GREEN BOND PRICING IN THE PRIMARY MARKET:

January - June 2018

H1 (Q1-Q2) 2018

Report highlights

- Includes USD29.4bn of benchmark sized green bonds issued in H1 (Q1-Q2) 2018
- Green bonds achieve greater spread compression, and larger book cover during pricing than vanilla equivalents on average
- Green bonds in H1 2018 priced either on or outside their yield curves
- Green bonds tend to tighten more than vanilla benchmarks within 7 and 28 days of pricing
- 55% of green bonds sold to investors declaring themselves green
- Spotlight on Emerging Market green bond issuers

Climate Bonds Initiative

IFC International Finance Corporation World Bank Group

obvion hypotheken

With support and funding from Obvion Hypotheken

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Introduction

This is the 6th paper in our series exploring how green bonds behave in the primary markets. It is our first semi-annual paper, and covers bonds issued in the first half of 2018 (H1 2018). During this period, USD81.7bn of green bonds in 21 currencies were issued in line with the Climate Bonds Taxonomy.[1] This study captures 36% of that amount, USD24.2bn of EUR bonds and USD5.2bn of USD bonds (see chart on page 14). Our methodology is designed to capture the most liquid portion of the market for which data is available (methodology on page 18). We have increased the minimum size for inclusion from USD300m to USD500m, thus including only benchmark issues.[2]

Report highlights

- **On average, green bonds achieve larger spread compression during pricing than vanilla equivalents**

  See more on page 3

- **On average, green bonds achieve larger book cover than vanilla equivalents**

  See more on page 3

- **55% of green bonds were allocated to investors declaring themselves as green**

  See more on page 5

- **Green bonds either priced on their curves, or exhibited the traditional new issue premium**

  See more on page 6

- **On average, green bonds tended to have larger spread tightening than comparable baskets and indices**

  See more on pages 10

- **Spotlight on Emerging Market (EM)[5] Green bonds - we look at 28 green bonds included in our pricing analysis to date from EM domiciles**

  See more on pages 12

Market developments

To date, a larger number of EUR than USD denominated bonds have qualified for our pricing analysis. In H1 2018 the contrast is particularly marked, with 23 EUR and six USD green bonds meeting the requirements.

A floating rate note (FRN) structure offers investors protection in an environment where interest rates are expected to rise. The FRN format dominated USD issuance during H1 2018, and has extended to the green bond market in both USD and EUR. A total of seven bonds were excluded from our study because of their structure:
USD: Industrial & Commercial Bank of China 2021 and 2023, and Bank of America 2022.
EUR: FRNs from Industrial & Commercial Bank of China 2021, Bank of China 2023, and hybrid bonds from Iberdrola and Engie.

In early July, Mario Draghi reiterated[3] that green bonds meeting the eligibility criteria have been included in the ECB's asset purchase programme (APP), which is now winding down. From the end of 2018, it is expected that new money will cease to be allocated to APP. Proceeds from maturing debt will continue to be rolled into new assets for the foreseeable future. The cessation of this source of support will affect all qualifying debt equally, and we see no reason why green bonds should perform any differently from other types of bonds as a result. The ECB publishes a list of corporate APP bonds available for lending.[4] As of mid-July 2018, this list comprised 1155 bonds, including 39 green bonds, five of which were priced in H1 2018: TenneT 2028 and 2034, Iberdrola 2026, ACS Servicios 2026, and ENEL 2026. We do not know what proportion of these bonds the ECB owns, only that it participated in the deals.

This paper includes 29 bonds from 28 issuers (TenneT issued two bonds), 17 of which are repeat green bond issuers. 14 out of 22 EUR issuers have visited the green bond market at least once. Notably, **TenneT** has now issued ten green bonds, for a total of EUR5.75bn, which dwarfs its five outstanding vanilla bonds totalling EUR1.7bn. **Iberdrola** has also issued ten green bonds, with a combined value of USD7.65bn, but still has 54 vanilla bonds in a variety of currencies totalling USD14bn. **Poland** issued a 3-year EUR750m international bond in 2016, and became the first Sovereign to revisit the green bond market, adding a EUR1bn 8-year in January 2018. Three of the six USD bonds were from repeat green bond issuers: **EIB**, **National Australia Bank**, and **MidAmerican Energy**. As usual, qualifying bonds are dominated by issuers from a handful of sectors: 14 bonds are from Financial Corporates, six are from quasi governments, five are from utilities, three are from Sovereigns, and there's one bond from Industrials.

The 11 first time green bond issuers included in this publication are:

EUR:

- The Kingdom of Belgium issued the country's first green OLO
- Belgian financial group KBC
- Norwegian mortgage banks Sparebank 1 Boligkreditt, and DNB Boligkreditt
- Austrian financial group Raiffeisen Bank
- Swedish banking group Svenska Handelsbanken
- Spanish banking group BBVA
- Spanish industrial ACS Servicios

USD:

- Hong Kong based Swire Properties
- Chinese real estate company Beijing Capital Polaris Investment Co Ltd.
- Republic of Indonesia issued the first green Sovereign Sukuk

In response to a query, we looked at the relative size of green bonds and non-green and whether this may impact pricing. For transparency, we have included the relative size of the comparable baskets in the summary statistics (see pages 15-16. We have also printed a table of the sizes of the bonds used in our yield curve analysis. The upshot is that green bonds are not necessarily smaller (see page 18).

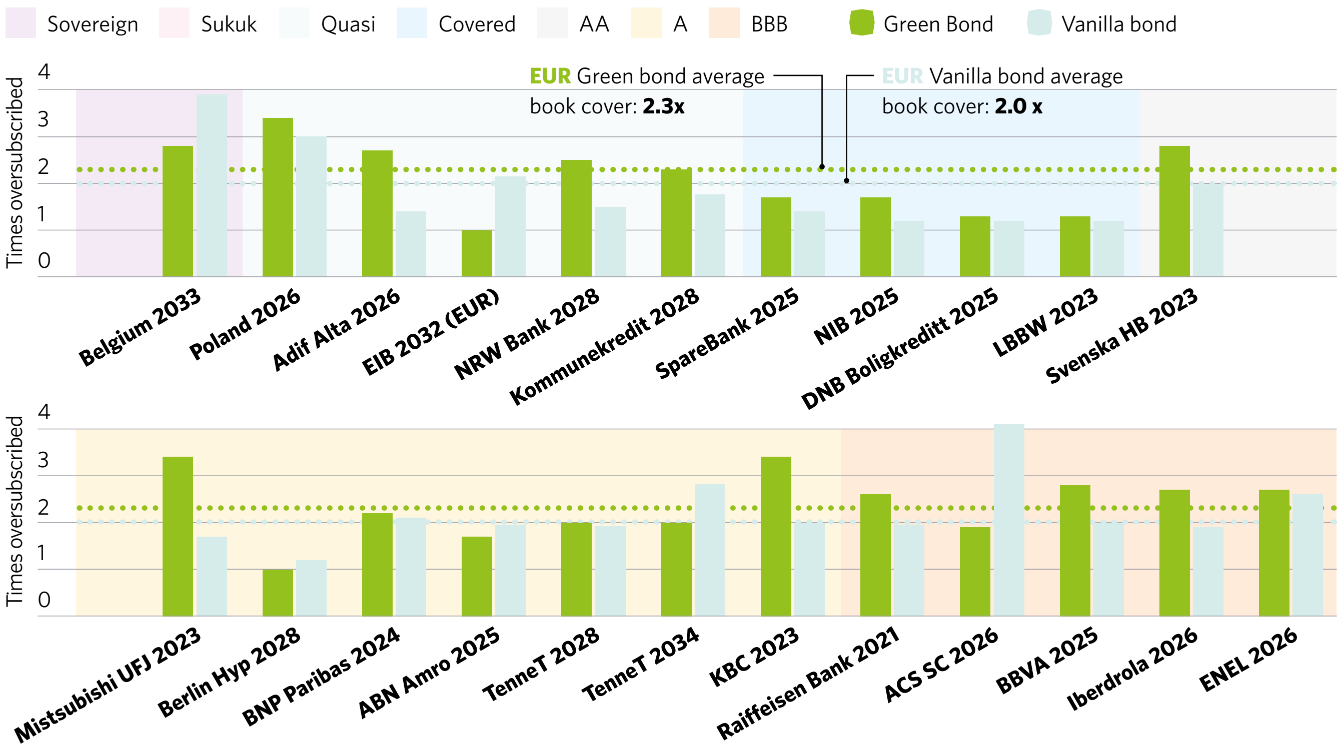
1. Spread compression and book size: Green bonds achieved larger average oversubscription and greater spread compression than vanilla equivalents

- **EUR:** Oversubscription average is 2.3x for green bonds, and 2x for vanilla bonds. Spread Compression, average -8bp for green bonds vs. -7bp for vanilla equivalents
- **USD:** Oversubscription average is 3.4x for green bonds, and 3x for vanilla bonds. Spread Compression, average -18bp for green bonds vs. -14bp for vanilla equivalents

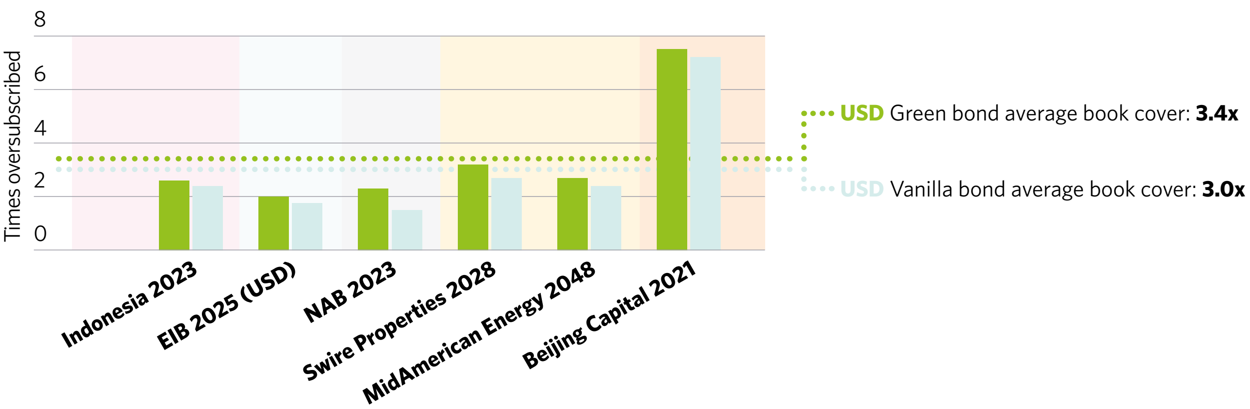
We have observed that in terms of order book size, and spread compression, green bonds are oversubscribed, and experience price tightening during book building, like non- green bonds. We compare green bonds to vanilla equivalents to determine whether there are notable differences in the magnitude of change. In H1 2018, green bonds in our sample achieved larger average oversubscription than their vanilla baskets. On an individual basis, 17 out of 23 EUR bonds, and six out of six USD bonds had larger oversubscription. Average spread compression during pricing was also larger for green bonds than vanilla equivalents. We have enough data to know that USD and EUR green bonds behave differently during the pricing process. On average, USD green bonds achieve average larger book cover than vanilla equivalents and the spread compression also tends to be larger for USD green bonds compared to EUR. On average, the difference in book cover between green bonds and vanilla bonds denominated in EUR is -0.09 times. For USD bonds, it is -0.4 times. The difference in spread compression between green bonds and vanilla bonds denominated in EUR is -0.4bp, while for USD bonds, the difference is -2.4bp. The first half of 2018 is the first period during which we have observed that green bonds perform better than vanilla equivalents in both USD and EUR in terms of having larger book cover, and greater spread compression. Demand for benchmark sized green bonds has remained robust during this period.

Methodology notes: Green bonds are compared to baskets of vanilla bonds. The baskets comprise bonds that most closely match the green bonds and are issued during the same quarter. The baskets in this publication include between 1 and 11 bonds. Methodology discussion page 18, and summary statistics of the baskets are on pages 15-16.

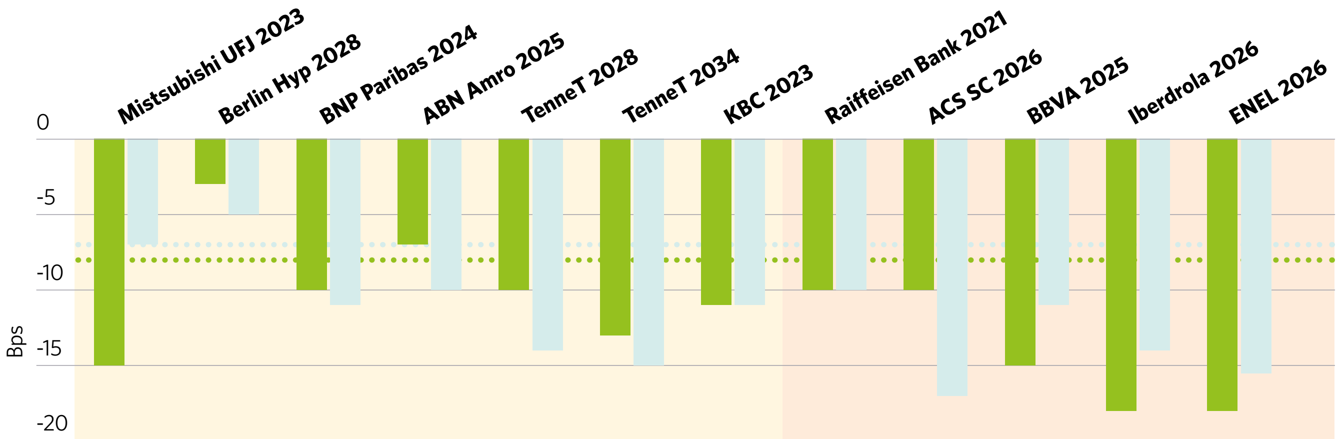
17 out of 23 EUR green bonds achieved larger oversubscription than vanilla equivalents



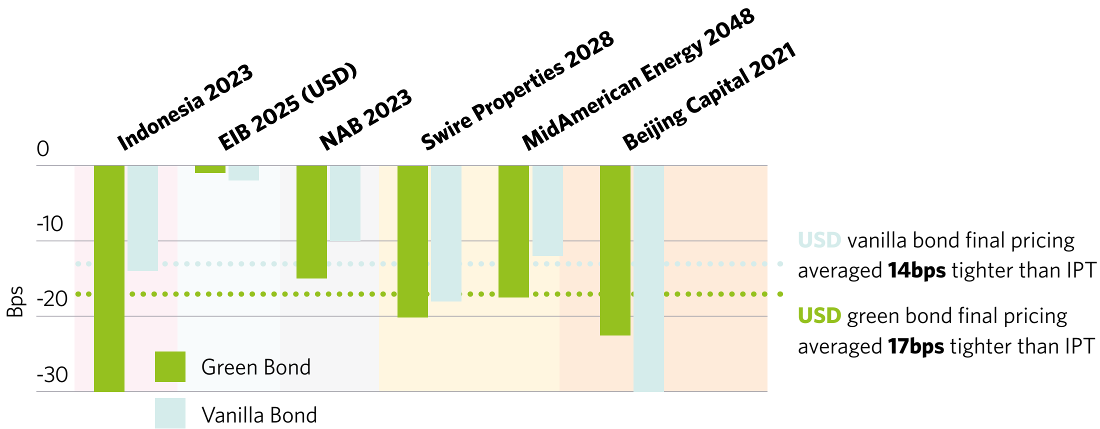
All USD green bonds achieved larger oversubscription than vanilla equivalents



16 out of 23 EUR green bonds tightened more than their basket during the pricing process



3 out of 6 USD green bonds tightened by more than their baskets during the pricing process



2. Green allocations: 55% of the amount raised by green bonds was allocated to investors declaring themselves as green

- 55% of the amount raised through green bonds in our sample was allocated to those labelling themselves as green or socially responsible investors

Green bonds can introduce issuers to a broader investor base than they would normally have access to including those labelling themselves as green, a unique source of support for the green bond market. We approached the issuers in our H1 2018 sample and asked what percentage of their deals were allocated to green investors. 17 out of 28 issuers responded with the distribution statistics. Overall, 55% of green bonds in our sample were allocated to investors declaring themselves as green.

We started recording this data in Q2 2017, and 55% is the highest average level of green allocation we have seen in any of the individual periods. The amount of green bonds qualifying for our research has remained roughly static at USD14-15.5bn per quarter. This suggests that the investor appetite for labelled green bonds might be growing. In H1 2018, TenneT had the highest level of green participation with 81% of the 2028 bond and 73% of the 2034 bond being allocated to green investors. Others, with allocations on the lower end of the scale, such as Berlin Hyp. 2028 (20%), and Indonesia 2023 (29%) demonstrate that support is coming from all areas of the market. This diverse range of buyers will be critical in enabling the market to reach the necessary scale required to fund the transition to a low carbon economy. Even if an investor has no explicit need to buy green bonds, there is no reason not to either.

Several issuers who did not want to disclose specific distribution detail indicated that they had high participation from green investors:

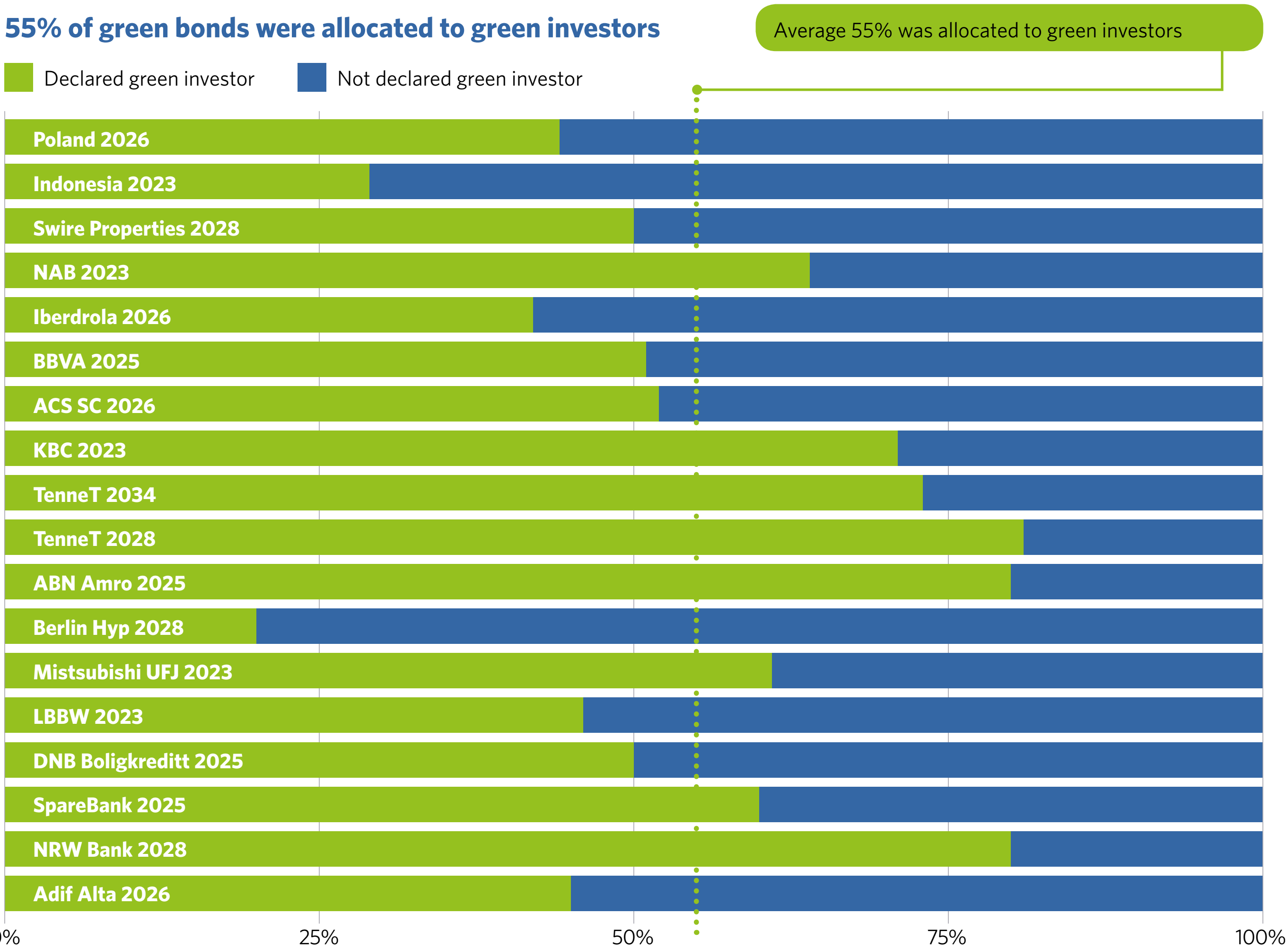
NIB said that although they could not share numbers, most of the investors on the order book had a green mandate.

KommuneKredit told us: “The transaction received strong interest from ESG investors. Investors with a sustainability motivation represented a strong proportion of the final allocation (namely APG asset management and ACTIAM N.V.), and the granularity of the order book reflects the high quality and diversity of growing demand for KomuneKredit’s second green bond.”

Raiffeisen explained: “We experienced a strong participation from green investors, many of whom were new names, in addition to traditional senior credit investors.”

Methodology notes: Green investor information is provided by each issuer and is taken at face value. There is no universal definition of a green investor. This data relies on self-disclosure from buyers who may have green allocations within a portfolio but may not only use the green allocation to buy the bond. Alternatively, buyers may claim to be using green allocations in the hope of receiving more bonds and then park them elsewhere, or sell them. We note that investors including Amundi, AXA IM, Blackrock, Calvert, Mirova, Nikko AM, PIMCO have dedicated green bond portfolios while other buyers such as AP4 and SwissRe actively integrate green bonds throughout their portfolios.

55% of green bonds were allocated to green investors



3. The Greenium: Bonds priced either on or outside their curves

- **EUR:** 4 bonds priced on their curves, 10 bonds exhibited new issue premia
- **USD:** 1 bond priced on its curve, 3 bonds exhibited new issue premia

The new issue premium is extra yield that a buyer gets, and a seller pays for a new bond in comparison to where seasoned bonds from the same issuer are trading in the secondary market. A new issue premium is a standard feature of the bond market, and an issuer bears this cost to attract new investment.

Occasionally, a bond may be issued with a higher price and lower yield compared to existing debt, and the bond will sit inside its own yield curve. This is known as a new issue concession, or when present in green bonds, we have termed it a greenium.

Logically, there is no reason a bond being green would impact its price because 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 albeit minimal costs such as certification and third-party review. Market dynamics such as supply, interest rate expectations, and geo-political issues can influence pricing for vanilla and green bonds.

We were able to build yield curves for 17 out of 28 issuers in our H1 2018 sample which is a good result. In order to be viable for this analysis, issuers need enough bonds outstanding for a yield curve to be built. Our Q4 2017 paper only included six out of a sample of 23.

Among the EUR green bonds priced in H1 2018, four priced on their curves, while 10 exhibited the traditional new issue premia, whereas among the USD green bonds, one priced on its curve, and three exhibited new issue premia. None of the green bonds in our sample exhibited a greenium during H1 2018.

During the last two and a half years we have looked at yield curves for 60 green bonds. 31 out of 60 exhibited the traditional new issue premia, though often reported to be smaller than expected. A new issue premium is a normal result, and the absence of one is beneficial to the issuer. 29 out of 60 bonds in our sample priced either on their curve or exhibited a greenium.

Five of the bonds in our H1 2018 sample have secondary market green bond curves in addition to vanilla curves. The green and vanilla curves of TenneT, BerlinHyp, Iberdrola, and NRW, and EIB USD track one another closely as one would expect. EIB EUR is the only bond in our sample for which the green curve, comprising four seasoned green bonds, sits inside the non-green curve. The EIB EUR green bond priced on 22nd May 2018, priced with a new issue premium to the green curve but sat squarely on the vanilla curve.

Methodology notes: We use yield on issue date, which reflects the price 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. 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), finally we add our subject bond (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 18, 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 after 01/01/2010.

We note that many bonds, particularly government and quasi government bonds tend to be reopened repeatedly. All data pertaining to yield curves, including the sizes of the bonds, are taken as of the pricing date.

A closer look at green bond features that could impact pricing

Relative sizes of green and vanilla bonds
Green bonds are sometimes smaller than vanilla equivalents. This could result in proportionally greater demand pre and post issuance, and perhaps influence pricing. To explore the average bond size, we averaged the current (end June 2018) size of bonds that we used to build our yield curves, dividing the bonds into green and non-green, and tabulated the results alongside the green bond(s) issued H1 2018.

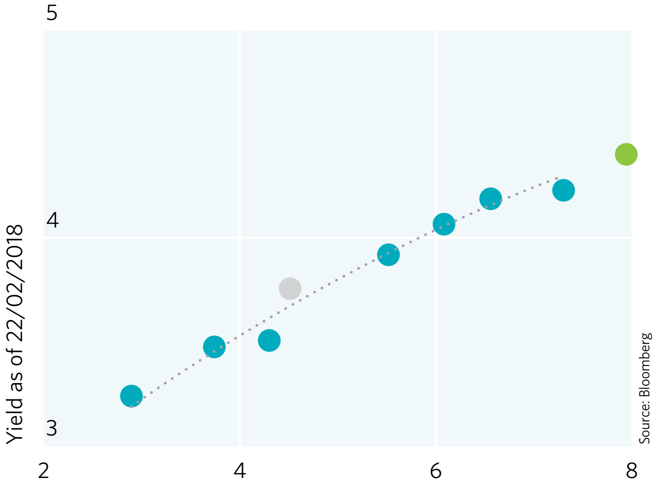
For this paper, we have raised the minimum size for inclusion to benchmark size USD500m. Seven out of 17 of the green bonds for which we have yield curves are bigger in size than the average of the non-green bonds from the same issuer that we have used to build the yield curve. Two of those priced on their curves, the rest exhibited new issue premia. See table, page 18.

Certification and pricing
Third party research has suggested that certified green bonds may receive better pricing than non-certified green bonds. Issuers of bonds that comply with the Climate Bonds Standard can apply to have their bonds certified as Climate Bonds. That label guarantees that the bond will contribute to limiting global warming to two degrees.

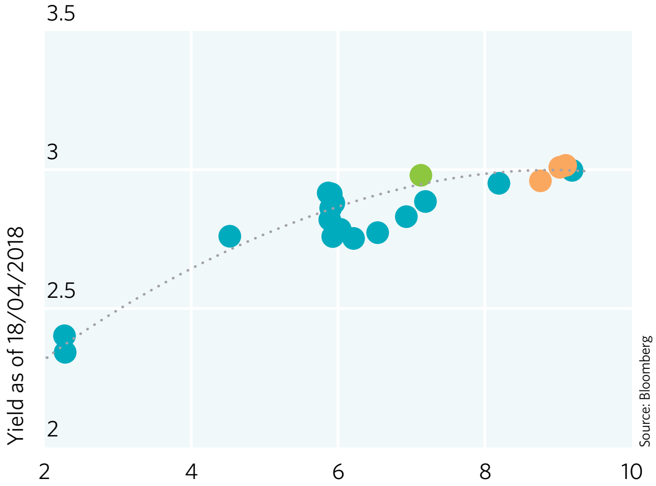
To receive the Climate Bonds stamp of approval, an issuer must appoint an approved third-party verifier, who supplies an assurance report that the bond meets the Climate Bonds Standard for reporting and accountability, and the relevant sector criteria. The benefits of certification are the highest standards of transparency and integrity for both buyer and seller. Almost three quarters of green bonds have received an external review. Climate Bonds certification is one of many options for doing this, and the costs incurred are comparable. The certification can be very helpful for first time green bond issuers, as well as those originating in EM. In some markets, it has become a standard, with almost all green bonds issued in Australia receiving Climate Bonds certification. The certification amplifies all the advantages that many green bond issuers experience such as increased visibility and a broader investor base.

To determine whether certification can offer pricing benefits, we would need to compare a certified green bond with another green bond, matching every characteristic apart from the certification. To date, this is not possible, but it could happen because Climate Bond Standards are in development and do not yet cover all sectors. An issuer could thus split the proceeds of a bond into two or more tranches according to what could be certified and what could not, and those could be compared.

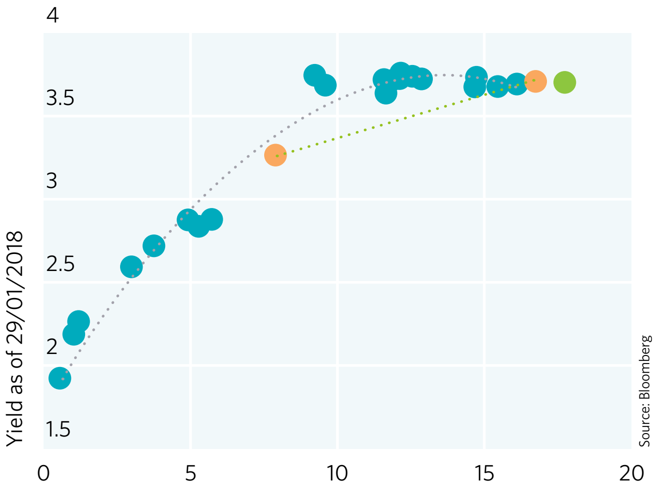
Indonesia 2023 USD - exhibited new issue premium



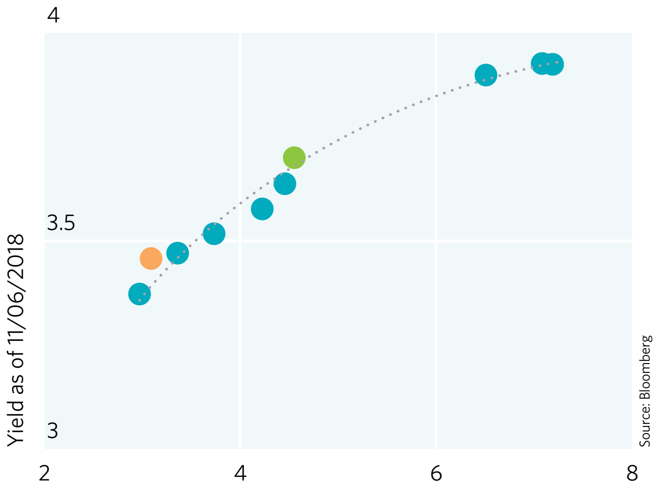
EIB 2025 USD - exhibited new issue premium



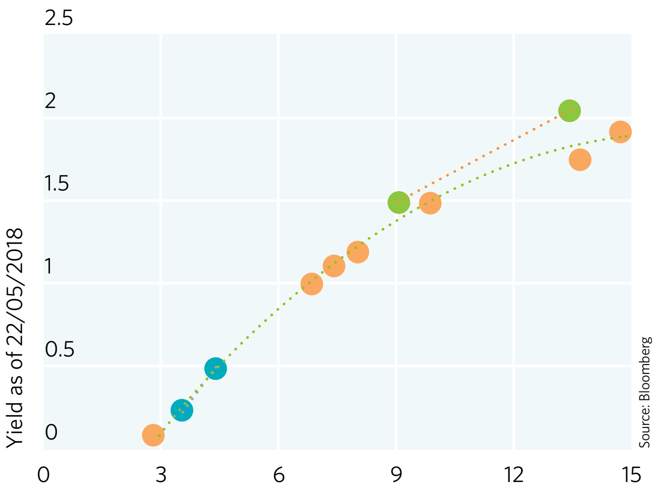
Mid American Energy 2048 USD - priced on the curve



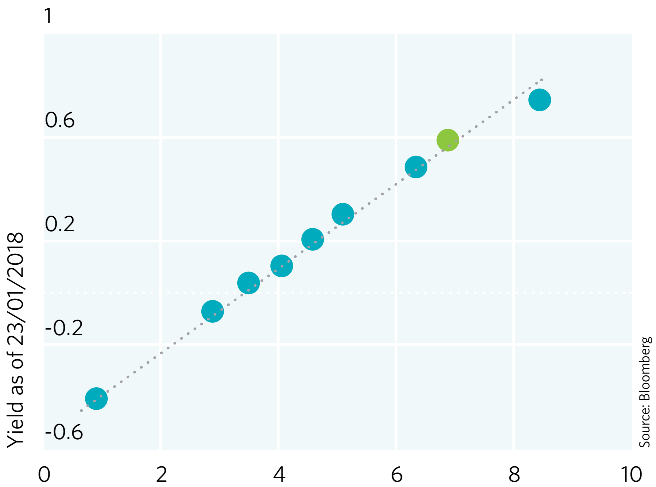
National Australia Bank 2023 USD - exhibited new issue premium



TenneT 2028 & 2034 EUR - exhibited new issue premium

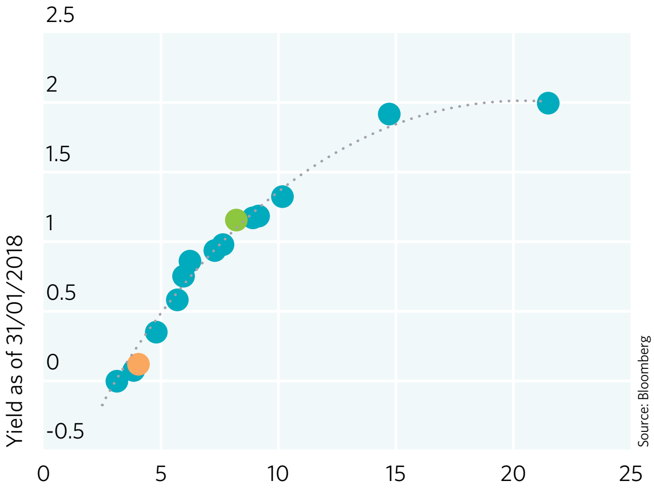


Sparebank 2025 EUR - exhibited new issue premium

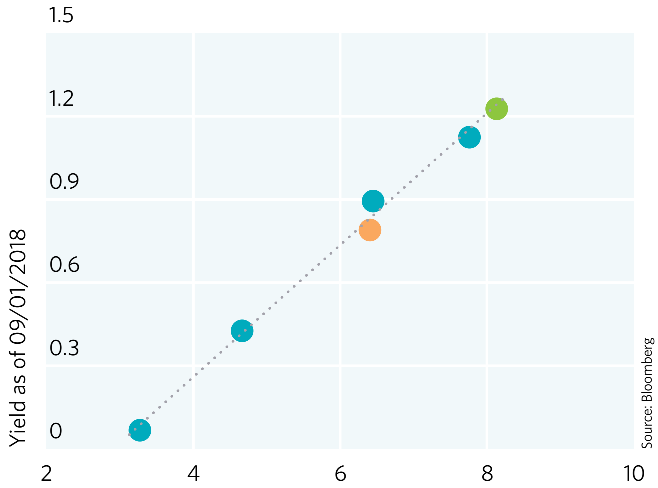


New issue green bonds · Vanilla bonds · Seasoned green bond · Non green bond issued on the same day as the green bonds

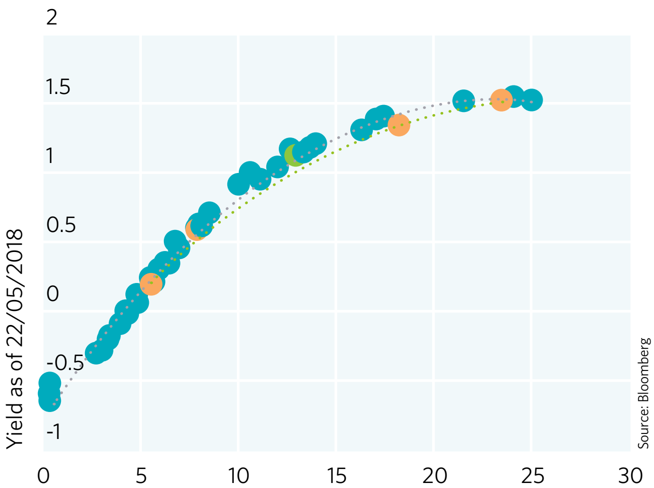
Poland 2026 EUR - priced on the curve



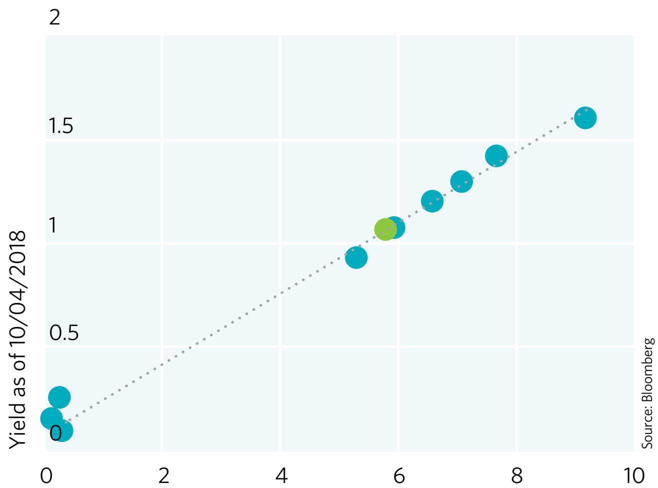
ENEL 2026 EUR - priced on the curve



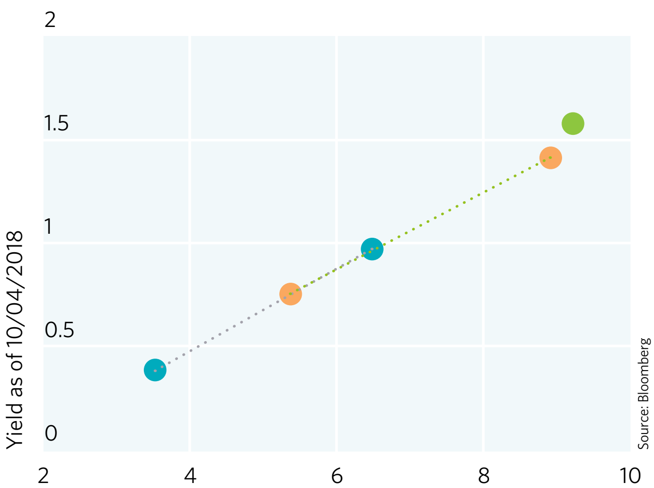
EIB 2032 EUR - priced on the vanilla curve, exhibited new issue premium compared to the green curve



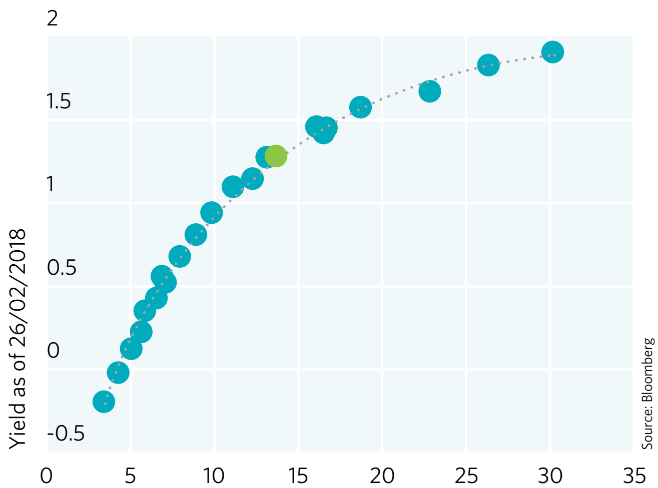
BNP Paribas 2024 EUR - priced on the curve



BerlinHyp 2028 EUR - exhibited new issue premium

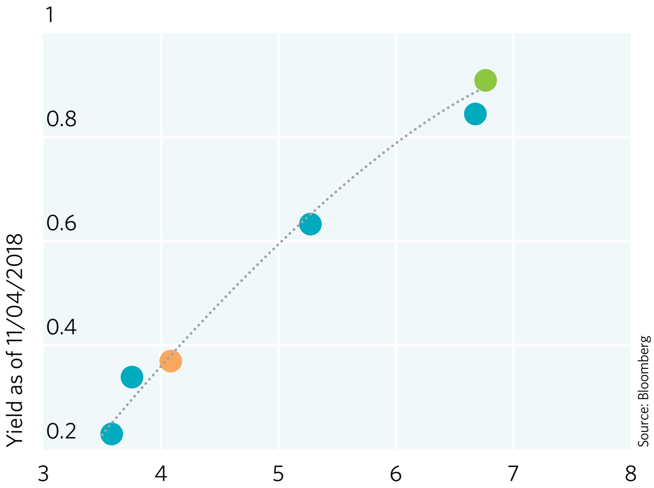


Kingdom of Belgium 2033 EUR - priced on the curve

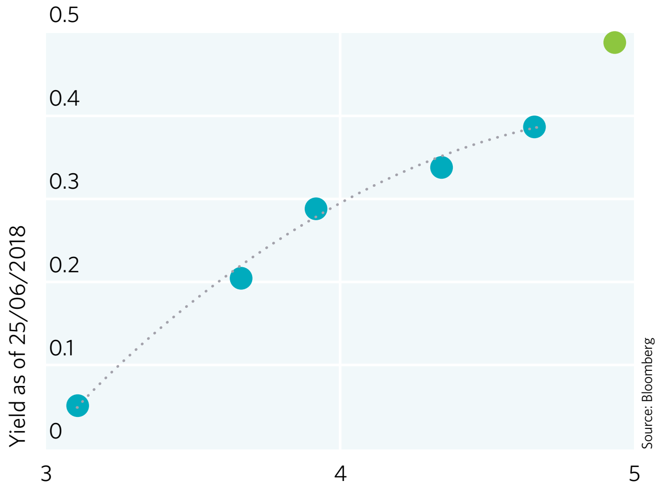


New issue green bonds   Vanilla bonds   Seasoned green bond   Non green bond issued on the same day as the green bonds

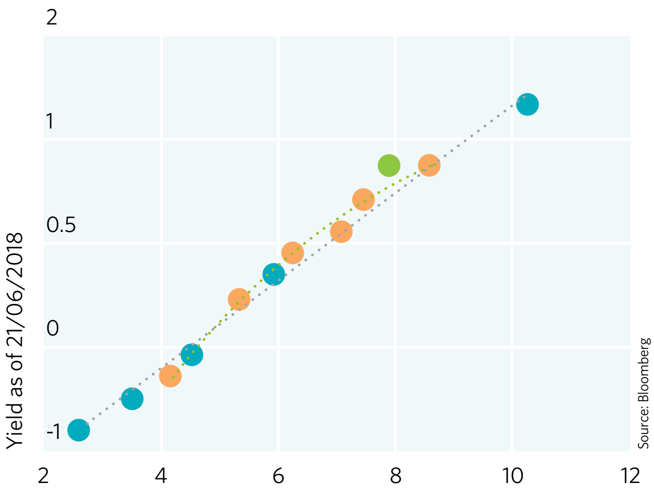
ABN Amro 2025 EUR - exhibited new issue premium



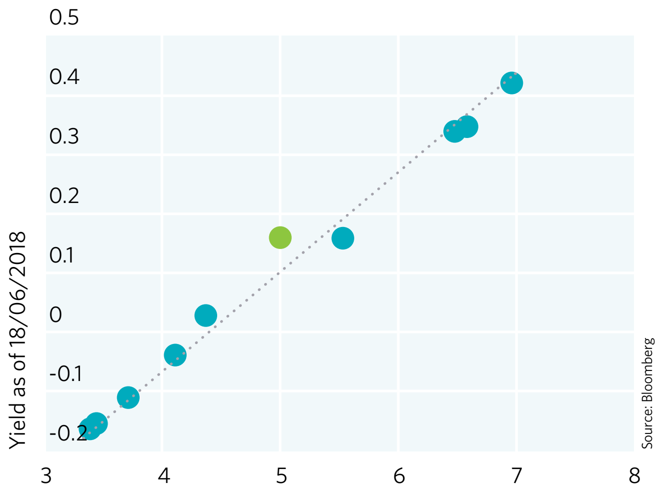
Svenska Handelsbanken 2023 EUR - exhibited new issue premium



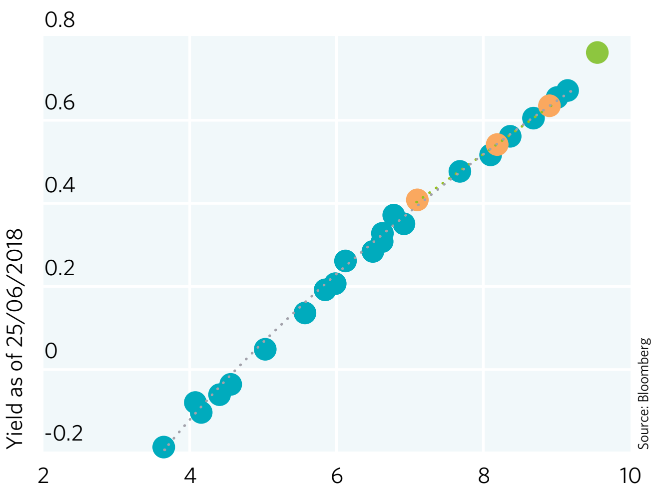
Iberdrola 2026 EUR - exhibited new issue premium



LBBW (Covered) 2023 EUR - exhibited new issue premium



NRW Bank 2028 EUR - exhibited new issue premium



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

4. Performance in the immediate secondary market:

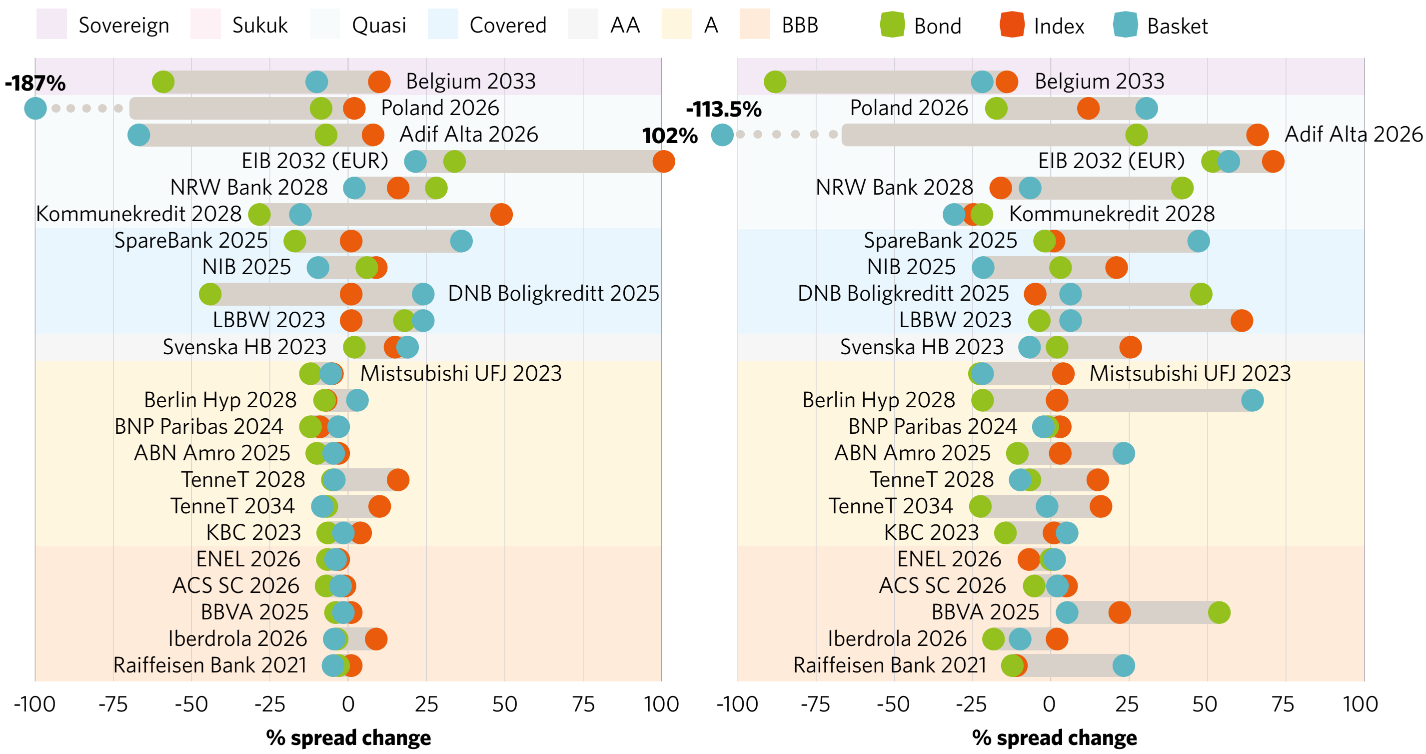
- **7 days after pricing,** 62% of green bonds had tightened more than comparable bonds, 90% of green bonds had tightened more than their comparable index
- **28 days after pricing,** 59% of green bonds had tightened more than comparable bonds, 66% of green bonds had tightened more than their comparable index

We know that many bonds deliver price improvements in the immediate secondary markets. Investors may be looking to get involved in or increase their position in a transaction where desired allocations were underfilled. If bonds are issued early in the month, this could be an opportunity for managers to add some off-benchmark performance before bonds enter indices at month end. We look at how bond spreads change in the immediate secondary market. Seven days after pricing date, 21 out of 29 green bonds had tightened, and after 28 days, 18 out of 29 green bonds had tighter spreads compared to their pricing date. We compare these changes to 1. baskets of matched securities and 2. corresponding indices, to determine how green bonds perform against 'the market' or similar risk. During H1 2018, green bonds tended to have larger spread tightening than comparable baskets and indices. Seven days after pricing date, 15 out of 23 EUR and three out of six USD green bonds had tightened more than their corresponding baskets. After 28 days, 14 out of 23 EUR and two out of six USD green bonds had tightened more than their baskets. Comparing bonds to corresponding indices, seven days after pricing date, 22 out of 23 EUR and four out of six USD green bonds had tightened by a larger percentage. After 28 days, that had softened slightly to 18 out of 23 EUR and one out of six USD green bonds. Secondary market tightening compared to indices and baskets has tended to be present in a larger number of EUR denominated green bonds than USD. We suspect this may be due to a larger number of green or socially responsible investors in Europe. Based on the results of our H1 2018 analysis, we can say that green bonds appear to have performed well in the immediate secondary market.

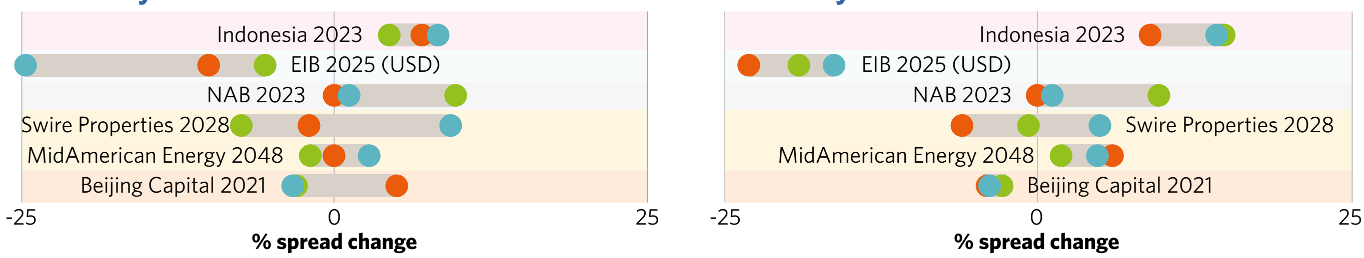
Methodology notes: Each bond is matched with a basket of comparable bonds issued in the same quarter, fitting the parameters described on page 18. The baskets are a proxy for other investment opportunities in the same quarter. The number of bonds in each basket ranges from one to 12. Summary statistics of the baskets are on pages 15-16. Bonds can behave differently according to which part of a month they are issued in. Geopolitical events can influence bond prices. The baskets are designed to circumvent the fact that green and vanilla bonds sharing the same or similar characteristics are rarely issued on the same day. 2. Indices. We compare each bond to a standard iBoxx index.[6] The indices are granulated by currency, asset class, tenor, and credit rating all of which can influence the pricing of a bond. As a result, each green bond is compared to an index composed of seasoned bonds sharing similar characteristics. For example, Iberdrola 1.25% 2026 EUR is matched with EUR Corporates BBB 7-10 Index.

7 calendar days include 5 data observations, 28 calendar days include 20 data observations.

EUR 7 day H1 2018 / EUR 28 day H1 2018



USD 7 day H1 2018 / USD 28 day H1 2018



5. Quotes from Treasurers

Issuing green bonds can bring many benefits to issuers. Profile is the obvious one, as green bonds can help issuers to highlight a commitment to sustainability issues. There are many ancillary benefits arising from green bonds too. Treasurers are happy to highlight the many benefits of issuing green bonds. Here are some of the quotes we have gathered from H1 2018 green bond issuers.

More broadly, green bonds have focused government and investor attention on climate change, the risks and opportunities it presents and the need to finance investment in climate change mitigation and adaptation.

SpareBank 1 Boligkreditt AS
0.5% 30/01/2025 EUR1bn, priced 23/01/2018

Eivind Hegelstad, Investor relations, SpareBank: *"The bond was very well received, in terms of the order book and the attention from investors and the fixed income and covered bond specific press. It was a great success to be able to place the bond after a period of intense work to prepare the Green Bond Framework, which was executed with excellent help and advice from ING (green bond structure advisor) and our technical consultants Multiconsult in Norway (an approved CBI verifier organization). The bond not only helped SpaBol achieve meaningful further investor diversification but also nicely underscored the growing sustainability efforts amongst the Issuer's parent banks, as well as incentivizing and motivating the banks to target increased green mortgage lending. Some of the SpareBank 1 banks are now offering incentives to their mortgage customers who want to make their properties more energy efficient or build an energy efficient home."*

Republic of Poland International Government Bond
1.125% 07/08/2026 EUR1bn, priced 31/01/2018

Undersecretary of State, Piotr Nowak: *"We are happy with the receipt of our Green Bond by market participants. Demand at over EUR3bn once again exceeded our expectations. High share of green investors in the final allocation confirmed confidence in Poland's efforts to tackle climate change."*

ACS Servicios Comunicaciones y Energia SL 1.875% 20/04/2026 EUR750m, priced 12/04/2018

Noé Martín, Controller, Cobra Concesiones: *"The inaugural green bond of ACS Servicios, Comunicaciones y Energía, was announced to the market on April 12th after an intensive and comprehensive roadshow throughout the most important European cities. Investor feedback was very positive, highlighting the transparency given by the company on its Green angle. This feedback manifested in the orderbook, which quickly reached EUR1.6bn, allowing the company to tighten the initial spread from MS+130bps area to MS+120bps. What it is worth highlighting is the strong support from high quality investors, with more than 85% of the EUR750m allocated to real money accounts. Additionally, 67% of the bonds were allocated in the geographies visited on the roadshow and more than 50% to SRI investors."*

ABN Amro Bank NV
0.875% 22/04/2025 EUR750m, priced 11/04/2018

Daniëlle Boerendans | Head of Long-Term Funding & Capital Issuance - Treasury ABN AMRO: *"The green bond was received very well by the market, which is also reflected in the number of orders. ABN AMRO has a very solid Green Bond Framework and this is the 3rd issuance of ABN in the green bond market, so we are a well-known name in this area."*

Banco Bilbao Vizacaya Argentaria SA
1.375% 05/14/2025 EUR1bn, priced 03/05/2018

Anabel Antona Santamaría, Investor Relations, BBVA: *"BBVA's inaugural green bond has demonstrated the attractiveness of green bonds, becoming the largest green European transaction issued by a financial institution in the Eurozone to date. BBVA's benchmark size for a standard SNP* transaction is EUR1bn, in other words we did not face any constraint derived from the green profile of this deal, given the ample eligible stock and credit generation capacity of BBVA."*
*Senior non-preferred

ADIF Alta Velocidad
1.25% 04/05/2026 EUR600m, priced 23/04/2018

Manuel Martinez Cepeda, Director de Tesoreria y Contabilidad: *"The second ADIF-Alta Velocidad green bond had a great acceptance by the market. The good investor reception allowed us to tighten the spread, which was set at +34bps over the SPGB. At closing, the demand exceeded EUR1.6bn with 90 investors participating in the deal. The order book saw a well-diversified investor base. The deal was very well diversified within investors from different countries whilst, by investor type, demand was mainly driven by real money investors. In the green bond side, there was a strong demand from SRI focus investors, with 45% of the final amount allocated to these investors."*

Nordic Investment Bank
0.5% 03/11/2025 EUR500m, priced 24-04-2018

Jens Hellerup, Head of Funding and Investor Relations, Nordic Investment Bank: *"NIB is thrilled on how investors are supporting the NIB Environmental Bond program. It is encouraging to see that more than 50 investors supported this deal and nearly half of them bought NIB for the first time. The result shows that NIB's environmental mandate and projects appeal to investors and will inspire us to continue our contribution to the development of the green bond market."*

TenneT Holding BV
1.375% 05/06/2028 EUR500m, priced 22/05/2018

2% 05/06/2034 EUR750m, priced 22/05/2018

Gerard Kits, TenneT: *"TenneT was able to navigate a challenging primary market, that witnessed a pulled transaction in the prior week and another the day after the transaction. Despite being up against a multi tranche deal from Deutsche Telekom on the day of launch, there was a lot of confidence that the combination of a strong credit like TenneT and the green aspect of the transaction would attract strong interest. This was supported by feedback which TenneT received in its non-deal roadshow in April."*

6. Spotlight on Emerging Market Green Bonds

We see huge untapped potential for Emerging Market (EM)[7] countries to issue green bonds. Growing populations and increased urbanisation mean that many emerging market economies will require large scale investment in infrastructure. Given the risks associated with extreme weather events, this infrastructure needs to be low carbon and climate resilient. Emerging market countries are among the most vulnerable to the effects of climate change, but a recent report from Imperial College Business School confirms that for many of these countries, the cost of borrowing is higher.[8]

Green bonds provide a potential vehicle for large scale public and private sector funding and can attract new participants from the international investor community for those emerging market nations able to issue bonds. Aggregation could be a useful strategy to fund smaller projects.

Issuers in this space are keen to discuss whether they can expect better pricing for a green bond. This could mean that the new issue premium is smaller than it may have been historically, or lower than had been expected. Climate Bonds Initiative uses the term greenium to mean green bonds that price inside their own yield curves. At present, we can't demonstrate this because of insufficient data. While preferential pricing cannot be guaranteed in any market, green bonds can offer myriad other benefits to issuers.

The ICMA's Green Bond Principles encourage extra transparency around assets financed, and internal management processes which can enhance investor comfort in emerging markets. The external review process serves to confirm that adequate procedures are in place to manage the proceeds. For example, Nigeria (Moody's: B2 / S&P: B) issued a local currency green bond in December 2017, which included a mechanism to ringfence the proceeds. An inspection team comprising stakeholders was appointed to monitor the standard of work. Where the standard was not being met, the borrowers were asked to achieve the required standard before more money could be released. This anecdote highlights a critical differentiating feature of green bonds which can be leveraged successfully by emerging market issuers: investors can retain better control of the proceeds.

Between January 2016 and the end of June 2018, USD80.47bn of green bonds were issued from EM (see table page 17). An overwhelming 93% of this debt was denominated in CNY, USD, and EUR. During this same period, a further USD25.9bn was also issued from supranational development banks. Most of the proceeds raised would have also been directed into emerging markets including those having insufficient credit status to raise and manage money directly. The most prolific domiciles for EM green bonds to date have been China (Moody's: A1 / S&P: A+), Mexico (Moody's: A3 / S&P: BBB+), and India (Moody's: Baa2 / S&P: BBB-).

An active green bond market is contingent on an active bond market. Our pricing work to date has concentrated on investment grade rated bonds, in either USD or EUR with a minimum size of USD300m (issued 2016-2017), and USD500m (2018). Over the past two and a half years, our sample of bonds has included 29 green bonds issued from 10 EM countries (see table page 17). Seven of these green bonds are EUR denominated, the remaining 22 are USD. The combined size is USD20.5bn, just over a quarter of the total EM issuance over the same period.

Eight sectors are represented: financial (12 bonds), industrials (4), government (3), quasi government (2) basic materials (2 bonds), consumer cyclical (2), utilities (2), and energy (1). Financials, utilities, and quasi governments in that order, are the three largest sectors represented in the DM bonds qualifying for this paper. Just two of our EM bonds come from utilities. Green bonds are the ideal vehicle to finance development in infrastructure including utilities, and we hope to see more issuance in this and other non-financial corporate sectors as the market expands. Demonstration bonds from local sovereign issuers could also contribute to more green bond issuance in EM. Thus far, Poland and Indonesia have issued benchmark sized bonds in hard currency. Nigeria and Fiji have issued green bonds in local currency, though not large enough to qualify for this paper. Benchmark size and hard currency could help other EM governments to attract funding from the international investment community in future. The Sustainable Banking Network recently published Creating Green Bond Markets[9] which includes an overview of regulations and guidelines for green bonds in EM, as well as several case studies.

"All financing will be green"

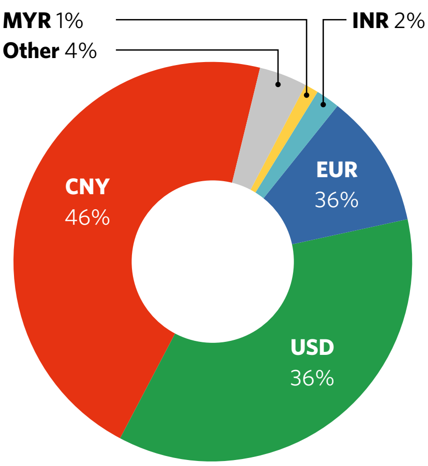
Patrick Njoroge - Governor, Central Bank of Kenya, 24/5/2018

Appetite for green bonds in the hard currencies has sufficiently evolved to absorb larger bonds, with most dedicated green bond funds situated in Europe.As part of our general work on distribution of green bonds, we have obtained data for 8 out of 28 EM green bonds over the past 2.5 years (table page 17). On average, 31% of these 8 bonds was bought by investors describing themselves as green. Poland 2026 (41%) and ICBC 2022 (43%) had the largest allocations to green investors. Both of those issuers have a A rating. Meanwhile, Indian Railway 2027 (24%) and Rural Elec 2027 (24%) had the lowest allocations to green investors, both having India as the country of risk.

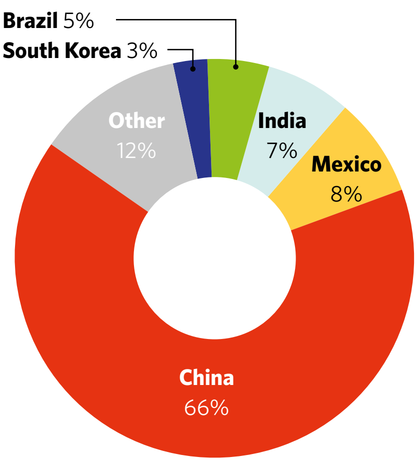
Mexico City Airport (Moody's: Baa1 / S&P: BBB+) has raised a total of USD6bn split between four bonds, making Mexico the most prolific investment grade EM domicile of green bonds in our sample. The order book for Mexico 4.25% 2026 USD1bn received indications of interest of ten times the size of the bond, which is extraordinary, and the largest we have observed for either a green bond or a vanilla equivalent over the last two and a half years.

China is the overwhelming presence in the EM green bond space due to clear policy guidelines from the PBoC. Chinese issuance totalled USD53.1bn between the start of 2016 and June 2018. Most Chinese green bonds are CNY denominated, but USD5.8bn worth of bonds has qualified for our pricing studies, divided between four EUR green bonds and six USD. Bank of China (Moody's A1 / S&P: A) and

46% of EM green bonds issued 2016-2018 are denominated in CNY



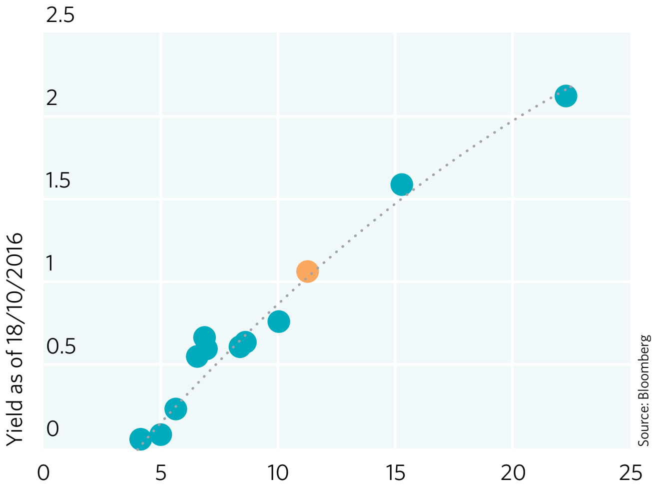
66% of EM green bonds issued 2016-2018 are from Chinese issuers



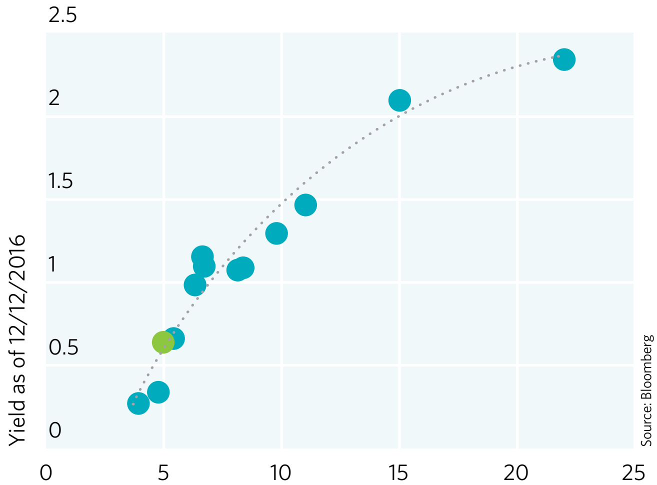
China Development Bank (Moody's: A1 / S&P: A) have each issued green bonds in both EUR and USD. Crucially, Chinese bonds issued in the hard currencies enable investors to express a view on China without needing an onshore presence or having to trade through bond connect. We will explore the Chinese bond market in more detail in our next publication.

Poland (Moody's: A2 / S&P: BBB+): is the third largest EM in our sample due to a pair of green sovereign bonds issued in December 2016 and January 2018. Poland is an emerging market green bond issuer with comparable vanilla bonds. Poland's first green bond was issued in 2016, and came with a small new issue premium, while the green bond issued in January 2018 priced on the curve. Looking at two other recent issues from Poland we can see that they both also came on the curve. Therefore, in the case of Poland, investors required a small premium for the demonstration green bond, but the second bond priced no different from a non-green bond. During the pricing process, spreads of the green bonds moved 12bps each from initial price thoughts to final pricing, compared to 5bps and 7bps for the vanilla bonds. The order book of the green bond for which we have data is at least double that of the vanilla bonds. In terms of distribution, 41% and 61% of the green bonds went to dedicated green funds, resulting in diverse sources of funding. This is an important feature for emerging markets because a diverse investor base affords the issuer more flexibility when reopening bonds.

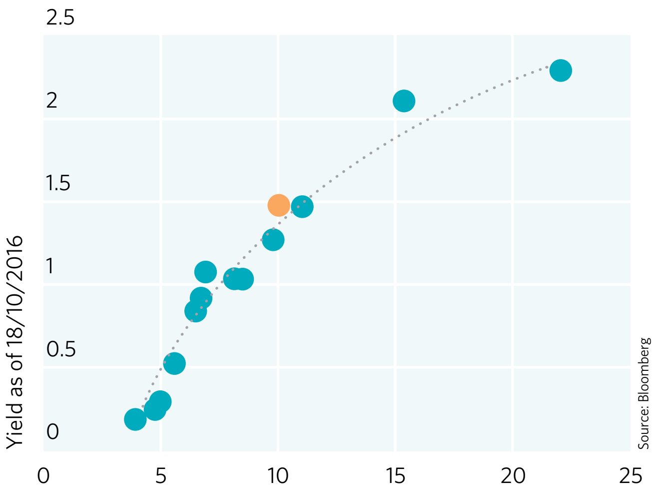
1. Poland 1% 2028 - not green EUR0.75bn



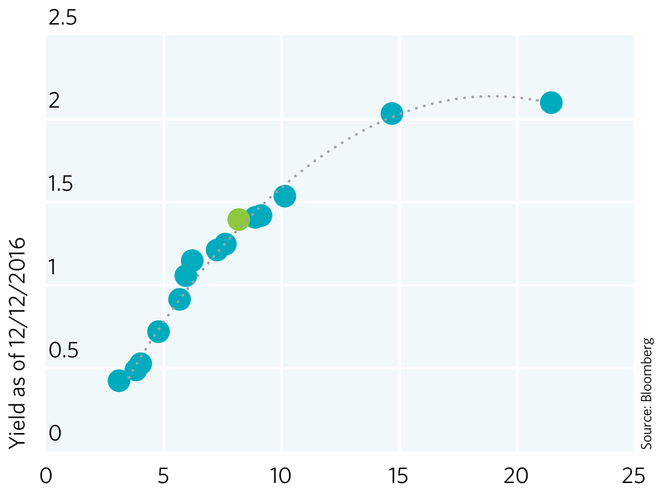
2. Poland 0.5% 2021 - green EUR0.75bn



3. Poland 1.375% 2027 - not green EUR1.0bn



4. Poland 1.125% 2026 - green EUR1.0bn



Vanilla bonds   Seasoned green bond   New issue green bond

Exchange Traded Funds

Exchange Traded Funds (ETF) offer a liquid and transparent route for investors to gain exposure to financial markets. Transaction costs are low compared with buying the individual exposures.

At present, the green bond ETF market is small, because the green bond market is small. Lyxor and VanEck entered the market in 2017. Their early entry will give them the benefit of track-record and penetration once the green bond market is big enough to support this area of investment on a larger scale. The green bond label provides visibility, making them easier to identify. This will be critical for their selection into ETFs at the point where the market reaches an inflection point.

VanEck Vectors Green Bond ETF launched in March 2017 at USD5m and, as of July 2018, had USD18.2m market cap. It includes only bonds identified as green by CBI, tracking the S&P Green Bond Select index.

Lyxor Green Bond ETF, which is based on the Solactive Green Bond Index, launched at the end of February 2017 with a market cap. of just over EUR5m. As of June 29th 2018, that had increased to almost EUR54m, so has grown eleven-fold.

7. Conclusion

Almost USD30bn of green bonds were included in our analysis of pricing behaviour for the first half of 2018. Issuance remained steady, particularly in EUR, with just 6 out of 29 qualifying bonds being denominated in USD. We were pleased to see 11 first time green bond issuers joining 17 repeat visitors.

Qualifying green bonds issued during the observation period achieved, on average, larger book cover and spread compression compared to vanilla baskets. We were able to build yield curves for 18 out of 29 green bonds, and did not see any evidence of a greenium, or new issue discount. Five of the bonds priced on the curve, and 13 bonds exhibited the traditional new issue premium.

In the immediate secondary market 72% of green bonds had tighter spreads after seven days. After 28 days 62% of green bonds had tighter spreads.

Comparing immediate secondary market performance to baskets of matched securities, 62% of green bonds had tightened more than their baskets after 7 days, and 55% after 28 days. Measured against corresponding indices, after 7 days 26 out of 29 green bonds had exhibited larger spread tightening, while after 28 days, that was 66% of bonds.

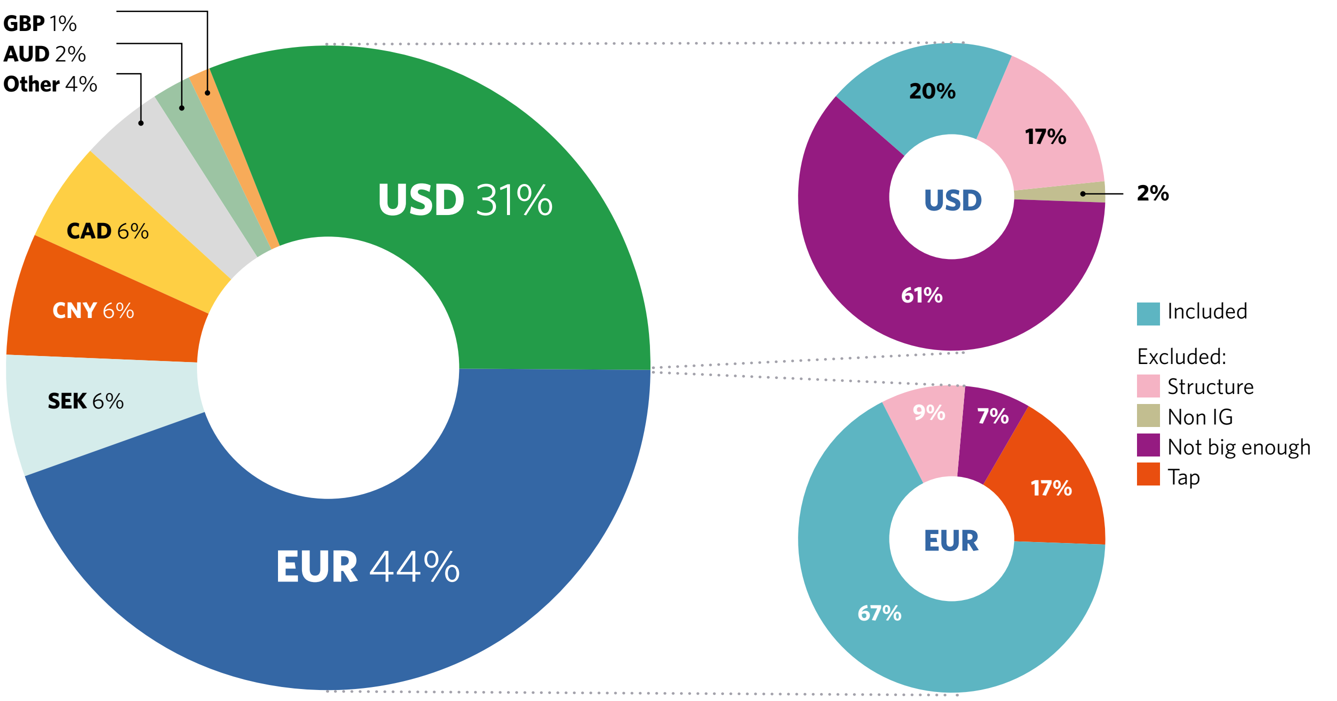
We have observed that more EUR green bonds tend to achieve spread tightening in the immediate secondary market compared to USD green bonds, which we attribute to investors in European funds typically placing greater emphasis on the associated benefits of green bond ownership. We suspect that European investors look to increase their unfilled positions in the immediate secondary markets and are evidently willing to pay a premium to do so.

From the perspective of the buyer, in H1 2018, green bonds appear to have offered some value compared to vanilla equivalents. They are popular in the primary markets, but from the yield curves we could build, we could not see any evidence of a greenium. However, in the secondary markets, green bonds in our sample demonstrated larger spread tightening when compared to vanilla equivalents and corresponding indices. Bond issuers also receive many advantages from issuing green bonds including a broader and more diverse investor base, increased engagement with stakeholders, and reinforced commitment to responsible company management.

The number of dedicated green bond buyers appears to have increased this year. There has been a rise in the number of green bonds allocated to those declaring themselves as green, while issuance of benchmark-sized bonds has remained steady. Despite the sector diversity remaining limited, more issuers will be encouraged to print green bonds as the buyer pool continues to grow. We are pleased to note that as we prepare this note for publication, Vodafone has published a green bond framework, a first for the telecom sector.

The results of our analysis pertain to a limited number of green bonds chosen according to parameters designed to capture the most liquid portion of the market. The behaviour of green bonds will change according to the economic backdrop, as it would for all bonds. We expect to move into a bear market phase towards the end of the year, as interest rates continue to rise and the effect of the ECB winding down the APP kicks in on the demand side. Bonds may come with wider spreads to remain attractive to investors. We will continue to monitor the behaviour of green bonds in the primary markets, with our next publication including green bonds issued in the second half of 2018.

USD81.7bn of green bonds issued in H1 2018



EUR Summary Statistics of bonds used for comparison

Bonds sharing similar characteristics to green bonds in our sample

Q1 - Bonds issued between January 01 and March 31 2018	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
Mitsubishi UFJ 0.68% 26/01/2023	1	0.68%	5	0.5
A Financial Corporate 4-8 Years	8	0.91%	5.75	0.8
Enel 1.125% 16/09/2026	1	1.125%	8	1.25
BBB Utilities 9-12 Years	2	1.5%	10.5	0.9
Sparebank 1 Boligreditt 0.5% 30/01/2025	1	0.5%	7	1
AAA Covered Bonds 5-10 Years	12	1.8%	7	0.9
Poland 1.125% 07/08/2026	1	1.125%	8	1
A Sovereign	2	0.9%	10	2.75
Belgium 1.25% 22/04/2033	1	1.25%	15	4.5
AA EU Sovereign (includes only RAGB 0.25% 2028)	1	0.75%	10	4

USD Summary Statistics of bonds used for comparison

Bonds sharing similar characteristics to green bonds in our sample

Q1 - Bonds issued between January 01 and March 31 2018	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
Swire Properties 3.5% 10/01/2028	1	3.50%	10	0.5
A Real Estate 10 Years (includes only EQR 3.5% 2028)	1	3.98%	10	0.75
Government of Indonesia 3.75% 01/03/2023	1	3.75%	5	1.25
BBB Sovereign Sukuk (includes only SHARSK 4.226% 2028)	1	4.23%	10	1
MidAmerican Energy Co. 3.65% 01/08/2048	1	3.65%	30	0.7
A Utilities 30 Years	4	3.97%	30	0.7
Beijing Capital Polaris Inv. Co. 4.25% 26/03/2021	1	4.25%	3	0.5
BBB Emerging Market Financial Corporates 10 Years (includes only LNGFOR 4.5% 2028)	1	4.50%	10	0.5
Q2 - Bonds issued between April 01 and June 30 2018				
EIB 2.875% 13/06/2025	1	2.875%	7	1.5
Supranational 3-5 Years	3	2.68%	3.7	2.1
National Australia Bank 3.625% 20/06/2018	1	3.625%	5	0.75
AA Banks 5 Years (includes only Westpac 3.65% 2023)	1	3.65%	5	1

Q2 - Bonds issued between April 01 and June 30 2018	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
KBC Group NV 0.875% 06/27/2023*	1	0.875%	5	0.5
BBVA 1.375% 14/05/2025	1	1.375%	7	0.75
BBB Financials 5 Years *Based on composite credit rating up to end June 2018	3	1%	5	0.5
EIB 1.125% 15/11/2032	1	1.125%	14	0.5
EU Supranational 10+ Years (includes only ESM 1.2% 2033)	1	1.2%	15	2.0
TenneT 2% 05/06/2034	1	2%	16	0.75
A Non-Financial Corporate 12 Years	4	1.84%	12	0.5625
TenneT 1.375% 05/06/2028	1	1.375%	10	0.5
Iberdrola 1.25% 10/28/2026	1	1.25%	8	0.75
A-BBB Utilities 4-10 Years	6	1.35%	8	0.6
NRW Bank 0.75% 06/30/2028	1	S	10	0.5
AA-AAA Development Banks 5-7 Years	4	0.25%	6	3.425
Svenska Handelsbanken AB 0.375% 07/03/2023	1	0.375%	5	0.5
AA Banks 5-7 Years	2	0.45%	6	1.25
Kommunekredit 0.75% 05/07/2028	1	0.750%	10	0.75
AA Regional 7 Years	2	0.63%	7	1.5
ACS Servicios Comunic. 1.875% 20/04/2026	1	1.875%	8	0.75
BBB Industrials 10 Years	2	1.68%	10	0.525
Berlin Hyp AG 1.5% 18/04/2028	1	1.5%	10	0.5
A Consumer Finance 5 Years (includes only SNCF 0.875% 2023)	1	0.875%	5	0.5
BNP Paribas 1% 17/04/2024	1	1%	6	0.5
A Diversified Financials 5-10 Years	3	1.12%	6.7	0.73
Raiffeisen Bank Intl. 0.25% 05/07/2021	1	0.25%	3	0.5
ABN Amro Bank NV 0.875% 22/04/2025	1	0.875%	7	0.75
A Banks 5 Years	3	0.82%	5	0.75
Nordic Investment Bank 0.5% 03/11/2025	1	0.5%	7	0.5
Supranational 5-10 Years	2	0.525%	7.5	1.3
ADIF Alta Velocidad 1.25% 04/05/2026	1	1.25%	8	0.6
AA Agency 7 Years (includes only UNEDIC 1.25% 2033)	1	1.25%	7	1
DNB Boligkreditt AS 0.625% 06/19/2025	1	0.625%	7	1.5
LB Baden-Wuerttemberg 0.125% 27/06/2023	1	0.125%	5	0.5
AAA Covered 5-7 Years	3	0.525%	6.3	0.83

Benchmark sized EM bonds issued in either USD or EUR between January 2016 and June 2018

Country of Risk	Name	Coupon	Maturity	Pricing Date	Currency	Size USD bn	Size Local bn	Book cover	IPT	% allocated to green investors	Spread Compression	Primary Spread	Sector	Composite Rating
Arab Emirates	National Bank of Abu Dhabi PJSC	3	30/03/2022	27/03/2017	USD	0.6	0.6	1.3	105	N/A	7.0	98.0	Financial	AA-
Arab Emirates	First Abu Dhabi Bank PJSC	3	30/03/2022	27/03/2017	USD	0.6	0.6	1.9	105	N/A	7.0	98.0	Financial	AA-
Brazil	Fibria Overseas Finance Ltd	5.5	17/01/2027	11/01/2017	USD	0.7	0.7	4.3	363.79	N/A	29.6	334.2	Basic Materials	BBB-
Chile	Inversiones CMPC SA	4.375	04/04/2027	30/03/2017	USD	0.5	0.5	4.8	238	N/A	37.5	200.0	Basic Materials	BBB-
China	LTC GB Ltd	2.75	26/05/2021	19/05/2016	USD	0.4	0.4	6.0	170	N/A	30.0	140.0	Consumer, Cyclical	NR
China	Bank of China Ltd/Luxembourg	1.875	12/07/2019	04/07/2016	USD	0.5	0.5	2.4	145	N/A	20.0	125.0	Financial	A
China	Bank of China Ltd/Luxembourg	0.75	12/07/2021	05/07/2016	EUR	0.6	0.5	2.6	120	N/A	25.0	95.0	Financial	A
China	Bank of China Ltd/London	1.875	09/11/2019	03/11/2016	USD	0.5	0.5	N/A	115	N/A	20.0	95.0	Financial	NR
China	Three Gorges Finance II Cayman Islands Ltd	1.3	21/06/2024	14/06/2017	EUR	0.7	0.7	3.1	110	N/A	17.0	93.0	Energy	A+
China	Industrial & Commercial Bank of China Ltd/Lux	2.875	12/10/2022	28/09/2017	USD	0.4	0.4	1.5	120	43%	21.0	99	Financial	NR
China	China Development Bank	0.375	16/11/2021	09/11/2017	EUR	1.2	1.0	2.3	63	N/A	20.0	43.0	Financial	NR
China	China Development Bank	2.75	16/11/2022	09/11/2017	USD	0.5	0.5	4.5	100.00	N/A	22.0	78.0	Financial	NR
China	CGNPC International Ltd	1.625	11/12/2024	04/12/2017	EUR	0.6	0.5	2.6	140	N/A	20.0	120.0	Utilities	A-
China	Beijing Capital Polaris Investment Co Ltd	4.25	26/03/2021	19/03/2018	USD	0.5	0.5	N/A	210	N/A	22.5	187.5	Financial	BBB-
India	Axis Bank Ltd/Dubai	2.875	01/06/2021	23/05/2016	USD	0.5	0.5	2.2	175	N/A	15.0	160.0	Financial	BBB-
India	Rural Electrification Corp Ltd	3.875	07/07/2027	29/06/2017	USD	0.5	0.5	3.9	200	24%	32.5	167.5	Financial	BBB-
India	Power Finance Corp Ltd.	3.75	06/12/2027	28/11/2017	USD	0.4	0.4	N/A	180	N/A	22.5	157.5	Financial	BBB-
India	Indian Railway Finance	3.835	13/12/2027	05/12/2017	USD	0.5	0.5	3.0	165.00	24%	20.0	145.0	Quasi Government	BBB-
Indonesia	Perusahaan Penerbit SBSN Indonesia III	3.75	01/03/2023	22/02/2018	USD	1.3	1.3	N/A	139.48	29%	30.0	109.5	Government	BBB
Korea	Export-Import Bank of Korea	2.125	11/02/2021	02/02/2016	USD	0.4	0.4	2.8	105	N/A	17.5	87.5	Quasi Government	AA-
Korea	Hyundai Capital Services Inc	2.875	16/03/2021	07/03/2016	USD	0.5	0.5	2.6	165	N/A	15.0	150.0	Consumer, Cyclical	BBB+
Lithuania	Lietuvos Energija UAB	2	14/07/2027	07/07/2017	EUR	0.3	0.3	4.7	150	30%	30.0	120	Utilities	NR
Mexico	Mexico City Airport Trust	5.5	31/10/2046	22/09/2016	USD	1.0	1.0	4.0	380	N/A	55.0	325.0	Industrial	BBB+
Mexico	Mexico City Airport Trust	4.25	31/10/2026	22/09/2016	USD	1.0	1.0	10.0	320	N/A	45.0	275.0	Industrial	BBB+
Mexico	Mexico City Airport Trust	5.5	31/07/2047	13/09/2017	USD	3.0	3.0	3.3	300	30%	25.0	275	Industrial	BBB+
Mexico	Mexico City Airport Trust	3.875	30/04/2028	13/09/2017	USD	1.0	1.0	6.0	200	30%	25.0	175	Industrial	BBB+
Poland	Republic of Poland Govt International Bond	0.5	20/12/2021	12/12/2016	EUR	0.8	0.8	1.9	60	N/A	12.0	48.0	Government	A-
Poland	Republic of Poland Govt International Bond	1.125	07/08/2026	31/01/2018	EUR	1.2	1.0	3.4	35	41%	12.0	23	Government	A-

Source: Thomson Reuters

7. Methodology

This paper includes labelled green bonds issued during H1 2018. We have included all labelled green bonds meeting the following specifications:

- Announcement date between 01/01/2018 and 30/06/2018
- Currency: USD or EUR
- Size >= USD500m
- Investment grade rated
- Minimum term to maturity of three years at issue
- Consistent with Climate Bonds Taxonomy
- Amortising, perpetual, floating, and other non-vanilla structures are excluded.

We have designed these parameters to capture the most liquid portion of the market, while not limiting diversity. Paucity of data remains a challenge. All historical data is based on asset swap spreads for EUR denominated bonds. For USD bonds, spreads are against a US treasury curve. All historical data is taken from Thomson Reuters EIKON.

Comparable baskets:

Comparable baskets include bonds issued in the same quarter as the 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 within a three month period. The number of bonds in each basket ranges from one to 11 bonds. We acknowledge that bonds behave differently according to which part of the month they are issued in, and that geopolitical events can influence bond prices from one day to the next. We have designed this proxy to circumvent the fact that green and vanilla bonds sharing similar characteristics are rarely issued on the same day.

Relative sizes of green and vanilla bonds used in yield curve construction

	Currency	Average size non-green bonds	Average of other green bonds	Green bond issued H12018
Indonesia	USD	1.47	1.3	1.25
EIB	USD	3.2	0.4	1.5
MidAmerican Energy	USD	0.4		0.7
NAB	USD	0.5	0.5	0.5
Tennet	EUR	0.5		0.5 (2028) & 0.75 (2034)
Sparebank	EUR	1.0	0.75	1.0
Poland	EUR	1.5	1.25	1.0
ENEL	EUR	1.25	1.5	1.25
EIB	EUR	3.6		0.5
BNP Paribas	EUR	1		0.5
BERLIN Hyp	EUR	0.6		0.5
Belgium	EUR	10.8	0.5	4.5
ABN Amro	EUR	1.0		0.75
Svenska Handelsbanken	EUR	1.0	0.8	0.5
Iberdrola	EUR	0.5		0.75
LBBW	EUR	0.75	0.5	5
NRW	EUR	0.7		0.5

Notes
1. https://www.climatebonds.net/standard/taxonomy
2. The change in minimum size from USD300m to USD500m excluded 2 EUR denominated bonds, and 2 USD denominated
3. https://www.ecb.europa.eu/pub/pdf/annex/ecb.sp180709_tran-script.en.pdf?d0bd98150affdcbcd1ea9e80f128b90b
4. https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html#cspp
5. We use the MSCI Market definition: https://www.msci.com/market-classification
6. https://ihsmarkit.com/products/iboxx.html
7. We use the MSCI Market definition: https://www.msci.com/market-classification
8. https://imperialcollegelondon.app.box.com/s/e8x6t16y9baj-b85inazbk5mdrqtvxfzd
9. https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publica-tions_report_sbngreenbond2018.

www.climatebonds.net

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