Green Bonds-Lessons for India

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Abstract

Green Bonds have been drawing a lot of attention in the recent times due to a movement towards sustainable finance all over the world. However, the experience of green bonds in the developed and emerging countries have been quite mixed and put the policymakers and the corporates into a quandary. This paper traces the history of green bonds globally and in India over the last decade and highlights the differences with the comparable conventional bonds. The paper looks into the economics and signaling aspects of the issuance of green bonds and also compares the empirical evidence for deriving some trends. In the last section, the authours also discuss the policy maker's dilemma on regulating and monitoring green bonds. For a country like India where the green bond market is still nascent the paper will serve a good introduction to this new instrument in the market.

Keywords: Climate change, green bonds, sustainable bonds, Indian green bond market.

1. Introduction

The recent climate struggles that are being faced around the globe including rising temperatures, greenhouse gas emissions etc have led to huge economic & social losses globally whose impact has been tremendously felt by the developing/emerging markets. For instance, temperatures above the oceans have been increasing leading to an increased number of cyclones & floods which have led to huge loss of life & property. The 2018 floods in Kerala caused more than $4.4 billion in asset impairments and displaced around a million people (UNDP report, 2018) followed by cyclone Amphan in West Bengal and Odisha in 2020 which caused around $14 billion in damage and affected 6 million people (State of the Global Climate report, 2021). The economic cost of climate-related disasters amounted to around $2.25 trillion over the last two decades, an increase of more than 250 per cent, compared to the previous 20 years. (Amundi and IFC, 2018; Picciariello, A., Colenbrander, S., Bazaz, A. and Roy, R.,2021). If no mitigating action is taken, global temperatures could rise by more than 3°C and the world economy could shrink by 18% in the next 30 years. (Swiss Re Group, 2021). According to the World Bank (2021), Natural disasters cost about $18 billion a year in low- and middle-income countries through damage to power generation and transport infrastructure alone. They also trigger wider disruptions for households and firms costing at least $390 billion a year. This highlights the increasing urgency for business models/ industries & government to focus on developing a sustainable and low carbon economy, which is more difficult for developing countries as their economic growth stands to get restricted, so climate change as well as controlling it, impacts them the most.

The intensifying impacts of climate change have navigated their way into the financial ecosystem both directly and indirectly in the form of two types of risks, the first being transition risks, which arise due to transition to low carbon economy thus shifting focus away from carbon-intensive assets and physical risks which arise due to economic damages to physical assets directly caused by climate change.(Yannis Dafermos & Maria Nikolaidi & Giorgos Galanis, 2017).The world recorded the first climate change-related bankruptcy back in 2019, where a Californian utility The Pacific Gas and Electric (PG&E) succumbed to liabilities which resulted from massive wildfires

In a path-breaking study Swiss Re predicts, the world stands to lose close to 10% of total economic value by mid-century if climate change stays on the currently anticipated trajectory, and the Paris Agreement and 2050 net-zero emissions targets are not met (Swiss Re, 2021). As per the study, current likely temperature-rise trajectories, supported by implementation of mitigation pledges, would entail 2.0–2.6°C global warming by mid-century. This will produce the outcome where the global GDP would be 11–14% less than in a world without climate change (ie, 0°C change). Under the same no climate change comparative, the Paris target too result in negative GDP impact, but less much so (–4.2%). In the worst case scenario in which temperatures rise by 3.2°C by mid-century, with society doing nothing to combat climate change, the global economy would be 18% smaller than in a world without warming,

reinforcing the imperative of, if anything, more action on climate change (Swiss Re., 2021). This highlights the need for climate financing instruments like green bonds to achieve this transition.

2.Green Bonds

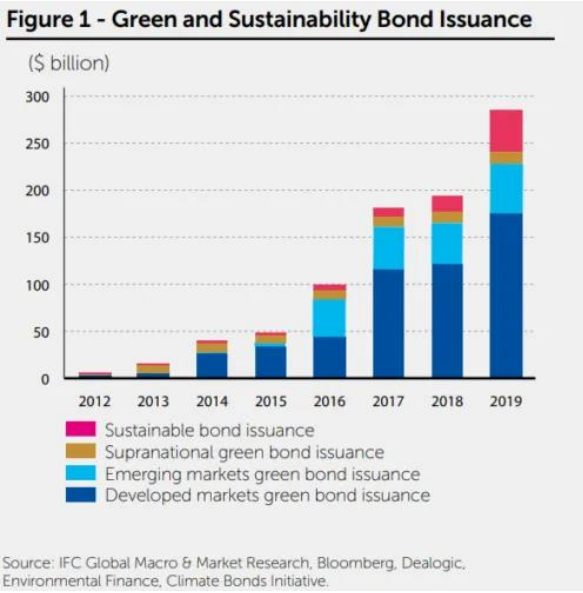
Globally, following the need for sustainable investments and projects, the idea of green bonds- a fixed-income debt instrument whose proceeds will have the sole use of financing green/climate-friendly projects such as renewable energy, green buildings, waste management, electric vehicles etc, was introduced. Green bond issuances act as a source of financing various green investments, which are the need of the hour to promote sustainability across various sectors. Although the concept of green bonds is relatively new, governments and industries all over the world have started paying more attention to them as they are specifically focused on promoting sustainability practices & projects, whose nature is typically different from conventional investments/projects. This specialisation helps firms & investors to focus better on green projects which are financially material to them as well as establish an image/reputation of their commitment towards the environment.

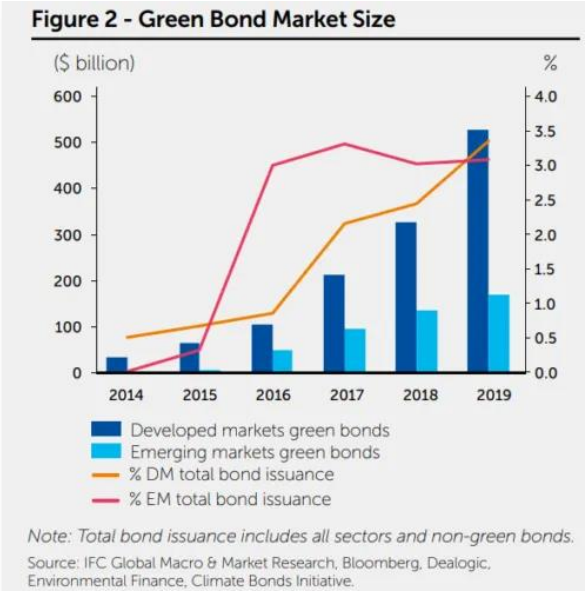
2.1 History & Growth

The very first green bond was issued in 2007 with the AAA-rated issuance from multilateral institutions European Investment Bank (EIB) and World Bank. Till today the cumulative green bond issuance throughout the world has reached a staggering amount of US $1.273 Trillion (as of June 2021). When exactly did green bonds start getting a push?

From the year 2013 Green bonds started receiving wider recognition. March of 2013 witnessed the bond market reacting to the first US $1 bn green bonds issued by IFC which sold just an hour after the issue, followed by the November of 2013 when the first corporate green bond was issued by a Swedish property company, named Vasakronan. By the end of 2015, the cumulative amount reached the USD100 bn mark & by November 2017 the milestone of USD100 bn in annual issuance was achieved (Climate Bonds Initiative). In 2021, the green bond market witnessed some major issuances like the issuance of the largest green hybrid bond at EUR 2 bn in February 2021 by Iberdrola the funds of which will be used to finance offshore wind farms & the issuance of a USD 2.5bn green bonds by the Government of Hong Kong in January 2021, whose proceeds will fund projects that will improve the environment (ICMA, 2021)

Source: Climate Bond Initiative (https://www.climatebonds.net/market/explaining-green-bonds)

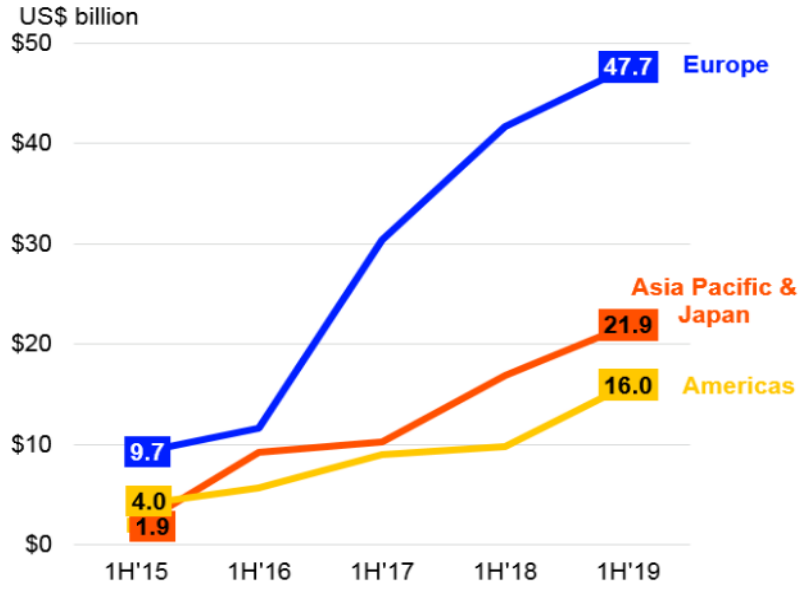




Sources: Emerging Market Green Bonds Report 2018

The period after 2015 witnessed various global markets increasing the issuance of green bonds. European issuance reached USD 116.7bn, up 74% from 2018. Asia-Pacific, saw 29% of year-on-year growth & North America observed a 46% growth.

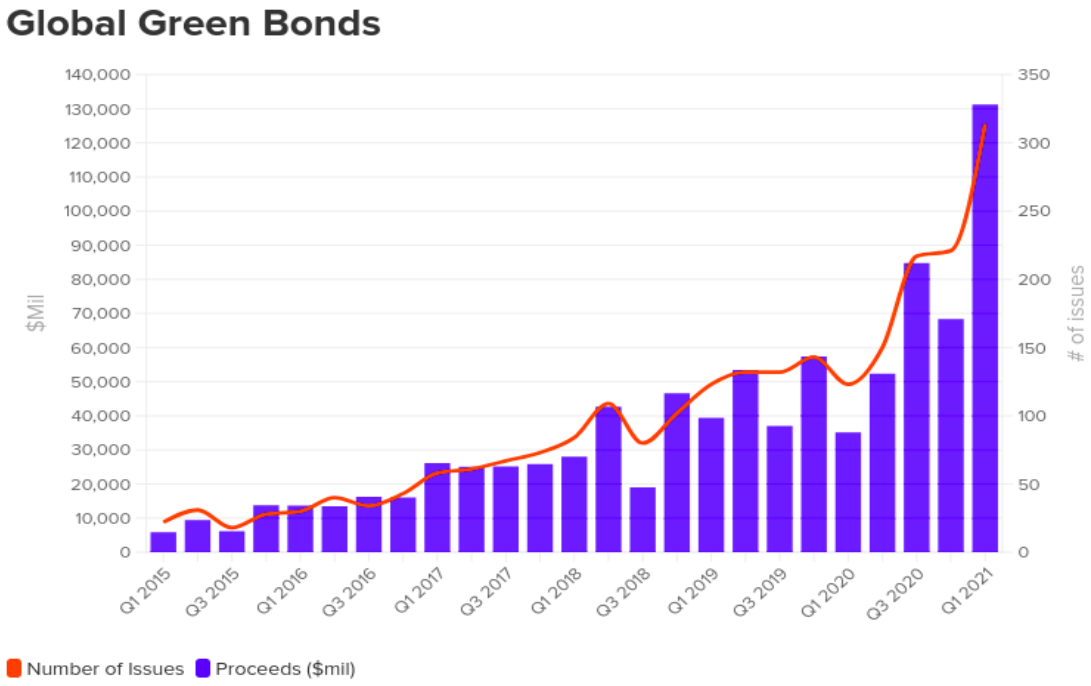
Growth of green bonds by region, 2015-2019:



Source: Refinitiv.https://www.linkedin.com/pulse/week-42-green-bonds-making-real-difference-sasja-beslik/

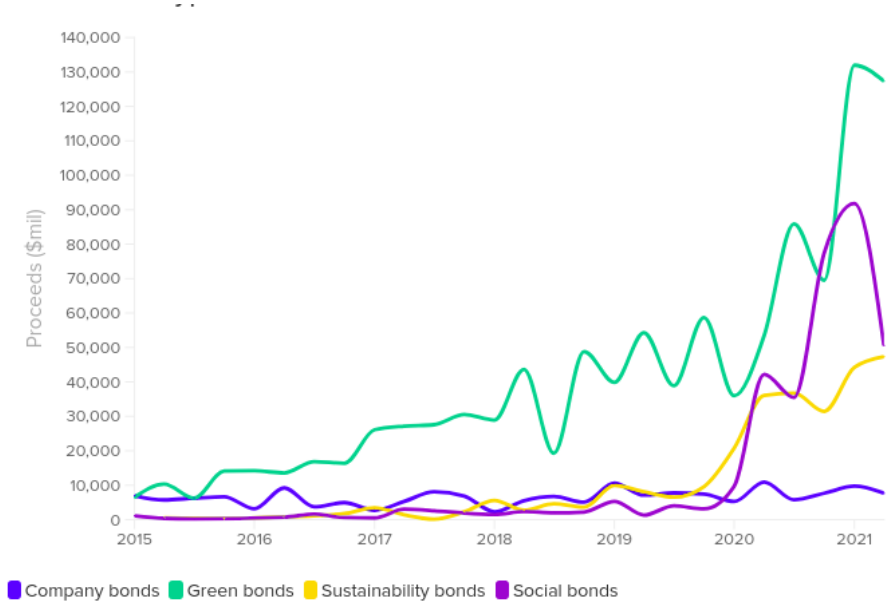
2.2 Current Period

Globally, green bond issuance rose by more than 400 per cent year on year and reached an issuance of USD 131.3 bn in the first quarter of 2021. (Refinitiv 2021)



Source: Refinitiv Deals Data

Green bonds have observed the highest growth compared to other sustainable bonds throughout the years.



Source: Refinitiv Deals Intelligence

2.2 Types of Green Bonds

Type	Proceeds raised by bond sale are	Debt recourse	Example
"Use of Proceeds" Bond	Earmarked for green projects	Recourse to the issuer: same credit rating applies as issuer's other bonds	EIB "Climate Awareness Bond" (backed by EIB); Barclays Green Bond
Green Revenue Bond	Earmarked for or refinances green projects	Revenue streams from the issuers though fees, taxes etc are collateral for the debt	Hawaii State (backed by fee on electricity bills of the state utilities)
Green Project Bond	Ring-fenced for the specific underlying green project(s)	Recourse is only to the project's assets and balance sheet	Invenergy Wind Farm (backed by Invenergy Campo Palomas wind farm)
Securitisation (ABS) Bond	Refinance portfolios of green projects or proceeds are earmarked for green projects	Recourse is to a group of projects that have been grouped together (e.g. solar leases or green mortgages)	Tesla Energy (backed by residential solar leases); Obvion (backed by green mortgages)
Covered Bond	Earmarked for eligible projects included in the covered pool	Recourse to the issuer and, if the issuer is unable to repay the	Berlin Hyp green Pfandbrief; Sparebank 1 Bolligkredit green

		bond, to the covered pool	covered bond
Loan	Earmarked for eligible projects or secured on eligible assets	Full recourse to the borrower(s) in the case of unsecured loans. Recourse to the collateral in the case of secured loans, but may also feature limited recourse to the borrower(s).	MEP Werke, Ivanhoe Cambridge and Natixis Assurances (DUO), OVG
Other debt instruments	Earmarked for eligible projects		Convertible Bonds or Notes, Schuldschein, Commercial Paper, Sukuk, Debentures

Source: Climate Bond Initiative (https://www.climatebonds.net/market/explaining-green-bonds)

2.3 Green Taxonomy and Standards

Given the adoption of green bonds across the world one major question arises. What exactly is the green taxonomy, i.e, how to identify whether a project/investment/asset is green or not? What kind of standards or guidelines need to be followed to receive the certification or approval for the issuance of green bonds or to identify as a green project?

The concept of taxonomy / green taxonomy in sustainable finance is that of a classification system that allows us to identify assets, projects or investments as green and helps in establishing standard green definitions across markets & industries. The criteria for being eligible can be either quantitative or qualitative or can be a list of categories based on sustainability assessments. The idea behind taxonomy is that they should have a targeted purpose, complement the existing international frameworks, usable for all-purpose in the markets, be open & compatible & transition enabled. A few official sector taxonomies across the world include the EU taxonomy, The Green Bond Endorsed Project Catalogue (2015 Edition) ("2015 Project Catalogue") published by the China Green Finance Committee & Malaysia's Climate Change and Principle-based Taxonomy. (Nicholas Pfaff (ICMA), Ozgur Altun (ICMA), and Yanqing Jia (ICMA): Overview and Recommendations for Sustainable Finance Taxonomies, 2021)

Globally the most famous & accepted standards include the Green Bond Principles which were published in January 2014 by the International Capital Markets Association (ICMA) to establish rules for labelling a bond as green and the Climate standard board developed under the guidance of the Climate Bond Initiative (CBI), which certifies green bonds while aligning with the Paris Agreements goals to make sure that the proceeds are reserved for climate-friendly investments. Both CBI & ICMA have regularly updated their guidelines since their

initial launch and have tried to be as exhaustive as possible. Some categories of green projects which are listed by the ICMA & CBI include renewable energy, energy efficiency, pollution prevention & control, clean transportation, water waste management, Circular Economy, Green Buildings etc.(ZLATANSKA and KALCHEVA, 2019; ICMA; CBI)

Green bonds, because of their special nature require monitoring & reporting so that the proceeds are used for the purpose they were issued for primarily. Often, to prove their credibility, second party certifications are required pre-issuance and regular reporting is required post-issuance. They diversify the issuer's portfolio as well as signal the issuer's commitment towards green & sustainability issues. These bonds provide institutional investors with fixed income securities ranging over a long term maturity as green projects/investments usually require more time. Green bonds don't exist in isolation and are derived from a much broader universe of sustainable finance which also touches on concepts like ESG & CSR. The impact of a high ESG rating and a strong CSR performance opens doors to cheap financing as well as tighter spreads and more market confidence (Hachenberg and Schiereck, 2018). It is important to note that till now we were highlighting the use case of green bonds, but what is the comparative between green bonds internally as well as with conventional bonds? As green bonds are restricting funds of companies and require strong credentials to gain investor confidence what will motivate the issuer to choose this over the conventional vanilla bonds which will offer more flexibility in terms of fund spending.

3.Comparison with conventional

In a broader context, the utility/ existence of green bonds in presence of conventional bonds from a company perspective may not make much sense because green bond proceeds can only be used for environment-friendly projects which restrict their use case over the flexibility of spending that conventional bonds provide. Moreover, the green bonds require third party verifications in the market for credibility which also give rise to compliance and issuance costs which can be avoided in the case of conventional bonds.

3.1 Rationales for companies to go green

Given the alternative what can be the possible rationales for a company choosing green bonds over conventional:

a) Signaling: To signal their commitment exclusively towards going green and adopting a more sustainable approach in their current working system. This will reinforce a company's image in a more positive light and would highlight their efforts of being more open-ended towards the environment. This makes a company focus on adopting more eco-friendly practices and taking small steps towards sustainability even if they can't pull something major at once. (Riley, 1979; Spence, 1973, Lyon and Maxwell, 2011; Lyon and Montgomery, 2015)

b) The greenwashing principle: A company may issue bonds to promote a picture of them trying to be more sustainable but without taking any meaningful course of action. The proceeds may not be used for the intended projects. (Berrone, Fosfuri, and Gelabert, 2017; Lyon and Montgomery, 2015; Marquis, Toffel, and Zhou, 2016).
c) Cost of capital: These bonds can act as a cheap source of financing for the issuers if investors are willing to make a trade-off on financial returns for the possible environmental benefits that could be achieved by executing these projects (Flammer, 2020)

To run a comparison between a conventional, let's say a brown bond, and a green bond a concept called matching methodology is commonly used. In this process of inspection two bonds are chosen, one green & one brown, such that they are similar in a lot of parameters like returns, cost of issuance, country of origin, industry, year of origin etc. Then the company's post-issuance performance is compared across both bonds to analyse the impacts. A common observation here is that companies with a green bond issuance tend to observe a higher environmental rating & lower emission, which support their green commitment and thus take away the doubt of greenwashing. Even in terms of ownership, green bond issuers observe an increased interest from long term & green investors as the company's green image attracts them towards their projects. (Flammer, 2020).

Green bond premium, that is the yield difference between green & conventional bonds, also determines how competitive they can be. Many studies point out that the acceptable yield differences should be as minimal as possible and returns should almost be the same, even though the greenness of the bond can help companies turn eco-friendly, investors still prefer the pricing & returns to be competitive enough to invest in them. (Flammer, 2020; Hachenberg and Schiereck, 2018). This implies that although a company may have a good ESG score or CSR criteria the cost of debt may not get cheap, and investors are not willing to trade off returns for environmental benefits thus pointing towards the fact that the third rationale of cheap financing may not be applicable

3.2 Matching Method

Bachelet, Bechhhetti & Manfredonia (Maria Jua Bachelet, Leonardo Becchetti and Stefano Manfredonia, 2019) attempted comparison between conventional and green bonds using matching methodology in which the bonds which were defined by the issuer & listed by the Climate Bonds Initiative were considered to be green. They further defined a subgroup of the green bonds as "certified" if they met one of the following two criteria:
(1) CBI-defined requirements.
(2) externally certificated by a third party

To implement the matching methodology certain metrics had to be followed:
1. Issued by the same organization (including supranational, municipal, and corporate institutions)
2. Had the same currency

3. Had the same rating (Moody's rating or, when not available, S&P Sustainability 2019, 11, 1098 7 of 22 rating),
4. Had the same bond structure
5. Had the same coupon type (only considered fixed-rate bonds).

Table 1. Matching method between green and brown bond.

Bond Characteristic	Matching Criterion
Amount issued	±400%
Coupon rate	±0.25%
Maturity date	±2 years
Currency	Same
Issuer	Same
Rating	Same
Coupon type	Same (fixed rate)

Source: Maria Jua Bachelet, Leonardo Becchetti and Stefano Manfredonia The Green Bonds Premium Puzzle-The Role of Issuer Characteristics and Third-Party Verification, 2019

Table 3. Descriptive statistics for green and brown bonds. Perc. = percentile.

Green Bonds	Count	Mean	SD	1st Perc.	25th Perc.	50th Perc.	75th Perc.	99th Perc.
Yield	39,333	2.03	2.55	−0.45	0.39	1.54	2.45	11.82
Price ask	38,435	100.87	4.71	79.68	99.55	100.62	102.40	115.53
Price bid	38,513	100.64	4.69	79.63	99.41	100.41	102.16	115.02
Liquidity	38,435	−0.22	0.34	−1.75	−0.26	−0.13	−0.08	−0.011
ZTD	39,333	0.053	0.225	0	0	0	0	1
Yield SD	39,329	0.06	0.074	0.01	0.033	0.049	0.075	0.42
Coupon	39,333	1.93	1.66	0.12	0.75	1.62	2.3	8.5
Amount ($)	39,333	0.169	1.32	0.0003	0.00032	0.005	0.006	4.45
Time to Maturity	39,333	3219.02	2833.80	77	862	2743	2745	9936

Brown Bonds	Count	Mean	SD	1st Perc.	25th Perc.	50th Perc.	75th Perc.	99th Perc.
Yield	39,333	2.01	3.21	−0.45	0.44	1.51	2.32	11.93
Price ask	38,869	101.14	4.71	80.94	99.67	100.70	102.16	116.08
Price bid	38,964	100.85	4.85	79.02	99.50	100.51	101.94	115.82
Liquidity	38,869	−0.27	0.44	−2.5	−0.27	−0.13	−0.07	−0.01
ZTD	39,333	0.056	0.23	0	0	0	0	1
Yield SD	39,329	0.11	1.80	0.01	0.032	0.049	0.08	0.49
Coupon	38,778	2.01	1.66	0.12	0.75	1.62	2.5	8.5
Amount ($)	39,333	0.26	3.07	0.00013	0.0031	0.0075	0.011	0.78
Time to maturity	39,333	3248.82	3102.90	45	700	2292	4322	11,360

Source: Maria Jua Bachelet, Leonardo Becchetti and Stefano Manfredonia The Green Bonds Premium Puzzle-The Role of Issuer Characteristics and Third-Party Verification, 2019

According to the comparison seen in the table above it was observed that the average green bond yield was positive, the bid-ask spread of green & conventional bonds was close, green

bond yields were slightly higher whereas brown bonds more volatile. Coupon distribution was almost the same and on average the time to maturity of brown bonds was one month higher.

3.3 Green Vs Conventional

While comparing green and a conventional bond we need to look at certain parameters to understand the difference or the similarities between the two. As stated earlier most of the studies use matching methods to draw a comparative, i.e, keeping a few metrics constant, they study the variability of others. Few such variables that we will be looking at are cost, subscription, risk, return, credit rating, liquidity, volatility & pricing.

3.3.1. Costs

It is important to note that the green bond is issued keeping a certain use in mind, i.e, climate/environmental benefits. Therefore, it is integral that the proceeds are earmarked and are used accordingly for the right purpose. To gain investor confidence as well as justify the right use of funds, issuers must engage in things like third-party certification, regular reporting, sustainability consultant, project tracking system, internal decision making etc. All these factors give rise to additional costs which do not take place in conventional bonds. These costs however may not be very significant and keep the green bonds at par with conventional bonds. (Analysis of Green Bond Financing in the Public Transportation Industry, 2021)

3.3.2 Subscription

In the case of green bonds, they are oversubscribed compared to their conventional counterpart. This is a common observation across all green markets. This happens primarily due to a demand-supply mismatch, as we know the green bond market is pretty small so often demand surpasses the supply leading to oversubscription (Arora and Raj, 2020) According to the CBI's report (H1, 2019) USD green bonds observed an average oversubscription of 4.1 times whereas it was 3.9 times for EURO bonds. In India the situation of the last few years has been tabulated below:

Year	Company	Oversubscription	CARE Rating	Issue size
2016	IREDA	5.1	AA+	Rs.10 bn
2017	REC	3.9	AAA	USD 450 mn
2017	IRFC	3	AAA	USD 500 mn

Source: NAMEETTA NIERAKKAL and BENITA BENNY GREEN BONDS: THE FUTURE OF CLIMATE CHANGE FINANCE IN INDIA

3.3.3 Liquidity

The liquidity of an asset or security is indicative of the ease with which it can be bought and sold in the market without much fluctuation in its price. Research suggests that green bonds are less liquid compared to standard bonds. This again results from its small market size and scarcity of supply & issuance volume. Indicators like bid-ask spreads can also be used to understand liquidity. It is basically the difference between the ask & the bid price of an asset in a market. Wider the spread, the less the liquidity. A comparison between median bid-ask spreads for green and traditional bonds across the USD and Euro markets shows lower liquidity for green bonds which trade at wider spreads compared to their conventional counterparts (Arora and Raj, 2020).

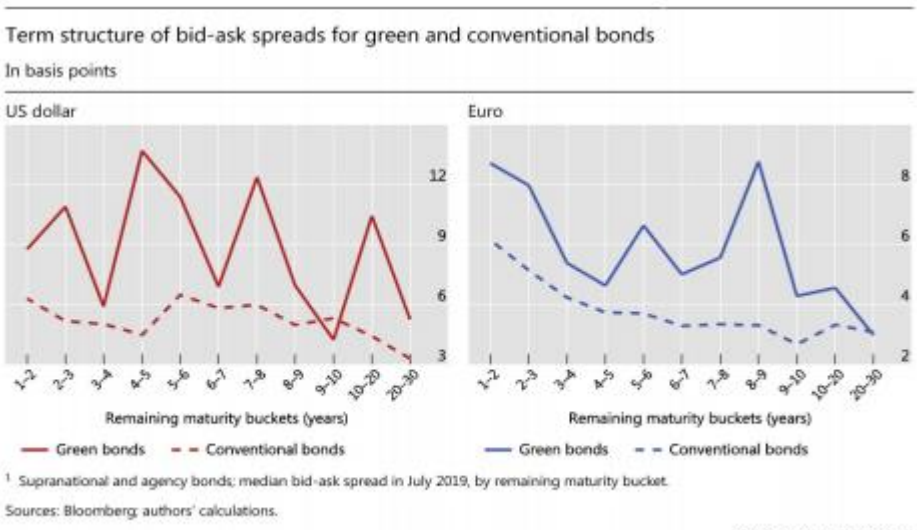


Fig 5. Bid-Ask Spreads of Green and Conventional Bonds (Source : BIS Report)

Source: RadhaArora, Dr Manisha Raj A Comparative Study on the Performance of Green and Traditional Bonds,2020

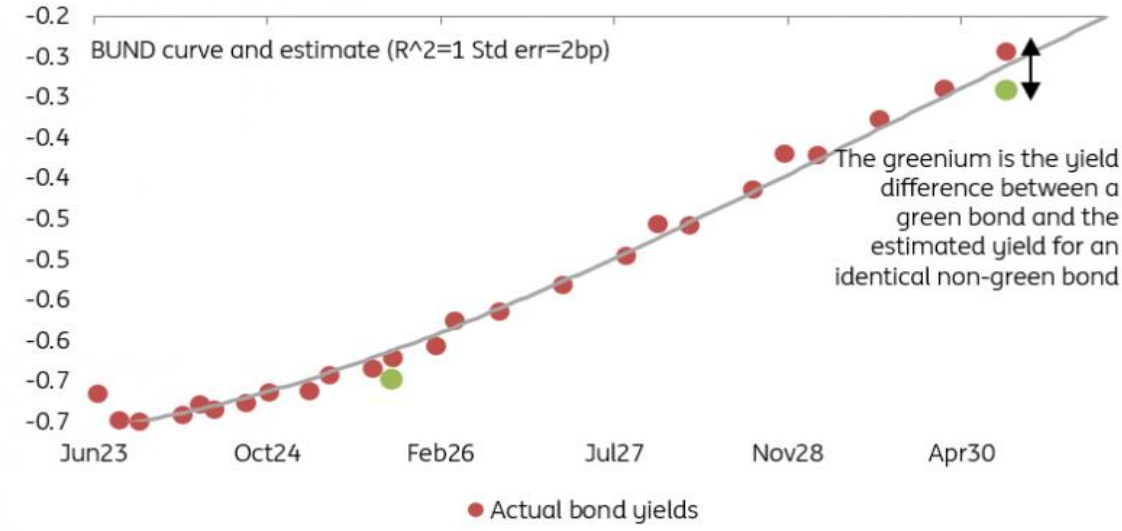
3.3.4 Risk

Credit risk is a risk associated with the borrower defaulting and failing to pay back the principal/interest or meeting the contractual obligations. Green & conventional bonds both have been observed to have identical risk characteristics provided they are from the same issuer. However, due to the nature of the use of proceeds of green bonds, there can be some additional risks due to climate change or environmental threats. There is also an added risk of greenwashing if the issuer fails to prove the ideal use of his proceeds for green projects.
One more kind of risk that can arise is that of clawback/ penalty provision where the issuer will have to pay a penalty if the promised green benefits are not met although such a type of risk is somewhat less common. These additional risks can be mitigated by regular reporting, adhering to green guidelines & maintaining information symmetry with the investors. (Analysis of Green Bond Financing in the Public Transportation Industry, 2021; Arora and Raj, 2020)

3.3.5 Returns

Returns are basically the profits/losses generated in an investment over a period and yield on a bond is a return to the investor in the form of coupon payments. Let's introduce a term here called the green bond premium aka greenium, which labels the yield difference between green & an equivalent conventional bond. A fixed result hasn't been observed in terms of yield difference and most of the research has concluded that both bond yields are usually competitive & comparable(Flammer, 2020; Hachenberg and Schiereck, 2018; Arora and Raj, 2020). Insights from some of the most extensive studies (Larcker& Watts, 2019; Hyun, Park and Tian, 2019) on the subject reveal green bond yields to be comparable to standard bonds in view of an insignificant yield differential observed. That is so to say that the green bond premium can be positive or negative depending upon the market, time, issuer etc. It is important to note that earlier one of the rationales for green bonds included the concept of cheap financing, where we assumed that the investors would be willing to trade off returns for environmental benefits. But this isn't the case as it has been observed that investors expect similar & competitive returns even in green bonds.

Although it is established that in terms of risk & returns there is not much difference between the two bonds, we can't ignore the fact that the green bond market is pretty small and that demand is still greater than supply. Due to this reason oversubscription takes place and thus this opens space for green bonds commanding a premium which can be reflected through lower yields



Source: https://think.ing.com/articles/greenium-bundle-part-4-so-what-is-a-greenium-and-how-do-we-get-to-it

A study says (Arora and Raj, 2020)**,** the US dollar market observed a higher premium of 4 basis points, but the Euro green bonds market observed a negative premium of 12 base points. This is also observed that yield differential narrows over time making the bonds more comparable.

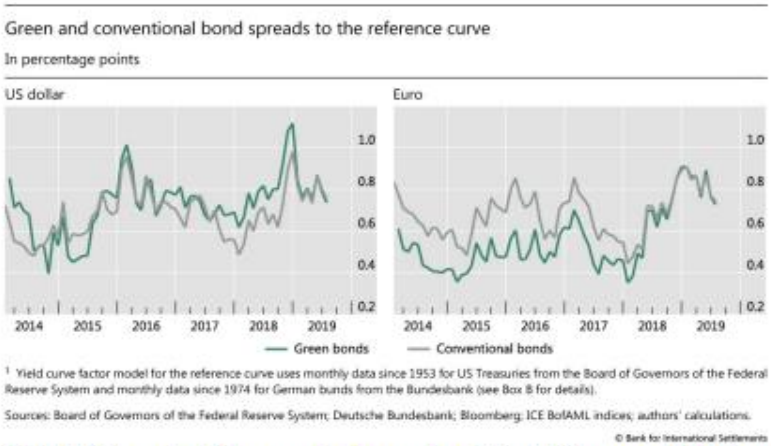


Fig 6.(Yield Spreads of Green and Conventional Bonds (Source : BIS Report)

Source: RadhaArora, Dr Manisha Raj A Comparative Study on the Performance of Green and Traditional Bonds,2020

3.3.6. Credit Rating

A bond rating refers to a scoring mechanism that represents the creditworthiness & quality of a bond. The higher the rating of the bond the safer it is, i.e, the risk of default is less, and the interest offered is also lesser. The bonds with a higher rating are referred to as investment-grade bonds("AAA" to "BBB-") whereas the bonds with a lower rating are called non-investment-grade bonds("BB+" to "D"). Conventional bonds are spread out across all the grades but green bonds before 2017 were mostly found at the lower end of the credit rating spectrum and after 2017 started to spread out more across the various ratings. Currently, in terms of credit rating, green bonds can be found equally among various grades as conventional and thus this shows that green bonds can/ cannot be risky and don't have a default nature. As seen in the graph below, green bonds and conventional bonds have broadly similar credit ratings, with an exception of government-issued bonds in the US dollar market. Majority of green bonds issued in this sector fall in BBB+ to BBB- category (low credit rating). (Arora and Raj, 2020)

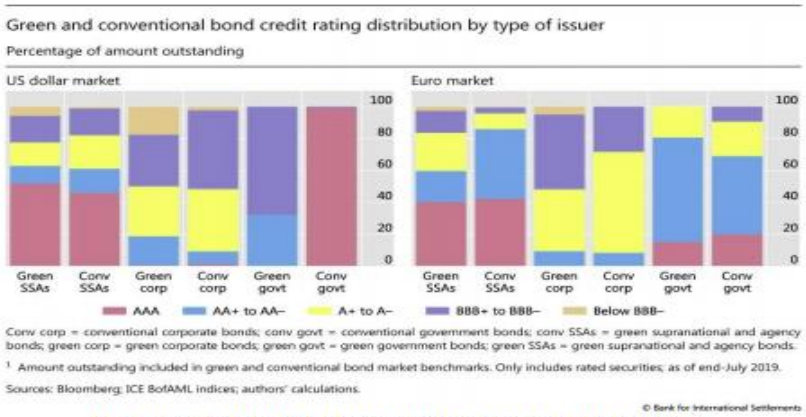


Fig 4. Credit Rating by Issuer Type (Source : BIS Report)

Source: RadhaArora, Dr Manisha Raj A Comparative Study on the Performance of Green and Traditional Bonds,2020

3.3.7 Volatility

Volatility judges the risk associated with security; it primarily is a statistical measure of deviation from the expected return on a security. Pham (Linh Pham et al., 2016) built a framework to model the volatility of a financial asset based on the multivariate Generalized Autoregressive Conditional Heteroskedasticity (GARCH) framework, a family of statistical models originally proposed by Bollerslev (1986) and Engle (2002) and have been widely used in the literature studying the relationship between different financial time series' volatilities (Bauwens, Laurent, and Rombouts 2006). Here we look at two effects:

a) Volatility Clustering effect: This basically refers to the phenomenon of observing clusters of high & low volatility in the green bond market over a fixed interval of time. Using time-series data on daily closing prices of the S&P green bond indices between April 2010 and April 2015, the results from Linh Pham et al., 2016 suggest that there is significant volatility clustering in the green bond market, where periods of high volatility are often followed by further periods of high volatility and periods of low volatility are followed by periods of low volatility. This effect is strongly observed in the case of labelled green bonds compared to their non-labelled and conventional counterparts of similar credit rating

b) Spillover Effect: The green bond market isn't independent of the conventional bond market and vice versa thus establishing a relationship of interdependence between the two. Empirical results show that a shock in the green bond market tends to spill over to the conventional bond market and this spillover effect variable over time (Linh Pham et al., 2016). It also observes an upward trend in the correlation of volatility between labelled green bond & conventional bond market, reasoning with the fact that there exists a convergence of returns between the two.

4. Corporate Green bonds & Corporate Financial Performance

If the issuer is a financial/non-financial corporation & not a government body, then the green bond is called a corporate green bond. For corporations, such issues can be an indicator of their commitment to sustainability. There are however several metrics to judge a corporate's social & environmental performance which will aid the investors to make the right decision, a few of which are the ESG Rating, Corporate Social Responsibility (CSR), post-issuance sustainability reporting etc. In this section, we will explore the concepts of ESG rating & CSR & their effects on a company's financial performance, stock market reaction after green bonds is issued & the impact of sustainability reporting.

4.1 Stock Market Reaction

A lot of studies and research have made observations around the stock market reaction at the time of issuance of green bonds. It has been observed that within a short time frame of the issue/announcement it receives a positive response from the stock market especially for bonds with stronger certifications and first-time issuances (signaling a shift of focus towards

sustainability captivates the market). Moreover, it also receives a positive acknowledgement from the shareholders and observes positive abnormal returns in reaction to the issuer's environment-friendly behaviour. (Flammer, 2020)

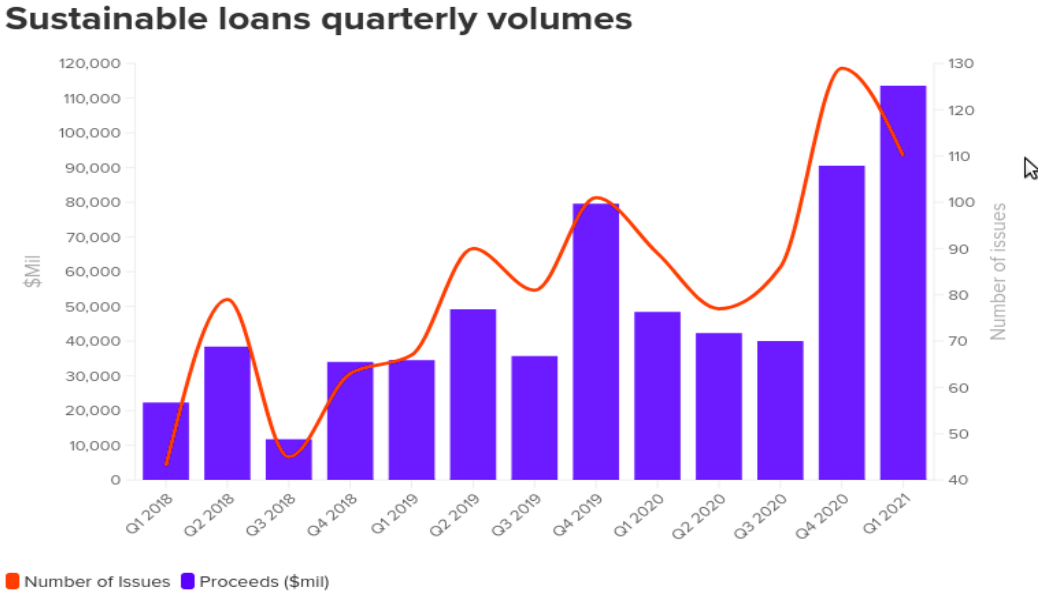
4.2 Corporate Financial Performance

Some studies observed that bonds supported with a good ESG rating observe tighter spreads & better performance compared to their lower ESG counterparts. Moreover, most studies have also reported that there is a non-negative influence of ESG rating and CSR on a company's financial performance. Although the impact of ESG rating & CSR on financial performance hasn't been absolutely consistent it has been positive in a lot of cases and is also known to have added to the image and reputation of companies as climate-friendly and green. (Hachenberg and Schiereck, 2018)

Sustainability reporting by companies is a concept wherein the company integrates their social and environmental performance with their financial performance. The benefits are two-fold: it increases transparency from the side of the issuing company thus reducing informational asymmetry & giving investors more market knowledge & secondly acts as a tracking system to assess the company's performance post-issuance. So incorporating sustainability reporting will give a push to the adoption of green bonds.

4.3 Sustainable finance Market for Corporate issuers

Currently, the sustainable finance market is heavily dominated by European issuers with 62 per cent market share in the first quarter of 2021, followed by America with 18 per cent & Asia with 15 per cent. (Refinitiv, 2021)



Source: Refinitiv Deals Data

5.The Indian Green Bond Market

Currently, a majority of India's energy needs are still sourced by non-renewable sources of energy/ fossil fuels etc. As of 2020, more than 75% of India's energy needs are still met by non-renewable sources of energy (IEA, 2020). In order to shift to renewable/greener sources of energy green projects have to be undertaken on a national as well local scale to ensure a significant transition to environmentally friendly sources of energy. These projects however require a huge investment and the current sources of funding for such projects in India is through commercial bank loans, NBFCs, multilateral organisations, government initiatives such as accelerated depreciation, viability gap funding, tax exemptions, and generation-based incentives**,** contrary to the developed economies where such kind of projects are financed using debt & equity financing. (Prakash and Sethi, 2020).

This poses a problem as the cost of capital is significantly high in this type of funding and it negatively impacts return on any project which is a key consideration for investors in 'green' projects. According to Polzin (2017), the cost of renewable energy projects in India is 24-32% higher than similar projects in developed countries, primarily due to the higher cost of debt in India (Prakash and Sethi, 2020). The high cost of capital disincentivizes the undertaking of such projects & therefore it's important to introduce cheaper sources of financing for such projects in the market.

Given the above context, the question arises that what are the possible sources of financing such sustainable projects in India. Broadly categorizing, there are two types of sources public and private both of which can be further segmented into national and international. For public funds, one point to note is that they are very skewed. A lot of metrics determines their availability. For example, national public funds usually come from government grants or aid institutions or multilateral banks etc (Prakash and Sethi, 2020). Often these funds have a lot of competition in terms of their use and are difficult to obtain, similarly, for international funds, there is again a lot of competition, and it often depends on the socio-political relations as well. This proves that public funds are not a long term & strong solution for financing sustainable projects thus highlighting the need for green financial instruments such as green bonds.

5.1 Green Bonds in India

The Green bond market in India is the second-largest emerging green bond market globally after China. In terms of green projects, the proceeds from green bonds have mostly been used in renewable projects and thus the market hasn't witnessed much diversity in funding across green sectors. Electric Vehicles are an upcoming and growing market in India that requires more alternative sources of financing other than just NBFC & Bank loans & green bonds can have a potential contribution here. Since 2018, Green bonds have constituted only 0.7 per cent of all the bonds issued in India (RBI, 2021). Let's take a look at the sustainable bond issuances in India from 2015 to 2021

Rise of Sustainable Bond Issuances in India

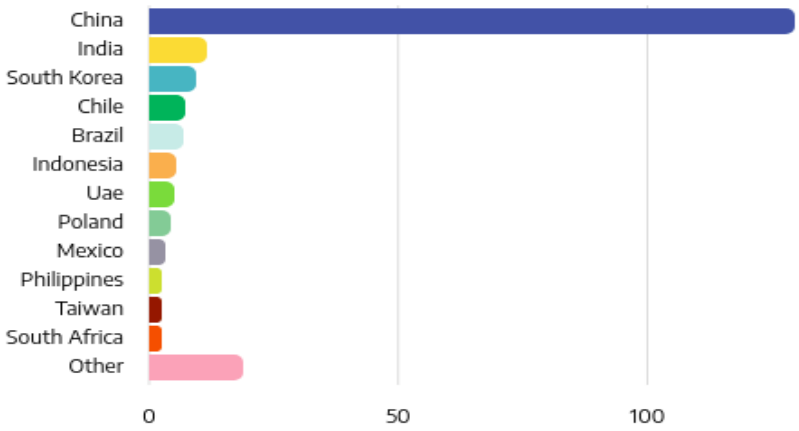
	All Sustainable Bonds		Green Bonds	
Issue Date Totals	Proceeds ($ mln)	"Number of Issues "	Proceeds ($ mln)	"Number of Issues "
CY2021: Jan-May 12	4958.5	12	3525.4	7
CY2020	2330.2	9	450	1
CY2019	4000.5	13	3013.7	8
CY2018	913	6	646.9	1
CY2017	4311.8	25	3168	12
CY2016	1061.1	10	806	3
CY2015	1662.6	13	847.1	2

SOURCE Refinitiv, an LSEG business

Source:https://www.forbesindia.com/article/sustainability-special/green-bonds-sustainable-bonds-demand-picks-up-in-india-in-the-pandemic-era/68141/1

5.2 Green Bond Timeline of India

- In December 2014, The India Green Bonds Market Development Committee (IGMDC) was set up by the Federation of Indian Chambers of Commerce & Industry (FICCI)
- In 2015, India's first green bond was issued by Yes Bank with an aim of raising an amount of US$80 million for solar, wind, biomass & small hydropower projects (Yes Bank, 2018)
- In January 2016, SEBI issued its guidelines for green bond issuers in India (SEBI, 2017)
- The central bank of India RBI announced a string of measures to deepen the corporate bond market in 2016 (SEBI, 2016).
- SEBI provided further clarification on the issuance and listing of green bonds with a circular governing the disclosure requirements, in May 2017 (SEBI, 2017).
- In 2018, the State Bank of India (SBI) entered the Green Bond market with a $650 million certified climate bond.
- In the first half of 2019, India became the second-largest emerging Green Bond market (amongst developing countries) after China with $10.3 billion worth of transactions, as per the Economic Survey 2019-20.
- In October 2019, India joined the International Platform on Sustainable Finance (IPSF) to scale up the environment-friendly investments.



India is the 2nd largest emerging market for green bonds globally

Source: https://www.climatebonds.net/market/data/

Table 3: Green Bonds Issuance Since January 1, 2018 (Corporate and Government: All Maturities)

Country	Amount issued ($Mn)	Number of bond issued	Amount issued as per cent of all bond issuance (per cent)	Number of bonds issued as per cent of all bond issuance (per cent)
Euro Area[1]	1,96,854	594	1.7	0.4
China	63,023	183	0.3	0.2
USA	35,421	71	0.2	0.2
Japan	11,815	88	0.1	1.1
South Korea	11,781	44	1.0	0.4
Central and Southern America[3]	8,869	53	0.5	1.0
India	**7,992**	**22**	**0.7**	**0.3**
South-east Asia[2]	7,208	86	0.6	1.4
Australia and New Zealand	5,878	15	1.1	0.8
UK	5,311	17	0.4	0.5
Hong Kong	4,781	19	0.5	1.0
Singapore	496	9	0.05	1.2

(Source: RBI Bulletin, January 2021)

5.3 Challenges to Green Bonds in India

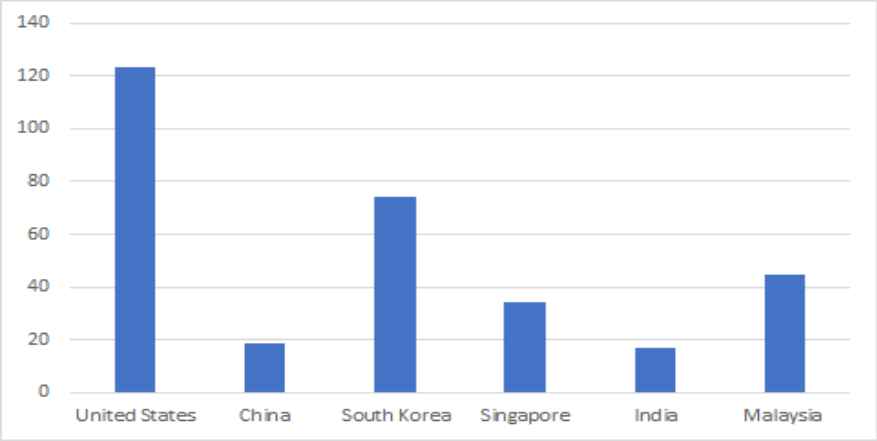
5.3.1 Small Corporate Debt Market in India

The long-term corporate debt market in India is still small as compared to developed economies including a few developing economies as well. Government securities (G-Secs) account for 70 - 75% of the outstanding value of issued securities and 90-95% of the trading volumes in the Indian Debt Markets (IEPF,2019) In terms of maturity and size India's debt market has been lagging and given the distribution of debt securities it majorly incorporates highly rated bonds.

The scenario in the debt market can be traced back to the restrictions placed on institutional investors. (Prakash and Sethi et al., 2020) According to the Companies Act 2015, insurance companies can invest only in public limited companies which closes the door for green bonds typically issued through the special purpose vehicle (SPV) route. Similarly, both pension and provident funds also come under strict guidelines which effectively rule them out as an investor class for green bonds (FICCI, 2016). The restriction of investing solely in corporate bonds with an 'AA' rating, automatically discouraged and eliminated any company with a lower rating from raising capital through a bond issue.

The secondary debt bond market/ the long term debt market in India also lacks depth and suffers from poor liquidity, shallow or short term trading, inefficiencies, limited investor base etc especially in the context of green bonds. In addition to this, Indian entities prefer to issue bonds that are USD denominated over INR denominated because of lower interest rates on USD (2.75%-6%) as compared to INR(7.38%-10.75%) which indicates a higher risk associated with INR denominated bonds arising because of their volatile nature & low liquidity of the secondary debt bond market. (Prakash and Sethi, 2020)

In India, as of 2018, the bond to GDP ratio is at 17.16. In contrast to this, the bond to GDP ratio for countries like the United States is at 123.47, South Korea is at 74.30, Singapore at 34.02 and Malaysia at 44.50 (RBI, 2018)



Bond to GDP Ratio of countries
Source: Crisil-Assocham Report (January 2018) and IMF Private Debt Database.

5.3.2. Low credit rating

Green bonds in India suffer several challenges and one of them being a low credit rating which increases their risks and limits a lot of institutional investor investment. Certain measures have been adopted to tackle this, one of them being credit enhancement. Credit enhancement is a technique to improve the risk profile of a company and reduce its default risk. (Prakash and Sethi et al., 2020) India took its first step in this direction by allowing its banks to provide partial credit enhancement for corporate bond issues up to 50% of the issue size for infrastructure projects (RBI, 2016). An implemented example of credit enhancement is India Infrastructure Finance Company Ltd. (IIFCL) partially guaranteeing the green bond issue of ReNew Power. This innovative structure enhanced the bond issue's rating from BBB to AA+, making it attractive for institutional investors.

5.3.3. Private Placements & Oversubscription

The problem of oversubscription of green bonds is prevalent in India as well due to a demand-supply mismatch. The corporate debt market is already small compared to other economies and additionally, the contribution of green bonds is even lesser which leads to bonds being oversubscribed.

Another issue in the market is that of private placements of green bonds reducing the investor base & public awareness as well public investment. A lot of green bonds are subscribed through private placements eg: (Nierakkal and Benny et al., 2021). SBI issued USD 100 million worth of green bonds in 2020, all of which were issued through private placements (Economic Times, 2020). Yes, Bank in 2015 issued green bonds out of which a total of USD 100 million was again issued through private placements (Yes Bank, 2018). This issue is arising due to two reasons:

1) Lack of issuer interest: Public placements are tedious jobs for issuers because of stringent rules for documentation and disclosure because of which they find it easier to issue bonds through private placements
2) SEBI guidelines: SEBI has made it compulsory for green bond issuers to issue initially through private placements and depending on its success opt for public placements later

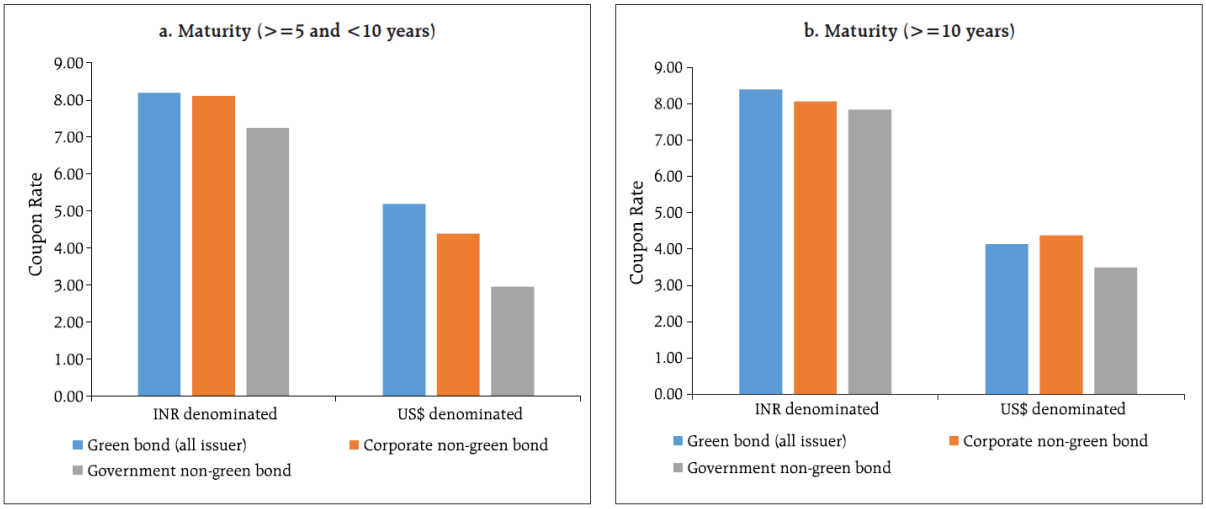
This in turn is affecting the liquidity of green bonds as investors are holding it till maturity thus affecting the trading in the secondary market.

5.3.4. Borrowing Costs

The cost of issuing green bonds has generally remained higher than the conventional bonds in India. A recent RBI study (RBI bulletin, January, 2021) shows that the average coupon rate for green bonds issued after 2015 with 5-10 years maturities have been higher than the comparable corporate and government bonds. One can see similar pattern emerging in INR denominated

green bonds. However, for the US$ denominated green bonds the yields have been lower than corporate bonds.

Average Coupon Rate (per cent) for Bonds Issued



(Source: RBI Bulletin January 2021)

6. Policy Provisions to push the adoption of green bonds

To push the issuance of green bonds in the market, several policies have been incorporated or suggested by respective authorities let's take a look at a few of them.

6.1 Tax Incentives to Issuers

Tax payment gives a sense of loss of income to both the issuer and investor, if tax incentives are provided or incorporated in national policies especially for green bonds not only will it lead to increased issuance & investment but also provide green bonds with a competitive edge over their conventional counterparts. These incentives can be provided in a variety of ways.

6.1.2 Direct Subsidy Bonds

The name itself hints at the fact that the bonds will be subsidized by the government over interest payments (Nierakkal and Benny et al., 2021). Qualified Energy Conservation Bonds in the US where the program allows for the issuance of tax credit bonds by municipalities for the purpose of clean energy, where approximately 70% of the coupon is provided by a tax credit or subsidy to bondholder from the Government (Climate Bonds Initiative, 2018).

6.1.2 Tax Credit Bonds

Here the issuers aren't required to pay the interest payments to the investors as the investors receive tax credits instead. The above-mentioned example of Qualified Energy Conservation Bonds in the US applies here also.

6.1.3 Tax-exempt Bonds

As the name suggests the investors are exempted from paying taxes on the interests that they receive on green bonds. This type of tax exemption green bond was issued in Brazil for wind energy financing (Climate Bond Initiative, 2018)

6.2 Improving risk-return profile of Green Bonds

Due to the small market and long-term nature of projects along with the risk of greenwashing and information asymmetry, green bonds can prove to be a risky investment. Therefore, policies should also focus on risk reduction as well as improving the risk-return characteristic. Some tools that have been used to counter this are:

6.2.1 Guarantees

To reduce the risk of greenwashing & improve credibility, third-party certifications by appropriate authorities like government or sustainability-focused entities like investment banks, etc can be added to the issue. This will improve investor confidence in the issuance. (Nierakkal and Benny et al., 2021) The European Investment Bank's project bond initiative provides credit enhancement for bond issuance to address the policy objectives of the EU's Connect Europe Program (Climate Bond Initiative, 2019).

6.2.2. Insurance

This will act as a guarantee to the investors in case the issuer defaults. The interest payments will then be made by the insuring entity like the government or a green bank.

7. Challenges to the green bond market

7.1 Information Asymmetry

A major challenge in the green bond market is that of information asymmetry as the investors/ the public have lesser material knowledge regarding the investment/ issue compared to the issuing company. This leads to a knowledge gap and thus riskier investments as the entire nature of the project /company performance are not known thus reducing transparency.

To tackle information asymmetry for green bonds particularly certain measures can be adopted like certifications, sustainability reporting by companies including disclosures to ESG related risks, Corporate Social Responsibility etc

7.2 Green taxonomy

Green taxonomy basically refers to labelling bonds as green if they meet certain criteria, i.e, it refers to a definition of green. But this definition is still unclear in a lot of markets setting unclear boundaries. This again becomes an issue for both the investor as well as an issuer as they struggle to define the nature of investment/project and are not aware whether it falls under the umbrella of green or not.

To be more precise, governments can implement policies/ documentation which define a project/investment to be green if they tick certain boxes at the same existing green institutions/ new institutions especially for this purpose can be set up for identification and approval of a green project.

7.3 Lack of Public awareness

The green bond market is still small in a lot of economies and thus awareness related to it is also less. The public isn't aware of the nature of green projects/investments or the intricacies surrounding them due to which the investor base becomes skewed and opportunities are lost on both sides

It is important that the public be made aware of these projects and the corresponding details & their market knowledge be increased. Availability & disclosure of data, as well as incentives to invest, will help in increasing public awareness & investment

7.4 Lack of standardisation

A lack of appropriate green bond frameworks and guidelines makes it difficult for companies to go ahead with the issue of green bonds. Although some international standards have been set up like the ICMA & CBI guidelines, it is still important that national governments formulate specific frameworks & policies according to their markets to push for an easier and clear issuance of green bonds

7.5 Identifying the opportunities

A lack of identified bankable projects and green project pipelines is also an issue. The first step of any investment is to identify suitable projects. Similarly, it is important to identify appropriate and important green projects which would help companies/governments meet sustainable goals

7.6 Cost of issuing

As green bonds provide funds that are very particular in their use i.e, financing green projects credibility is required. This calls for additional costs in the form of certifications, reporting,

administrative costs etc. To balance off these costs, certain initiatives in the form of providing credit enhancements, tax incentives, aggregation and securitization options etc can be taken up by governments and green institutions/banks.

8. Conclusion

This paper provides an overview of the green bond market. It first examines the impact of climate change throughout the world and the resulting economic losses that followed, highlighting the need for more climate-friendly projects and thus a more suitable and accessible form of financing for various institutions. This shows that green bond adoption is set to grow even more as governments and corporations throughout the world are trying to reduce the negative impact on climate.

Secondly, we look at certain parameters surrounding the green bond market including a rough timeline of growth & history, types of bonds and the taxonomy involved. We observe that in the last 5 years green bonds have grown tremendously across various markets and are expected to keep growing at a fast rate. The green bonds themselves are segregated into various types depending on their use case. We also observe the importance of having guidelines and standard definitions to provide more clarity on green bond issuances. Although there are certain international standards set, there is still a need for more national and local frameworks to carry out the broad-scale implementation of green bonds

Thirdly, we try to understand the rationales behind issuing green bonds, their relationship with corporate performance and comparison with conventional bonds. Out of the three rationales discussed, the most acceptable one was that of signaling, i.e, issuers want to signal their commitment towards climate-friendly projects. In comparison to conventional bonds, for most of the metrics both of them are very competitive and are on a similar level, highlighting that green bond will be able to compete with conventional bonds and be at par. For corporate performance, we observed that green bond issuances generated a positive stock market reaction and as a result of good ESG, CSR and regular sustainable reporting also observed improved investor confidence.

Lastly, we looked at the Indian green bond market, challenges, and policy implementations for the general green bond Market. Although India has emerged as the second-largest emerging green bond market it still has a long way to go as most of the projects are still funded by conventional sources of financing. The green bond market across the world faces a lot of challenges and effective implementation can take place through proper government support and policies to increase awareness, market knowledge, clarity and incentivizing issuers as well as investors to adopt green bonds.

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