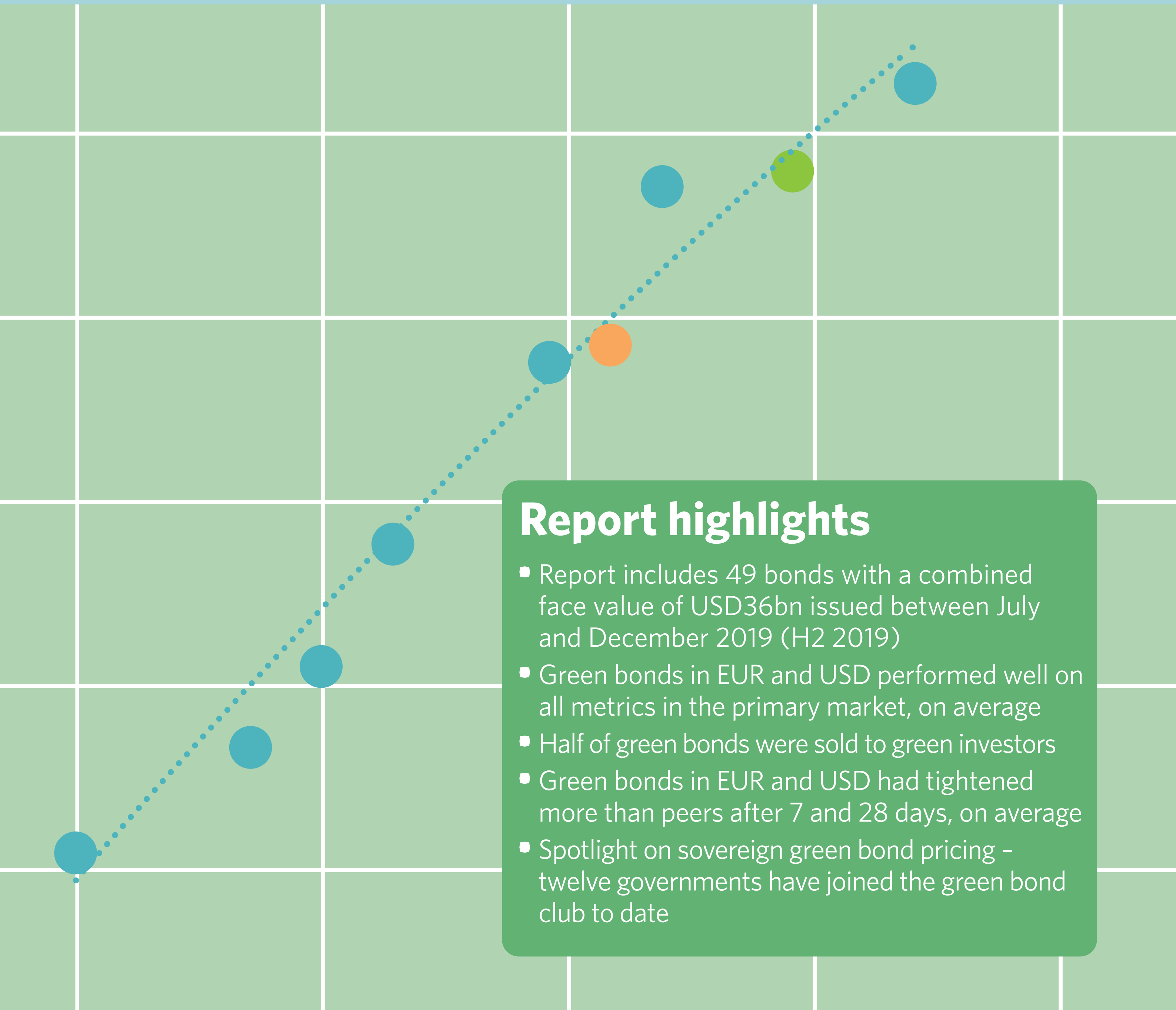
GREEN BOND PRICING IN THE PRIMARY MARKET:

July - December 2019

H2 (Q3-Q4) 2019



Report highlights

- Report includes 49 bonds with a combined face value of USD36bn issued between July and December 2019 (H2 2019)
- Green bonds in EUR and USD performed well on all metrics in the primary market, on average
- Half of green bonds were sold to green investors
- Green bonds in EUR and USD had tightened more than peers after 7 and 28 days, on average
- Spotlight on sovereign green bond pricing – twelve governments have joined the green bond club to date

Climate Bonds INITIATIVE

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LYXOR Asset Management SOCIETE GENERALE GROUP

With funding support by Obvion Hyptheken and Lyxor Asset Management

Introduction

This is the ninth report in our pricing series, in which we observe how green bonds perform in the primary markets. This report includes bonds issued in the latter six months of 2019 (H2 2019).

Our methodology is designed to capture the most liquid portion of the green bond market and is therefore limited to USD and EUR bonds with a minimum original issue size of USD500m. We include developed market (DM), emerging market (EM) and supranational issuers (SNAT).[1] The full methodology is explained on page 21.

During this period, USD132bn of green bonds were included in the Climate Bonds Green Bonds Database. This paper includes 27% of that amount, or USD36bn, split between 49 green bonds from 46 issuers. EUR is the dominant currency with 36 bonds totaling USD26bn (EUR23.5bn), while 13 USD denominated bonds had a combined issue size of USD10bn.

Report highlights

- **Green bonds achieved a higher book cover and spread compression than vanilla equivalents, on average.**
  See more on page 3
- **Half of green bonds were allocated to investors describing themselves as green**
  See more on page 6
- **We built yield curves for 19 bonds in our sample, of which just three priced with normal new issue premia.**
  See more on page 7
- **Seven and 28 days after pricing green bonds had, on average, tightened more than vanilla baskets and matched indices.**
  See more on page 12
- **Twelve governments have joined the sovereign green bond club and a similar number have stated their intention to do so. We shine a spotlight on sovereign green bonds in a special feature.**
  See more on pages 14

1. Market developments

In the second half of 2019, the hunt for yield created strong demand for all types of bonds globally. Between January and October 2019, the ECB did not allocate new capital to its asset purchase programme (APP) but continued to reinvest the proceeds of maturing debt. In September 2019, it announced an extension of the APP giving extra momentum to qualifying assets.[2] As a result, from November 2019, net asset purchases were resumed at a rate of EUR20bn per month for as long as deemed necessary to reinforce the expansionary nature of the ECB's policy rates. The APP includes corporate, public sector, asset-backed, and covered bonds. As before, banks were excluded, but car companies, whose financial arms have banking licenses, were not. Insurance companies were also eligible. This technical support undoubtedly added to the demand for eligible EUR green and vanilla bonds alike.

Meanwhile, in the US, the Fed. cut rates three times: in July, September, and October, to 'sustain the expansion' of the US economy.[3] USD corporate bond yields consequently remained low throughout the second half of the year.

Thirty qualifying issuers revisited the green bond market in H2 2019 each with a single bond. **KfW** celebrated five years as a green bond issuer as its first bond, issued in 2014, matured. KfW updated its Green Bond Framework, and issued its first USD green bond under the new framework a USD2bn maturing in 2029.

A total of 17 issuers joined the green bond market during the observation period. Thirteen of those issued financial corporate green bonds including **Generali** 2030 (SSUB) which was the first financial corporate green bond in the senior subordinated category. One debut issuer was classified as SSA, and four were utilities, including **E.ON** that issued a two tranche deal with five- and eleven-year maturities. E.ON 2024 became the first BBB-rated corporate bond to price through swaps.

Other bond labels

With the growth of the sustainable finance agenda, the labelled bond market has diversified beyond green bonds. The issuance of **sustainability and social bonds** has increased rapidly since 2018. The Climate Bonds Initiative (Climate Bonds) supports the Sustainable Development Goals (SDGs) and sees green bonds as directly contributing to achieving specific SDG outcomes, especially in relation to SDGs 6, 7, 9, 11, 13, 14 and 15.

However, Climate Bonds remains focused on green bonds, which are specifically linked to climate change mitigation, adaptation and resilience. Consequently, under other labels, the proportion of proceeds allocated to projects which are not also green may not exceed 5% for inclusion in Climate Bonds' main labelled Green Bond Database. As of the end of December 2019, labelled instruments that focus on contributing to non-climate related SDGs amounted to USD85.1bn.[4]

With close to 30-years of experience lending to finance sustainable projects, **Deutsche Kreditbank** has a large loan portfolio which it can pass on to investors via the capital markets. So far, it has issued four EUR500m bonds with sustainability-related labels. The programme started in 2016 with a 5-year green bond, followed by a 7-year green bond in 2017, both of which were senior unsecured. In September 2018, Deutsche Kreditbank introduced a separate social bond programme. The first bond from the new programme was a 10-year covered bond with the use of proceeds split between social housing, public supply, health and care, education, and research. In October 2019 the 10-year blue social covered bond was launched to refinance loans given to urban, local, or regional water supply, and sewage companies. This bond (**DKB 2029 (CO)**) was included in the Climate Bonds Green Bond Database because 100% of the proceeds were earmarked for water and wastewater projects, which are included in the Climate Bonds Taxonomy.

Remarks:

- Based on Moody's and S&P credit ratings, a broader range of seniority rankings for financial corporate green bonds were observed in 2019, including more examples of the Senior Non-Preferred label. Seniority rankings were denoted using the following abbreviations: Senior Preferred = SP, Senior Non-Preferred = SNP, Senior Subordinated = SSUB, Senior Unsecured = SU. We have also denoted Covered bonds as CO. As per our standard methodology, we match the payment rank of the green bond when selecting appropriate vanilla bonds with which to compare the performance.
- **Ferrovie 2026** is compared to BBB consumer discretionary which is consistent with how we treated the first FERROV bond issued November 2017.
- We have excluded social bonds (where known) from comparable baskets. We suspect, though have not yet tested, that investors attach a value to this label.

2. Spread compression and book size: Green bonds in both EUR and USD attracted larger book cover, and exhibited greater spread compressions, than vanilla equivalents

- **EUR:** Average oversubscription was 2.8x for green bonds, and 2.0x for vanilla equivalents. Spread compression averaged 13.3bps for green bonds and 12.9bps for vanilla bonds.
- **USD:** Average oversubscription was 2.7x for green bonds and 1.9x for vanilla equivalents. Spread compression averaged 13.7bps for green bonds and 11.0bps for vanilla bonds.

Green bonds are oversubscribed, and experience spread tightening as part of the pricing process, just like vanilla bonds. To help determine whether investors attach any value to the green label, we compare green bonds to carefully selected vanilla equivalents.

In November 2019, Climate Bonds published the results of its first Green Bond European Investor Survey, which identified actions that could accelerate the growth of the green bond market, both in Europe and globally.[5] The results of the survey indicated a shortage of green bonds, with 67% of respondents overweight the market. non-financial corporate and sovereign issuers represented a substantially lower share of currently available bonds compared to stated demand from respondents, almost two-thirds of which said they prefer green bonds where available, and competitively priced. The results of the survey repeatedly emphasised that there is unmet demand for green bonds.

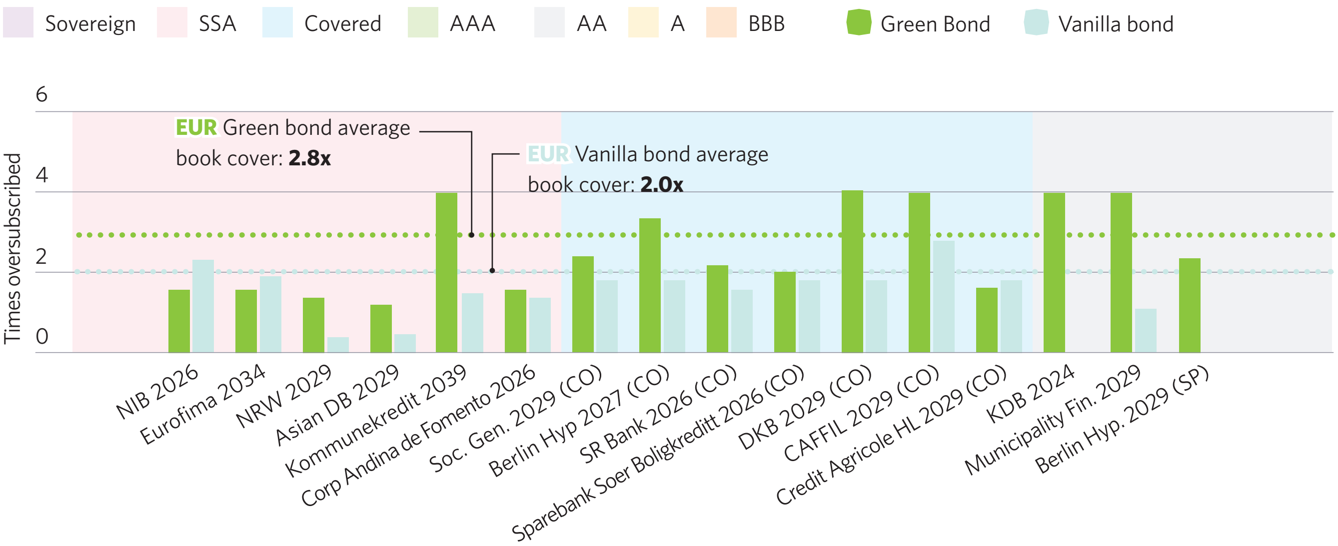
In the first half of 2019, oversubscriptions and average spread compressions were the largest since we started monitoring them in 2016. In H2, these metrics largely returned to levels similar to those previously seen, though with notable exceptions such as Santander 2029 (SP), and Stedin Holding 2029 in EUR, and Welltower 2029 in USD. On average, green bonds in both EUR and USD achieved greater book cover, and experienced larger spread compression than vanilla equivalents.

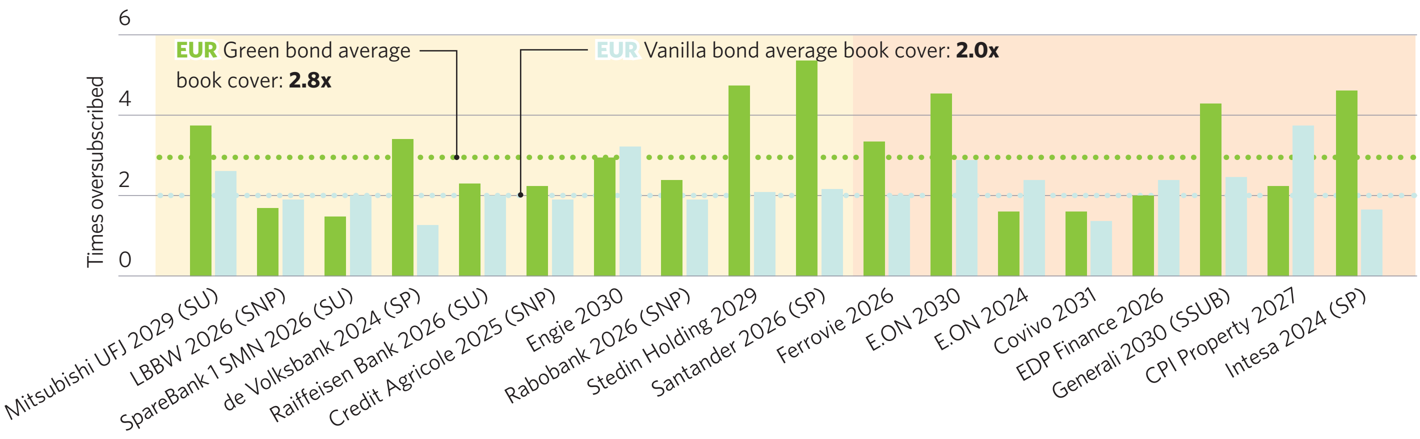
EUR green bond pricing

Two thirds (65%) of EUR green bonds achieved larger book cover than vanilla equivalents. Three EUR green bonds experienced the same spread compression as comparable vanilla baskets, while more than half (55%) of the remaining green bonds tightened more than their counterparts.

Book cover Two first-time green bond issuers, Santander 2026 (SP) and Generali 2030 (SSUB) both performed well on all metrics starting with book cover of 5.4x and 4.3x respectively. Both achieved larger spread compression than vanilla equivalents, and then tightened by more than their comparable baskets and indices in the immediate secondary market. The Generali bond was the first green tier two capital bond, while the Santander transaction offered a larger than usual size (EUR1bn) for a financial green bond. Generali 2030 (SSUB) priced inside its own yield curve. There were not enough bonds to build a yield curve for Santander.

22 out of 34 EUR green bonds attracted higher book cover than vanilla equivalents





Spread compression E.ON, which is in the BBB rating category, printed a EUR1.5bn (USD1.7bn) two-tranche deal split into 2024 and 2030 maturities, divided equally, with proceeds earmarked for renewable energy. E.ON 2030 achieved spread tightening of 37.5bps the largest observed since we started monitoring in 2016. E.ON 2024 managed 30bps of tightening and priced at 15bps through mid-swaps becoming the first bond in the BBB rating category to price with a negative yield, green or otherwise. We could not construct a yield curve for E.ON as the number of bonds was insufficient.

NB1: We were unable to source book cover data for two EUR bonds: China Construct Bk 2022 and Ned. Water 2034. They are thus not shown on the book cover charts. **NB2:** There were no comparable bonds for KDB 2024 or Berlin Hyp. 2027 (CO). However, since the green bonds themselves did have data, they are charted.

USD green bond pricing

In USD, four out of six green bonds for which we had both green and vanilla data points attracted larger book cover than vanilla baskets. Eleven out of 13 green bonds achieved larger spread tightening compared to vanilla equivalents.

Book cover Debut green bond issuer, Welltower 2027, had the largest book cover among USD green bonds at 5x, but there was no book cover data for the comparable bonds.

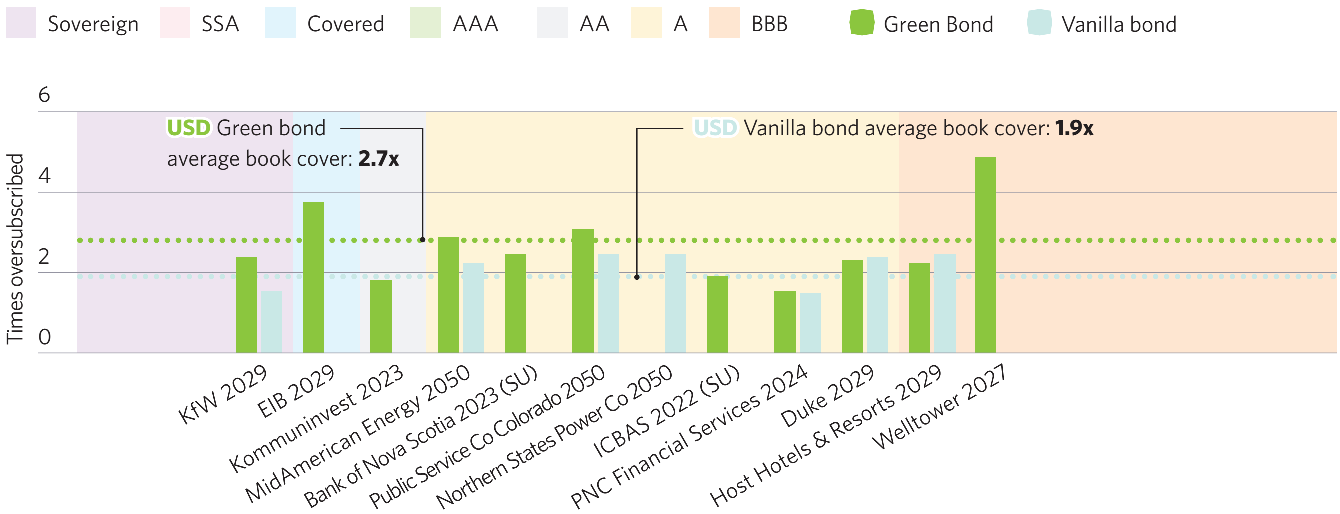
Spread compression All corporate green bonds in our sample tightened by at least 15bps. Welltower 2027 and seasoned green bond issuer ICBAS 2022 (SU) achieved the largest spread compression (25bps) among the USD denominated green bonds. ICBAS tightened 15bps more than its comparable basket.

Both EUR and USD green bonds appear to have performed well compared to vanilla peers during the book building phase. Demand remains robust, and as long as there is a shortage of green labelled bonds, we expect this to continue.

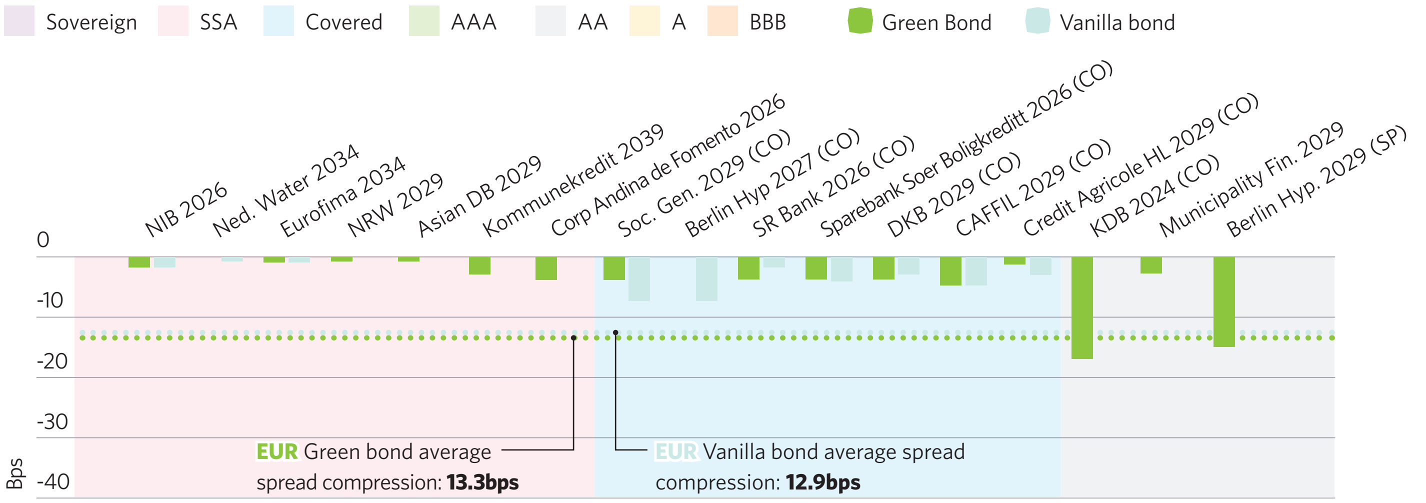
NB1: We were unable to source book cover data for two USD bonds: EBRD 2024 and Northern States Power Co. 2050. The bonds are not charted. **NB2:** There is no book cover data for the comparable baskets of five USD green bonds: EIB 2029, Kommuninvest 2023, Bank of Nova Scotia 2023 (SU), ICBAS 2022 (SU), and Welltower 2027. As the green bonds themselves did have data, they are charted.

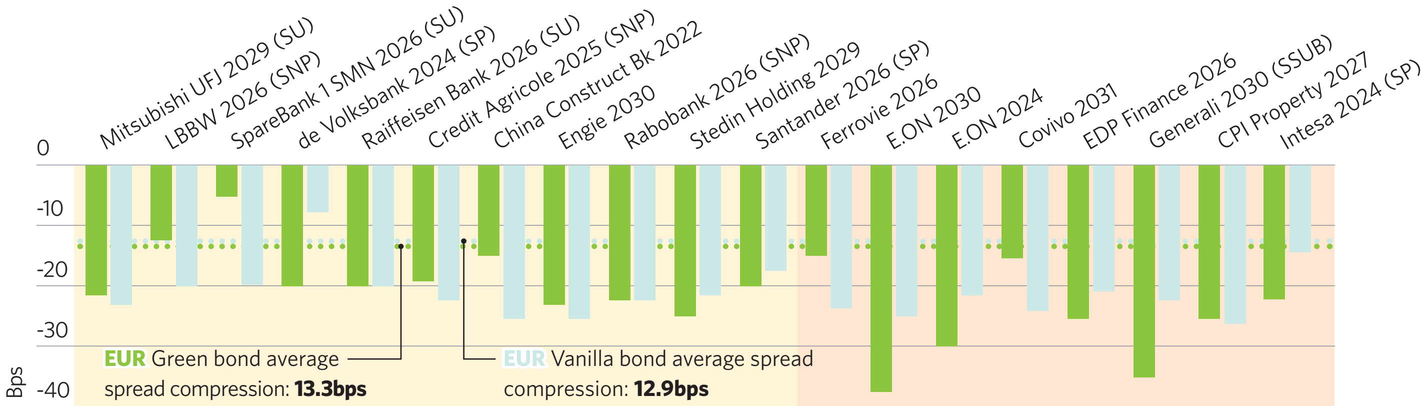
Methodology notes: Baskets comprise bonds that most closely match the green bonds and are issued during the same quarter. The baskets in this publication include between one and five bonds. For an explanation of the methodology, see page 21, and for summary statistics of the baskets, see page 18.

Four out of six USD green bonds attracted higher book cover than vanilla equivalents

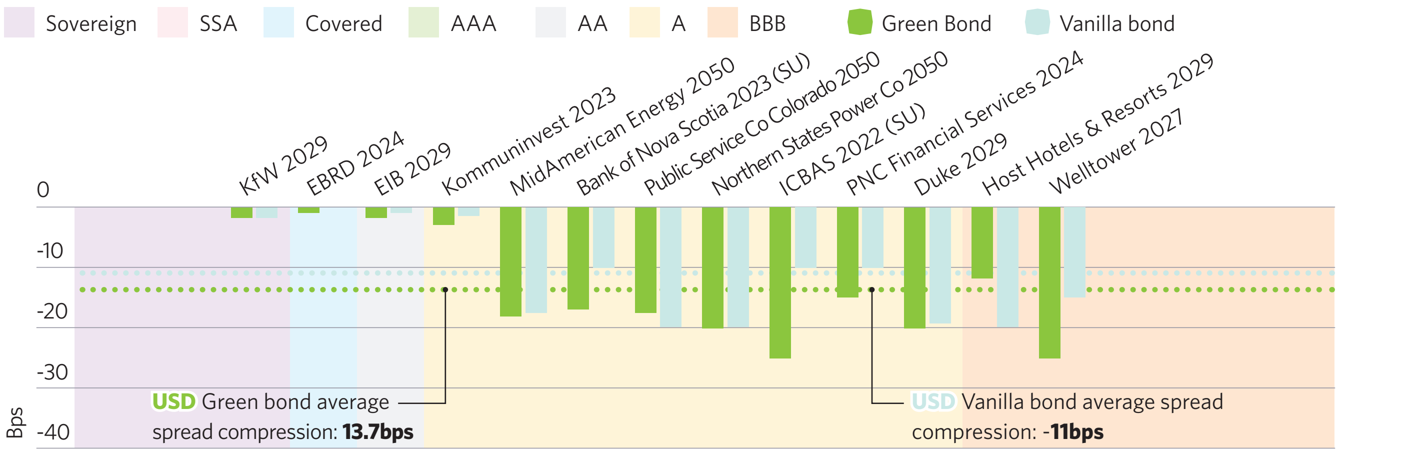


Five EUR green bonds tightened by the same as, and 16 tightened more than vanilla baskets during the pricing process





Eleven out of 13 USD green bonds tightened by more than their vanilla baskets during the pricing process



3. Green allocations: Half of green bonds in our sample were allocated to investors describing themselves as green

- 50% of the amount raised from green bonds in our sample was allocated to investors labelling themselves as green or socially responsible.

Investors declaring themselves as green are growing in number and represent a unique source of support for green bond issuers, contributing to the squeeze in demand for green bonds. Treasurers almost always describe the inclusion of new investors as an intangible benefit of issuing green bonds.

Pricing remains a critical consideration, and US-based investors including those describing themselves as green, are particularly sensitive to price tightening in the primary market. One US issuer we contacted mentioned that its bond attracted a mixture of green and vanilla accounts during book building, but the green investors were the first to withdraw as pricing was tightened.

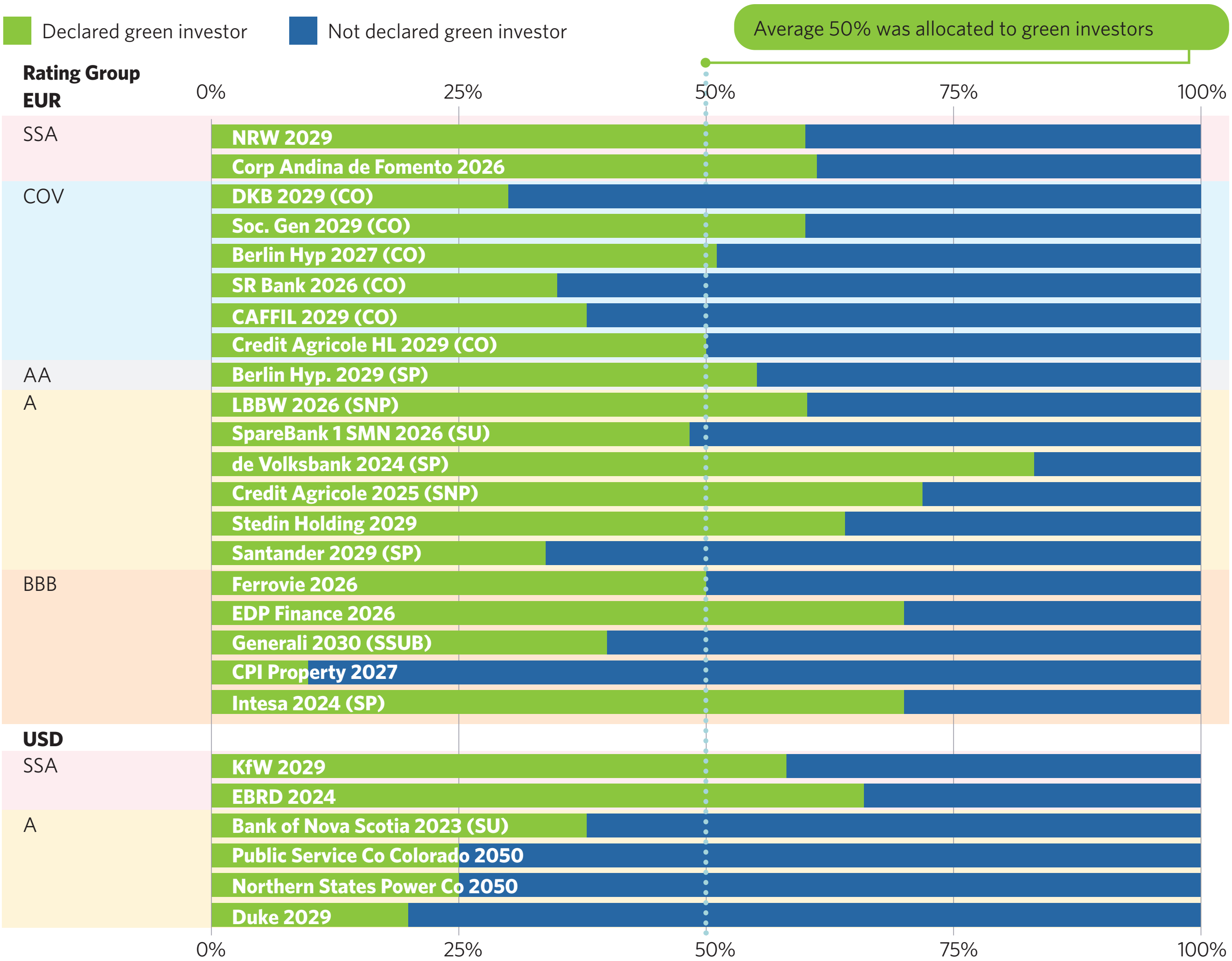
Benchmark sized green bonds which are are eligible for inclusion in broad market bond indices, as well as specialised green bond indices, are increasing in number. The inclusion of green bonds in broad market indices means that mainstream investors are obliged to consider them along with vanilla bonds. Overall, the 50% allocation to investors describing themselves as green in our sample translates into USD10bn of green bonds allocated to green accounts, with a similar amount bought by non-dedicated investors.

All 47 issuers (E.ON SE and Xcel Energy issued two bonds each) in our H2 2019 sample were contacted and invited to disclose the percentage of their green bond that was allocated to investors describing themselves as green or socially responsible. Of the 36 issuers who responded, 25 replied with the allocation split between issuers who described themselves as green, and those who did not. A further nine did not want to share the distribution data. One did not know, and one disclosed this but asked for the number to be kept confidential. Among the issuers that did not state a precise split, several noted the high participation of investors with a green or ESG mandate.

As always, respondents to this question emphasised that they had used their best efforts to classify their investors. Berlin Hyp, for example, noted that its definition of Socially Responsible Investors used to determine the 51% allocation, included pure green bond investors, as well as those with ESG requirements. By December 2020, the first set of screening criteria for the EU green bond taxonomy will provide clear definitions for green and sustainable assets. These requirements will make it easier to define the exact nature of a green investor. Eventually, we hope that all bond investors will actively preference green bonds as part of their investment strategy.

Methodology notes: Green investor participation is provided by issuers. There is no methodology for defining a ‘green’ investor and we acknowledge that this is subject to interpretation. There is no way to monitor how investors split their allocations of green bonds among their different portfolios.

Half of green bonds were allocated to green investors



4. The greenium: 16 out of 19 green bonds priced on or inside their yield curves

The new issue premium is the extra yield that a buyer receives, and a seller pays for a new bond compared to where seasoned bonds from the same issuer are trading in the secondary market at the time of issuance. A new issue premium is a standard feature of the bond market.

Sometimes, a bond may be issued with a higher price, and thus lower yield compared to outstanding debt. The bond will price inside its own yield curve. This is known as a new issue concession; when present in a green bond, we have termed it "greenium".

There is no reason why a bond being green should impact its price, since green bonds rank pari-passu (on equal footing) with bonds of the same rank and issuer. There is no credit enhancement to explain pricing differences and issuers of green bonds incur costs such as third-party review and certification, although these are typically negligible. Green bonds and vanilla equivalents are subject to the same market dynamics such as supply, rate expectations, and geo-political issues.

In H2 2019, we were able to build yield curves for 19 out of the 49 bonds in our sample, eight of which had already issued green bonds sharing similar characteristics.

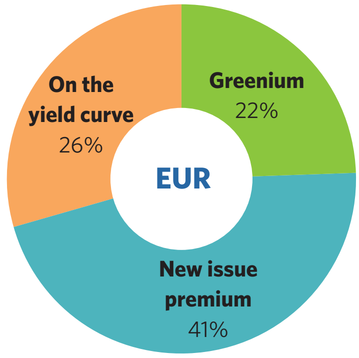
A limitation to building more yield curves was presented by the various payment or seniority rankings of the green bonds in our sample.

Among our set of 19 green bonds, just three priced with normal new issue premia while eight priced on the yield curve. Seven priced inside their yield curve, exhibiting a greenium: in EUR, Municipality Fin. 2029, EDP Finance 2026, Generali 2030 (SSUB), and CAFFIL 2029 (CO). In USD, EIB 2029, MidAmerican Energy 2050, and Duke 2029.

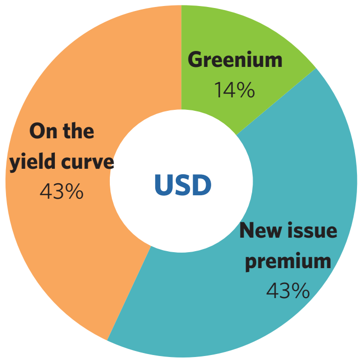
Since 2016, we have built yield curves for 89 EUR, and 44 USD green bonds (noting the limitations of constructing yield curves for bonds in our sample). The outcomes are shown right. Slightly under half of each currency category priced with the traditional new issue premia while just over half priced either with a greenium, or on the yield curve.

The sample remains small and there is fragmentation among credit ratings and issuer types. Furthermore, the number of investors actively seeking the green label has increased over the period of observation which is likely to have impacted pricing dynamics of green bonds. We plan to explore this topic in greater depth in the coming months.

EUR green bond pricing outcomes 2016-2019



USD green bond pricing outcomes 2016-2019

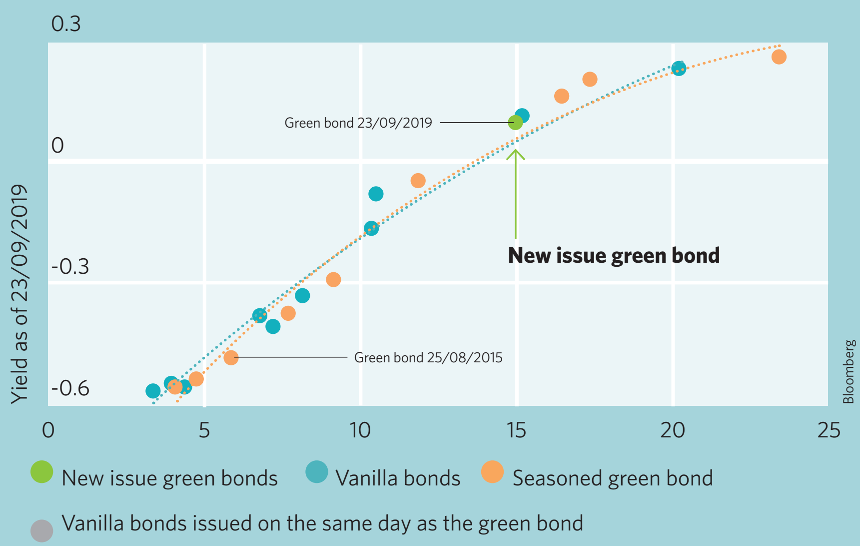


Spotlight on Ned. Water

For Dutch development bank Nederlandse Waterschapsbank (Ned. Water) we have constructed an EUR social bond curve with eight data points, and a vanilla curve with ten data points. The curves do not appear to be differentiated. Ned. Water also has two outstanding green bonds

The red dots are the bonds issued under the social label; blue are the vanilla bonds. While the curves have been plotted independently, they are intertwined, probably because Ned. Water has a focus on water and sustainability and all projects are strictly filtered for their social and environmental impacts. However, the green bond priced in 2015 appears to be trading slightly tight in the secondary market, suggesting that investors do attach value to the green label, which is likely enhanced by the lack of supply of green bonds. The new green Ned. Water 2034 bond, from September 2019, priced just inside an older, 2036 maturity, vanilla bond.

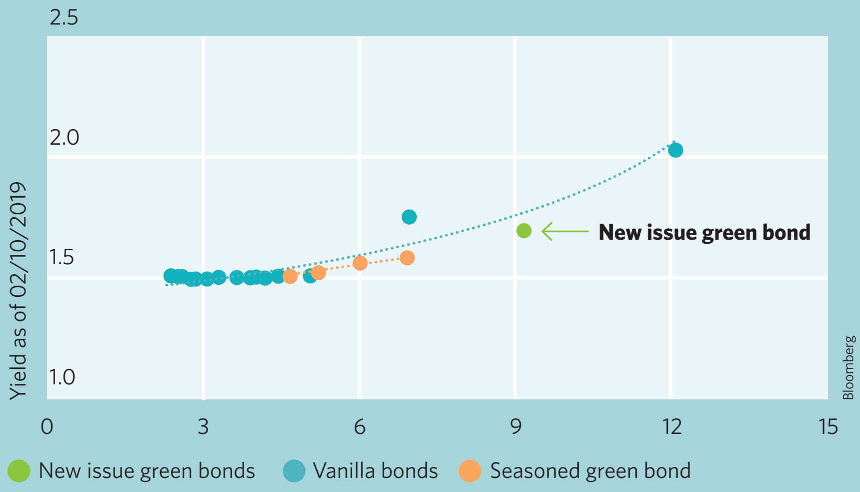
Ned. Water 2034 EUR - new issue premium



Spotlight on EIB

As of the end of 2019, EIB had issued 45 labelled green bonds in 13 currencies.[6] We constructed an EIB USD secondary market green curve consisting of four bonds, and a vanilla curve including 15 bonds. The EIB 2029 USD priced on the green curve, but with a greenium to the vanilla curve. In H1 2019, we looked at the EIB 2042 EUR, which priced in the same way. In both currencies, it appears that EIB's green bonds were being priced relative to its green curve, at a discount to its vanilla curves.

EIB 2029 USD - on the green curve, greenium to vanilla curve

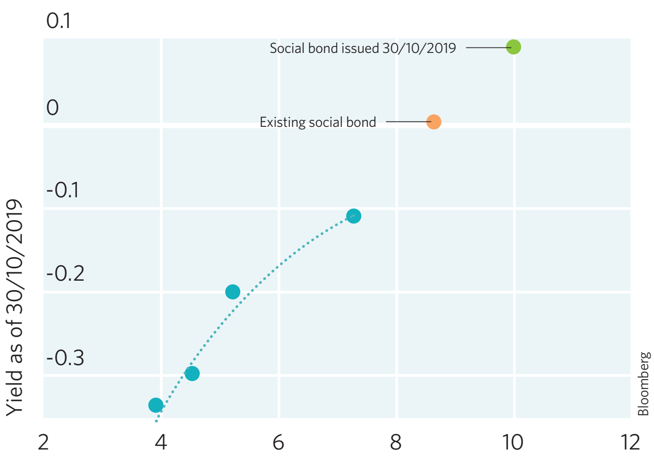


Spotlight on Engie SA

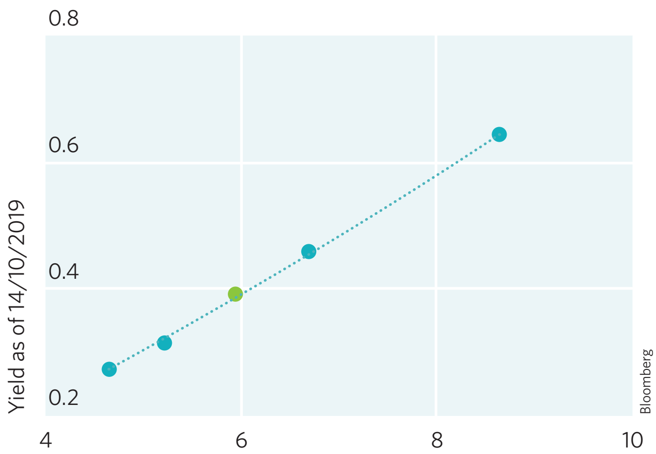
Engie is a utility company with a stated ambition to become a world leader in the transition to zero carbon.[7] Between 2012 and 2018 Engie halved its emissions and plans to continue this trajectory. The issuer has two yield curves, one green, one vanilla, but they are in fact difficult to separate. This suggests than investors believe they are lending to a green organisation, or at least one that has a stated transition pathway, when buying Engie debt. In October 2019, Engie issued its 11th green bond with the EUR900m proceeds to be split equally between Renewable Energy, Low Carbon Transport, Low Carbon Buildings, Water, and Land Use. This bond priced with a normal new issue premium but tightened more than its vanilla basket and corresponding index in the secondary market (see page 12).

Engie 2030 EUR - new issue premium

Deutsche Kreditbank 2029 (CO) EUR - new issue premium

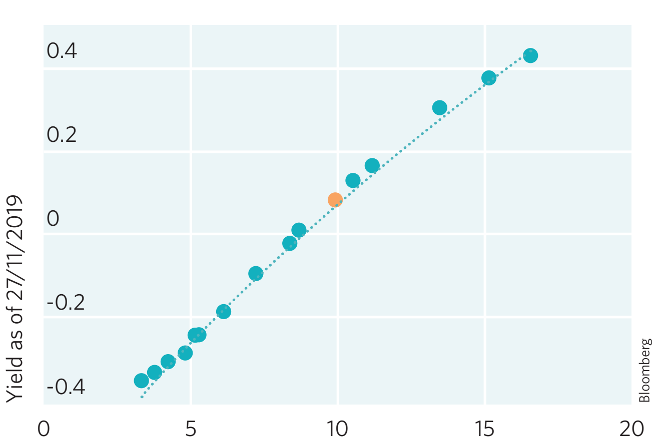


Credit Agricole 2025 (SNP) EUR - on the curve

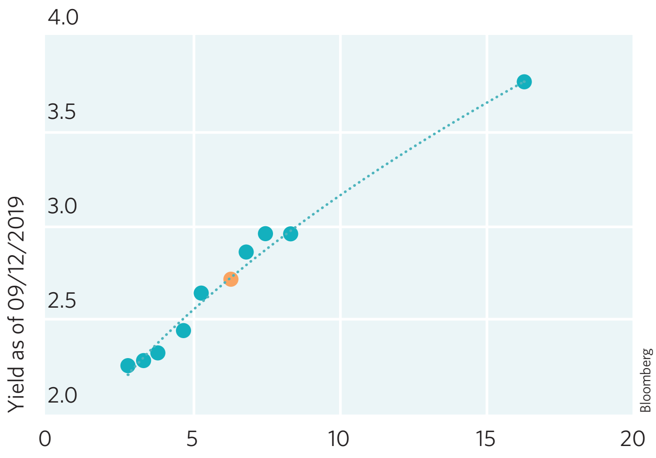


New issue green bonds · Vanilla bonds · Seasoned green bond · Non-green bond issued on the same day as the green bonds

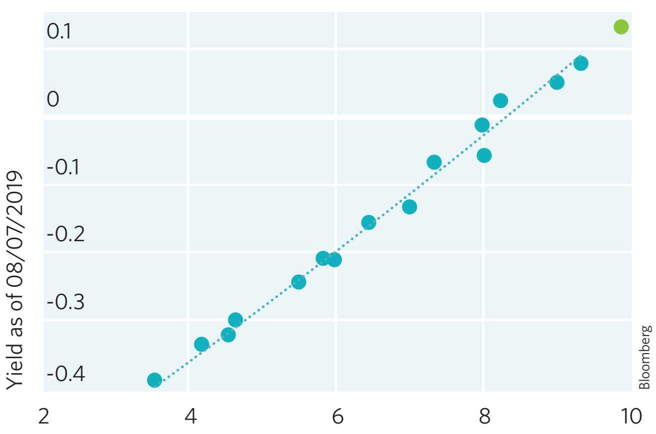
Credit Agricole HL (CO) EUR - on the curve



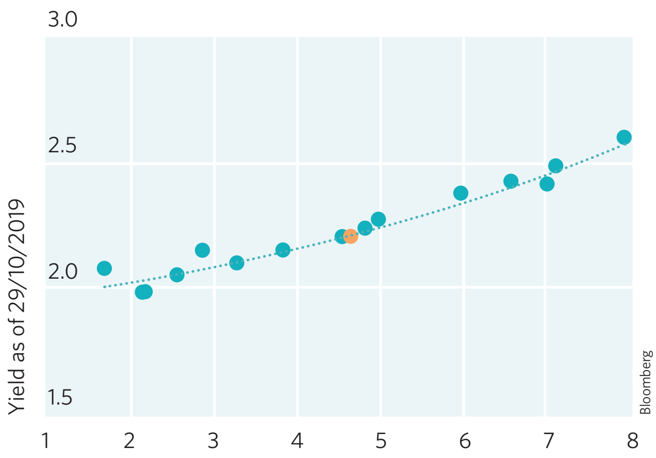
Welltower 2027 USD - on the curve



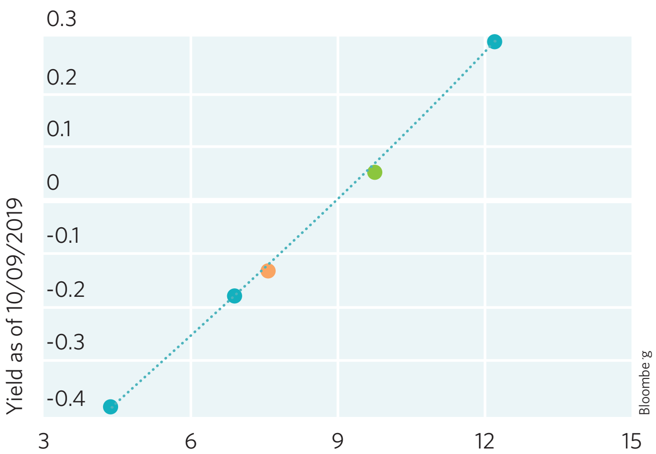
SocGen 2025 (CO) EUR - on the curve



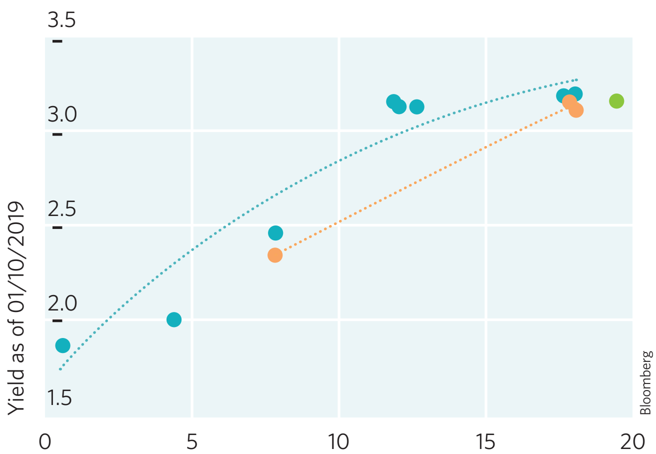
PNC 2024 USD - on the curve



Municipality Fin. 2029 EUR - greenium

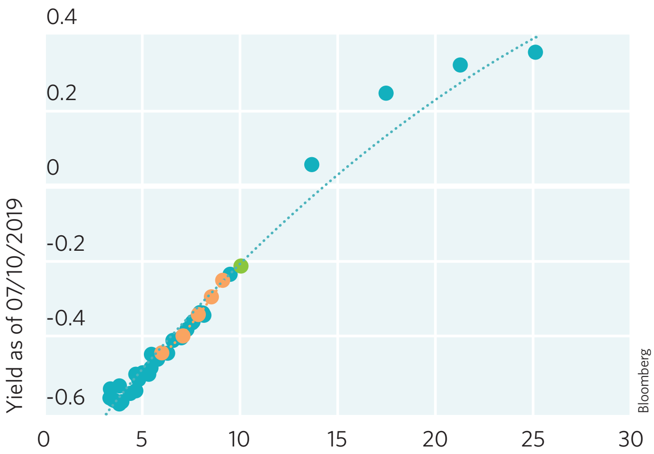


MidAmerican Energy 2050 USD - greenium

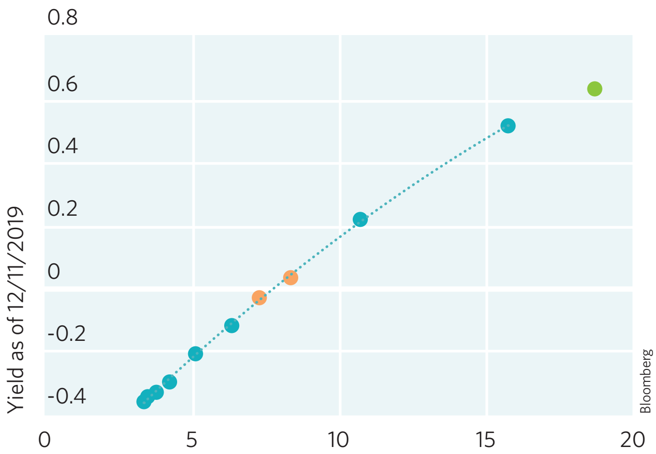


New issue green bonds   Vanilla bonds   Seasoned green bond   Non-green bond issued on the same day as the green bonds

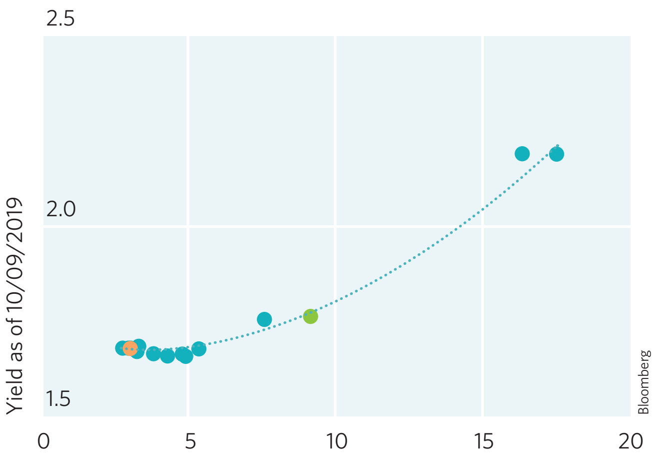
NRW Bank 2029 EUR - on the curve



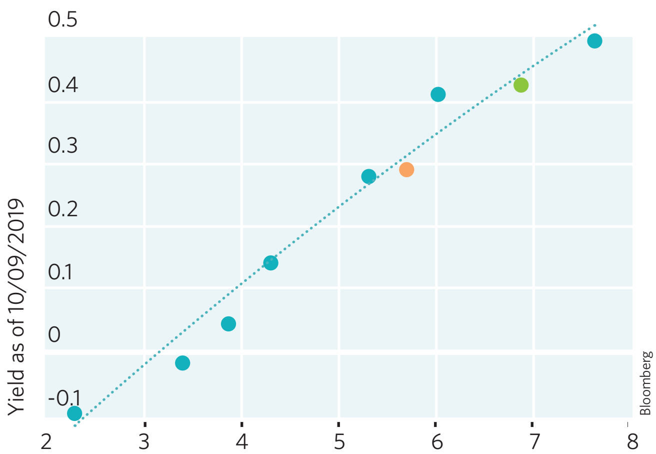
Kommunekredit 2039 EUR - on the curve



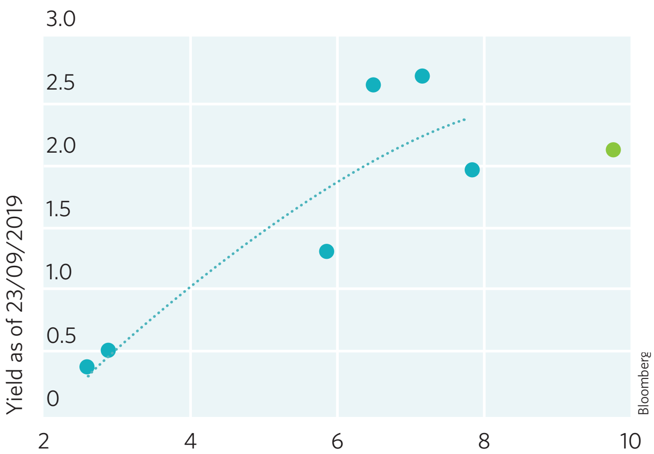
KFW 2029 USD - on the curve



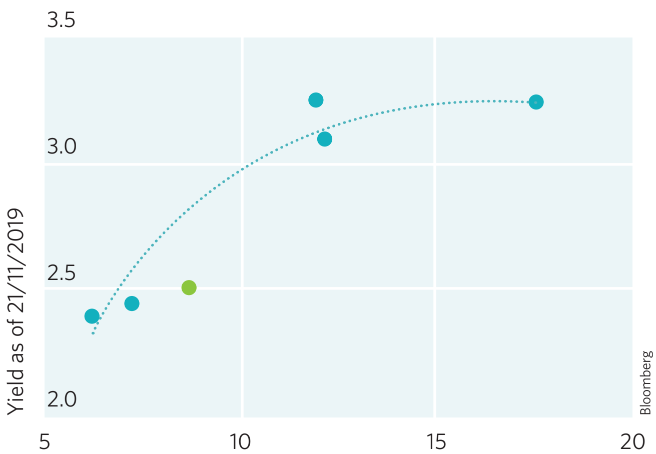
EDP Finance 2026 EUR - greenium



Generali 2030 (SU) EUR - greenium

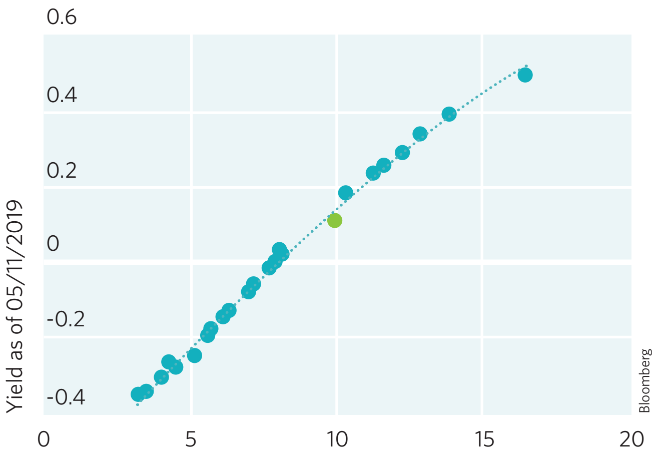


Duke Energy Florida LLC 2029 USD - greenium

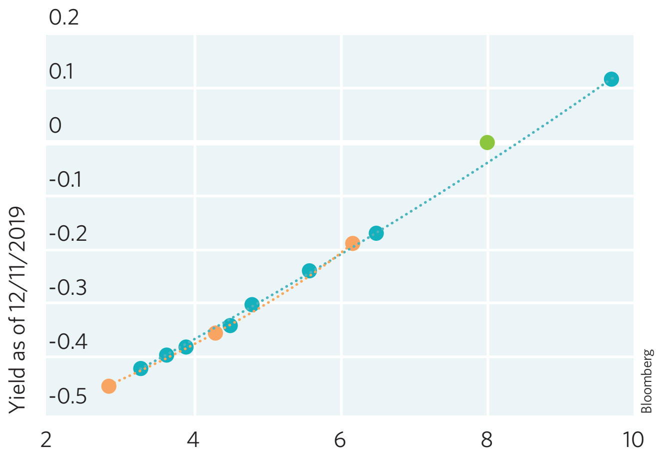


New issue green bonds | Vanilla bonds | Seasoned green bond | Non-green bond issued on the same day as the green bonds

CAFFIL 2029 (CO) EUR - greenium



Berlin Hyp. 2027 (CO) EUR - new issue premium



Methodology notes: We use yield on issue date, which reflects the price that the green bond offered on the pricing date. For comparable bonds, we use the yield-to-convention-mid.

For all bonds, we use modified duration to mid, and all the data is as of the pricing date of the green bond. The modified duration is the percentage price change of a security for a given change in yield. The modified duration increases with risk.

First, we plot seasoned vanilla bonds (blue dots) and fit a 2nd order polynomial yield curve. Next we overlay any seasoned green bonds (orange), and finally, we add our subject bonds (green). We include the yield curves of bonds in our sample with a minimum of four suitable comparable bonds.

Comparable bonds used for this exercise must fit the specification for green bond selection outlined on page 21, except that the use of proceeds is not limited. Bonds must share the same credit rating and payment rank as the green bond and have been issued on or after 01/01/2010.

New issue green bonds · Vanilla bonds · Seasoned green bond · Non-green bond issued on the same day as the green bonds

5. Performance in the immediate secondary market

- **7 days after pricing,** 60% of green bonds had tightened more than comparable vanilla baskets; 57% had tightened more than their corresponding index.

- **28 days after pricing,** 56% of green bonds had tightened more than comparable vanilla baskets; 58% had tightened more than their corresponding index.

Many bonds deliver price tightening in the immediate secondary market since investors may want to increase their position or open a position in a bond they did not get allocated. Timing is an important factor,

		% change 1 week			% change 1 month		
Rating Group	Bond	Green Bond	Vanilla Basket	Corresponding iBoxx Index	Green Bond	Vanilla Basket	Corresponding iBoxx Index
SSA	NIB 2026	0.5%	8.3%	-16.1%	-3.9%	-4.6%	-32.3%
	Ned. Water 2034	0.5%	-21.9%	-1.6%	-8.5%	-8.4%	-13.5%
	Eurofima 2034	0.6%	-21.9%	1.5%	-8.0%	-8.4%	-8.4%
	NRW 2029	43.8%	5.3%	-11.7%	60.3%	-7.1%	-19.7%
	Asian DB 2029	-18.3%	5.3%	3.3%	6.9%	-7.1%	4.2%
	Kommunekredit 2039	-9.5%	60.2%	5.9%	-3.7%	81.9%	11.0%
	Corp Andina de Fomento 2026	-4.1%	29.2%	18.3%	-4.8%	28.5%	17.1%
COV	Soc. Gen. 2029 (CO)	16.8%	17.9%	-2.9%	5.8%	14.9%	-12.2%
	Berlin Hyp 2027 (CO)	-13.7%	17.9%	4.2%	13.3%	14.9%	2.5%
	SR Bank 2026 (CO)	8.4%	11.1%	4.2%	-3.4%	39.7%	0.7%
	Sparebank Soer Boligkreditt 2026 (CO)	23.8%	1.9%	3.6%	2.8%	-2.4%	-5.2%
	DKB 2029 (CO)	-50.0%	12.9%	-4.0%	-69.3%	-18.9%	-14.8%
	CAFFIL 2029 (CO)	4.0%	5.8%	-2.4%	7.5%	9.5%	6.8%
	Credit Agricole HL 2029 (CO)	19.8%	12.9%	16.5%	34.5%	-18.9%	4.3%
AA	KDB 2024	4.0%	N/A	-2.8%	9.5%	N/A	-18.8%
	Municipality Fin. 2029	14.9%	35.4%	-4.0%	-3.1%	32.7%	23.8%
	Berlin Hyp. 2029 (SP)	-15.9%	N/A	-8.2%	-8.0%	N/A	10.2%
A	Mitsubishi UFJ 2029 (SU)	-18.5%	-2.0%	-3.6%	-36.1%	-12.7%	4.4%
	LBBW 2026 (SNP)	-2.1%	14.5%	-6.4%	-3.9%	17.3%	10.5%
	SpareBank 1 SMN 2026 (SU)	-7.5%	-11.5%	1.8%	-7.2%	-9.8%	4.0%
	de Volksbank 2024 (SP)	2.4%	1.6%	-1.9%	-0.1%	-12.6%	6.0%
	Raiffeisen Bank 2026 (SU)	-6.0%	-11.5%	6.6%	-8.6%	-9.8%	-2.9%
	Credit Agricole 2025 (SNP)	-9.5%	5.0%	-6.7%	-6.4%	7.4%	-12.8%
	China Construct Bk 2022	-4.5%	-1.3%	-9.3%	-18.6%	-9.4%	-16.1%
	Engie 2030	-16.1%	-12.0%	-3.4%	-26.6%	-22.5%	-11.7%
	Rabobank 2026 (SNP)	-2.7%	5.0%	-5.7%	5.6%	7.4%	-0.1%
	Stedin Holding 2029	-6.5%	-3.0%	2.3%	-9.5%	-10.9%	5.5%
	Santander 2026 (SP)	-4.4%	-3.2%	1.9%	-31.3%	-5.2%	-15.2%
BBB	Ferrovie 2026	-18.4%	6.3%	-4.4%	-30.1%	5.4%	-4.9%
	E.ON 2030	3.4%	-9.3%	0.7%	5.4%	-0.7%	-1.2%
	E.ON 2024	20.3%	-7.6%	0.0%	54.5%	4.9%	1.2%
	Covivo 2031	7.5%	-2.5%	-6.2%	9.1%	-4.4%	-2.7%
	EDP Finance 2026	-6.9%	-7.6%	-3.0%	-7.0%	4.9%	2.7%
	Generali 2030 (SSUB)	-8.6%	-9.9%	-3.9%	-21.2%	-5.0%	-10.1%
	CPI Property 2027	-4.5%	-26.8%	-4.2%	-8.7%	-35.3%	-7.0%
	Intesa 2024 (SP)	-5.9%	-1.0%	-0.4%	-22.9%	-13.8%	-14.8%
SSA	KfW 2029	-48.2%	-10.5%	2.8%	-26.4%	-4.9%	12.8%
	EBRD 2024	-11.5%	-2.8%	11.9%	11.5%	-24.5%	11.2%
	EIB 2029	-4.7%	-27.8%	-2.8%	-58.5%	-22.2%	-7.1%
	Kommuninvest 2023	16.2%	-36.0%	-0.4%	26.7%	-2.1%	-6.2%
AA	MidAmerican Energy 2050	-3.5%	-2.0%	1.3%	-22.0%	-12.2%	-9.6%
A	Bank of Nova Scotia 2023 (SU)	-7.1%	0.0%	-2.7%	-3.3%	-6.6%	4.7%
	Public Service Co Colorado 2050	-5.2%	-33.9%	1.3%	-4.5%	-38.2%	5.0%
	Northern States Power Co 2050	4.3%	-33.9%	-1.7%	-10.0%	-38.2%	-0.7%
	ICBAS 2022 (SU)	-1.2%	0.8%	-6.1%	-1.3%	0.8%	-3.2%
	PNC Financial Services 2024	14.5%	-15.1%	1.2%	5.5%	-23.4%	-0.2%
	Duke 2029	2.1%	-0.1%	-3.8%	-18.1%	-5.1%	-14.3%
BBB	Host Hotels & Resorts 2029	3.2%	9.5%	-1.2%	5.5%	6.3%	4.1%
	Welltower 2027	-14.2%	-5.0%	-4.8%	-20.0%	-10.9%	-5.6%

because bond indices rebalance at each month end. Therefore, for bonds issued early in the month, this could be an opportunity for managers to add some off-benchmark performance before bonds are added to benchmark indices. Once bonds enter indices, except for credit events, liquidity evaporates, and accurate spreads are quoted on a bilateral basis. Our consideration of the secondary market only extends to one month after the pricing date of each bond.

In H2 2019, 63% of green bonds in our sample had tightened seven days after pricing; after 28 days, this had increased to 73%. To contextualise this spread tightening, we compare each green bond to two alternatives. Firstly, we match each green bond to a vanilla bond or a basket of vanilla bonds sharing similar characteristics, issued during the same quarter (see methodology notes). This comparison is a proxy for the opportunity cost to the investor. Secondly, we compare each green bond to a matched index to monitor their performance against 'the market'.

After seven days,

- 60% of green bonds had tightened by more than their vanilla baskets: 63% of EUR and 54% of USD green bonds
- 57% of green bonds had tightened by more than their corresponding index: 54% of EUR and 62% of USD green bonds

These numbers are a bit higher compared to H1 2019, perhaps because primary demand returned to more normal levels in H2. The three bonds (for which we had data) that priced with a new issue premium all tightened in the secondary markets by a larger magnitude than vanilla equivalents: DKB 2029 (CO), Engie 2030, and BHH 2029 (SP). Perhaps investors saw this as an opportunity to profit from the more generous pricing levels.

After 28 days,

- 56% of green bonds had tightened by more than their vanilla baskets: 59% of EUR and 50% of USD green bonds
- 58% of green bonds had also tightened when compared to corresponding indices: 56% of EUR and 67% of USD green bonds

Six out of the seven bonds that we identified as having priced with a greenium had conceded against comparables after seven days but surged 28 days after pricing. This behaviour offers benefits for both the issuer and investors. Overall, demand for all types of green bonds remains buoyant 28 days after pricing.

Methodology notes:

1. Comparable baskets. Each green bond is matched with a basket of vanilla comparable bonds issued in the same quarter (except where noted), fitting the parameters described on page 21. The number of bonds in each basket ranges from one to five depending on what has been issued in a given quarter. Summary statistics of the baskets are on page 21. Bonds can behave differently according to which part of the month they are issued in. Geo-political events can also influence bond prices. We use comparable baskets because green and vanilla bonds sharing similar characteristics are rarely issued on the same day. We have created this proxy to illustrate what else an investor could have done with their money during the same quarter. 2. Indices. We compare each bond to a standard iBoxx index. The indices are granulated by currency, asset class, tenor, and credit rating all of which can influence the behaviour of a bond. Each bond is therefore compared to an index sharing similar characteristics, for example, MidAmerican Energy 2050 is matched with the iBoxx USD AA Corporate 10+ Years index.

Seven calendar days include five data observations. Twenty-eight calendar days include 20 data observations.

6. Green bond ETF

In October 2019 Lyxor launched its second green bond ETF. The Lyxor Green Bond ESG Screened fund includes green bonds overlaid with an ESG filter. The fund was designed to complement the Lyxor Green Bond DR UCITS ETF, the very first green bond ETF introduced in February 2017, and now brings the number of green bond ETF products to six. Growth in the assets of some of these funds has been quite startling. At the end of December 2019, the Lyxor Green Bond DR UCITS ETF was 33 times larger than at launch. The Franklin Liberty Euro Green Bond ETF initiated in April 2019, had grown by 50% by December. ETF provide a vehicle for passive investors to replicate the green bond market. The growth of green labelled ETF represents another source of demand for the green label, which is used to determine inclusion.

ETF name	Currency	Index	Launch date	Size at launch	AUM Dec 2019
Lyxor Green Bond DR UCITS ETF	EUR	Solactive Green Bond Index	February 2017	EUR5m	EUR165m
Van Eck Vectors Green Bond ETF	USD	S&P Green Bond Select Index	March 2017	USD5m	USD27m
iShares Global Green Bond ETF	USD	Bloomberg Barclays MSCI Global Green Bond Select	November 2018	USD25m	USD38m
UC MSCI European Green Bond ETF	EUR	Bloomberg Barclays MSCI European GB Issuer Capped EUR Index	November 2018	EUR 20m	EUR21m
Franklin Liberty Euro Green Bond ETF	EUR	Bloomberg Barclays MSCI Euro Green Bond Index	April 2019	EUR10m	EUR16m
Lyxor Green Bond ESG Screened	EUR	Solactive Green ESG Bond EUR USD IG TR Index	October 2019	EUR4m	EUR4m

7. Spotlight: Sovereign green bonds can help to meet the objectives of the Paris agreement.

Who is in the sovereign green bond club?

As of December 2019, twelve governments had joined the sovereign green bond club. Between them, issuing 19 sovereign green bonds totalling USD53.7bn, almost half of which was issued in 2019 (USD24.5bn). The Netherlands, Hong Kong and Chile issued debut sovereign green bonds during the year; Poland, Indonesia and Nigeria returned to the market; and France, Belgium and Ireland reopened existing bonds.

Poland got the market started in December 2016, with a EUR750m 5-Year green bond. Subsequently Poland has issued three more bonds, making it the most prolific issuer of individual green sovereigns. The French green OAT (GrOAT) is the largest single sovereign green bond having been tapped seven times, reaching EUR23.3bn by the end of 2019.

By the end of 2019, Nigeria and Fiji had issued in local currencies and the remainder in either EUR or USD. Poland, France, Belgium, Lithuania, the Netherlands, Ireland and Chile had issued in EUR taking the lion's share of the cumulative USD53.7bn. The Seychelles, Indonesia, Hong Kong and Chile collectively issued USD4.4bn in USD. There is huge potential for growth of USD denominated issuance if more EM issuers come to the market.

For governments with access to domestic and international capital markets, sovereign green bonds can help attract the private sector-based investment needed for sustainable developments and to fulfil the objectives included in each country's Nationally Determined Contributions (NDCs).

In accordance with the Paris Agreement, NDCs should be communicated by each party and recorded in a public registry. As of February 2020, 186 nations out of 196 parties had submitted their NDCs each of which includes a roadmap for that country to meet their stated commitments. Sovereign green bond issuance has a role to play in the NDC process.

Investors want more sovereign green bonds

Sovereign green bonds are well understood, frequently issued, products that can bring scale to the market through benchmark pricing, liquidity, and precedent. The results of Climate Bonds Green Bond European Investor Survey published in November 2019 highlighted a lack of supply in all types of green bonds.[8] Sovereigns and non-financial corporates were the two asset classes in which institutional investors stated they particularly wanted to buy more green bonds.

Sovereign pricing performance

To date, 13 sovereign green bonds from eight issuers have qualified for our pricing analysis. In order to do so, bonds must fit the size and other parameters set out in the methodology on page 21.

Sovereign pricing performance

Issuer	Coupon	Maturity	S&P/ Moody's rating	Currency	Initial size (USDbn)	Pricing date	Pricing relative to issuer's yield	Covered in pricing paper
Poland	0.5%	20/12/2021	A-/A2	EUR	0.75	12/12/2016	New issue premium	January 2016-March 2017
France*	1.75%	25/06/2039	AA/Aa2	EUR	7.00	24/01/2017	Greenium	January 2016-March 2017
Poland	1.125%	07/08/2026	A-/A2	EUR	1.00	31/01/2018	On the curve	January-June 2018
Indonesia	3.75%	01/03/2023	BBB/Baa2	USD	1.25	22/02/2018	New issue premium	January-June 2018
Belgium**	1.25%	22/04/2033	AA/Aaa	EUR	4.50	26/02/2018	On the curve	January-June 2018
Ireland***	1.35%	18/03/2031	A+/A2	EUR	3.00	10/10/2018	On the curve	July – December 2018
Indonesia	3.9%	22/02/2024	BBB-/Baa2	USD	0.75	12/02/2019	On the curve	See note below
Poland	2%	08/03/2049	A-/A2	EUR	0.50	28/02/2019	New issue premium	January-June 2019
Poland	1%	07/03/2029	A-/A2	EUR	1.50	28/02/2019	On the curve	January-June 2019
Netherlands	0.5%	15/01/2040	AAA/AAA	EUR	6.00	21/05/2019	Greenium	January-June 2019
Hong Kong	2.5%	28/05/2024	AA+/Aa2	USD	1.00	21/05/2019	No yield curve	January-June 2019
Chile	3.5%	25/01/2050	A+/A1	USD	1.42	17/06/2019	Greenium	January-June 2019
Chile	0.83%	02/06/2031	A+/A1	EUR	0.86	25/06/2019	On the curve	January-June 2019

Subsequent taps to the end of 2019:

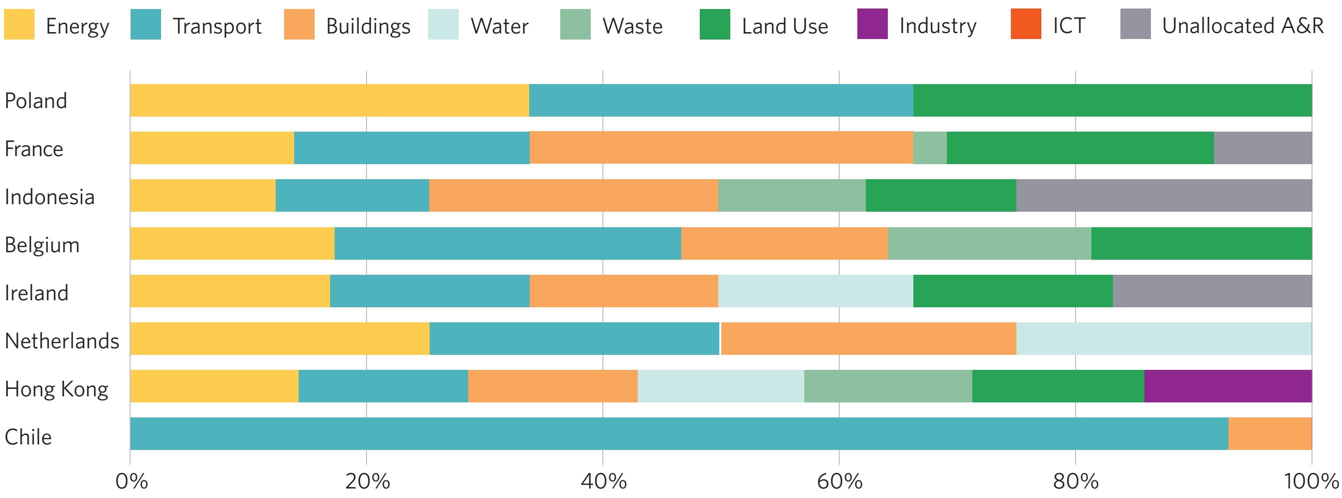
*** France** - FRTR: EUR1.632bn 26/05/2017; EUR 1.065bn 01/12/2017; EUR1.096bn 30/03/2018; EUR4bn 26/06/2018; EUR1.737bn 07/02/2019; EUR2.471bn 02/05/2019; EUR1.676bn 05/09/2019

**** Belgium** - BGB: EUR1.272bn 18/03/2019; EUR 1.002bn 22/07/2019; EUR0.112bn 29/07/2019

*****Ireland** – IRISH: EUR2.0bn 10/10/2019

NB: The Indonesia 3.9% 22/02/204 did not have enough bookbuilding data for inclusion in our pricing paper, but we were able to build a yield curve

Selected sovereign green issuers - Use of proceeds



Use of proceeds

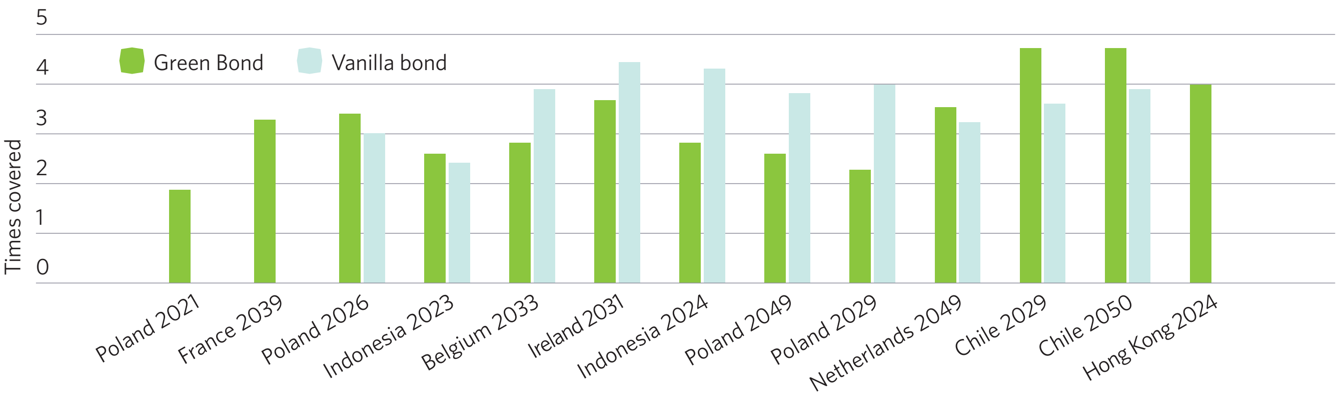
Green bonds can be used to fund a range of infrastructure projects, many of which are already being funded via vanilla sovereign bonds. Guided by its NDC targets, each government can develop its own strategy as indicated by the varied use of proceeds of the eight sovereign issuers included in our recent pricing analysis. Hong Kong shared the proceeds of its bond between seven categories and was the only sovereign green bond to allocate proceeds to Industry. Chile's initial bonds mostly distributed the funds to low-carbon Transport, predominantly adding to and upgrading its metro lines (85%).[9] To date, no sovereign green bond has included ICT among the use of proceeds

Book-building

Green bonds are compared to vanilla equivalents to determine whether the magnitude of oversubscription and price tightening is different. Fewer new sovereign bonds are issued compared to other asset classes such as corporates, which makes it challenging to find comparable data for sovereign green bonds. For ten sovereign green bonds for which we had data for both legs of the analysis, half attracted higher book cover than vanilla equivalents.

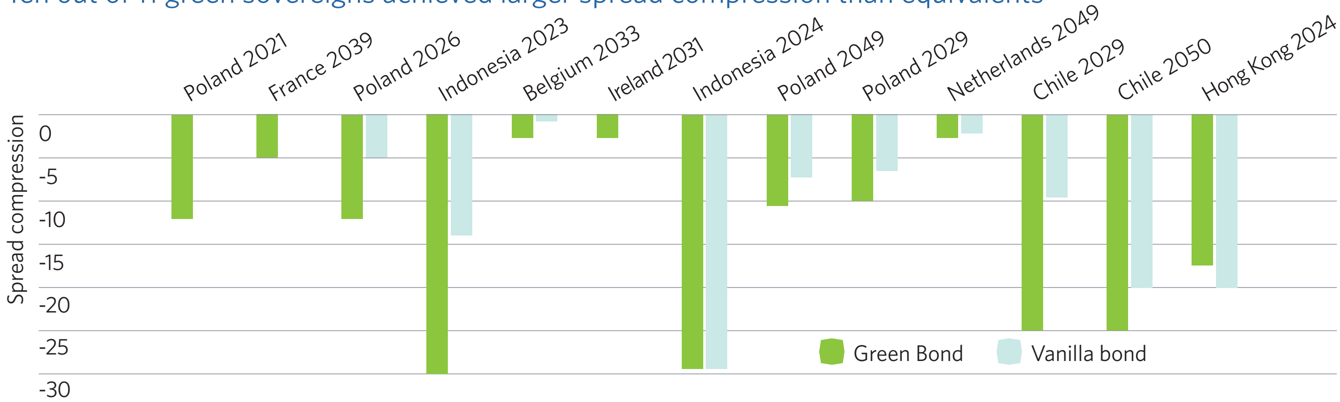
All sovereign green bonds in our sample except one achieved larger spread compression than their comparable baskets.[10] This suggests that investors buying green bonds are stickier, possibly because the choice of bonds is so limited, i.e. they need to invest in green labelled bonds to meet their investment mandates.

Five out of ten sovereigns attracted higher book cover than vanilla equivalents



We could not find book cover data for comparable bonds for Poland 2021, France 2039 or Hong Kong 2024.

Ten out of 11 green sovereigns achieved larger spread compression than equivalents



We could not source spread compression data for comparable bonds for Poland 2021, France 2039, or Ireland 2031.

Investor participation

Green bonds can introduce a broader investor base to issuers, often encompassing support from different regions. Dedicated buyers of green bonds offer a unique source of support and many mainstream investors actively give preference to green bonds, where possible. On average, 52.5% of green bonds are sold to investors declaring themselves green or socially responsible.

As noted, green bond investors are often perceived as stickier since the investible opportunity set is limited. Broad market indices do not exclude green bonds, so mainstream buyers have no reason not to buy them, and the sovereign asset class (composed of vanilla bonds, apart from those mentioned here) constitutes the largest share of all broad market indices. We expect that the value of the label will increase further as the number of green bond ETF grows.

Anecdotally:

- France advised that they had 200 names in their green sovereign book, compared to 100 names they ordinarily get.
- NTMA (Ireland) informed Climate Bonds that green investors had been allocated more than half of the total.
- 41% of Poland 2026 was allocated to green investors. For Poland 2021, it was 61%.
- 29% of Indonesia 2023 was allocated to green investors.
- Chile's USD bond attracted interest from 40 green investors and the EUR bond attracted 64 green investors. 71% of its EUR bond was allocated to green investors.
- The Dutch State Treasury Agency (DTSA) offered priority allocation of the Netherlands 2040 to 'real money' (unleveraged) bidders willing to formally declare their green credentials. Thirty-two investors registered this status, and 29% of the bond was allocated to green investors

The greenium

Among sovereign green bonds, France, the Netherlands and Chile 2050 exhibited a greenium. Five sovereign green bonds have priced on their curves, while three have exhibited a normal new issue premium. There were not enough comparable bonds to build a yield curve for Hong Kong.

The French GrOAT has remained inside the vanilla yield curve in the secondary market. This means that subsequent reopenings also benefitted from pricing at a greenium. The French Treasury has noted that the bond shares all the liquidity features of its vanilla bonds.

The greenium is defined on page 7.

Green sovereigns have impact

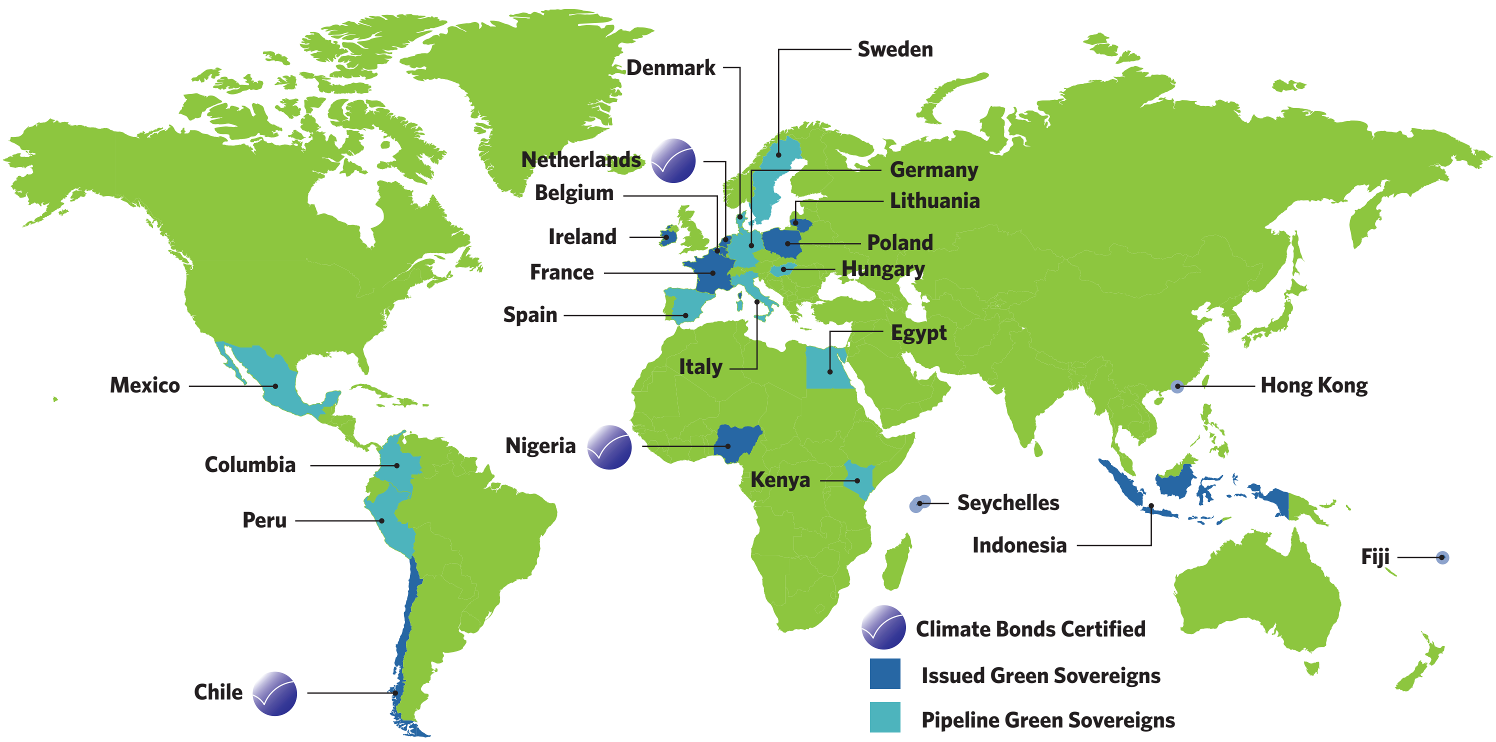
The sovereign green offerings made to date have been well received by the markets. Alongside the twelve nations that have already issued, at least another eleven have indicated their intentions to join the sovereign green bond club in 2020-2021. At the time of writing, Mexico had commenced its roadshow. Egypt had announced the appointment of banks to assist in the issuance process. Germany, Sweden and Spain look to be proceeding with plans to issue in the latter part of 2020. Indications for 2020/2021 have been observed from Colombia, Denmark, Hungary, Italy, Kenya, and Peru.

The Bank for International Settlements (BIS) calculated that there were USD55.6tn of government bonds outstanding as of December 2019.[11] The current December 2019 total of USD53.7bn of sovereign green bonds (USD60bn at the time of writing in early March 2020) is less than 0.1% of total sovereign debt showing there is ample room for growth. As Climate Bonds has repeatedly noted, there's a mix of G7, G20, OECD and MENA nations that are yet to join the club.

There's also plenty of room for multilateral development banks and development finance institutions and other organisations to assist smaller nations develop their green finance capabilities including coming to market with a sovereign green bond. The IFC was instrumental in Fiji's sovereign green bond while the IDB assisted Chile.

The provision of capital is available from a growing base of investors. Labelling debt as green is an opportunity for governments to display their commitment to a low carbon future and provide a lead to domestic stakeholders including regulators, issuers and investors. There is a wider impact of sovereign green issuance that far outweighs the actual amount issued.

In this COP26 year greater involvement of private finance in climate investment is being sought by governments.[12] Nothing would strengthen the exhortation for others to act more than a statement that green sovereign is in the pipeline for 2020 or 2021.



8. Conclusion

During the second half of 2019, slightly over USD132bn of labelled green bonds were added to the Climate Bonds Green Bond Database, exceeding the USD125bn captured in H1.[13] In H2, they were denominated in 28 currencies, EUR being the most popular as usual, representing 37%.

The analysis presented in this paper is based on 27% of the total green bond issuance during the observation period (USD36bn). While over half of the EUR issuance was eligible for inclusion, only 20% of USD green bonds were suitable. Most USD bonds (64%) were excluded for being too small. For example, Fannie Mae issued USD15bn worth of green bonds, but individually, each of the 681 bonds was not big enough for inclusion.

On average, both EUR and USD green bonds achieved higher book cover and greater spread compression than vanilla equivalents. We could only build yield curves for 19 bonds in our sample, of which just three exhibited a new issue premium. The remainder either priced with a greenium, or flat to the yield curve. In the immediate secondary market green bonds tightened by a greater magnitude, on average, than both comparable vanilla baskets, and indices. The results of our analysis indicate that demand for green bonds remains robust. This scenario is ideal and can please both treasurers and investors alike.

We expect the strong demand for EUR green bonds to be exacerbated by three trends:

1. The steady growth in the number of funds looking for labelled green bond paper, both via explicit green mandates and/or investors preferencing green paper
2. The stealth mainstreaming of green bonds is underway. The number of green bonds being issued in benchmark size is increasing, and such green bonds are thus eligible for inclusion in mainstream benchmark indices. Benchmark index constituents must be considered for portfolio inclusion by passive funds, irrespective of green preferencing
3. The growth in the number of green ETF will continue to put pressure on the green label where this is a feature of the policy guidelines.

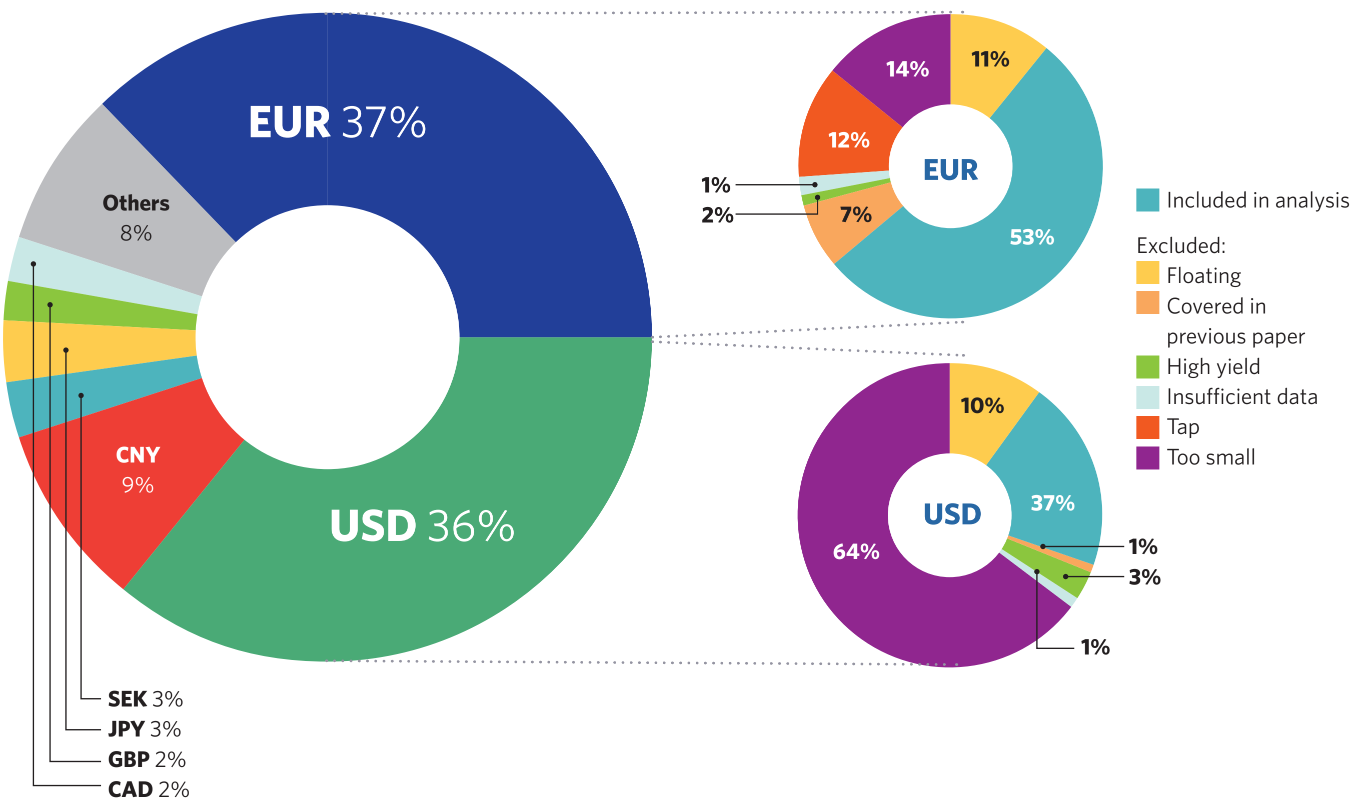
The USD green bond market remains broadly isolated from these pressures at present. The climate agenda and its ramifications for investors have received less exposure in North America compared to other regions. Consequently, while investors may be prepared to explore green bonds, they are largely unwilling to pay more for the label while there is no requirement for them to do so.

More than with other asset classes/issuer types, the issuance of sovereign green bonds has the power to substantially scale up green investments – especially for infrastructure – while sending an important signal to the market and increasing the visibility of green finance and projects among the general public. As a clear reflection of a government's commitment towards a low-carbon future, we expect many more countries to join the sovereign green bond club including the eleven who have already indicated their intention.

This analysis is based on a limited number of green bonds, chosen according to the parameters outlined on page 21. Green bonds issued in other currencies, structures, formats, and sizes may perform differently from those discussed in this paper.

We started monitoring green bond pricing in 2016, and after four years, at the end of 2019 we had looked at 287 securities. As the profile of green bonds has evolved in the intervening period, pricing dynamics have also been affected. We will continue to monitor the behaviour of green bonds in the primary and immediate secondary market.

EUR and USD were the dominant currencies for labelled green bonds in H2 2019



EUR summary statistics of bonds used for comparison

Bonds sharing similar characteristics to green bonds in our sample

Q3 - Green bonds priced between July 01 and September 30 2019	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
LBBW 0.375% 29/07/2026 (SNP)	1	0.0%	7	0.5
Svenska Handelsbanken AB 0.05% 09/03/26 (SNP)	1	0.05%	7	0.75
SpareBank 1 SMN 0.125% 11/09/2026 (SU)	1	0.125%	7	0.5
Raiffeisen Bank International AG 0.375% 25/09/2026 (SU)	1	0.375%	7	0.75
ANZ New Zealand Bank 0.375% 17/09/2029 (SU)	1	0.375%	10	0.5
de Volksbank NV 0.01% 16/09/2024 (SP)	1	0.01%	5	0.5
A Banks 5 Years Senior Preferred	2	0.125%	5	0.80
Societe Generale SFH SA 0.125% 18/07/2029	1	0.125%	10	1
Berlin Hyp AG 0.01% 19/07/2027	1	0.01%	8	0.5
AAA Covered bonds 8-10 Years	8	0.0565%	9.3	0.77
Mitsubishi UFJ Financial Group Inc 0.848% 19/07/2029	1	0.848%	10	0.5
Mizuho Financial Group 0.402% 09/06/29	1	0.402%	10	0.50
Assicurazioni Generali SpA 2.124% 01/10/2030	1	2.124%	11	0.75
CCAMA 2.215% 16/09/2029	1	2.125%	10	0.50
Covivio 1.125% 17/09/2031	1	1.125%	12	0.5
A-BBB Real Estate 9-12 Years	4	0.971%	10	0.6
E.ON SE 0.35% 28/02/2030	1	0.350%	11	0.75
BBB Utilities 10-11 Years	2	0.938%	10.5	0.6
E.ON SE 0% 28/08/2024	1	0.0%	5	0.75
EDP Finance BV 16/09/2026	1	0.375%	7	0.6
BBB Utilities 5-6 Years	2	0.0521%	5.5	0.5
Ferrovie dello Stato Italiane SpA 1.125% 09/07/2026	1	1.125%	7	0.7
A-BBB Consumer Discretionary 6-8 Years	3	0.405%	7	0.7
Municipality Finance PLC 0.05% 06/09/2029	1	0.05%	10	0.5
AAA-AA Regional Governments 10 Years	2	0.0%	10	0.75
Nordic Investment Bank 0% 25/09/2026	1	0.0%	7	0.5
KFW 0% 30/09/2026	1	0.0%	7	4.0
Eurofima 0.15% 10/10/2034	1	0.15%	15	0.5
Nederlandse Waterschapsbank NV 10/02/2034	1	0.0%	15	0.5
SSA 10-15 Years	2	0.05%	12.5	3.25
Korea Development Bank 0% 10/07/2024	1	0.0%	5	0.5
No suitable comps available				

Q4 Green bond priced between October 01 and December 31 2019	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
Credit Agricole SA 0.375% 21/10/2025	1	0.38%	6	1
Cooperatieve Rabobank UA 0.25% 30/10/2026	1	0.25%	7	0.75
A SNP Financials 5-7 Years	4	0.138%	6	0.75
China Construction Bank Corp/Lux. 0.05% 22/10/2022	1	0.05%	3	0.5
Export-Import Bank China 0% 15/10/2024	1	0.0%	5	0.7
Engie SA 0.5% 24/10/2030	1	0.50%	11	0.9
BBB Utilities 11-12 Years	4	0.61%	11.75	0.55
Stedin Holding NV 0.55 14/11/2029	1	0.50%	10	0.5
BBB Utilities 10 Years	2	0.86%	10	0.675
Banco Santander SA 0.3% 04/10/2026	1	0.30%	7	1
A SP Financials 7 Years	3	0.45%	7	0.83
CPI Property Group SA 1.625% 23/04/2027	1	1.63%	8	0.75
BBB Real Estate 8 Years	2	0.750%	8	0.5
Intesa Sanpaolo SpA 0.75% 04/12/2024	1	0.75%	5	0.75
A SP Banks 5 Years	3	0.19%	5	0.67
SR-Boligkreditt AS 0.01% 08/10/2026	1	0.01%	7	0.5
Consumer Finance Covered 7 Years	3	0.01%	7	1.1
Sparebanken Soer Boligkreditt AS 0.01% 26/10/2026	1	0.01%	7	0.5
Banks Covered 7 Years	2	0.01%	7	0.55
Caisse Francaise de Financement Local 0.1% 13/11/2029	1	0.10%	10	0.75
Auckland Council 0.125% 2029	1	0.125%	10	0.5
Credit Agricole Home Loan SFH SA 0.05% 06/12/2029	1	0.05%	10	1.25
Deutsche Kreditbank AG 0.01% 11/07/2029	1	0.01%	10	0.5
Consumer Finance Covered 10 Years	3	0.02%	10	0.83
NRW Bank 0% 15/10/2029	1	0.0%	10	0.5
Asian Development Bank 0% 2029	1	0.0%	10	0.75
Development Banks 10 Years	2	0.0%	10	0.925
Kommunekredit 0.625% 21/11/2039	1	0.63%	20	0.5
Regionals 20 Years	2	0.05%	20	0.5
Corp Andina de Fomento 0.625% 20/11/2026	1	0.63%	7	0.75
Regionals 7-8 Years (one issued in Q3 2019)	2	0.0%	7.5	1
Berlin Hyp AG 0.5% 05/11/2029	1	0.50%	10	0.5
No suitable comps available				

USD summary statistics of bonds used for comparison

Bonds sharing similar characteristics to green bonds in our sample

Q3 - Green bonds priced between July 01 and September 30 2019	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
Public Service Co of Colorado 3.2% 01/03/2050	1	3.2%	31	0.55
Northern States Power Co/MN 2.9% 01/03/2050	1	2.9%	31	0.6
A Utilities 30 Years	3	3.16%	30	0.66
The Bank of Nova Scotia 2.375% 18/01/2023	1	2.375%	4	0.5
Truist Fin Corp 2.2% 16/03/2023	1	2.20%	4	1.1
Ind. & Comm. Bank of China Ltd/HK 2.25% 16/09/2022	1	2.25%	3	0.5
Xingsheng BVI Co Ltd 3.375% 07/25/2022	1	3.375%	3	0.5
Host Hotels & Resorts 2029 3.375% 15/12/2029	1	3.375%	10	0.65
BBB Real Estate 10 Years	4	3.318%	10	0.5
EBRD 1.625% 27/09/2024	1	1.625%	5	0.7
SSA 5 Years	2	1.455%	5	2.75
Kreditanstalt fuer Wiederaufbau 1.75% 14/09/2029	1	1.75%	10	2
Development Banks 10 Years	2	1.79%	10	1.5

Q4 - Green bonds priced between October 01 and December 31 2019	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
PNC Financial Services Group Inc 2.2% 01/11/2024	1	2.2%	5	0.65
Truist Bank 2.15% 12/06/2024	1	2.2%	5	1.25
Duke Energy Florida LLC 2.5% 01/12/2029	1	2.5%	10	0.7
BBB Utilities 10 Years	5	2.79%	10	0.7
MidAmerican Energy Co 3.15% 15/04/2050	1	3.15%	31	0.6
AA-A Utilities 30 Years	5	3.29%	30	0.6
Welltower Inc 2.7% 15/02/2027	1	2.7%	8	0.5
BBB Healthcare 7 Years	2	2.25%	7	2.25
European Investment Bank 1.625% 09/10/2029	1	1.625%	10	1
Supranationals 10 Years	2	1.75%	10	2
Kommuninvest I Sverige AB 1.625% 24/04/2023	1	1.625%	4	1
Regionals 5 Years	2	1.677%	5	1.75

Methodology

This paper includes labelled green bonds issued during H2 2019. We have included labelled green bonds meeting the following specifications:

- Announcement date between 01/07/2019 and 31/12/2019
- Currency: EUR or USD
- Benchmark size i.e. >= USD500m
- Investment grade rated
- Minimum term to maturity of three years at issue
- Consistent with the Climate Bonds Taxonomy i.e. included in the Climate Bonds Green Bond Database

Amortising, perpetual, floating-rate, and other non-vanilla structures were excluded. We have designed these parameters to capture the most liquid portion of the market while not limiting the diversity of data. All historical data is based on asset swap spreads for EUR denominated bonds. USD bonds are compared to a US treasury curve. All historical data is from Refinitiv EIKON.

Two bonds qualified for our analysis but could not be included due to the paucity of available data:

IDB Trust Services (Islamic Development Bank), ISDB 0.037% 04/12/2024

MAF Sukuk Ltd., MAFUAE 3.9325% 28/02/2030

Comparable baskets include bonds issued in the same quarter as the subject green bond. Comparable bonds must fit the parameters described above except that the use of proceeds is not green. The resulting baskets are a proxy for how the money could have been invested in the same quarter in which the green bond was issued. The number of bonds in each basket ranges from one to five bonds. We acknowledge that bonds behave differently depending on when they are issued and that geo-political events can affect bond prices from one day to the next. We have designed this proxy to circumvent the fact that vanilla bonds and green bonds with similar characteristics are rarely issued on the same day.

Endnotes

1. MSCI https://www.msci.com/market-classification
2. https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html#cspp
3. https://www.federalreserve.gov/monetarypolicy/files/monetary20191030a1.pdf
4. Climate Bonds data
5. https://www.climatebonds.net/resources/reports/green-bond-european-investor-survey-2019
6. Climate Bonds Green Bond Database
7. Gas, which is part of Engie's transition, is not supported by the Climate bonds taxonomy
8. https://www.climatebonds.net/resources/reports/green-bond-european-investor-survey-2019
9. In cases where exact splits of use of proceeds are not given, they are recorded as equal splits between categories in the Climate Bonds Green Bond Database. This data is thus indicative only, the actual use of proceeds may be quite different, with even greater variation between countries
10. There were no comparable bonds for the Hong Kong 2024 issued in Q2 2019. We matched the bond with Qatar 3.375% 14/03/2024 priced in March 2019.
11. BIS Quarterly Review, December 2019
12. https://www.bankofengland.co.uk/events/2020/february/cop26-private-finance-agenda-launch
13. In the prior pricing paper, Green Bond Pricing in the Primary Market January to June 2019, USD118bn of labelled green bonds were identified as having been issued in H1 2019. This figure was later augmented as more bonds issued during the period were verified as green. This process of verification can take some time to establish if more information on green credentials is needed.

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