#)
- Tang, D. Y., & Zhang, Y. (2020). Do shareholders benefit from green bonds? *Journal of Corporate Finance*, 61, 101427. [\[CrossRef\]](#)
- Tarigan, R. A. (2024). Moderating role of activa structure on bond prices of manufacturing companies on the Indonesia stock exchange. *International Journal of Business Law and Education*, 5(1), 919–934. [\[CrossRef\]](#)
- Teti, E., Baraglia, I., Dallochio, M., & Mariani, G. (2022). The green bonds: Empirical evidence and implications for sustainability. *Journal of Cleaner Production*, 366, 1–9. [\[CrossRef\]](#)
- Tjandrasa, B. B., Siagian, H., & Jie, F. (2020). The macroeconomic factors affecting government bond yield in Indonesia, Malaysia, Thailand, and the Philippines. *Investment Management and Financial Innovations*, 17(3), 111–121. [\[CrossRef\]](#)
- Tolliver, C., Keeley, A. R., & Managi, S. (2020). Drivers of green bond market growth: The importance of Nationally Determined Contributions to the Paris Agreement and implications for sustainability. *Journal of Cleaner Production*, 244, 118643. [\[CrossRef\]](#)
- Tomczak, K. (2024). Sovereign green bond market: Drivers of yields and liquidity. *International Journal of Financial Studies*, 12(2), 48. [\[CrossRef\]](#)
- Trinh, Q. T., Nguyen, A. P., Nguyen, H. A., & Ngo, P. T. (2020). Determinants of Vietnam government bond yield volatility: A GARCH approach. *Journal of Asian Finance, Economics and Business*, 7(7), 15–25. [\[CrossRef\]](#)
- Tu, C. A., Rasoulinezhad, E., & Sarker, T. (2020). Investigating solutions for the development of a green bond market: Evidence from analytic hierarchy process. *Finance Research Letters*, 34, 101457. [\[CrossRef\]](#)
- Wang, F., & Liu, J. (2024). Green bond and corporate environmental investment: The moderating effect of environmental concern. *Finance Research Letters*, 65, 105607. [\[CrossRef\]](#)
- Wang, Q., Zhou, Y., Luo, L., & Ji, J. (2019). Research on the factors affecting the risk premium of China's green bond issuance. *Sustainability*, 11(22), 6394. [\[CrossRef\]](#)
- Wang, Y., Liu, C., & Wang, G. (2020). Geopolitical risk revealed in international investment and world trade. *Risk Management*, 22, 133–154. [\[CrossRef\]](#)
- Wijaya, R., Rahayu, D. H., & Budiman, S. (2024). Determinan Sisi Penawaran green bonds ASEAN. *Media Ekonomi*, 32(1), 33–44. [\[CrossRef\]](#)
- Wu, Y. (2022). Are green bonds priced lower than their conventional peers? *Emerging Markets Review*, 52, 100909. [\[CrossRef\]](#)
- Zenno, Y., & Aruga, K. (2023). Investigating factors affecting institutional investors' green bond investments: Cases for Beijing and Shenzhen. *Sustainability*, 15(6), 4870. [\[CrossRef\]](#)
- Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of banking & finance*, 98, 39–60. [\[CrossRef\]](#)
- Zhang, J., Yang, G., Ding, X., & Qin, J. (2024). Can green bonds empower green technology innovation of enterprises? *Environmental Science and Pollution Research*, 31(7), 10032–10044. [\[CrossRef\]](#)

- Zhou, S. (2021). Macroeconomic determinants of long-term sovereign bond yields in South Africa. *Cogent Economics & Finance*, 9(1), 1929678. [[CrossRef](#)]
- Ziebart, D. A., & Reiter, S. A. (1992). Bond ratings, bond yields, and financial information. *Contemporary Accounting Research*, 9(1), 252–282. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.