Vol. 06, No. 1 (2024) 63-68, doi: 10.24874/PES06.01.008

Proceedings on Engineering Sciences

www.pesjournal.net

CLIMATE BONDS: THE GREEN ADVANTAGE

Reepu[1]

Received 17.01.2023.
Received in revised form 21.04.2023.
Accepted 03.05.2023
UDC – 347.768

Keywords:

Economic, Environment, Green bonds, Greenium.

A B S T R A C T

This study provides a literature review on green bonds, which have emerged as a significant tool for sustainable finance and impact investing. Green bond market pricing, green bond financing's consequences on the economy and environment, and legal and institutional concerns in the green bond market are all discussed in this study's literature analysis. Greenium, or the degree to which "green" bonds cost more than their "non-green" equivalents, is a popular topic of discussion in the academic literature on market pricing. Economic and environmental literature impacts primarily deal with the reaction of the stock market to the issuing of green bonds, the value implications of these bonds for other parties, and the impact on investment in environmentally friendly initiatives. The existing problems and potential solutions in the green-bond market are discussed in this study.

1. INTRODUCTION

Climate change has emerged as one of the most pressing challenges of our time. In order to mitigate its impacts and transition to a sustainable future, there is a crucial need to mobilize significant financial resources. One innovative solution that has gained momentum in recent years is the concept of climate bonds. These bonds, also known as green bonds, are designed to raise funds specifically for projects that contribute to climate change mitigation, adaptation, and environmental sustainability. This research explores the historical, pricing as well as legal aspect. "Green finance" and their sook for "green bonds" are also becoming more and more popular, which shows how important SRI and environmentally friendly financing are. As of 2019, more than US$754bn worth of green bonds had been issued through nearly, 6k deals than 927 acquirer. The sooq in context to green bonds is worth more than US$250 billion, which is based on how many green bonds are out there. The pace of development breaks records annually. This fast growth of the market shows how important the instrument is to socially responsible investing (SRI). It also shows how important it is for government officials as well as lawmakers must comprehend the impact of environmentally friendly bond funding. market participants,acquirers, the economy as a whole, and natural environment.

Climate bonds are fixed-income financial instruments that are issued by governments, municipalities, corporations, and other entities to fund projects with clear environmental benefits. These projects encompass a wide range of areas such as renewable energy, energy efficiency, sustainable transportation, green buildings, and water management. The proceeds generated from climate bond issuances are exclusively allocated to finance these projects. Climate bonds offer investors an opportunity to support sustainable development while also receiving a stable financial return.

During the 21st Conference of Parties, often known as COP21, which took place in 2015, the 196 countries that were represented at the conference came to an agreement to "make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development." This action was taken in order to "hold the increase in the global average temperature to well below 2 °C above pre-industrial

[1] Corresponding author: Reepu
Email: reepu.technowize@gmail.com

levels." The dilemma of how to finance the transition to a global low-carbon economy in order to realize this ambitious goal seems more and more crucial as time goes on. This is especially true when taking into consideration the enormous amount of cash that is necessary in order to go from rhetoric to action. According to a report published by the OECD in 2017, it is predicted that an extra investment of around 103 trillion US dollars would be necessary between the years 2016 and 2030 in order to satisfy the requirements of global development in a manner that is consistent with the environment. Because of the limited lending capacity of banks and the demand that is often placed on public budgets, it is necessary to use sources of capital from the private sector. According to research published by the World Bank in 2015, green bonds are seen as an essential component of the financial toolkit needed to ease the transition to an economy with lower carbon emissions.

According to the International Capital Markets Association (ICMA), "any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new or/and existing eligible green projects" is the definition of green bonds. Green bonds are a newer kind of investment bond. Green bonds are issued in the same way as conventional bonds, but the proceeds from green bonds are used to fund projects with a focus on environmental responsibility, such as those that seek to mitigate or adapt to climate change. Because of the potential importance of debt capital markets in funding activities that contribute to environmental sustainability, the Green bond market seeks to facilitate and encourage their use. The expansion of this market over the last several years is another proof of the huge potential of this financial product. In point of fact, the market has continued to expand and become more sophisticated ever since the European Investment Bank (EIB) released the very first green bond in the year 2007.

Over the past decade, climate bonds have experienced significant growth. According to the Climate Bonds Initiative, the global climate bond market reached a record value of $1.45 trillion in 2021. This surge in popularity can be attributed to several factors. Firstly, climate bonds provide a unique avenue for investors to align their financial portfolios with their environmental values, promoting responsible investment practices. Secondly, they enable governments and corporations to tap into a new source of funding for sustainable projects, supplementing traditional financing channels. This expansion has resulted in a substantial increase in renewable energy installations, energy-efficient infrastructure, and other green initiatives. Climate bonds, commonly referred to as green bonds, are a kind of financial instrument that is meant to generate funds expressly for the purpose of funding initiatives that would have a good impact on the surrounding environment. These bonds are issued by governments, municipalities, businesses, and other organizations to raise capital for initiatives that aim to mitigate the effects of climate change, promote the use of renewable energy sources, improve energy efficiency, and support sustainable development. The impact of climate bonds extends beyond financing. By directing capital towards climate-friendly projects, they stimulate economic growth, create jobs, and foster innovation in green technologies. Additionally, they contribute to reducing greenhouse gas emissions, promoting resilience to climate change, and enhancing environmental sustainability.

The capacity of climate bonds to attract investors who are interested in supporting environmentally beneficial activities while simultaneously seeking financial gains is the source of climate bonds' potential to have a positive impact on the environment.

The financial literature that examines how funding environmentally friendly bonds affects the economy concentrates primarily on twin fold facets. The first is mostly about how green bonds are priced on the primary and secondary markets. It also looks at how green bonds affect market participants. In particular, studies look at the "greenium," or the difference in pricing between green and non-green bonds which buyers can afford to shell out. Pursuant with the investor taste theory, buyers are willing to shell out extra for environmentally friendly bonds, hence the greenium ought to be favourable. According to the argument, individuals are prepared to forfeit money for the benefit of humanity, which means that green securities have a positive premium. The main economic idea behind so, according to this notion, greener markets for investment exist and markets for those who don't care about the environment are separate. Another myth is the belief that environmentally conscious investing doesn't provide favorable net present values, hence that environmentally friendly bonds ought to command an unfavorable premium. Another possibility is the value of greenium is nothing, in which case the cost of environmentally friendly bonds is equal to the cost of faux-green bonds. If this is the case, zero premium ought to be charged for environmentally friendly bonds.

While trying to find the greenium, the most important econometric problem is selection bias when putting together an illustration of environmentally friendly bonds. In the perfect scenario, a researcher would like the green labels to be given out at random, but this never happens in real life. In practise, empirical studies of green bond pricing usually use some sort of matching method, such as using bonds issued by the same firms, as Choi et al. (2020) did, or using bonds issued by different firms or by matching of propensity scores based on things that can be seen. We find that the results of existing studies regarding the valuation of green bonds which are assorted, based upon how the samples were chosen then how they were matched.
The other thing that is talked about a lot in finance literature is how the value of green bonds is affected. In

one sense, the cost of ecological bonds is higher than getting money through brown bonds i.e., companies ought to recompense more for issuing green bonds because of the option of getting certified as green or of not being able to use the money from green bonds in many ways. These things could make companies less likely to issue these. While, issuance of such bonds could send a inflated message about company's desire in extended, environmentally friendly investing, something buyers may interpret favourably. Environmental sustainability may increase a company's worth especially since investing into environmentally friendly initiatives over the long run may prove advantageous as they result in greater NPV. For instance, long-term financial results for environmentally friendly initiatives have been overwhelmingly positive. They are worth an improved NPV, are generally healthier ventures because of reduced hazards, which is good for equity holders. Still, the benefits of green financing can also make companies more likely to engage in greenwashing, which is when a company gives a false impression of how committed it is to eco-friendly business methods and goods. Greening the world could be nothing more than a spectacle or a marketing gimmick.

Lastly, we talk about the literature's most recent findings that look at how much green bond financing changes the ecological consequences of the money invested it is used for. Both short-term and long-term effects can be seen. In the short term, green bonds are good because they make it easier to pay for environmentally friendly projects that would be hard to pay for otherwise. Long-term effects will have to do with whether or not plans backed by such bonds really do lessen ecological hazards. Research oriented to lawful subjects related to financing such bonds. These studies look at the legislative structure which regulates such mechanism each amidst and amongst nations. Such bonds are self-labelled, when they are issued, the market responds positively. This gives issuers a strong reason to call its recent bond offerings "green bonds" even if they don't change in any way. Since the market has grown so quickly in the past few years, it is especially interesting to look into these issues.

2. HISTORICAL ASPECT

The UN Framework Convention on Changes in the Climate, a branch that disseminates research findings on the impact of climate change as well as its socioeconomic ramifications, published an assessment in 2007 which connected our actions to the increase in global temperatures. A number of Swedish pension funds decided to invest in green initiatives towards the end of the year 2007. In the last month of 2008, just over one year afterwards, the World Bank's became the very first institution to launch a "sustainable" bond." It did this to raise funds through investors who invest in fixed-income to support loan financing for initiatives associated with climate change that fulfilled specific requirements.

Following that, in 2013, IFC released the initial market-wide evaluate-sized ecological bonds denominated in U.S. dollars, apiece valued $1 billion. During the moment these went on sale, those ecological bonds had been the biggest available, which boosted the overall stock market.

The demand for green investment in areas like environmental remediation, energy efficiency, clean energy, clean transportation, and green buildings is expected to increase to the tune of USD 6-7 trillion annually over the next 15 years to help ease the world into a more environmentally sustainable and low-carbon economy. The urgency of securing the resources necessary to make the switch to a low-carbon economy in the face of growing climate change concerns is increasing daily.

The private sector's investment in low-carbon infrastructure must expand significantly if the established climate change goals are to be met. The International Energy Agency (IEA) estimates that increasing investment in "lowcarbon" power generation by a factor of three and increasing investment in energy efficiency by a factor of eight would be necessary to limit global warming to 2 degrees Celsius or below. Investments in energy supply and energy efficiency throughout the globe will need to reach 53 trillion US dollars by 2035 if temperatures are to climb by 2 degrees Celsius.

Most green investments nowadays are financed by loans from financial institutions. However, the bond market, which provides roughly a third of the total capital granted to firms globally, has not yet assumed a similarly central position in green finance. An OECD quantitative analysis looked at the potential for bond markets to finance a 2°C energy investment scenario, and they found that by 2030, issuance of bonds for low-carbon investments in the renewable energy, energy efficiency, and low-emission vehicle sectors could reach around USD700 billion in four markets (China, Japan, the EU, and the US). This forecast is predicated on the idea that governments would institute measures to encourage and facilitate the use of bonds for low-carbon initiatives.5 According to the OECD, the total amount of "green bonds" issued in 2015 amounted to less than 1% of the total bond issuance in the United States and less than 0.2% of all debt instruments issued globally. As a result, there is a sizable opening to develop the market for green bonds.

3. PRICING ASPECT

The pricing aspect of climate bonds plays a crucial role in attracting investors and ensuring the success of these financial instruments. Pricing refers to the determination of the interest rate, yield, and overall cost of issuing and investing in climate bonds. In standard models for pricing assets, the deferred estimate of the CF ought to be used to determine an investment worth it will bring

in the future. As sustainability bonds are securities with affirmed income with predictable earnings sources ahead of time, but there is some risk that the issuers will not pay back the money. Discount rates depend on the risk of interest rates, the marketplace's categories of buyers and the financial strength of environmentally friendly issuers.

Positive Greenium: Only few studies show that investors are willing to give up some of their wealth for the good of society. As a result, they are willing to pay more (or accept lower yields) for bonds that are good for the environment. Baker et al. (2018) makes an asset-pricing archetypal that considers investors' preferences and hooks these on a theoretical outline in which their behaviour is mostly set by outside factors, regardless of how investors feel. Using US environmentally friendly as well as faux-green bonds, Baker et al. (2018) demonstrate that investments that have greater ecological ratings had reduced predicted returns, which is in line with what this theory predicts. They view this as evidence that a real greenium is present.The identical findings have been seen in many other research, supporting the notion that going green has advantages. Zerbib (2019), for instance, examines a selection of 135 US environmentally friendly bonds and its faux-green equivalents, which are issued by the exact same company but exhibit the identical cling-level features. The average greenium, or the disparity between these bond returns versus their matched counterparts, has been determined to be 2 bps utilising the matched comparative dataset. According to the report, when the disparity in availability is put into consideration, the greenium might reach 8 bps. This is due to the fact that ecological bonds are typically less liquid compared to conventional bonds. The results presented depend on just a few trial bonds. It could be primarily a result of the matching procedure, and relies on the issuance and asset characteristics, which shrinks the number of samples. By examining 21 environmentally friendly bonds released throughout 2014 and 2017 as well as contrasting the rates of return upon issuing of environmentally friendly and faux-green assets of identical companies, Ehlers and Packer (2017) similarly arrived at the same result regarding the presence of a greenium. The debt ranges of identical providers at their most probable issuance dates are compared to the debt ranges at when 21 environmentally friendly bonds originally released. But they discover that once the debt securities are released, they frequently follow suit in the secondary market. Green debt obligations are exchanged closely then brown bonds, according to Hachenberg and Schiereck's (2018) research.

Negative Greenium: Unlike the studies we've talked about so far, which show that greenia is good, there are a few that say other things. Ecological bonds are a comparatively new type of financial instrument, as well as investors might see them as whether riskier or harder to get into. Because of this, investors might not desire green bonds as much, which can lead to higher yields on greener bonds. Karpf & Mandel (2017) look at returns on "green" municipal bonds in the US. Using Oaxaca-Blinder decomposition, they look at 1,880 bonds and find that sustainable bonds median of trading on the aftermarket for 7 basis points (bps) more than similar "brown" bonds. This means that green bonds have a higher yield. This could mean that investors don't like green bonds as much as they used to, or that they see more Sustainability bonds are risky and require higher returns compared to their equivalents.

Another collection of research says that since green bonds trade the same as vanilla bonds, there shouldn't be a difference in their yields either. This would mean that there is neither a positive nor a negative greenium. If there were no problems on the capital market, For instance, the price differential amidst "green" bonds as well as "non-green" bonds inclines towards go away towards the point where small investors with a lot of money could take advantage of it. Larcker and Watts 2019). Consider the possibility that buyers place a higher priority on ESG investing over the basic dangers or rewards associated with these instruments. They then attempt to pair an environmentally friendly bond alongside the faux-green bond that is closest in proximity. They accomplish that utilising an assortment of 640 identical pairs of US municipal bonds, both environmentally friendly and faux-green, that were released through an identical issuance on the identical day, had identical maturities, and were rated the exact same. They discover that both hazards and rewards remain identical once they coincide out to the final mark, and the greenium is shown to investors up front, it's close to zero. Larcker and Watts (2019) do a careful study, but they only look at one.

US local government bonds are a subset of green bonds, which could limit how widely it can be used. Reed et al. (2017) mentioned that sustainable bonds don't cost more. They say this is because investors don't trust that green bonds will help the environment. The pricing of climate bonds is influenced by several factors, including market conditions, risk considerations, and investor demand.

1. Market Conditions: The prevailing market conditions, including interest rates and economic outlook, can impact the pricing of climate bonds. In general, lower interest rates make borrowing cheaper, which can result in more favorable pricing for issuers of climate bonds. Conversely, higher interest rates may lead to higher borrowing costs, potentially affecting the pricing of these bonds.
2. Risk Considerations: The pricing of climate bonds is influenced by the risk associated with the underlying projects and the issuer. Investors typically evaluate the creditworthiness and financial stability of the issuer before investing. If the issuer has a strong credit rating and a proven track record, it may result in lower pricing as investors perceive lower risk. On the other hand, if there are concerns about the issuer's

financial stability or the project's viability, it may lead to higher pricing to compensate for the perceived risks.

3. Green Premium: Climate bonds often command a "green premium" due to their sustainable and environmentally friendly nature. This premium reflects the additional value that investors place on investments with positive environmental impacts. Investors who prioritize sustainability may be willing to accept a slightly lower financial return in exchange for the environmental benefits associated with climate bonds. This green premium can incentivize issuers to issue climate bonds and attract investors who are committed to sustainable investing.

4. Investor Demand: The demand for climate bonds can also influence their pricing. If there is strong investor demand for these bonds, issuers may be able to price them more competitively. Increasing investor interest in sustainable investing and growing awareness of climate-related risks and opportunities can drive demand for climate bonds. As the investor base for climate bonds expands, it can lead to more favorable pricing and lower borrowing costs for issuers.

It is worth noting that the pricing of climate bonds can vary depending on the specific market, issuer, and project characteristics. As the market for climate bonds continues to develop, issuers and investors are working towards standardizing pricing methodologies and improving transparency to enhance market efficiency.

4. LEGAL ASPECTS

Rose (2018) looks at the process of getting certified for sustainable bonds. Climate Bonds Initiative uses the Green Bond Principles set up by ICMA then wants the bond market more liquid. The CBI is a key part of the certification process for climate bonds. In order for a bond to be recognised as a sustainable bond, before issuing, the provider need to fill out a Standard Information Form which is then to be forwarded to Secretariat. In order to qualify for from before-issue, the developer must additionally use an examiner to perform a "pre-arranged protocols participation" or to give a "assurance report" stating whether the offering complies with environmental bond criteria. Similarly, issuers have the option of hiring an examiner to perform a "post-issuance assurance engagement." Rose (2018) also cites a number of case-studies to show the eminence of "assurance engagements."

Park (2018) and Park (2019) say that market investors are the real-world environmentally friendly bond supervisors because of the way regulations work now or because there aren't any good regulations. He suggests an independent framework for administration that would function on atop of democratic laws and its accreditation would naturally be geared towards investors. Since there is no government agency that investors must act as regulators to make sure green bonds are green. For example, Bond pricing ought to reflect the official endorsement of environmentally friendly bonds. This kind of mixed system of government would allow the private governance system to make up for what public regulation lacks. Similar to Barclays' (2017) finding that there is a negative Green premium in the secondary market (by roughly 25 basis points), Bloomberg (2017) has come to the similar conclusion. The yield term structure of Green and conventional bonds in the United States municipal bonds market was investigated by Karpf and Mendel (2017). They found that green bonds are penalized by the market since they fetch a higher yield on the secondary market. The authors arrived at this conclusion after discovering that the term structure of yield for conventional bonds was lower than that for Green bonds. Research on the green bond premium has been undertaken by Zerbib (2017), with a focus on 135 investment-grade senior bullet fixed-rate green bonds issued throughout the world. The study found that a statistically significant Green premium of 8 basis points is paid by secondary market bonds. Focusing on government agency bonds, Natixis (2017) finds that although there is a "shy Green advantage" in the SSA primary market (primary market for sovereign, sub-sovereign, and agency bonds), the Green premium in the secondary market is not so apparent and is somewhat variable. Despite the "shy Green advantage" in the SSA main market, this is still the case. Morgan Stanley (2017) found that investors may buy green bonds at spread levels similar to those of conventional bonds after accounting for sector, curve, and currency.

In 2016, I4CE said, "no clear evidence that Green bonds reduce the cost of capital for low-carbon projects organizations," but in 2017, HSBC noted that Green bonds price similarly to conventional bonds but trade at a premium. As of 2016, I4CE concluded that "no clear evidence" exists to support the claim that "Green bonds reduce the cost of capital for low-carbon projects organizations." The Climate Bonds Initiative (2016) looked at 14 separate bonds to see whether any of them had a "Greenium" at the time of issue. In the context of green bonds, a "Greenium" refers to a continually negative new issue premium. Based on their findings, the researchers concluded that this premium only materialized for certain types of bonds. They did, however, find that spreads on green bonds shrank dramatically in the short term secondary market.

Corporate social responsibility (CSR) performance is correlated with the cost of new bond issuance in the US market, according to research by Ge and Liu (2015). Companies with higher CSR performance can issue bonds at a lower cost. Environmental concerns are linked to higher costs of debt financing and worse credit ratings, as shown in an extensive cross-industry sample of US public companies assessed by Bauer and Hann (2010), whereas proactive environmental measures are linked to reduced costs of debt. One may read their conclusions in the paper "Environmental Concerns Are Associated with a Higher Cost of Debt Financing and Lower Credit Ratings."

5. CHALLENGES AND OPPORTUNITIES

Despite the remarkable growth of climate bonds, several challenges persist. One of the main hurdles is the lack of standardized definitions and guidelines for determining what qualifies as a climate bond. To address this, various organizations and initiatives have emerged, such as the Climate Bonds Standard and the Green Bond Principles, which provide frameworks for verifying the environmental integrity of bond issuances. Establishing clear standards and metrics is crucial to ensure transparency, credibility, and investor confidence in the climate bond market.

Another challenge is the limited availability of suitable projects. While the demand for climate bonds continues to grow, there is a need to identify and develop a pipeline of viable projects that align with sustainable objectives. Governments and corporations must invest in research, development, and infrastructure to facilitate the transition to a low-carbon economy.

Despite these challenges, there are ample opportunities to further promote climate bonds. Collaboration between governments, financial institutions, and the private sector is essential to create an enabling environment. Governments can introduce policies and regulatory frameworks that incentivize climate bond issuances and provide tax benefits to investors. Financial institutions can develop innovative financial products and increase their expertise in green financing. Enhanced investor education and awareness campaigns are also crucial to attract a broader range of investors and expand the climate bond market.

6. CONCLUSION

Climate bonds have emerged as a powerful tool to channel finance towards climate change mitigation and sustainable development. With their ability to mobilize capital for environmentally beneficial projects, climate bonds play a vital role in transitioning to a low-carbon economy. Three important research areas are discussed. We start by reviewing earlier research that examined the costs of sustainable bonds in both the primary as well as the secondary markets. Despite the fact that more studies have found support in favour of greenium, the outcomes can differ according on how the specimens were selected and the research was conducted. The primary issue is the selection bias that results from categorising bond offerings as "green." Second, it has been discussed about research that examines whether releasing ecological bonds impacts an entity's value. According to what I've read, most people appear to concur that green bond issuance generally receives favourable market reaction, as evidenced by way the stock market responds. The majority of the study's focus has been on the impact on value for stock holders because of the shortage of information. However, examining the impacts on other stakeholders would be an intriguing open empirical inquiry. Addressing challenges related to standardization, project availability, and investor education is crucial for the sustained growth of this market. By overcoming these obstacles and leveraging the opportunities at hand, climate bonds have the potential to unlock the necessary financial resources and accelerate the global efforts towards a more sustainable and resilient future. Finally, we examine the actual results of sustainability issuances as well as the associated legal problems.

References:

Baker, M., Bergstresser, D., Serafeim, G., & Wurgler, J. (2018). *Financing the response to climate change: The pricing and ownership of US green bonds.* Working Paper.

Bloomberg. (2017). *Investors are willing to pay a "Green" premium*. Bloomberg New Energy Finance report.

Choi, J., Hoseinzade, S., Shin, S. S., & Tehranian, H. (2020). Corporate bond mutual funds and asset fire sales. *Journal of Financial Economics*, *138*(2), 432-457.

Ehlers, T., & Packer, F. (2017). Green bond finance and certification. *BIS Quarterly Review September*.

Hachenberg, B., & Schiereck, D. (2018). Are green bonds priced differently from conventional bonds?. *Journal of Asset Management*, *19*, 371-383.

Karpf, A., & Mandel, A. (2017). Does it pay to be green?. *Available at SSRN 2923484*.

Larcker, D. F., & Watts, E. M. (2019). Where's the Greenium?. *Rock Center for Corporate Governance at Stanford University Working Paper*, (239), 19-14.

Reed, P., Cort, T., & Yonavjak, L. (2019). Data-driven green bond ratings as a market catalyst. *The Journal of Investing*, *28*(2), 66-76.

Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of banking & finance*, *98*, 39-60.

Reepu
Department of Management,
Chandigarh University, Punjab, India
reepu.technowize@gmail.com