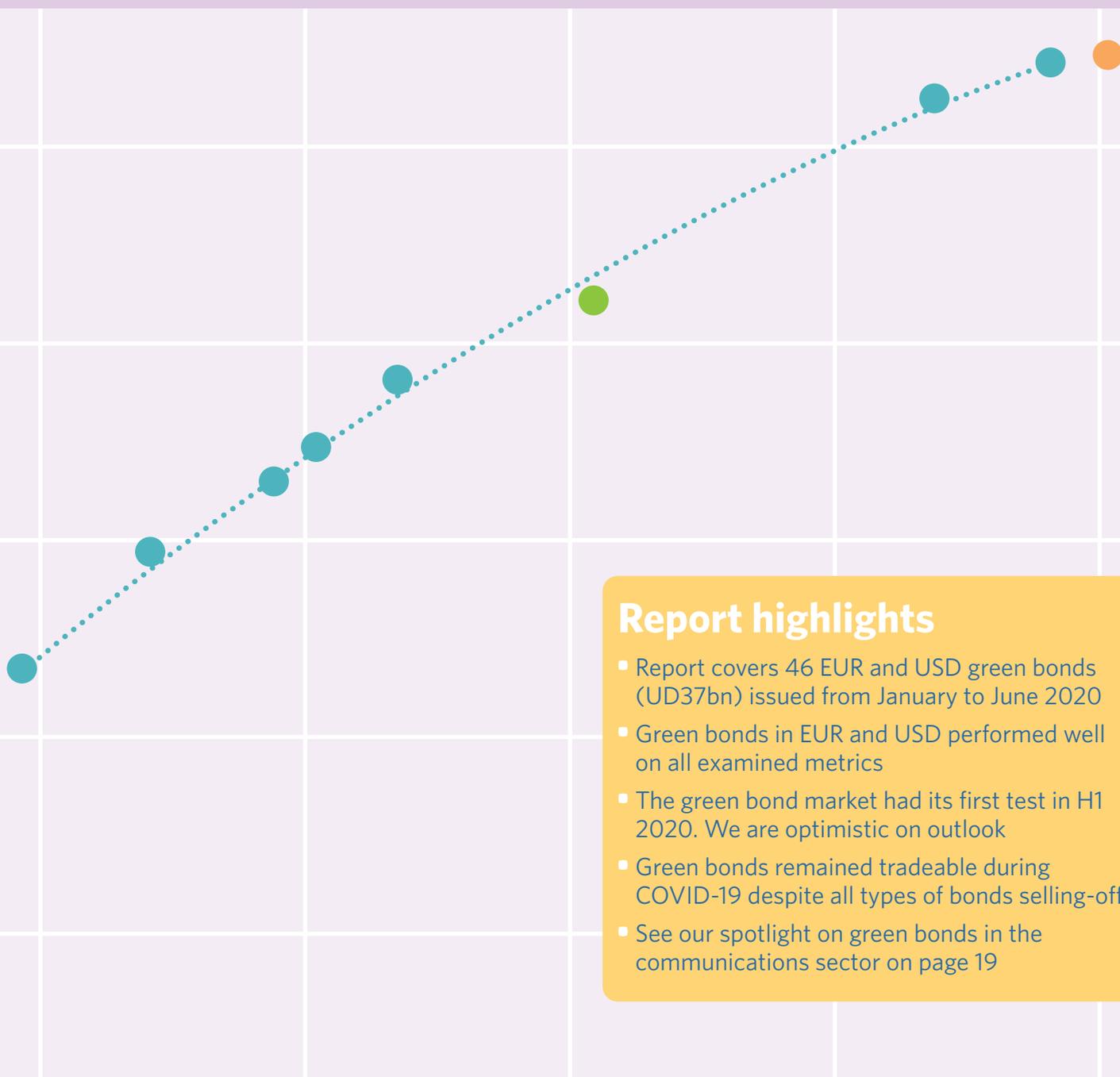


GREEN BOND PRICING IN THE PRIMARY MARKET:

January - June 2020

H1
(Q1-Q2)
2020



Report highlights

- Report covers 46 EUR and USD green bonds (UD37bn) issued from January to June 2020
- Green bonds in EUR and USD performed well on all examined metrics
- The green bond market had its first test in H1 2020. We are optimistic on outlook
- Green bonds remained tradeable during COVID-19 despite all types of bonds selling-off
- See our spotlight on green bonds in the communications sector on page 19

Climate Bonds INITIATIVE

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Introduction

This is the tenth report in our pricing series, in which we observe how green bonds perform in the primary markets. This report includes green bonds issued in the first six months of 2020 (H1 2020).

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. Developed market (DM), emerging market (EM) and supranational issuers (SNAT) are included.¹ The full methodology is explained on page 26.

During this period, USD92.1bn of green bonds were added to the Climate Bonds Green Bonds Database.² This paper includes the 40%

of that amount that met the above requirements (USD37bn), split between 46 green bonds from 41 issuers. EUR is the dominant currency with 38 bonds totaling USD31.3bn (EUR28.3bn), while eight USD denominated bonds had a combined issue size of USD5.7bn.

Report highlights

- **Green bonds achieved a higher book cover and spread compression than vanilla equivalents, on average.**
See more on page 5
- **On average, 55% of green bonds were allocated to investors describing themselves as having green or ESG mandates.**
See more on page 9

- **Yield curves could be built for 21 bonds in our sample. Eleven priced on or inside their yield curves.**
See more on page 13

- **Seven and 28 days after pricing green bonds had, on average, tightened more than vanilla baskets and matched indices.**
See more on page 16

- **Communications sector spotlight: Swisscom became the fifth communications organisation to issue a green bond. There is untapped potential for green bonds from this sector.**
See more on pages 19

1. Market developments

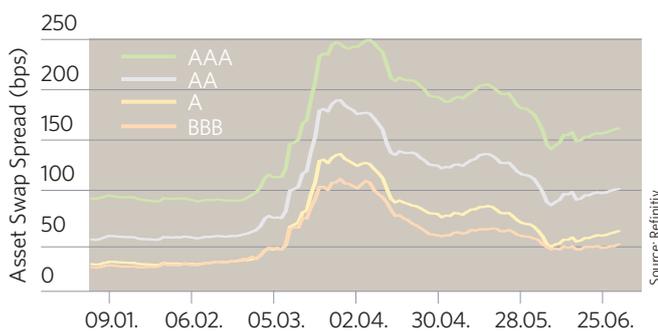
The green bond market was subject to its first serious test in the first quarter of 2020 as financial markets reacted to the impacts of the COVID-19 global pandemic.

Yields rose as the market sold-off aggressively between 20th February and 23rd March (the sell-off). In the US, the commercial paper market, which is a crucial source of liquidity for many corporates, completely froze. Credit markets stabilised towards the end of March as central banks detailed massive support frameworks. The ECB announced its EUR750bn Pandemic Emergency Programme on March 20th adding a further EUR600bn

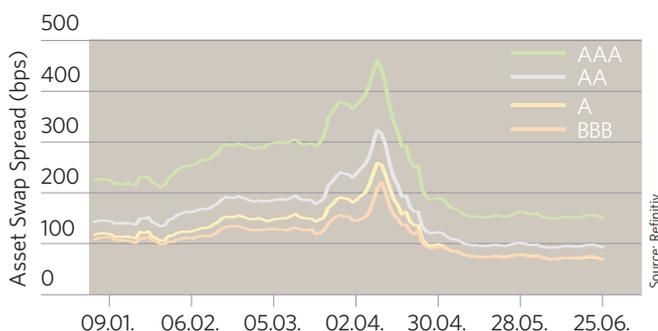
on 4th June. The FED launched its own commercial paper funding facility on 17th March. On the 23rd it committed to buying US Treasuries and agency MBS in 'amounts needed' and confirmed up to USD300bn of further measures including primary and secondary market corporate credit facilities. Issuers regained their confidence and there were record levels of corporate bond issuance in March, April, May, and June. Between March 17th and June 30th, USD920bn of investment grade credit was issued in the US market compared to USD320bn over the same period in 2019.³ In Europe, investment grade credit issuance (including SSA) had

reached EUR1.05tn by the end of June, a 33.4% increase on EUR790bn for the same period in 2019.⁴ However, particularly in the USD market, issuers were keen to shore up capital opportunistically without committing to a specified use of proceeds which is the essence of a green bond. Issuing a green bond also involves extra planning to identify green assets and have them assessed via an external party. While vanilla bond issuance soared to record levels, EUR green bond issuance didn't start getting back to normal until June. The USD green bond market took slightly longer and momentum had still not recovered by the end of H1.

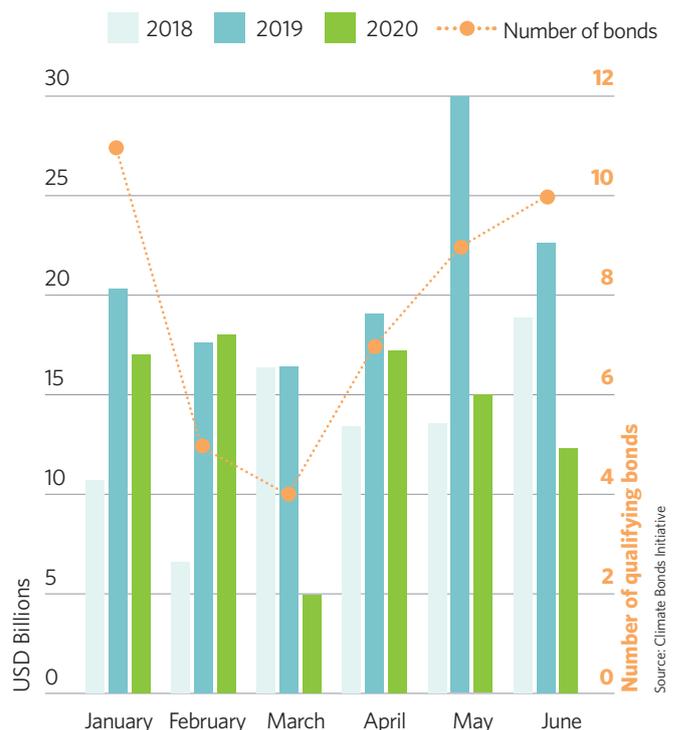
EUR Corporate credit spreads 2020



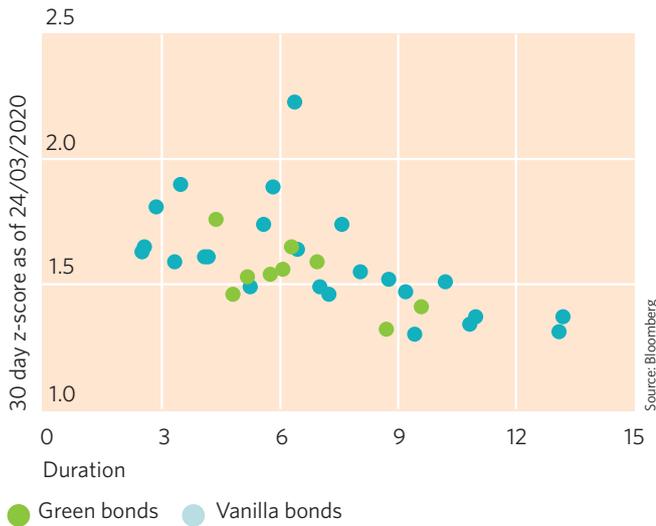
USD Corporate credit spreads 2020



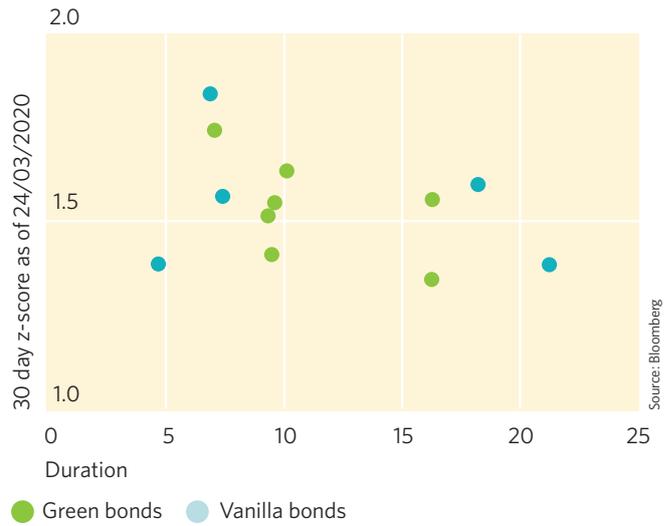
Green bond issuers returned to the market in Q2



BBB-rated EUR utility bonds issued in 2019



A-rated EUR utility bonds issued in 2019



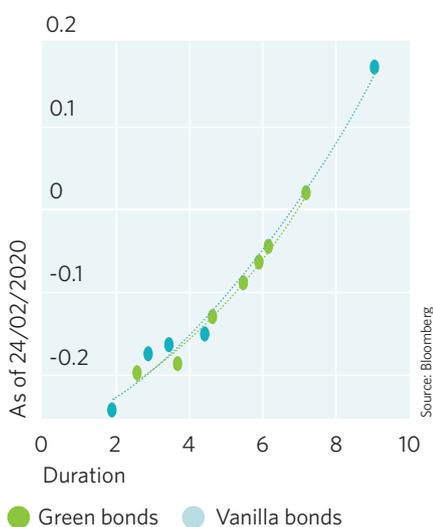
During the sell-off, data recorded rising yields for all types of bonds. There was no material difference between green and vanilla bonds in this regard. This is as one would expect since green bonds offer no credit enhancement compared to vanilla bonds from the same entity with the same payment rank. Comparing green bond indices with broad market equivalents offers little insight into the relative behaviour of green bonds during this period. Several structural differences make such comparisons meaningless. For example, green bond indices comprise a much larger allocation to utilities, and a much smaller share of industrials (which includes energy and airlines) compared to broad market equivalents. To get a sense of how green bonds behaved during the sell off, we compared the z-scores of individual

EUR Utility bonds issued in 2019. The z-score is the measure of how many standard deviations above or below the mean a data point is (see Remarks). EUR utilities offer the best sample for this analysis because there were similar numbers of green and vanilla equivalents issued in 2019.⁵ It should be noted that this exercise is based on available data, acknowledging that there was no activity in many individual bonds during the period of observation.

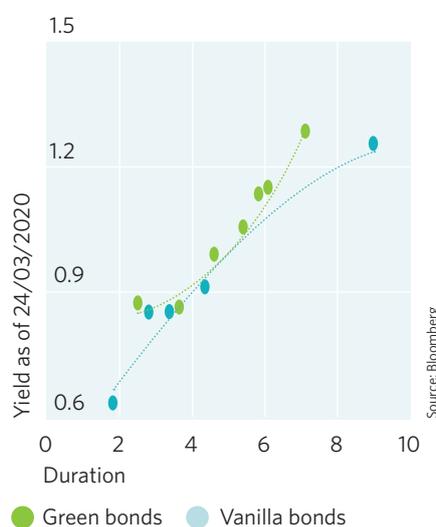
BBB-rated utility green bonds appear to have sold-off less aggressively compared to vanilla equivalents, while A-rated utility green bonds do not appear to have performed any differently. During the sell-off, liquidity dried up for all types of bonds and higher dealing spreads would have made it harder to sell assets. Lack of liquidity is a feature of risk

aversion, but we understand from multiple sources that green bonds did preserve sufficient liquidity to be transacted. This offered a clear lifeline to holders of green bonds who had the flexibility to liquidate their positions either to fund rare new issue opportunities, or redemptions. The EUR yield curves of several utilities suggest that while green bonds initially sold off as much as or more than vanilla counterparts, perhaps because the green bonds were easier to sell, in the aftermath investors may have attached a value to the green label. The green and vanilla yield curves of Iberdrola before, during, and after the sell-off illustrate this story. Spanish electric utility Iberdrola, like many European utilities, has a well-defined transition strategy financed through green bonds. German electric utility E.ON is another example, explored on page 12.

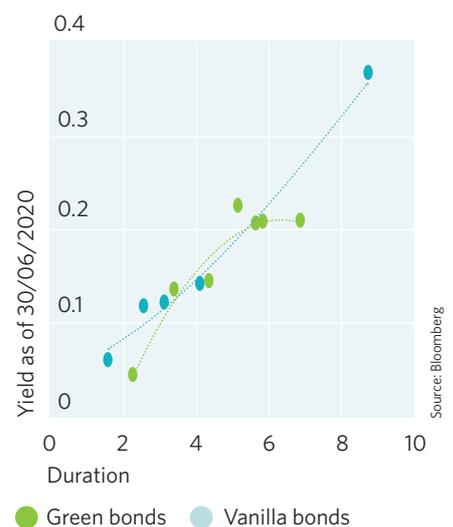
Iberdrola 24th Feb: Green and vanilla curves intertwined



Iberdrola 24th March - green bond curve outside vanilla



Iberdrola 30th June: green label shows value



New issues in H1 2020

In H1 2020, 29 qualifying issuers revisited the green bond market with a total of 34 bonds. Four issuers brought multiple deals:

- **In early January, Digital Euro Finco returned to the market** with its third and fourth green bonds totaling EUR1.4bn split between 2025 and 2030 maturities.
- **Chile issued its 3rd and 4th green bonds towards the end of January:** a EUR1.04bn 2040 and a USD750m 2032. They are part of a national strategy to finance projects that contribute towards Chile's NDC targets and were issued with assistance from the IDB
- **German electric utility E.ON** issued its third, fourth, and fifth green bonds in January, March, and May. The proceeds will contribute to sustainable infrastructure and energy efficiency projects.
- **The UK's National Grid issued two green bonds** beginning with a EUR500m 5-year in mid-January. In late June, this was followed by a USD600m 2030 bond from Niagara Mohawk Power, a US subsidiary. This was the first issue from National Grid's Green Financing Framework for any of their US entities and the bond priced through its own yield curve.

Twelve issuers brought debut labelled bonds. Among them:

- **Japan Finance Organisation for Municipalities (JFM 2027)** issued a EUR500m green bond in February. JFM is a joint funding organisation, designed to provide Japanese local governments with long-term funding at low interest rates. The net proceeds will be used for loans to local municipalities to finance or refinance existing or future sewerage projects.
- **Cadent Finance Plc (Cadent 2032)** came to market with an inaugural EUR500m 12-year Transition bond in March.⁶ Cadent's framework names four eligible project categories: retrofit of gas transmission and distribution networks to be hydrogen-ready, renewable energy, clean transportation, and energy efficient buildings. Types of projects within each category have been outlined and selection criteria aligned with the thresholds set out in the EU Sustainable Finance Taxonomy. Business transitions to low-carbon activities, and therefore transition bonds, will play an increasingly important role in the debt capital markets and Cadent's deal is the first of its kind in the UK and contributes to the UK's National Adaptation Plan.
- **Groupe BPCE France (BPCE 2030 (CO)),** issued a 10-year green covered bond in May. The proceeds are secured on mortgages to properties in the top 15% of energy efficiency in France and will finance further eligible green mortgage loans for green buildings. The bond attracted an order book of EUR6.4bn, the largest for a covered bond since 2013.

Remarks:

- The z-score is calculated as: $(\text{data point} - \text{mean}) / \text{standard deviation}$.
- The extreme market volatility of H1 2020 has influenced the methodology for selecting matched vanilla bonds. Vanilla bonds are normally the closest possible matches based on currency, credit rating, maturity, seniority, and sector chosen from bonds issued in the same quarter. In H1 2020, the pricing date of the green bond was the biggest influence on the direction of the price. Therefore, comparable bonds were selected having a pricing date as close as possible to the green bond. On pages 23-25 details of comparable bonds and baskets are given along with the respective pricing dates. Comparing to just one bond is not ideal as it exposes credit preferences and individual credit metrics come into play. This analysis is done on a best efforts basis using available data and is designed to demonstrate vanilla options available to investors at the time the green bond was issued.
- Seniority rankings of financial corporate bonds are denoted using the following abbreviations: Senior Preferred = SP, Senior Non-Preferred = SNP, Senior Subordinated = SSUB, Senior Unsecured = SU. Covered bonds are denoted as CO. As per our standard methodology, the payment rank of the green bond is matched where practicable when selecting vanilla bonds with which to compare the performance.

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 5.2x for green bonds, and 3.1x for vanilla equivalents. Spread compression averaged 25bps for green bonds and 20bps for vanilla bonds.

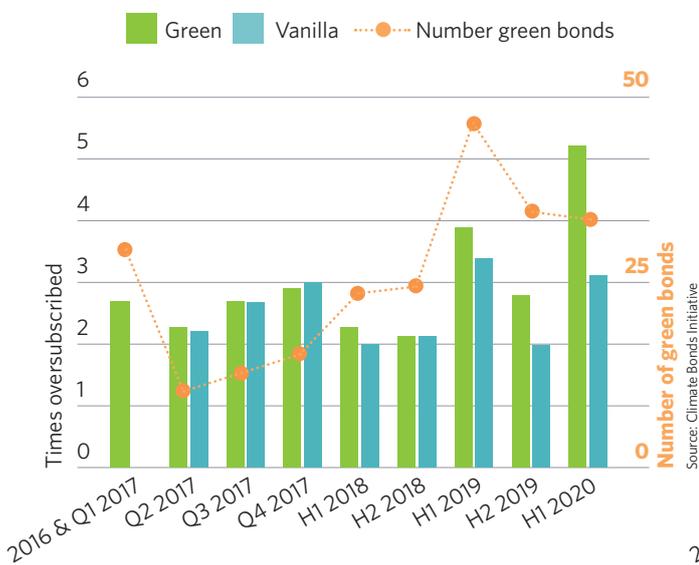
▪ **USD:** Average oversubscription was 2.6x for green bonds and 2.3x for vanilla equivalents. Spread compression averaged 20bps for green bonds and 18bps for vanilla bonds.

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, green bonds are compared to carefully selected vanilla equivalents.

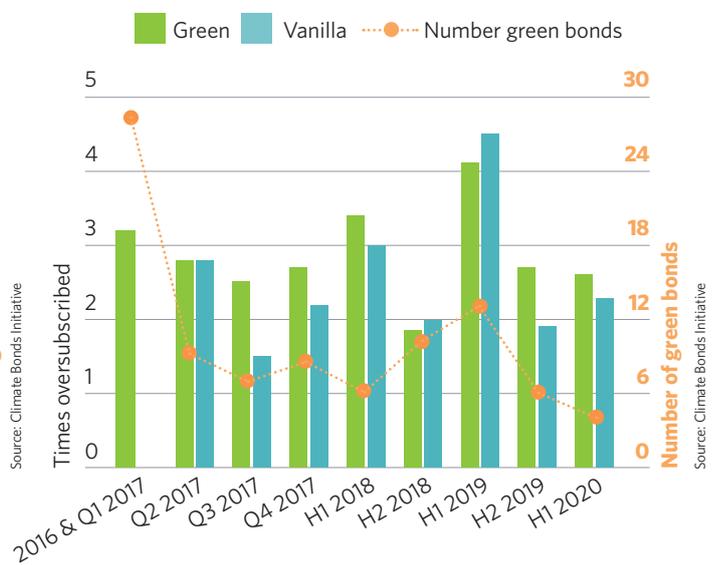
From March onwards, oversubscriptions and spread compressions were exaggerated for both green and vanilla bonds. The H1 2020 average green bond EUR oversubscription (5.2x) and spread compression (25bps)

were the highest since 2016, and almost double what was observed in H2 2019 (2.8x and 13.3bps). USD green bonds achieved higher average oversubscription and spread compression than vanilla equivalents. The average spread compression (20bps) is the highest observation of any period to date, but the book cover (2.6x) was below average (2.7x).

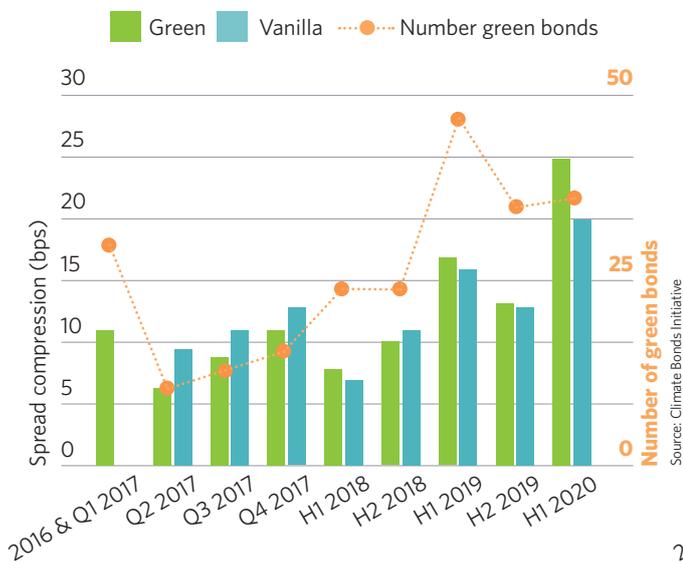
Average oversubscription of EUR bonds in sample



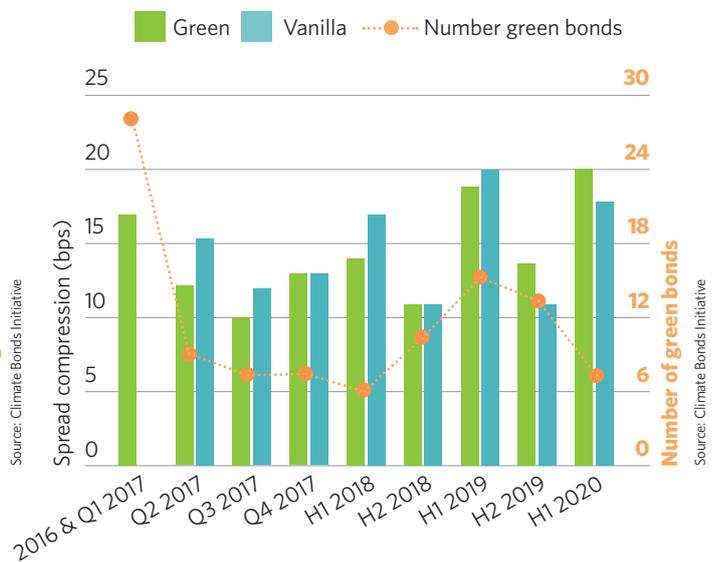
Average oversubscription of USD bonds in sample



Average spread compression of EUR bonds in sample



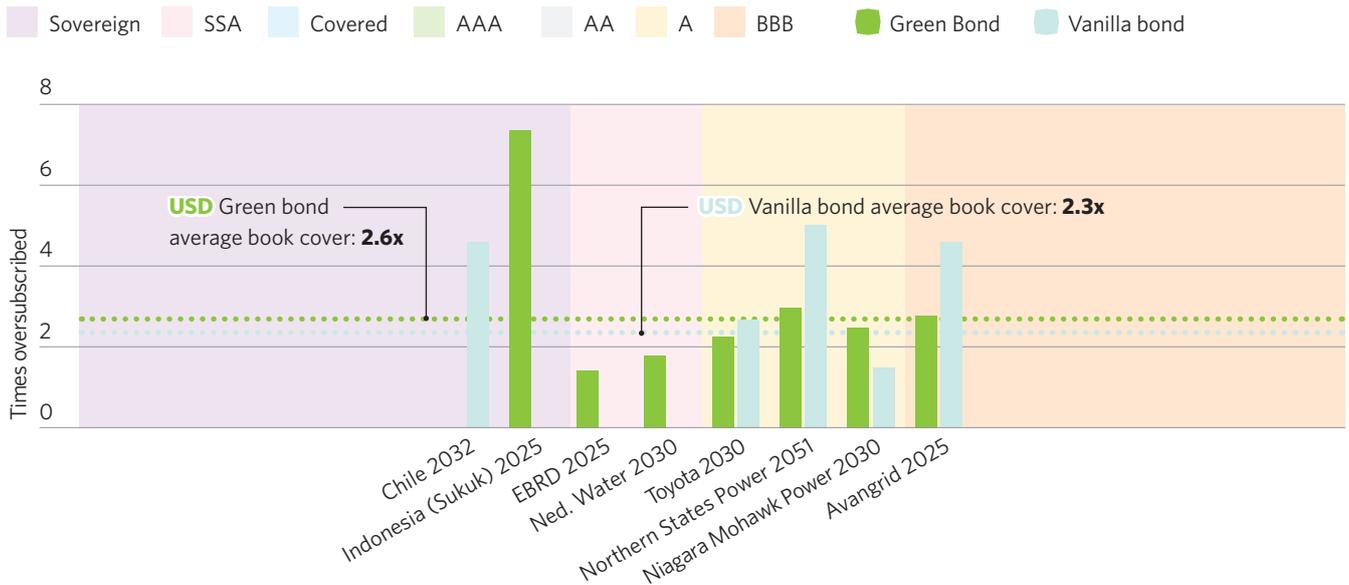
Average spread compression of USD bonds in sample



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



One USD green bond achieved higher book cover than vanilla equivalents



EUR green bond pricing

Nearly four-fifths (79%) of EUR green bonds achieved larger oversubscription than vanilla equivalents. One bond had equal book cover to its vanilla counterpart (Prologis Euro 2028), and there was no comparative analysis for four bonds. Just seven EUR green bonds achieved lower book cover than their comparable baskets. More than two thirds (69%) of EUR green bonds experienced larger spread compression compared to vanilla equivalents.

Eleven EUR green bonds had lower spread compression compared to peers. Two were equal to their vanilla counterparts (Hyp Noe 2024 (SP) and CCPIB 2027), and one lacked data.

Book cover The four largest individual book covers for green bonds ever recorded in this research series occurred in H1 2020. US real estate company Prologis 2032 returned to the market with its first benchmark sized green bond, while Dutch utility Alliander 2030 was a debut green bond issuer. Both priced on 3rd June and took the two top spots with 14x and 11.8x book cover respectively. Each bond was issued as 'will not grow' meaning the size was capped up front, and both were limited to EUR500m.

Iberdrola 2025 claimed the third spot with book cover of 11.6x. The bond came on 1st April and was only the fifth EUR denominated benchmark sized green bond issued since March 1st. Iberdrola has a well-defined transition strategy supported by a green bond curve, and utilities can be regarded as a safe haven in turbulent markets.

Debut green bond issuer Swisscom 2028 achieved book cover of 10x when it priced on 6th May. This bond was issued through a Netherlands based vehicle and thus was eligible for the ECB Corporate Sector Purchase Programme. This and the rarity of a green bond from the communications sector proved an attractive proposition (see Spotlight on page 19).

Spread compression EUR green bond spread compressions in H1 2020 also included the largest observations since 2016. In turbulent markets, primary dealers tend to start with exaggerated initial price thoughts to attract broad investor interest. Spread tightening can thus appear more dramatic compared with 'normal' times.

Prologis 2032 again took the top spot with 65bps of spread compression, this is the largest observed since 2016. Iberdrola 2025 managed to tighten 55bps while three more utilities achieved spread compression of 50bps: EDP 2027, E.ON 2025, and Alliander 2030. E.ON issued three EUR green bonds in H1 2020: E.ON 2027 EUR1bn on 9th January had spread compression of 22.5bps, E.ON 2025 EUR750m on 31st March had spread compression of 50bps, and E.ON 2031 EUR500m on 13th May had spread compression of 35bps. The E.ON 2027 priced on the vanilla curve, which in January was slightly outside the green curve. The E.ON 2025 and 2031 both priced with a new issue premium in spite of exhibiting more dramatic spread compression.

This emphasises the importance of context when comparing this data. The yield curves of E.ON are discussed again on page 12.

NB1: *We were unable to source book cover data for Chile 2040. There was no book cover data available for the comparable bonds for NIB 2027, Eurofima 2030, and Digital Euro Finco 2030. Consequently, comparative analysis is not charted for these bonds.*

USD green bond pricing

In USD, green and vanilla data points were available for just four bonds, and only one attracted larger book cover than its vanilla basket. Three out of seven green bonds achieved larger spread tightening compared to vanilla equivalents.

Book cover Indonesia 2027 was the third green Sukuk from the Republic of Indonesia and attracted a book cover of 7.3x, the largest among the USD green bond sample. Since there was no book cover data for the comparable bond, no conclusions can be drawn about the relative attractiveness of the green label. Four USD green bonds had comparable data, of which only Niagara Mohawk Power 2030, priced 23rd June 2020 achieved larger book cover than its vanilla basket of 2.5x against 1.5x.

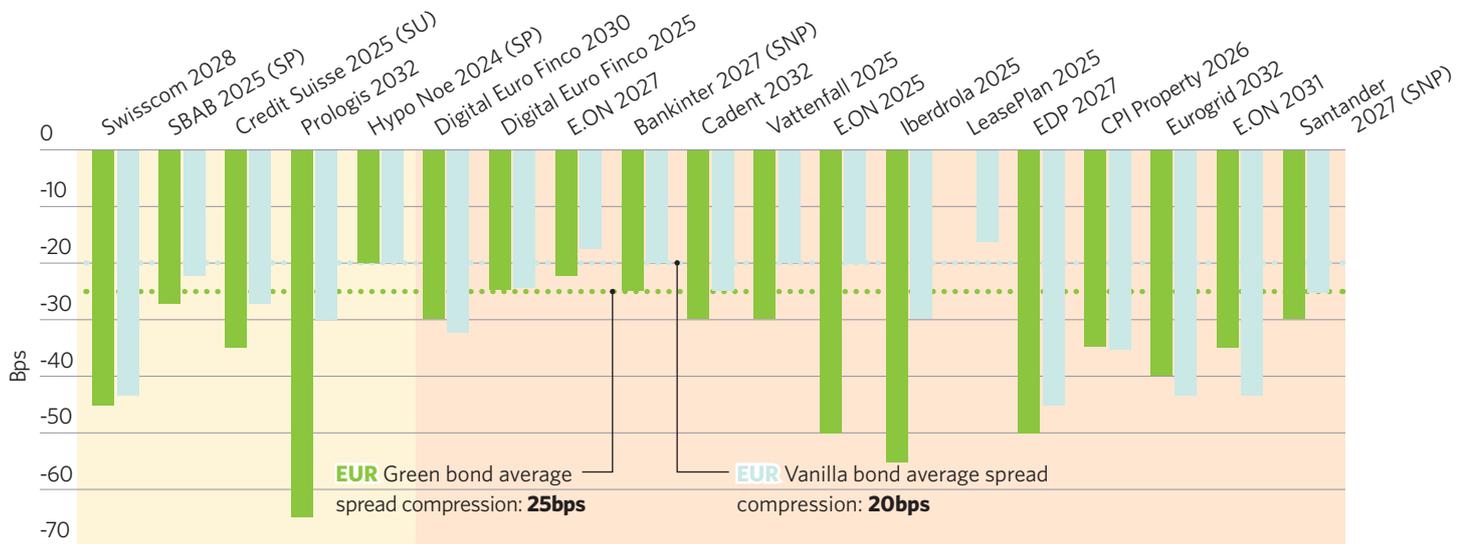
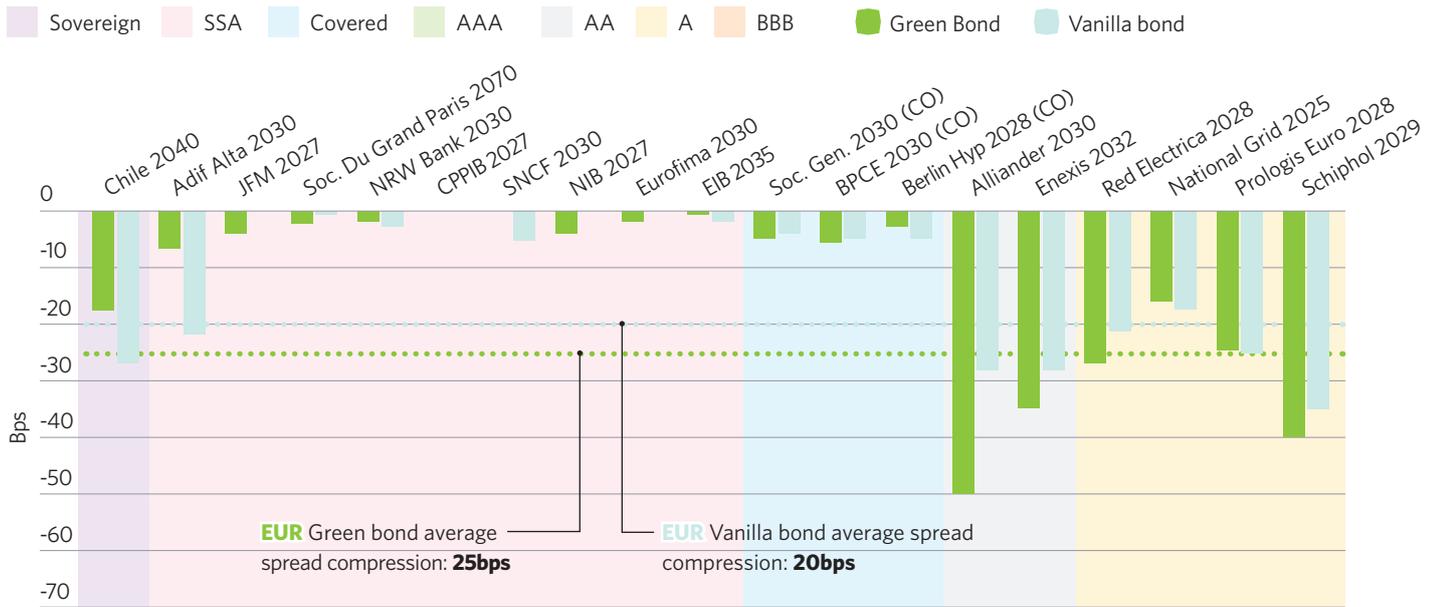
Spread compression Iberdrola subsidiary Avangrid 2025 priced on 7th April and achieved spread compression of 50bps. This is the largest observed for any USD green bond except for Mexico City Airport 2046 which was priced in 2016 and achieved spread compression of 55bp.⁷

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

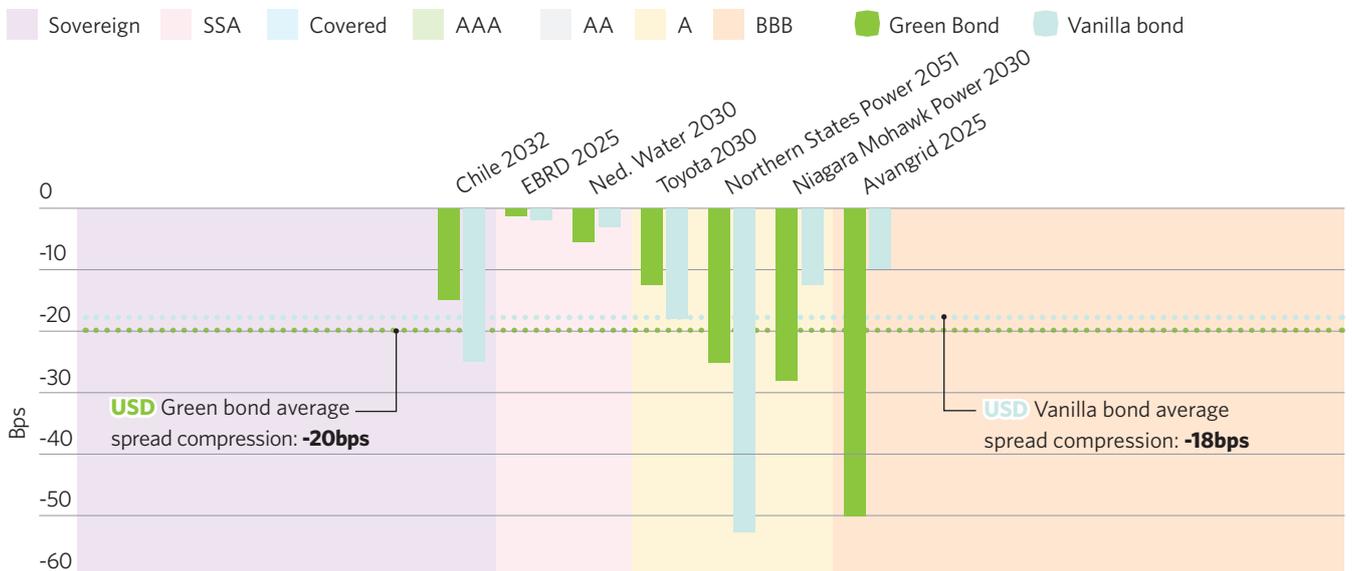
NB1: *We were unable to source book cover data for Chile 2032. There was no book cover data available for the comparable baskets of three USD green bonds: EBRD 2025, Ned. Water 2030, and Indonesia (Sukuk) 2025. NB2: We were unable to source spread compression data for Indonesia (Sukuk) 2025. Consequently, comparative analysis is not charted for these bonds.*

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 26, and for summary statistics of the baskets, pages 23-25.

25 out of 35 EUR green bonds tightened more than vanilla baskets during bookbuilding



3 out of 7 USD bonds tightened by more than vanilla baskets during bookbuilding



3. Green allocations: 55% was allocated to investors describing themselves as green

■ 55% of the amount raised from green bonds in our sample was allocated to investors labelling themselves as green or socially responsible.

All 41 issuers included in this analysis were contacted and invited to disclose the percentage of their green bonds that were allocated to investors describing themselves as green or socially responsible (green investors).

Of the 36 issuers who responded, 30 replied with the allocation split between green investors and non-green investors. Six declined to share the data and five did not reply.

In H1 2020, an increase in the average allocation to green investors to 55% was recorded, up from 50% in H2 2019.

Treasurers are keen to have as diverse an investor base as possible, and therefore welcome interest from new sources. Allocations to this category of investor ranged from 13% (Chile 2032) to 86% (Prologis Euro 2032). **Several issuers privately disclosed that green investors were easily sufficient in number to have taken 100% of the deal.**

Among those who did not want to share the split, the reason given was the subjective nature of the definition of green investors. Some primary dealers have developed proprietary methodologies for classifying green investors which they apply to the distribution of green bonds and this includes 'shades' of green classified as dark, medium and light. Where this split is given, we include investors falling into all three categories to capture those whose investment decisions are influenced by the green label.

This said, we are aware that investors who do not have a mandate that specifically demands the green label (those who are not 'dark green' investors) may be involved in the deal because they simply need to buy a bond. Several of those who did not want to disclose the split highlighted the high participation of dedicated accounts.

Green investors are growing in number and represent a unique source of support for green bond issuers amid global uncertainty.

The COVID-19 pandemic has put greater emphasis on socially responsible investment strategies, and we expect this interest to continue to grow. On July 8th Christine LaGarde confirmed in an interview with the Financial Times that the ECB has purchased around 20% of the green bonds eligible for its Asset Purchase Programme (APP) adding further demand pressure to the green label.

A third source of growing primary market demand arises from the inclusion of green bonds in broad market benchmark indices. Broad market indices include green bonds where they meet the criteria for constituent inclusion, and therefore any investor benchmarked to such an index would consider all eligible bonds, including those labelled green. As more benchmark sized green bonds are issued the extra demand from mainstream investors will escalate.

98% of respondents to The Green Bond Treasurer Survey 2020 said that their green bond attracted new investors.

In April, Climate Bonds published The Green Bond Treasurer Survey 2020, a comprehensive assessment of 86 treasurers' experiences of issuing green bonds.⁸ Treasurers almost always described the inclusion of new investors as an intangible benefit of issuing green bonds. The most frequently stated benefits of this were

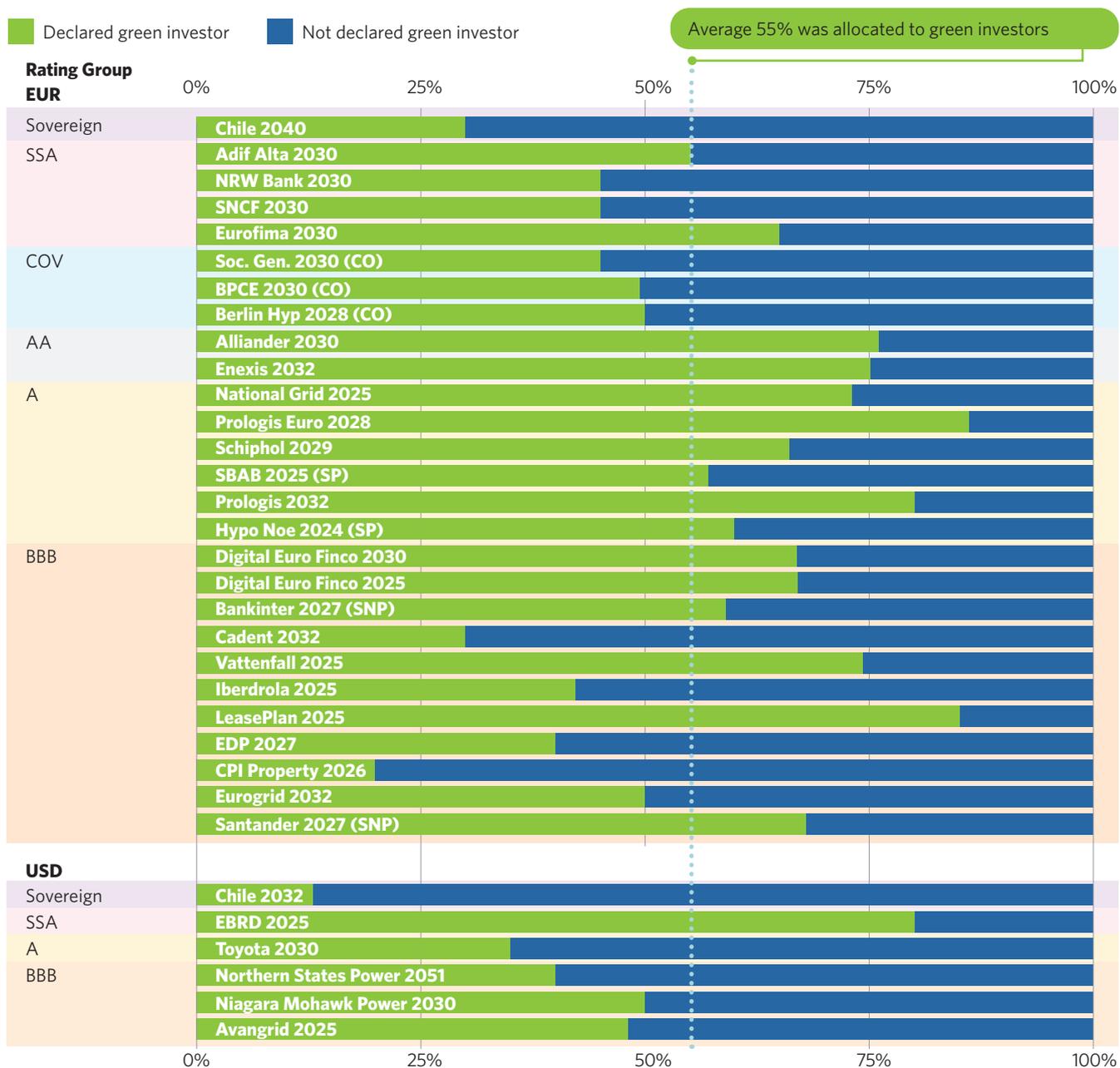
1. A more diverse pool of investors, offering greater flexibility to reopen or issue new bonds
2. A stickier investor base and
3. Greater visibility.

91% of respondents said a green bond facilitated more engagement with investors compared to a vanilla one. Investors

interrogated issuers on topics including the use of proceeds, the framework, and post issuance reporting. This dialogue resulted in investors having a more intimate knowledge of the organisation. Over two thirds (70%) of respondents said the demand for their green bond was higher than for vanilla equivalents. These findings were consistent with anecdotal evidence we have gathered from multiple conversations with treasurers and primary dealers in the preparation of this report series.

Methodology notes: Green investor participation is provided by issuers. There is no standard 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.

55% of green bonds were allocated to green investors



4. The greenium: 11 out of 21 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**”.⁹

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, geo-political issues, and the fall-out from global pandemics.

In H1 2020, we were able to build yield curves for 21 out of the 46 bonds in our sample, 14 of which had already issued green bonds sharing similar characteristics.

Within our sample of 21 green bonds:

- ten priced with normal new issue premia
- six priced on the yield curve (no new issue premia) and
- **five priced inside their yield curve, exhibiting a greenium:** in EUR, Berlin Hyp 2028 and in USD, Chile 2032, Toyota 2030, Indonesia (Sukuk) 2025, and Niagara Mohawk Power 2030.

By comparison, in H2 2019, just three out of 19 bonds priced with a normal new issue premium, the rest priced either on or inside their yield curves. This pricing pressure clearly eased off in H1 2020 as investors were more cautious and buying opportunistically, particularly in Europe. Market dynamics in the US were slightly different with the FED offering unlimited support and investor appetite remaining steady through book building for all types of bonds.

The green bonds in our sample that priced either on the curve, or with a greenium were issued firmly on either side of the sell-off period.

All three bonds in our sample originating from EM priced either on their curve (Chile 2040 EUR) or with a greenium (Chile 2032 and Indonesia (Sukuk) 2025, both USD). With yields remaining low, we would expect investors to explore EM risk but three data observations are insufficient for us to draw conclusions.

Ulf Erlandsson, CIO of Diem Credit, recently published a research report noting that green bonds tend to exhibit lower volatility in the secondary markets.¹⁰ This is important because it suggests that even if investors do pay a premium for the green label, they can be compensated in the secondary market with lower volatility.

This is also reassuring for treasurers and particularly important during periods of volatility such as that which we have just experienced.

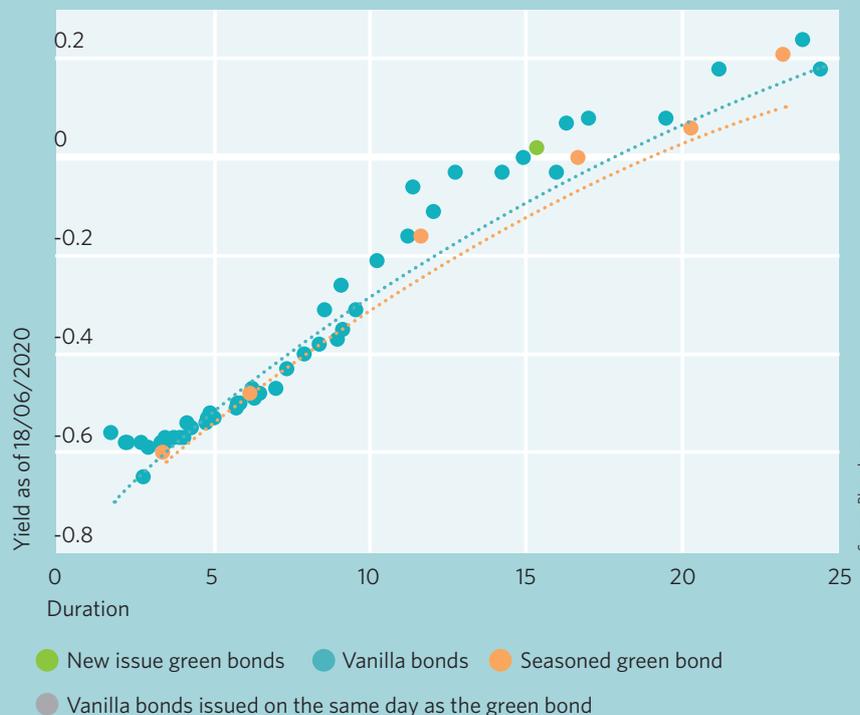
Spotlight on EIB

EIB issued its 51st Climate Awareness (green) Bond on 18th June 2020, an EUR1bn 2035 maturity. The EIB EUR vanilla curve comprises 47 bonds, and the green curve includes six bonds. The new green bond was 6x oversubscribed and priced outside the green curve and on the vanilla curve.

We spotlighted other EIB green bonds in our H2 2018 paper (EIB 2026) and our H1 2019 paper (EIB 2042). On both occasions, the green bond was inside the vanilla curve and on or slightly outside the green curve. In the case of our current green bond, the EIB 2035, we suspect it could be outside the green curve because SSA investors are diversifying into other types of responsible labels.

Most pandemic themed bonds were issued from China in March-April.¹¹ Therefore, these would be sustainability or social bonds, some of which incorporated allocations to pandemic related themes.¹² We expect that the pricing dynamics will return to normal once the market settles down.

EIB 2035 EUR - new issue premium



Source: Bloomberg

Spotlight on E.ON

German energy company E.ON had two EUR green bonds outstanding at the beginning of 2020 and added three more during H1.

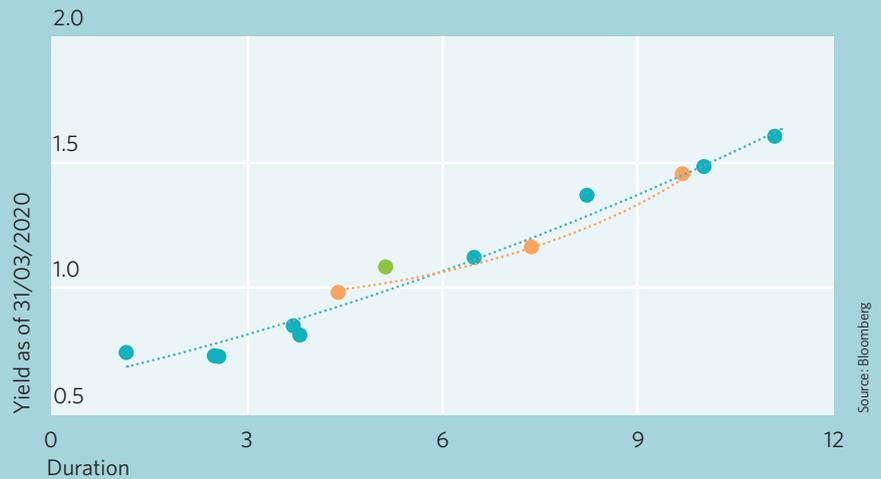
The first of those was issued on 9th January as part of a three-tranche EUR deal comprising a 7-year EUR1bn green bond and 4- and 11-year vanilla bonds. The green bond priced outside the green curve, but on the vanilla curve. The 4-year vanilla bond priced on the vanilla curve, while the 11-year priced with a new issue premium.

The second green bond priced on 31st March was a EUR750m 5-year which priced with a normal new issue premium.

The third green bond came as part of a three-tranche deal on 13th May comprising the EUR0.5bn 11-year green bond and vanilla bonds with 3- and 11-year maturities. While all three came with new issue premia, the green bond was the closest to the vanilla curve.

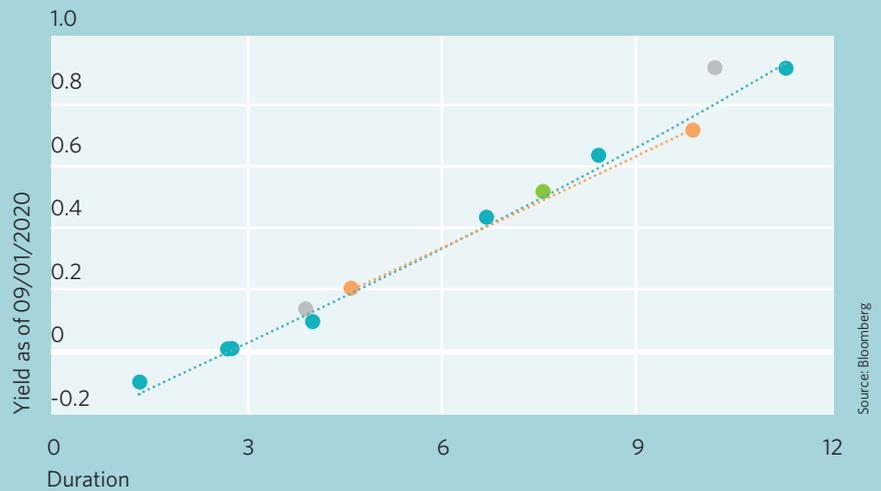
This is consistent with observations that we made about Iberdrola (page 3). Before the sell-off, investors attached a value to the green label. All types of bonds sold off during the sell-off period and investors were buying opportunistically, but the differentiation returned during the period of recovery.

E.ON 2025 EUR - new issue premium



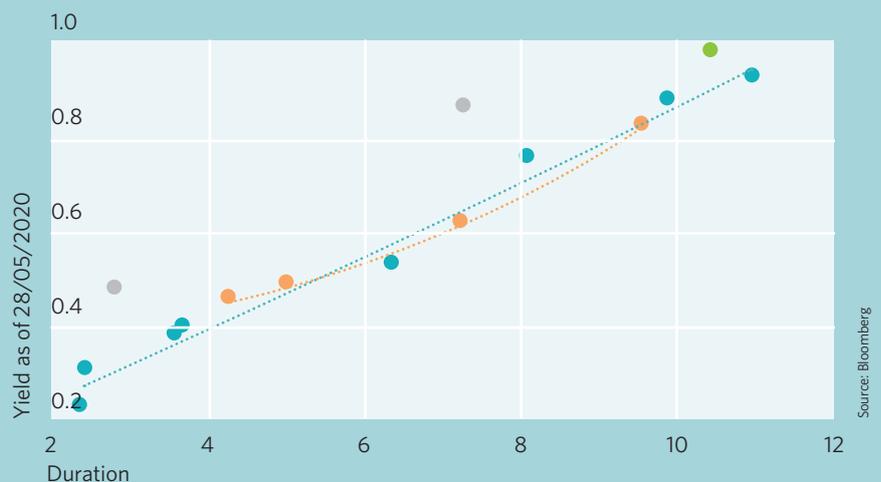
Source: Bloomberg

E.ON 2027 EUR - on the vanilla curve, outside green curve



Source: Bloomberg

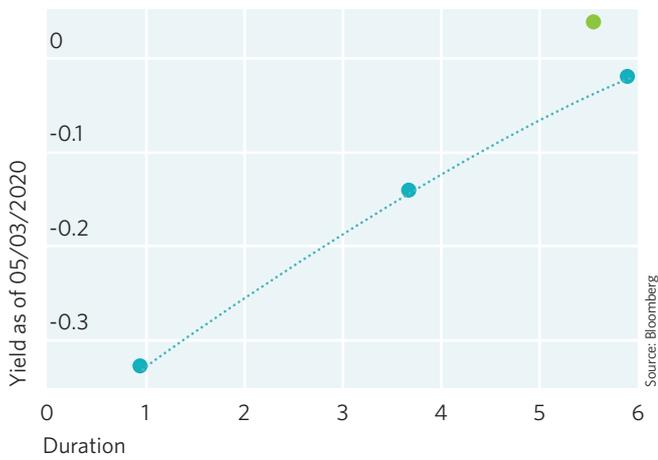
E.ON 2031 EUR - new issue premium



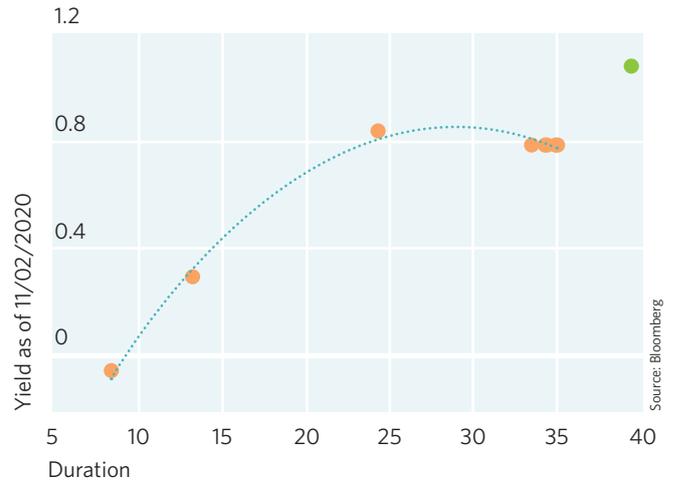
Source: Bloomberg

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

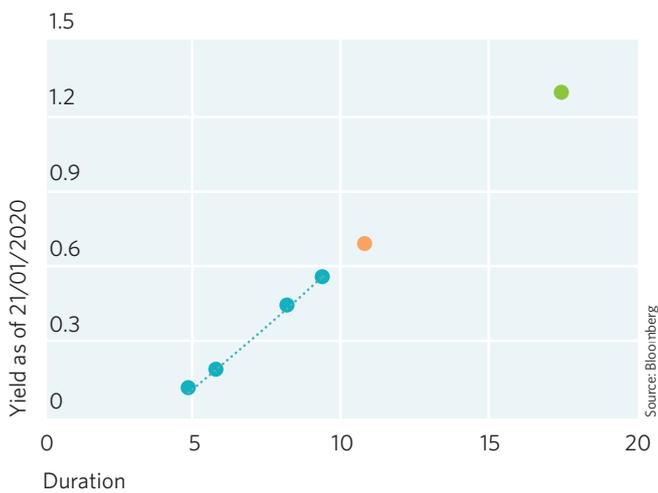
Vattenfall 2025 EUR - new issue premium



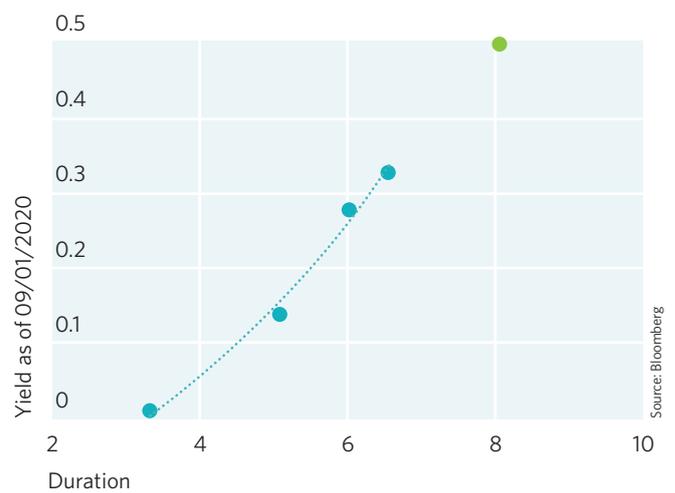
Soc. Du Grand Paris 2070 EUR (all bonds labelled green) - new issue premium



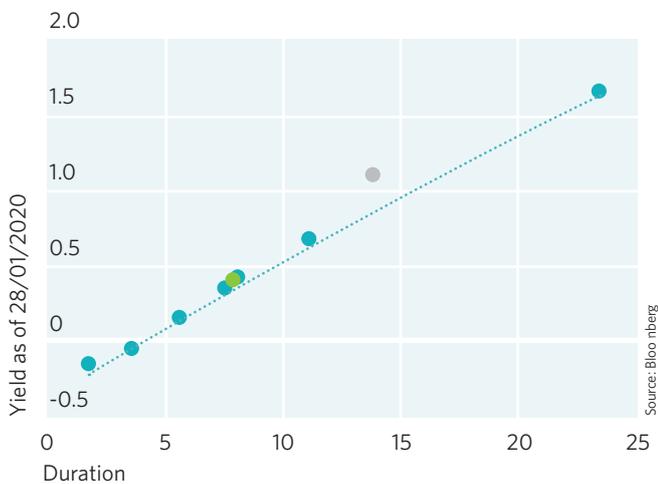
Chile 2040 EUR - on the curve



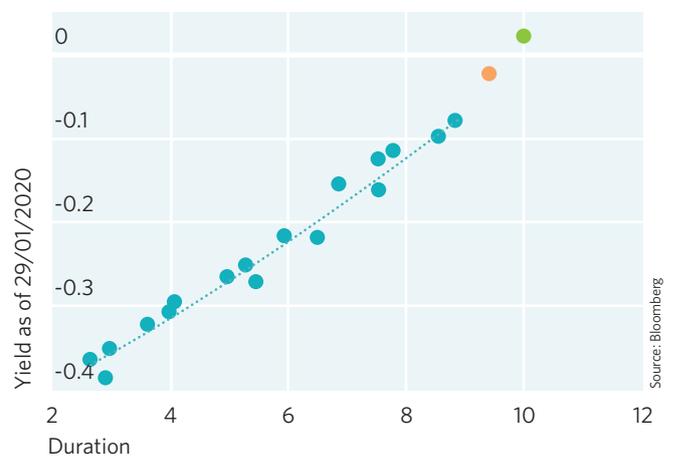
Red 2028 EUR - indeterminate



Prologis 2028 EUR - new issue premium

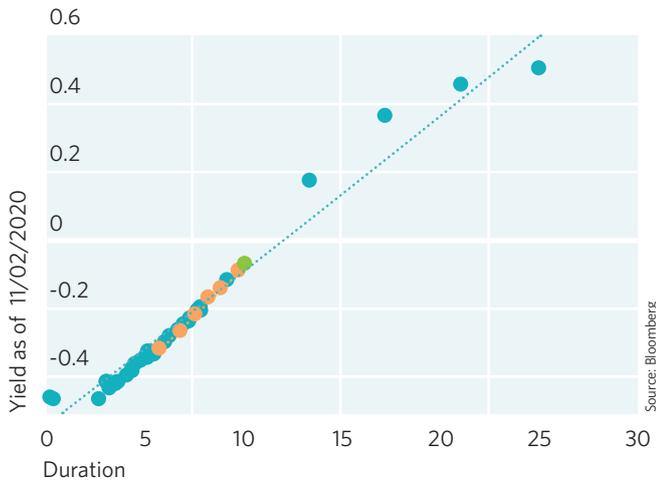


Soc. Gen. SFH 2030 (CO) EUR - new issue premium



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

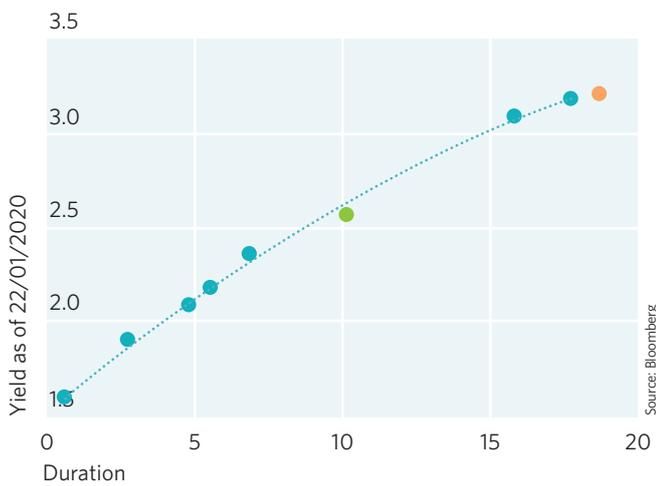
NRW 2030 EUR - on the curve



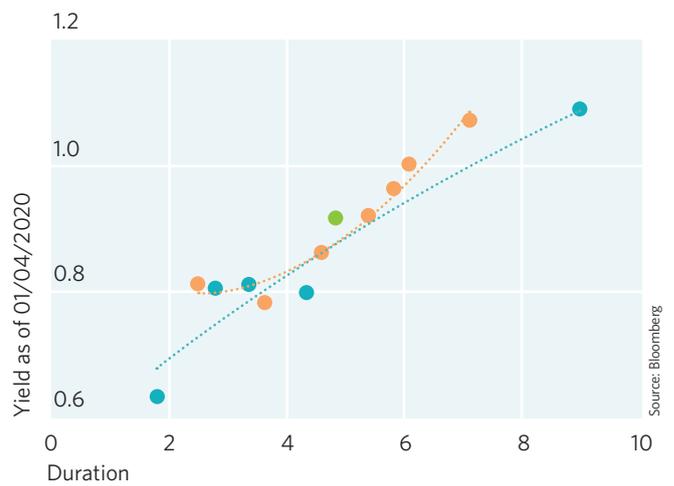
Toyota 2030 USD - greenium



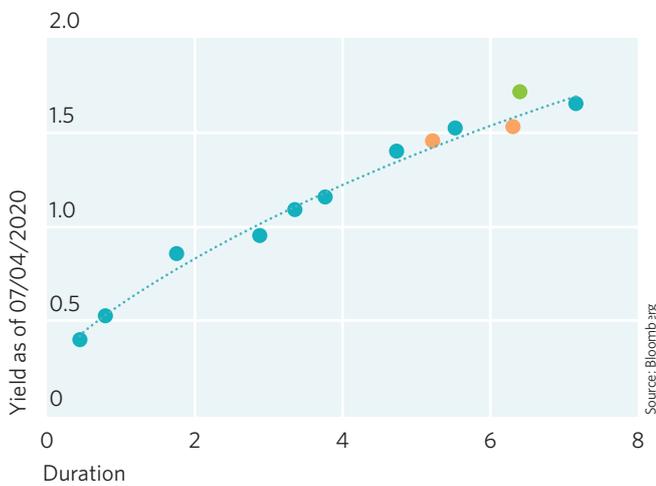
Chile 2032 USD - greenium



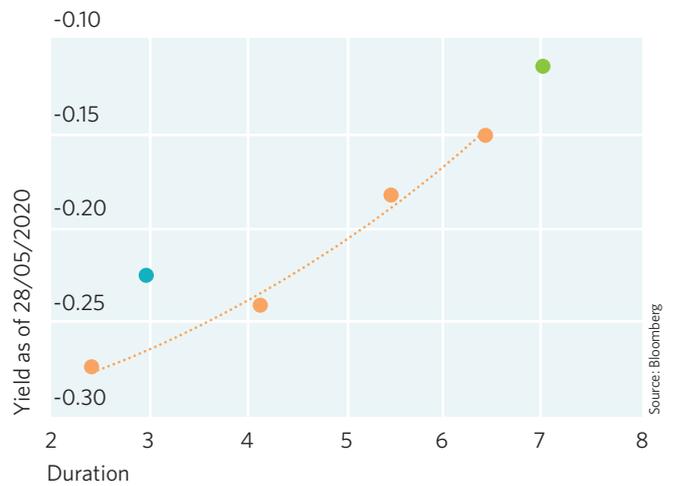
Iberdrola 2025 EUR - new issue premium



EDP 2027 EUR - new issue premium

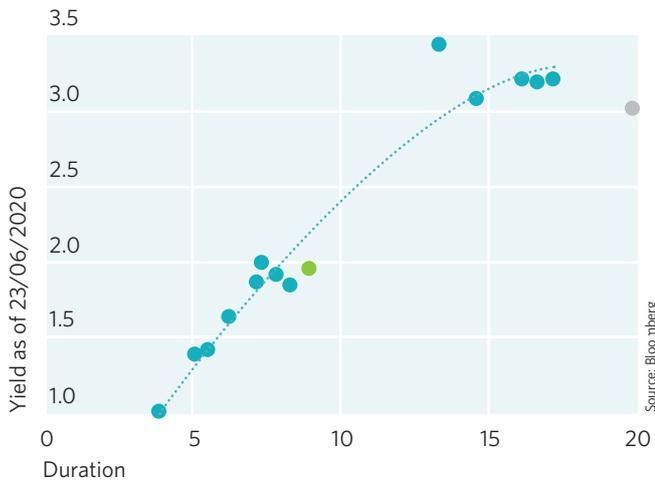


NIB 2027 EUR - on the green curve

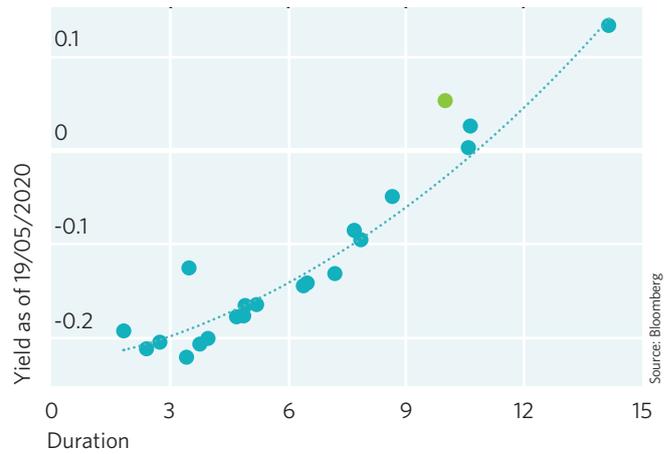


● New issue green bonds
 ● Vanilla bonds
 ● Seasoned green bond
 ● Non-green bond issued on the same day as the green bonds

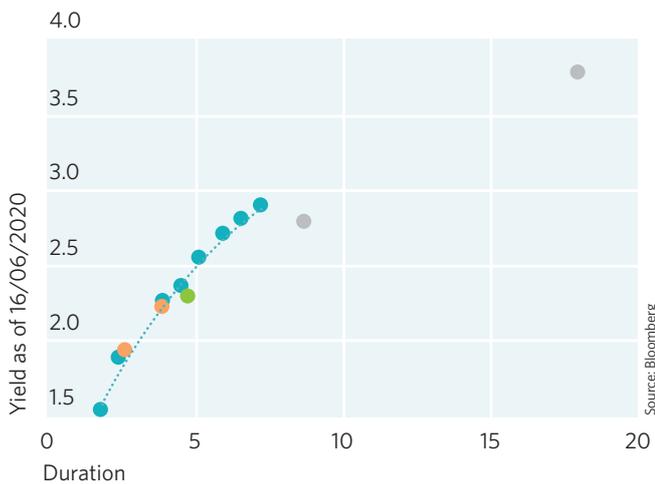
Niagara Mohawk Power Co. 2030 USD - greenium



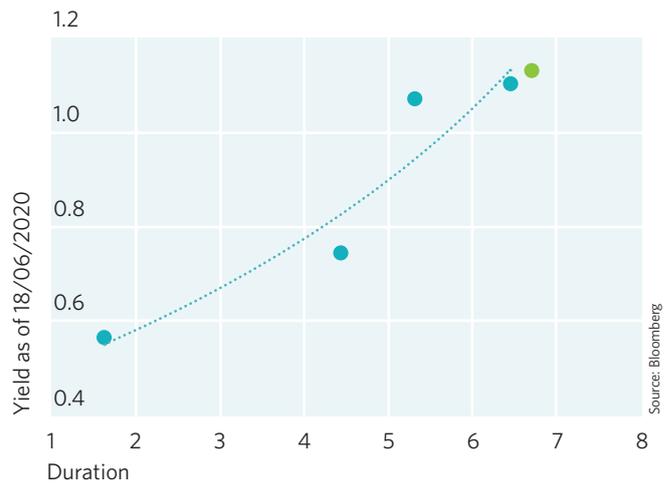
BPCE 2030 (CO) EUR - new issue premium



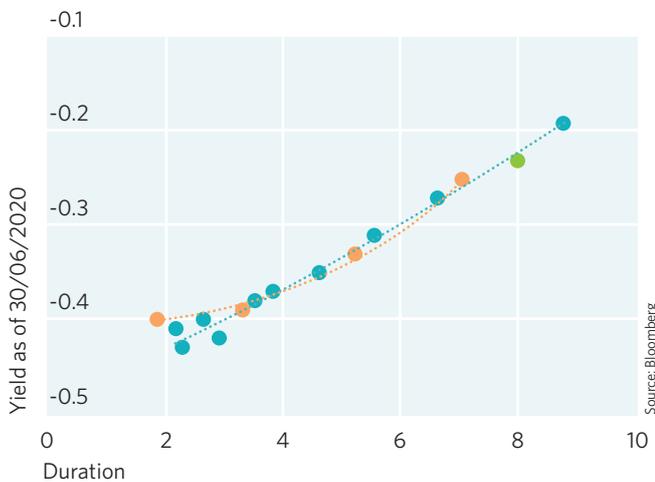
Indonesia 2025 (Sukuk) USD - Greenium



Santander 2027 (SNP) EUR - on the curve



BHH 2028 (CO) EUR - greenium



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 26, 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

▪ **Seven days after pricing**, 63% of green bonds had tightened more than comparable vanilla baskets; 68% had tightened more than their corresponding index.

▪ **28 days after pricing**, 59% of green bonds had tightened more than comparable vanilla baskets; 67% had tightened more than their corresponding index.

In H1 2020, 70% of individual green bonds in our sample had tightened seven days after pricing; after 28 days this had dropped slightly to 67%.

		% change 1 week			% change 1 month			
Rating Group	Bond	Green Bond	Vanilla Basket	Corresponding iBoxx Index	Green Bond	Vanilla Basket	Corresponding iBoxx Index	
EUR	Sovereign	Chile 2040	8.8%	2.5%	0.7%	3.8%	-4.3%	16.2%
	SSA	Adif Alta 2030	1.4%	N/A	1.0%	8.4%	N/A	5.1%
		JFM 2027	-22.3%	21.2%	-12.5%	-29.8%	22.7%	27.3%
		Soc. Du Grand Paris 2070	-1.2%	7.6%	-0.5%	41.9%	52.2%	53.3%
		NRW Bank 2030	-21.5%	22.0%	-7.0%	37.0%	-5.0%	82.0%
		CPIIB 2027	N/A	37.2%	55.2%	-13.3%	397.6%	179.1%
		SNCF 2030	10.0%	-7.6%	0.4%	13.5%	-20.9%	-31.8%
		NIB 2027	-15.5%	14.6%	-11.0%	-124.5%	-9.2%	-29.2%
		Eurofima 2030	-7.0%	14.6%	9.0%	-15.4%	-9.2%	-24.2%
		EIB 2035	27.0%	-15.6%	0.5%	-135.0%	-17.6%	1.7%
	Covered	Soc. Gen. 2030 (CO)	15.5%	15.3%	9.0%	22.5%	-20.5%	-6.7%
		BPCE 2030 (CO)	-31.3%	-3.2%	-13.2%	-47.1%	-26.9%	-32.3%
		Berlin Hyp 2028 (CO)	29.2%	0.5%	-8.7%	78.0%	-10.2%	-10.6%
	AA	Alliander 2030	-14.1%	-10.1%	-21.8%	3.7%	-19.9%	2.8%
		Enexis 2032	-12.6%	-10.1%	6.3%	2.9%	-19.9%	21.0%
	A	Red Electrica 2028	-19.8%	-5.2%	-4.1%	-30.1%	-0.4%	-5.0%
		National Grid 2025	-14.9%	-4.6%	-4.1%	-5.6%	0.4%	-5.2%
		Prologis Euro 2028	2.3%	-3.7%	0.2%	4.9%	-1.6%	9.9%
		Schiphol 2029	-10.1%	-3.3%	-17.1%	-40.4%	-20.5%	-30.8%
		Swisscom 2028	-2.6%	-0.7%	8.1%	-8.7%	-10.5%	-16.1%
		SBAB 2025 (SP)	-13.8%	4.7%	3.4%	-35.8%	-7.9%	-21.5%
		Credit Suisse 2025 (SU)	11.6%	-8.3%	7.2%	-41.0%	-28.6%	-38.6%
		Prologis 2032	-21.0%	-1.6%	-13.1%	-15.7%	-4.7%	-0.8%
		Hypo Noe 2024 (SP)	-14.5%	19.4%	2.5%	-25.7%	-5.0%	-7.6%
	BBB	Digital Euro Finco 2030	-16.9%	-9.7%	-4.2%	-15.2%	23.5%	-4.5%
		Digital Euro Finco 2025	-14.9%	0.6%	-2.3%	-5.0%	1.3%	-5.5%
		E.ON 2027	-4.6%	-9.5%	-0.6%	-11.0%	-6.7%	-5.1%
		Bankinter 2027 (SNP)	N/A	N/A	N/A	N/A	N/A	N/A
		Cadent 2032	18.0%	-11.7%	25.9%	60.7%	36.6%	70.3%
		Vattenfall 2025	52.5%	-11.4%	47.5%	158.2%	-41.0%	122.4%
	E.ON 2025	-11.9%	-11.4%	-4.1%	-48.2%	-41.0%	-21.0%	
	Iberdrola 2025	-10.6%	-4.3%	-5.1%	-38.9%	-27.1%	-21.9%	
	LeasePlan 2025	-8.6%	-5.0%	-18.3%	-14.5%	-15.7%	-25.9%	
	EDP 2027	-21.1%	-13.4%	-11.8%	-24.5%	-29.3%	-21.0%	
	CPI Property 2026	-2.0%	-10.5%	3.7%	-10.9%	-20.4%	-12.7%	
	Eurogrid 2032	-3.3%	3.4%	6.5%	-26.7%	5.8%	-8.5%	
	E.ON 2031	-3.1%	3.4%	0.1%	-30.6%	5.8%	-22.9%	
	Santander 2027 (SNP)	-1.1%	4.0%	2.5%	-5.7%	-0.1%	-1.8%	
USD	Sovereign	Chile 2032	15.4%	7.3%	4.2%	1.9%	4.5%	4.5%
		Indonesia (Sukuk) 2025	-1.1%	-4.0%	0.3%	-2.1%	2.5%	-2.5%
	SSA	EBRD 2025	-8.5%	-84.2%	-4.2%	55.6%	-5.1%	49.6%
		Ned. Water 2030	-0.9%	2.2%	-4.3%	4.5%	2.2%	-13.3%
	A	Toyota 2030	-3.1%	1.1%	-1.0%	115.3%	24.4%	75.7%
		Northern States Power 2051	12.7%	-12.4%	15.0%	-0.8%	0.1%	10.7%
		Niagara Mohawk Power 2030	1.9%	-14.2%	2.4%	-25.7%	-30.7%	-12.5%
BBB	Avangrid 2025	-22.1%	-28.2%	-20.0%	-42.5%	-41.9%	-28.4%	

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, 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 consequently only extends to one month after the pricing date of each bond.

To contextualise spread movements, 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 as closely as possible to the green bond. 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,

- 63% of green bonds had tightened by more than their vanilla baskets: 71% of EUR and 25% of USD green bonds
- 68% of green bonds had tightened by more than their corresponding index: 65% of EUR and 75% of USD green bonds.

The headline numbers are a bit higher than H2 2019, which one would expect where the pricing has been more generous. More EUR bonds did better than their baskets compared to USD bonds, while the numbers were more similar when comparing the performance of bonds against indices. All the USD green bonds are compared to just one vanilla bond, with the top priority for matching being the timing of the issuance, so lots of the results are influenced by individual name performance.

For example, Avangrid 2025 had tightened by 22% 7-days after pricing, which suggests strong improvement. Its vanilla comparable bond, Nisource 2030 priced on the same day, but had a ten-year maturity and after seven days had tightened by 28%. The index data matches the performance over the exact same period, and for corporate bonds we match the indices by credit rating bucket, and maturity band, so could be a better indicator of relative performance considering the volatility we have seen in H1 2020.

After 28 days,

- 59% of green bonds had tightened by more than their vanilla baskets: 61% of EUR and 50% of USD green bonds.
- 67% of green bonds had also tightened when compared to corresponding indices: 70% of EUR and 50% of USD green bonds

After 28 days, EUR green bonds had, on average tightened by more than both vanilla baskets and corresponding indices. Sixteen bonds from our EUR sample tightened more than both baskets and indices after both seven and 28-days. There is no obvious link between these bonds in terms of sector, maturity, credit rating, or issue date. USD bonds appeared to perform less well in the immediate secondary market, though this could be due to paucity of data as much as investor preference.

NB1: *Adif Alta 2030 is matched with Cassa Depositi e Prestiti 1% 02/11/2030 for which there was no secondary market asset swap spread data available. NB2: There was no one week data available for CCPIB 2027. NB3: There was no secondary market asset swap spread data available for Bankinter 2027 (SNP)*

Methodology notes:

1. The extreme market volatility of H1 2020 has influenced the methodology for selecting matched vanilla bonds. Vanilla baskets normally comprise the closest possible matches based on currency, credit rating, maturity, seniority, and sector among bonds issued in the same quarter. In H1 2020, the pricing date of the green bond was the biggest influence on the direction of the price. Therefore, comparable bonds were selected having a pricing date as close as possible to the green bond. On pages 23-25 we give details of comparable bonds and baskets and include the pricing date. Comparing to just one bond is not ideal as it exposes credit preferences and individual credit metrics come into play. This analysis is done on a best efforts basis using available data. 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, Iberdrola 2025 is matched with the iBoxx EUR Corporates BBB 5-7 index.

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

6. Green bond ETFs

ETFs generally experienced net inflows over H1 2020, though there was an outflow of around EUR25bn during March.¹³ It appears that this investor anxiety did not extend to some of the green bond ETFs as Lyxor reported that they did not have a single outflow from their green ETFs during March. This supports the notion that green bond investors tend to be more 'sticky'.

Since December, five of the six green bond ETFs have continued to exhibit strong growth. The Lyxor Green Bond ESG screened fund increased by 150% between December 2019 the end of June, the largest relative change. ETFs provide a vehicle for passive investors to replicate the green bond market. Throughout 2020 there has been increased focus on sustainable investment options as investors look at ways to protect their income from the impacts of natural disasters, and preference investment in entities which do not harm the environment.

We expect this trend to become more pronounced, and as a result, hope to see green bond ETFs grow in both number, and size. This will continue to provide a source of support for the green label in the secondary market. Given the extraordinary growth of green bond ETFs seen in H1 2020, we invited reflections from green bond ETF providers.

"We have seen increased interest for green solutions on the fixed income side from a variety of investors - discretionary, asset managers, and insurance companies. In this time of market uncertainty, we think investors recognise the merits of an active approach in a volatile environment which helps navigate the pitfalls of a standard market cap index approach. The combination of active management and the ETF wrapper offers investors the ability to benefit from our experience in the green bond market and to have a transparent and flexible vehicle."

Caroline Baron, Head of ETF Distribution EMEA, Franklin Templeton Investments

'Our green bond ETF has held up very well this year, including during the extreme volatility of March. The ETF did not experience any outflow, unlike other bond ETF in March (particularly corporate bonds). I think that is reflective of the investor base, and sustainable funds in general, which tend to make long-term, strategic allocations.'

Green bonds continue to perform as expected, and by that, I mean in line with the broader fixed income market once you adjust for things like sector and duration differences. To me that is why the market has been so successful and will continue to grow, because traditional fixed income investors can allocate to green bonds without significantly impacting the overall risk and return profile of their portfolio.'

William Sokol, Director of ETF Product Management, VanEck

ETF name	Currency	Index	Launch date	Size at launch	AUM Dec 2019	Total Assets 30 June 2020
Lyxor Green Bond DR UCITS ETF	EUR	Solactive Green Bond Index	February 2017	EUR5m	EUR179m	EUR 320m
Van Eck Vectors Green Bond ETF	USD	S&P Green Bond Select Index	March 2017	USD5m	USD26m	USD33m
iShares Global Green Bond ETF	USD	Bloomberg Barclays MSCI Global Green Bond Select	November 2018	USD25m	USD43m	USD82m
UC MSCI European Green Bond ETF	EUR	Bloomberg Barclays MSCI European GB Issuer Capped EUR Index	November 2018	EUR 20m	EUR21m	EUR22m
Franklin Liberty Euro Green Bond ETF	EUR	Bloomberg Barclays MSCI Euro Green Bond Index	April 2019	EUR10m	EUR16m	EUR29m
Lyxor Green Bond ESG Screened	EUR	Solactive Green ESG Bond EUR USD IG TR Index	October 2019	EUR4m	EUR4m	EUR10m

7. Spotlight on the communications sector - Swisscom dials into a warm investor welcome.

In early May 2020, Swisscom, the Swiss telecommunications provider, became the fifth entity in the communications sector to issue a green bond eligible for the Climate Bonds Green Bond Database.ⁱ Swisscom managed to accumulate EUR5bn worth of interest in the bond, translating into a book that was ten times covered. This bond was issued through a Netherlands based vehicle and thus was eligible for the ECB Corporate Sector Purchase Programme, and consequently ECB Pandemic Emergency Purchase Programme as well. Even in this context, interest of this magnitude is notable.

Communications issuers remain a rarity in the green bond market where investors are keen to diversify their sectoral risk.

Telefónica (Spain) was the first to take the plunge in January 2019 closely followed by Verizon (USA) in February 2019, and later Vodafone (UK) in May 2019. Telia (Sweden) joined the market in February of this year.

Telefónica and Telia each returned to the market, in January and June 2020 respectively.

To date, communications green bonds amounting to USD4.7bn have been included in the Climate Bonds Green Bond Database.

This is against a global sector size of USD1.6tn from 649 different issuing entities.ⁱⁱ

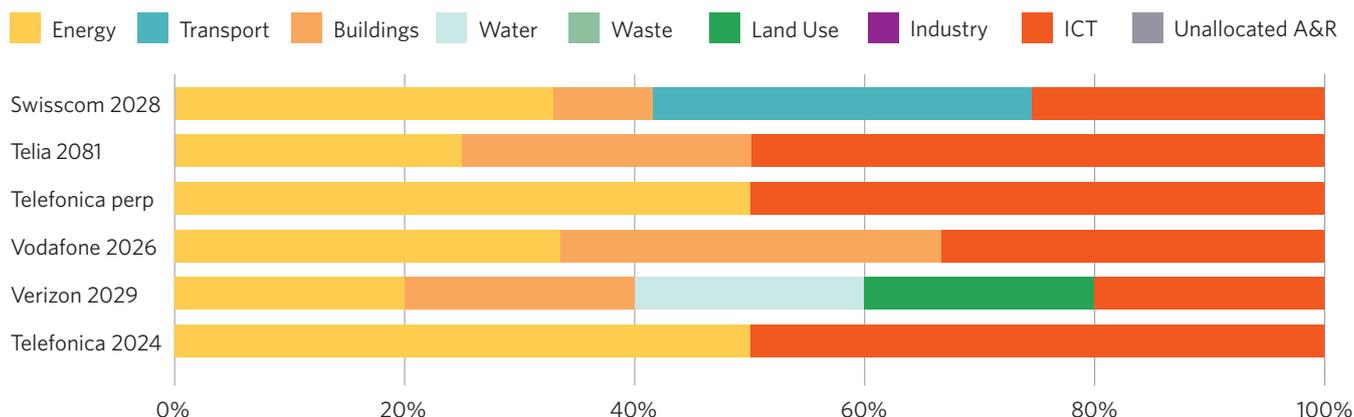
The green bonds issued in the communications sector have experienced remarkable pricing dynamics. Investors evidently welcome the opportunity to add much needed sector diversification to green bond portfolios which tend to be heavily biased towards issuers from the utility, financial services, and real estate sectors.

Green bonds issued in the Communications sector

Issuer	Coupon	Maturity	Currency	Initial size bn (Local/USD)	Pricing date	Spread Compression	Book cover	Pricing relative to yield curve	Remarks*
Telia Co AB	1.125	10/06/2025	SEK	0.75/0.075	03/06/2020	n/a	n/a	n/a	n/a
Swisscom Finance BV	0.375	14/11/2028	EUR	0.5/0.54	06/05/2020	-45.00	10.0	n/a	Largest book cover on the day
Telia Co AB	1.375	11/05/2081	EUR	0.5/0.55	04/02/2020	-43.75	7.0	n/a	Largest spread compression on the day
Telefonica Europe BV	2.502	Perpetual	EUR	0.5/0.55	27/01/2020	-31.24	3.3	n/a	Largest book cover and spread compression on the day
Vodafone Group PLC	0.9	24/11/2026	EUR	0.75/0.84	21/05/2019	-25.00	3.5	Greenium	Three tranche deal. The green bond achieved the largest book cover on the day
Verizon Communications Inc	3.875	08/02/2029	USD	1/1	05/02/2019	-20.00	8.0	On the curve	Largest book cover on the day
Telefonica Emisiones SA	1.069	05/02/2024	EUR	1/1.14	28/01/2019	-22.50	5.4	New issue premium	Largest book cover and spread compression on a day when 3/5 new issues were green

* Cohort is investment grade credit in the same currency as the green bond

ICT and Renewable Energy dominate the use of proceeds



Use of proceeds

The use of proceeds from communications green bonds have been earmarked for projects falling into six categories as classified by the Climate Bonds Taxonomy. The most popular is ICT (36%), followed by Renewable Energy (35%). All issuers reserved a portion of the proceeds of their green bonds to finance assets in these categories.

ICT investments include all projects to make communications companies and their customers more energy efficient. This could encompass reducing the energy required to provide broadband connections or run data centres for example. This could be achieved in several ways including changing the way data centres are cooled or by completing legacy upgrades such as switching networks from copper to fibre optic as fibre optic reduces energy consumption of customers by up to 80%. Investments in networks, solutions, and products based on the Internet of Things (IoT) could also help end users save energy - these are all included under the ICT use of proceeds.

Other categories may also be relevant for companies operating in this sector: for example, Verizon included a broader range of eligible use of proceeds in its green bond framework such as sustainable water

management (Water), and biodiversity and conservation (Land Use). The latter is a key consideration as communications companies build new network infrastructures.

The rapidity of technological developments means that companies operating in the communications space have continuous requirements for capital expenditure. They are energy intensive businesses and the forecasted growth in energy demand and thus emissions are only expected to increase. 5G services, for example, while more energy efficient per gigabyte, will result in exponential growth in traffic and will require many more mobile sites, wiping out the energy efficient gains.ⁱⁱⁱ Projects that make ambitious cuts to energy consumption could be eligible for inclusion in green or sustainable bonds. Companies may, for instance, need to upgrade their operations through improved networks for more efficient transmission and better connectivity; lower-carbon buildings and transportation fleet; and renewable energy generation, among others. Access to fast networks and guaranteed service through potential disasters can also support the building of resilient economies, as well as facilitating the continued scaling-up of working from home or another space that is not a traditional office environment - a well-

documented consequence of the ongoing COVID-19 pandemic.

In February 2020, a science-based target (SBT) to reduce greenhouse gas emissions across the communications sector was announced.^{iv} The guidance was developed by The International Telecommunication Union (ITU), in collaboration with industry organisations GeSI, and GSMA, and the Science Based Targets Initiative (SBTi). The objective is to help companies operating in the sector to design GHG emission reduction strategies in line with the Paris Agreement. The guidance highlights the need to take urgent action in the following areas:

1. Continued implementation of energy efficiency plans
2. Switch to renewable / low carbon electricity supply
3. Encouragement of carbon consciousness among end-users

These factors combined with the demonstrable investor demand for more green labelled debt from the sector could encourage more of the 649 communications bond issuers to prioritise spending on low carbon alternatives. Green bonds offer the perfect vehicle to fund such initiatives and projects.

Notes

- i. BICS communications sector
- ii. Bloomberg data as of 30/06/2020
- iii. <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-case-for-committing-to-greener-telecom-networks>
- iv. https://www.itu.int/en/mediacentre/Documents/Documents/GSMA_IP_SBT-report_WEB-SINGLE.pdf

8. Conclusion

During the first half of 2020 USD92.1bn of green bonds were added to the Climate Bonds Green Bond Database, 74% of the USD125bn issued in the same period in 2019. In H1 green bonds were issued in 23 currencies, and more than half were EUR denominated.

A temporary slowdown in green bond issuance. Year-on-year, vanilla bond issuance is up meaning that bonds with the green label constituted a smaller percentage of overall issuance. During the sell-off period, and directly afterwards, issuers were seeking urgent liquidity. The integrity of the green bond label means that it is harder to issue spontaneously, and issuers concentrated on shoring up capital and refinancing. We view this as a temporary slowdown. The motives for issuing green bonds have become more urgent than ever before, and we expect issuance to increase as market conditions stabilise.

The EUR green bond market has a growing number of benchmark deals, but the USD market still lacks large deals with adequate clarity around the use of proceeds. The analysis presented in this paper is based on 40% of the total green bond issuance during the observation period (USD37bn).

While over 60% of the EUR green bond issuance was eligible for inclusion, only 26% of USD green bonds were suitable with most (57%) being too small.

The COVID-19 pandemic and its ramifications have heightened interest in responsible investment strategies.

Throughout H1 demand for green bonds remained robust and on average, they performed well on all metrics. **Green bonds experienced record levels of interest** in terms of book cover and spread compression, and green investors were allocated a greater percentage of deals than ever on average, demonstrating that treasurers attach value to the diverse investor base that green bonds are known to attract.

Evidence of a more consistent greenium as seen in H2 2019 failed to materialise for most issuers in our H1 2020 sample. We expect this to return as the market gets back on its feet for at least as long as the lack of supply remains a consideration. In the immediate secondary market, green bonds perform well, on average tightening more than comparable bonds and indices after both seven and 28 days.

Green bond ETFs did not report any redemptions and in fact, experienced record growth in H1.

The continued strength in demand for green bonds suggests that investors see value in the green label. As the COVID-19 pandemic spread around the globe, green bonds sold off the same as vanilla counterparts. In the depths of the sell-off, green bonds could still be transacted giving much needed flexibility to their owners who had the possibility to liquidate their positions either to fund new issue opportunities, or redemptions. The market appeared to attach a value to the green label as things started to settle down.

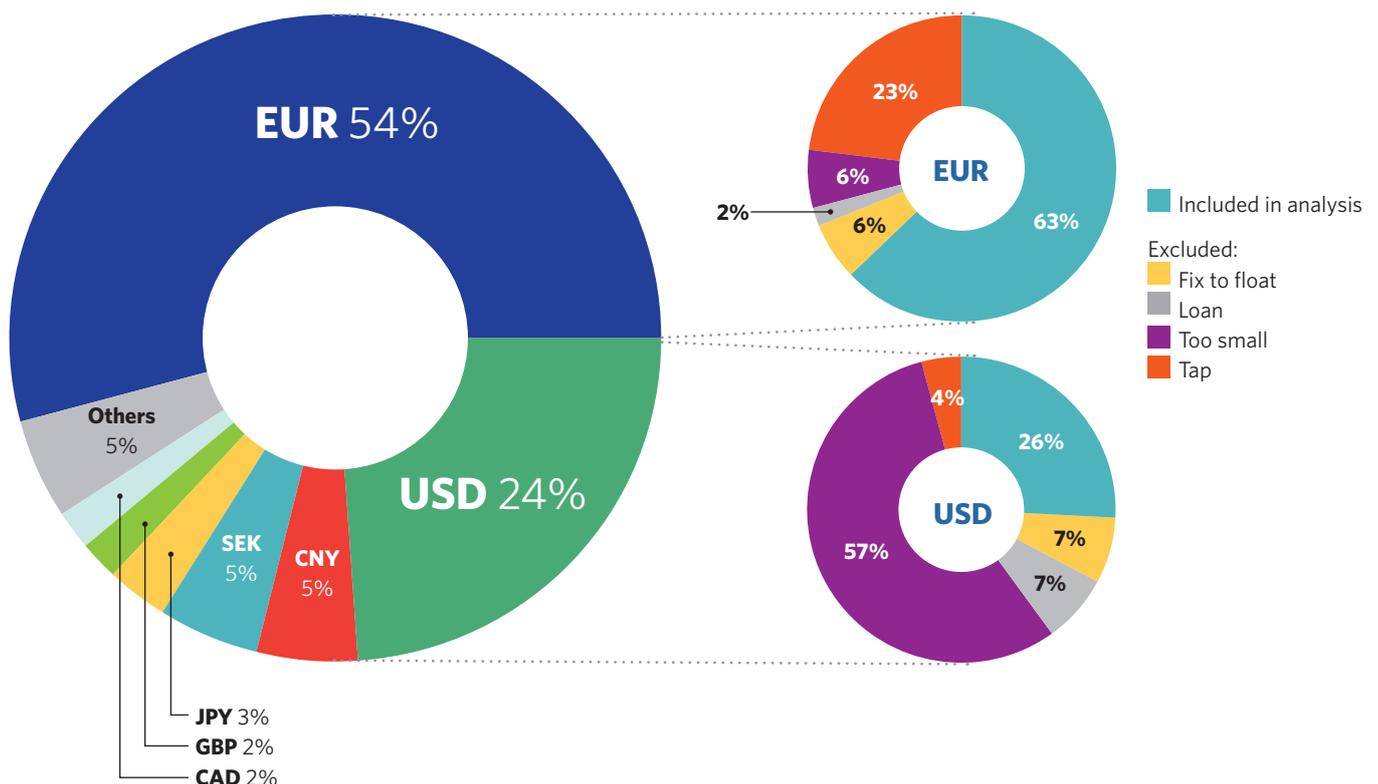
Reflections from a period of uncertainty - COVID-19 and the green bond market

The COVID-19 pandemic is not an isolated crisis, and more such events are expected. The issues that drove the creation of the green bond market have been brought sharply into focus.

Climate Bonds CEO Sean Kidney says:

"The pandemic originated from pathogens capable of jumping between species in degraded ecosystems. Climate change is a key driver of environmental stress and degradation. The IPCC has previously suggested that this is the first in what is likely to be a century of shocks related to environmental degradation linked to climate change."

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



World leaders have an opportunity to act by making sure that recovery packages are tilted towards supporting climate friendly investment in infrastructure and development. The two recently announced initiatives outlined below have enhanced the leadership profile of Europe in the green investment space. One of these initiatives supports supply, the other demand.

Green recovery can be financed by green bonds. Towards the end of May, the European Union announced Next Generation EU, a EUR750bn recovery plan for the European Union which will be financed through borrowing in the capital markets. Thirty percent of this and the EUR1trn seven-year budget has been earmarked for climate change projects (EUR500bn).

This commitment established a clear pathway for the European Union to meet its stated goal of becoming carbon neutral by 2050.

If this were funded even partially by green bonds, there would be a massive opportunity for investors to commit money to green bond and other responsible investment strategies paving the way for more corporate issuers to join the market.

Meanwhile, in an interview with the Financial Times in early July, ECB president Christine Lagarde confirmed that the ECB is reviewing its options to help combat climate change.

This could include preferencing green bonds as part of its Asset Purchase Programme (APP). The ECB already owns 20% of green bonds eligible under the terms of the APP.

In the Climate Bonds Green Bond Treasurer Survey 2020, a lack of suitable assets in the economy was cited as a potential obstacle to the growth of the green bond market. We expect that the post COVID-19 economic recovery will provide increased opportunities in green bonds for both issuers and investors.

This analysis is based on a limited number of green bonds, chosen according to the parameters outlined on page 26. 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, by mid-2020, we had looked at 313 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 summary statistics of bonds used for comparison

Bonds sharing similar characteristics to green bonds in our sample

Q4 Green bond priced between January 01 and March 31 2020	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn	Deal Size EURbn
Digital Dutch Finco BV 1.5% 15/03/2030	1	1.50%	10	0.75	08-Jan
NASDAQ Inc. 0.875% 02/13/2030	1	0.88%	10	0.6	10-Feb
Digital Dutch Finco BV 0.625% 15/07/2025	1	0.63%	5	0.65	08-Jan
BBB Financial Corporates 3-7 Years	3	0.52%	5.7	0.6	end Jan
Red Electrica Financiaciones SAU 0.375% 24/07/2028	1	0.38%	8	0.7	09-Jan
BBB Utilities 3-11 Years	4	0.43%	8.3	0.6	Jan
E.ON SE 0.375% 29/09/2027	1	0.38%	7	1	09-Jan
E.ON SE 2023 & 2030	2	0.3%	6.5	0.625	09-Jan
National Grid Electricity Transmission PLC 0.19% 20/01/2025	1	0.19%	5	0.5	13-Jan
BBB Utilities 3-9 Years	2	0.20%	6	0.625	Jan
Chile Government International Bond 1.25% 29/01/2040	1	1.25%	20	1.04	21-Jan
BBB EM Sovereigns 9-30 Years	4	2.07%	15.3	1.2	Jan
Prologis Euro Finance LLC 0.375% 06/02/2028	1	0.38%	8	0.55	28-Jan
BBB Financial Corporates 7 Years	2	0.75%	7	0.5	Jan
Societe Generale SFH SA 0.01% 11/02/2030 (CO)	1	0.01%	10	1	29-Jan
Credit Mutuel Home Loan SF 0.125% 01/28/2030 (CO)	1	0.125%	10	1.25	16-Jan
Bankinter SA (SNP) 0.625% 06/10/2027 (SNP)	1	0.625%	7	0.75	29-Jan
BBB Banks 7 Years (SNP)	3	0.625%	7	1.1	Jan
Adif Alta Velocidad 0.55% 30/04/2030	1	0.55%	10	0.6	29-Jan
Cassa Depositi e Prestiti 1% 02/11/2030 Social Bond	1	1%	10	0.75	04-Feb
Japan Finance Organization for Municipalities 0.05% 12/02/2027	1	0.05%	7	0.5	04-Feb
Land Niedersachsen 0% 02/11/2027	1	0%	7	1.125	04-Feb
NRW Bank 0% 18/02/2030	1	0%	10	0.5	11-Feb
Neder Waterschapsbank 0.05% 01/28/2030	1	0.05%	10	1	21-Jan
Societe Du Grand Paris EPIC 1% 18/02/2070	1	1%	50	2.5	11-Feb
AA SSA 10-100 Years	4	0.54%	37.5	1.825	Jan & Feb
Cadent Finance PLC 0.75% 11/03/2032	1	0.75%	12	0.5	04-Mar
Ausnet Service Holdings 0.625%	1	0.63%	10	0.5	13-Feb
Vattenfall AB 0.05% 15/10/2025	1	0.05%	5	0.5	05-Mar
E.ON SE 1% 07/10/2025	1	1%	5	0.75	31-Mar
Engie SA 1.375% 03/27/25	1	1.375%	5	1	20-Mar
CPPIB 0.25% 06/04/2027	1	0.25%	7	1	30-Mar
HESSEN 0% 03/10/25	1	0.00%	5	0.5	03-Mar

Q2 Green bonds priced between April 01 and June 30 2020	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn	Deal Size EURbn
Iberdrola Finanzas SA 0.875% 16/06/2025	1	0.875%	5	0.75	01-Apr
SEE Plc 1.25% 16/04/2025	1	1.250%	5	0.6	07-Apr
Royal Schiphol Group NV 2% 06/04/2029	1	2%	10	0.75	01-Apr
APRR SA 1.25% 14/01/2027	1	1%	7	0.5	01-Apr
LeasePlan Corp NV 3.5% 09/04/2025	1	3.5%	5	0.5	03-Apr
BBB Financials 4-7 Years	2	2.1%	5.5	0.55	02&08-Apr
EDP - Energias de Portugal SA 1.625% 15/04/2027	1	1.625%	7	0.75	07-Apr
BBB Utilities 6-8 Years	2	1.250%	7	0.85	06&07-Apr
Societe Nationale SNCF SA 0.625% 17/04/2030	1	0.625%	10	1.25	07-Apr
BPIFRANCE Financement SA 0.25% 29/03/2030	1	0.250%	10	0.25	28-May
Nordic Investment Bank 0% 30/04/2027	1	0%	7	0.5	23-Apr
EUROFIMA 0.1% 20/05/2030	1	0.10%	10	0.75	12-May
NRW Bank 0.0 14/05/2029	1	0%	9	0.5	07-May
CPI Property Group SA 2.75% 12/05/2026	1	2.75%	6	0.75	06-May
BBB Financials 7 Years	2	1.69%	7	0.5	19&27-May
Swisscom Finance BV 0.375% 14/11/2028	1	0.375%	8	0.5	06-May
A-AA Non-Financial Corporates 7-8 Years	2	0.380%	7.5	0.75	05&06-May
Eurogrid GmbH 1.113% 15/05/2032	1	1.113%	12	0.75	06-May
E.ON SE 0.875% 20/08/2031	1	0.88%	11	0.5	13-May
BBB Utilities 10-12 Years	2	1.100%	11	0.55	23-Apr & 08-Jun
SBAB Bank AB 0.5% 13/05/2025 (SP)	1	0.5%	5	0.5	06-May
A Financials 5 Years	2	0.48%	5	1.25	05-May
Credit Suisse AG Ln 0.45% 19/05/2025 (SU)	1	0.45%	5	0.5	11-May
BBB Financials 5 Years (SU)	2	1.69%	5	1.25	18&20-May
BPCE SFH SA 0.01% 27/05/2030 (CO)	1	0.01%	10	1.25	19-May
Arkea Home Loans 0.01% 04/10/2030 (CO)	1	0.01%	10	1	26-May
Prologis International Funding II SA 1.625% 17/06/2032	1	1.63%	12	0.5	03-Jun
Unibail-Rodamco-Westfield 2.0% 29/06/2032	1	2.00%	12	0.75	22-Jun
Alliander NV 0.375 10/06/2030	1	0.375%	10	0.5	03-Jun
Enexis Holding NV 0.625% 17/06/2032	1	0.625%	12	0.5	10-Jun
RTE Reseau de Transport 0.625% 08/07/2032	1	0.625%	12	0.5	30-Jun
Banco Santander SA 1.125% 06/23/2027 (SNP)	1	1.13%	7	1	18-Jun
BBB Financials 7-11 Years	1	1.06%	9	0.5	17&23-Jun
Hypo Noe LB Noe Wien AG 0.375% 06/25/2024 (SP)	1	0.375%	4	0.5	18-Jun
OP Corporate Bank Plc 0.125% 01/07/2024	1	0.125%	4	1	23-Jun
European Investment Bank 0.01% 15/11/2035	1	0.01%	15	1	18-Jun
NRW Bank 0.1% 09/07/2035	1	0.10%	15	1	30-Jun
Berlin Hyp 0.01% 07/07/2028 (CO)	1	0.01%	8	0.5	30-Jun
NN Bank NV Netherlands 0.01% 08/07/2030 (CO)	1	0.010%	10	0.50%	30-Jun

USD summary statistics of bonds used for comparison

Bonds sharing similar characteristics to green bonds in our sample

Q1 Green bonds priced between January 01 and March 31 2020	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn	Pricing date
Chile Government International Bond 3.95% 27/01/2032	1	2.55%	12	0.75	22-Jan
Saudi International Bond 2.75% 02/03/2032	1	2.75%	12	1	21-Jan
European Bank for Reconstruction & Dev. 1.5% 13/02/2025	1	1.50%	5	0.925	06-Feb
OEKB Oest. Kontrollbank 1.5% 02/12/2025	1	1.50%	5	1.5	05-Feb
Toyota Motor Credit Corp 2.15% 13/02/2030	1	2.15%	10	0.75	10-Feb
Stanley, Black & Decker 2.3% 03/15/2030	1	2.30%	10	0.75	03-Feb

Q2 Green bonds priced between April 01 and June 30 2020	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn	Pricing date
Avangrid Inc 3.2% 15/04/2025	1	3.2%	5	0.75	07-Apr
Nisource Inc 3.6% 01/05/2030	1	3.6%	10	1	07-Apr
Nederlandse Waterschapsbank NV 1% 28/05/2030	1	1.0%	10	0.5	20-Apr
BNG Bank NV 1% 03/06/2030	1	1%	10	1.25	27-May
Northern States Power Co/MN 2.6% 01/06/2051	1	2.6%	31	0.7	08-Jun
The East Ohio Gas Co. 3% 15/06/2050	1	3.0%	30	0.8	15-Jun
Perusahaan Penerbit SBSN 2.3% 23/06/2025	1	2.3%	5	0.75	16-Jun
Sharjah Sukuk Program 2.94% 10/06/2027	1	2.9%	7	1	02-Jun
Niagara Mohawk Power 1.96% 27/06/2030	1	2%	10	0.6	23-Jun
AEP Texas Inc 2.1% 01/07/2030	1	2.1%	10	0.6	29-Jun

Methodology

This paper includes labelled green bonds issued during H1 2020. Labelled green bonds meeting the following specifications are included:

- Announcement date between 01/01/2020 and 30/06/2020
- Currency: EUR or USD
- Benchmark size i.e. \geq 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. These parameters are designed 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.

Comparable baskets include bonds issued in the same quarter as the subject green bond, though this has been narrowed as far as practicable given the market volatility of H1 2020. 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 four 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. This proxy was designed 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. As of 1st August 2020
3. Bloomberg 30th June 2020, 'IG Analysis US: June Ends in Top 6 With July Bringing \$100B More' by Brian Smith
4. Bloomberg 30th June 2020, 'IG Analysis EU: Euroclear Bank Attracts Strong Investor Demand' by Paul Cohen
5. The Bloomberg Industry Classification Scheme (BICS) is used to determine economic sector classifications throughout this paper
6. Cadent labelled this bond as a Transition bond. However, since 100% of the proceeds are earmarked for projects falling under the Renewable Energy category, the bond is included in the Climate Bonds Green Bond Database.
7. Mexico City Airport was classified as 'non-aligned' and removed from the Climate Bonds Green Bond Database in March 2019.
8. <https://www.climatebonds.net/resources/reports/green-bond-treasurer-survey-2020>
9. Harrison, Caroline, Partridge, Candace and Aneil Tripathy. 2020. What's in a Greenium: An Analysis of Pricing Methodologies and Discourse in the Green Bond Market. The Journal of Environmental Investing 10(1), Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3684927
10. <https://anthropocenefii.org/afii-research>
11. AfDB, Council of Europe Development Bank and NIB were the only development banks outside of China to issue pandemic-themed bonds.
12. Other types of themed bonds are explored in the Climate Bonds Sustainable Debt Global State of the Market H1 2020
13. Monday Morning Memo: Review of the European ETF Market, H1 2020 by Detlef Glow, July 20, 2020