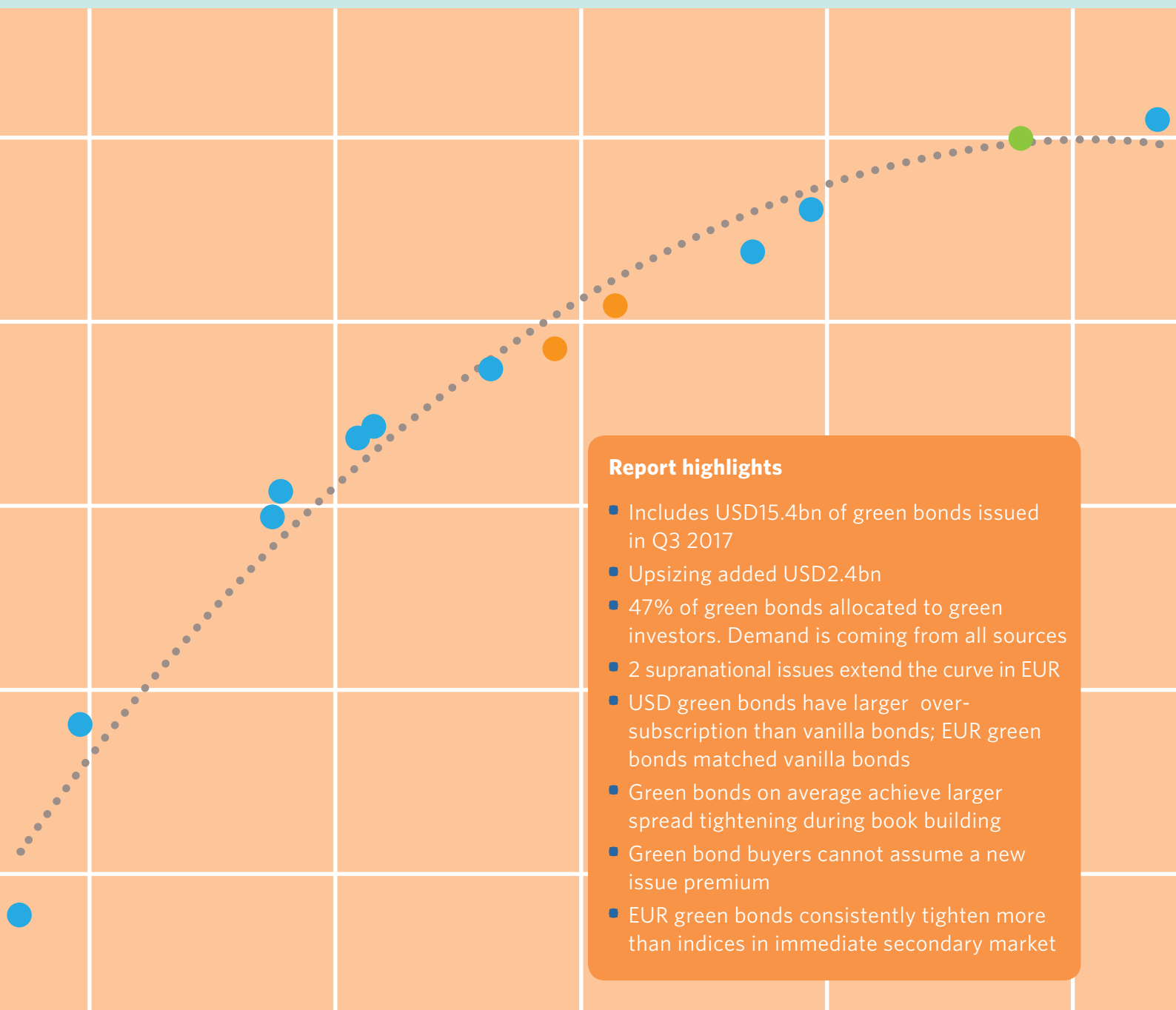


GREEN BOND PRICING IN THE PRIMARY MARKET:

July - September 2017

Q3
2017



Report highlights

- Includes USD15.4bn of green bonds issued in Q3 2017
- Upsizing added USD2.4bn
- 47% of green bonds allocated to green investors. Demand is coming from all sources
- 2 supranational issues extend the curve in EUR
- USD green bonds have larger over-subscription than vanilla bonds; EUR green bonds matched vanilla bonds
- Green bonds on average achieve larger spread tightening during book building
- Green bond buyers cannot assume a new issue premium
- EUR green bonds consistently tighten more than indices in immediate secondary market

Climate Bonds INITIATIVE

PAX
Pax World Mutual Funds

obvion
hypotheke

Rabobank

IFC International Finance Corporation
WORLD BANK GROUP

With support and funding from Pax World Mutual Funds, Obvion Hypotheke and Rabobank

Prepared jointly by the Climate Bonds Initiative and the International Finance Corporation

Additional funding was received from the Ministry of Finance of Japan and the Government of the Kingdom of Denmark through the Ministry of Foreign Affairs

Introduction

This is the third paper in our series examining the behaviour of green bonds in the primary markets. Prior publications covered green bond issuance between Q1 2016 and Q2 2017. This paper includes qualifying bonds issued in the third quarter (Q3) of 2017 and employs metrics similar to those used in previous papers.

Report Highlights

■ Green bonds priced tighter than IPT by more than vanilla equivalents

Overall, EUR green bonds tightened by 11bps compared to 9.1bps for a vanilla cohort. USD green bonds tightened by 12.1 bps, compared to 10.2bps for vanilla bonds.

See more on page 3

■ 47% of green bonds were allocated to green investors

This was 54% for bonds originating from developed markets, and 33% for emerging and frontier markets.

See more on page 5

■ Oversubscription was 2.5x for USD green bonds compared to 1.5x for vanilla bonds. EUR green bonds achieved 2.7x, same as market

Corporate green bonds in both currencies beat the vanilla cohort. In EUR it was 2.9x compared to 2.2x, and in USD it was 3.2x compared to 2.1x.

See more on page 3

■ Half the bonds in our sample priced on or inside their secondary curves

Green bond buyers cannot assume they will get a new issue premium.

See more on pages 6 and 7

■ Eight green bonds in our sample were increased at issue leading to a collective upsize of USD2.4bn

Six EUR green bonds and two USD green bonds were upsize during the pricing process.

See more on page 4

■ EUR bonds had larger price improvements than corresponding indices after 7 and 28 days

All EUR bonds tightened by more than their indices after 7 days, and all except one had done so after 28 days.

See more on pages 9 and 10

During Q3 2017, 96 labelled green bonds were issued, with a combined face value of USD30.3bn. While Q3 global bond issuance (USD7.9tn) declined slightly from Q2 (USD8tn),¹ labelled green bond issuance remained static quarter on quarter². This paper covers USD15.4bn, slightly over half of the total face value of labelled green bonds issued during Q3. Our sample is restricted by currency, not domicile of issuer, and includes green bonds from developed, emerging, and even frontier market countries³. Data availability remains a challenge and the 19 green bonds were chosen based on parameters designed to capture the most liquid portion of the market. See methodology discussion, **page 13**

Market developments

Bonds with long maturities allow investors to match known long term liabilities with cashflows from their investments. EIB celebrated ten years of activity in the green bond market by issuing a EUR1bn 30-year bond at the end of June, supporting the development of the market to include ultra-long dated paper. That was the longest EUR green bond in the market, until French railroad operator SNCF Réseau (SNCF) issued its 3rd green bond, also a 30-year tenor, of EUR750m, two weeks later. Both deals were allocated to mainly European based accounts (99% of EIB and 97% of SNCF⁴) with pension funds and insurance companies showing decent participation (EIB: asset managers & insurance companies

37%; SNCF: insurers and pension funds 58%). The good reception that these two bonds received underscores the demand for high quality longer dated green paper.

Similarly, this quarter, Mexico City Airport Trust (Mexico City Airport) issued a USD4bn green bond in two tranches in the middle of September, including a USD3bn 2047 maturity, to extend its liabilities by one year. Although we do not have distribution data for this bond, it was oversubscribed by 3.3 times, indicating a healthy reception from USD investors where long dated paper tends to be less popular compared to the EUR market. Infrastructure projects, such as those funded by the EIB, SNCF and Mexico City Airport bonds, are ideally suited to debt financing owing to the asset liability match.

The 19 bonds discussed in this paper come from 17 issuers, 12 of which are returning to the green bond market. The five first time green bond issuers were:

- French real estate company **ICADE**
- Austrian bank **Hypovorarlberg Bank AG**
- UK utility **SSE Plc.**, and to date, the largest green bond from a UK issuer
- Lithuanian state-owned utility **Lietuvos Energija**, issuing the first green bond from Frontier Market, Lithuania⁵
- Chinese bank **ICBC** (the world's biggest listed company by assets⁶).

All bonds in our sample were listed on at least one exchange. Two bonds were Certified under the Climate Bonds Standards: SNCF 2047 and ICBC 2022.

1. Order Books & Initial Price Thoughts (IPT): Oversubscription was larger for most green bonds. Green bonds priced tighter than IPT by more than vanilla bonds

▪ **EUR:** Oversubscription 2.7x for both green and vanilla bonds. Final pricing average -11bps than IPT, compared to market average of -9.1bps

▪ **USD:** Oversubscription 2.5x for green bonds, and 1.5x for vanilla bonds. Final pricing average -12.1bps than IPT, compared to vanilla average of -10.2bps.

Oversubscription is a normal feature of the bookbuilding process, and we would not expect different given current market conditions. However, even against this backdrop, USD green bonds tended to be oversubscribed more than their vanilla equivalents (see methodology notes, page 8).

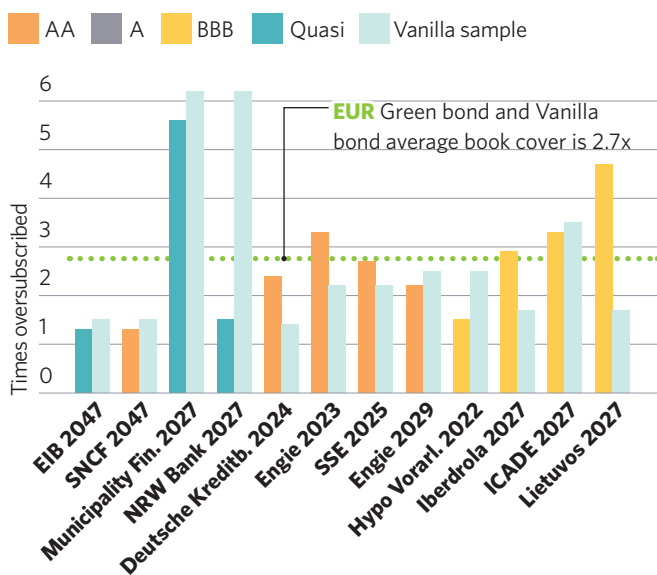
EUR green bonds covered their books by an average of 2.7x, the same as the market average.

Quasi government bonds had lower average oversubscription than the vanilla basket, partly because the AA Quasi government basket of vanilla bonds only included EFSF bonds. EFSF is the European Financial Stability Facility, a special purpose vehicle financed by members of the eurozone to address the European sovereign-debt crisis, backed by member governments. The oversubscription for the EFSF bonds was exceptionally high (6.2x), but it should be noted that Municipality Finance 2027 achieved oversubscription of 5.6x, the highest amount in our EUR green bond sample. The corporate bond average was 2.9x covered, against the market average of 2.2x.

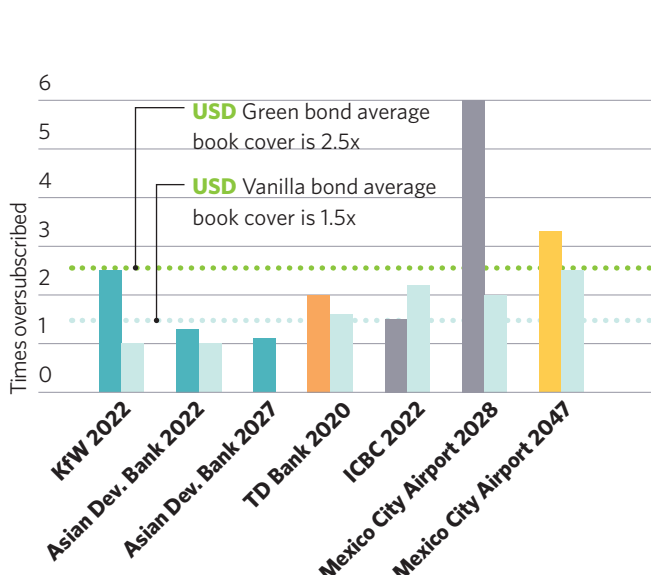
USD green bonds achieved 2.5x oversubscription, compared to 1.5x for the market average. BBB+ rated Mexico City Airport 2028 and 2047 had the highest levels of book cover, as they came to the green bond market for the second time with a dual tranche issue.

Bonds pricing tighter than IPT is the normal progression of the pricing process. During Q3, green bonds in our sample tightened more than the vanilla baskets. EUR Quasi governments shaved an average 2.3bps off the IPT while the corresponding basket managed 1.8bps. SNCF 2047 tightened by 4bps and the bond was upsized. Q3 2017 is the first quarter where we have noticed every EUR corporate green bond tightened by more than its basket. Lietuvos 2027 tightened by 30bps from IPT, double its basket. USD bonds also averaged more spread tightening than their baskets, although individual results were mixed. KfW 2022 moved by 3bps, vs. 1.3bps for its basket, while among the corporates, only TD Bank 2020 tightened less aggressively than its basket. Green bond pricing tighter than IPT by more than vanilla baskets suggests that for the bonds in our sample, the green angle may have contributed to tighter pricing at issue.

EUR: green bonds achieve the same book cover as vanilla equivalents

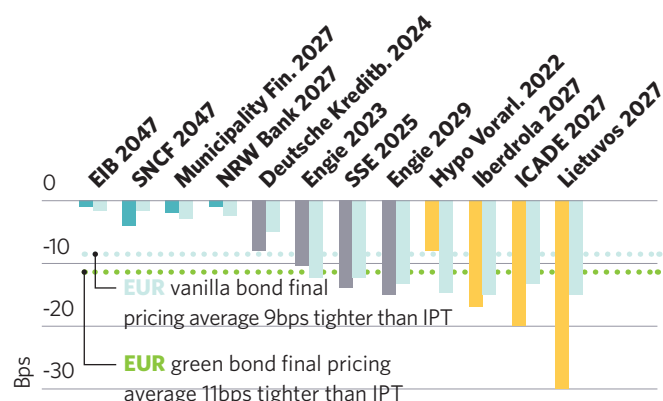


USD: green bonds achieve larger book cover than vanilla equivalents



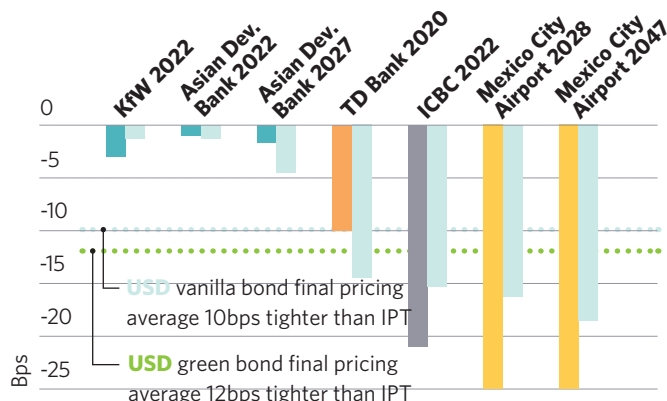
EUR: difference between IPT and final price is larger for green bonds

Final pricing is 11bps tighter than IPT



USD: difference between IPT and final price is larger for green bonds

Final pricing is 12bps tighter than IPT



2. Issue sizes: Eight green bonds were upsized for a total of USD2.4bn indicating strong demand

Some bonds can be increased in size, for others, the size is fixed, and the bond will be tagged No Grow, or Will Not Grow (WNG). Green bonds often fall into this category. Issuers need to demonstrate that there are enough green projects to match the amount that they intend to raise. For some issuers, the number of suitable projects is limited, and in fact, green bonds tend to be smaller than vanilla bonds from the same issuer for this reason. For others there is more flexibility and the final size of the deal can be increased to accommodate investor appetite. Eight bonds in our sample were upsized during the pricing process, leading

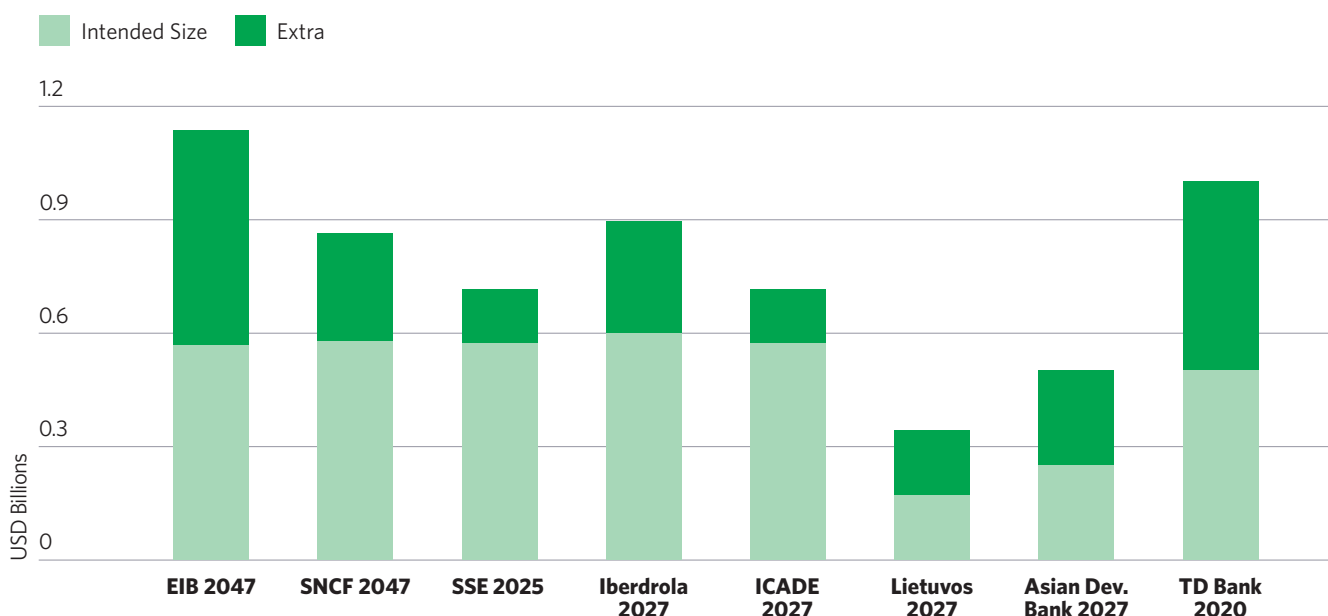
to a collective size increase of USD2.4bn. The increases ranged from 20% to 100%, with four bonds increasing by 100%, on the back of investor demand. Interestingly, the two ultra-long EUR bonds issued in Q3, SNCF 2047 and EIB 2047 were both upsized, indicating demand in the long end of the curve was strong. We do not have comparable data for non-green bonds, though upsizing is a feature of the normal new issue process. Eight out of 19 green bonds in our sample were increased in size because investor interest was sufficiently strong. Those eight issuers were able to increase their funding provision at prevailing low rates.

Methodology notes: Eight bonds in our sample were increased from the size stated in the original marketing communication.

Five bonds in our sample of 19 were marketed as WNG. Asian Development Bank issued a dual tranche issue. The longer dated 2027 tranche was increased, while the 2022 was not.

We could not find any explicit indication of grow or no grow for five bonds in our sample: Hypo Vorarlberg 2022, Municipality Finance 2027, Deutsche Kreditbank 2024, NRW Bank 2027 and KfW 2022.

Upsizing at issue increased Q3 green bonds by collective USD2.4bn



Klabin is the latest Brazilian pulp and paper company to come to the green bond market

In September 2017, BB+ rated Klabin placed a USD500m 10-year bond to finance a wide range of forestry, energy, and other projects. IPT opened at 5.375% and attracted subscription levels of 7x. Final pricing tightened by 40bps to yield 4.95%. While not included in our data sample due to its non-investment grade credit rating, Klabin told us that 30% of the deal was allocated to green investors. This is in line with EM green bonds in our sample issued in Q3 2017.

Klabin is the largest pulp, paper, and packaging company in Brazil, and the third in the sector to come to the international green bond market. In July 2016, Suzano, rated BB+, issued a USD500m green bond, followed by a BRL1bn (USD294m) in November 2016. Fibria, which has a BBB- investment grade rating, then issued a USD700m green bond in January 2017.

3. The Green Allocation Impact: 47% of the amount raised through green bonds was allocated to green investors

- 47% of the amount raised through green bonds in our sample was allocated to those labelling themselves as socially responsible or green investors

Green bonds can provide issuers with access to a more diverse investor base, including those explicitly labelling themselves as green. Bookrunners often state that participation from green accounts can contribute to tighter pricing. We approached all the issuers in our Q3 sample, and 12 of them were willing to disclose the percentage of their deal allocated to green investors. The data for KfW 2022 was publicly available from a third party.⁷ Altogether, we gathered data for 16 out of 19 bonds in our sample, plus Klabin (non-investment grade).

The 47% allocation to green investors is a slight decrease from Q2 2017, for which the overall number was 54%. One reason for this could be the tightening of credit spreads in Q3. For example, NRW Bank told us that their

2016 green bond issue had 65% participation from green investors, compared to 40% this time. However, since their latest bond was priced through French treasuries, some French accounts were excluded from the deal, and we know that there are several important French green bond funds such as AXA IM and Mirova.

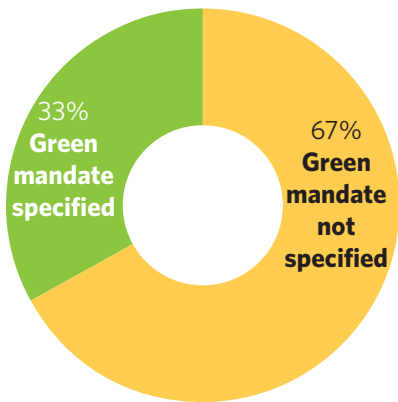
The average for DM green bonds was 54%, and 33% for EM&FM.³ This compares to 62% and 25% respectively for Q2 2017 green bonds. We know that most dedicated green bond funds are restricted to buying DM paper, which may explain the consistently higher numbers for the DM bonds in our sample. Among the four EM&FM bonds, Mexico City Airport 2028 and 2047, Lietuvos 2027, and Klabin all placed 30% of their deals with green bond investors. ICBC 2022 placed 43% with green investors, which is the highest we have seen during the last two quarters for a bond domiciled in EM&FM.

Green bonds are bought by investors falling into one of the following three categories:
1. Dedicated green bond funds 2. No dedicated

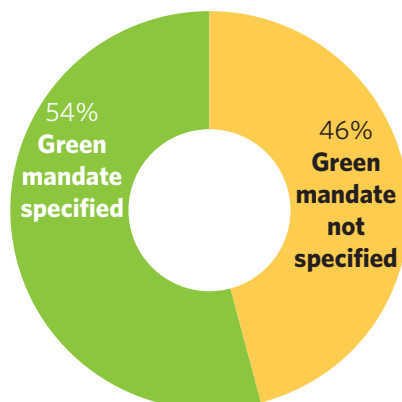
mandate but deliberately active in green bonds 3. Those for whom the green label is not relevant to investment decisions. The second category encompasses the investors who kickstarted and have supported the market so far. They buy bonds because they are green, although this is not dictated by an explicit mandate.

Methodology notes: Green investor information is provided by each issuer, and 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 the bonds in non-green portfolios. We note that investors such as Amundi, AXA IM, Blackrock, Calvert, Mirova, Nikko AM, and PIMCO have dedicated green bond portfolios (category 1), while others such as AP4 actively buy green bonds to fulfil a pervasive ESG strategy (category 2).

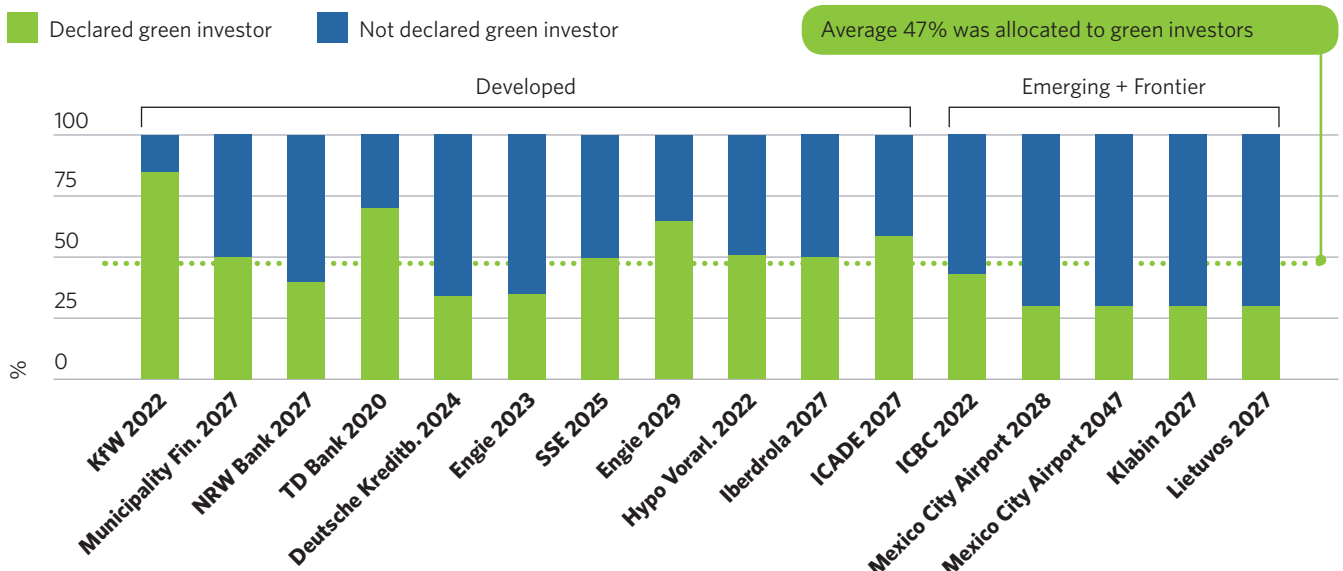
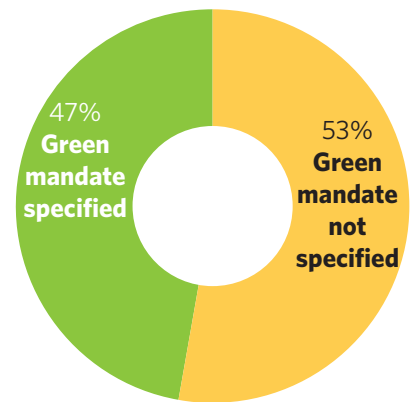
Emerging & Frontier Markets: 33% bought by investors with a green mandate



Developed Markets: 54% bought by investors with a green mandate



Green mandate % of green bonds in sample



4. The Greenium: some green bonds are pricing without new issue premiums

- 2 bonds priced just inside their curves = greenium
- 4 bonds priced on their curves = absence of a new issue premium
- 6 bonds priced outside their curves = new issue premium

The new issue premium is the extra yield that a buyer gets, and a seller pays, for a new bond, when compared 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 at a higher price and lower yield than 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, a greenium. Intuition suggests that a bond being green should not influence its price. 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 do incur minimal additional costs. Market dynamics such as supply, uncertainty surrounding interest rates, and geopolitical issues such as those faced by the US in Q3 2017 can influence final pricing for vanilla and green bonds alike.

For this analysis, our sample includes 12 out of the 19 green bonds covered in this paper, from 10 issuers. A lack of comparable bonds limits the sample size.

Two bonds priced slightly inside their curves, indicating a greenium. Four bonds priced on their curves, and six bonds priced outside their curves, exhibiting a new issue premium.

It is tricky to draw conclusions from a small number of bonds with mixed characteristics. The results differ on a bond by bond basis, which is what we have seen all along. Half of the green bonds in our sample did not exhibit a new issue premium. Our previous paper found 40% of bonds did not have a new issue premium. Whether or not this is due to the bonds being green we cannot

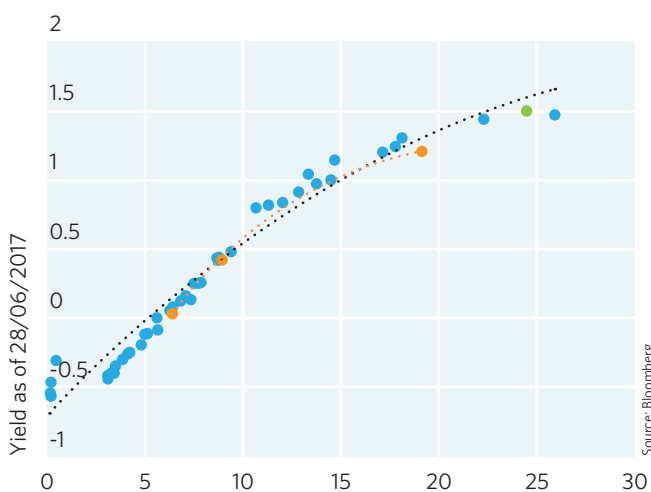
say, but buyers of green bonds certainly can't automatically expect a new issue premium.

Secondary market green bond curves

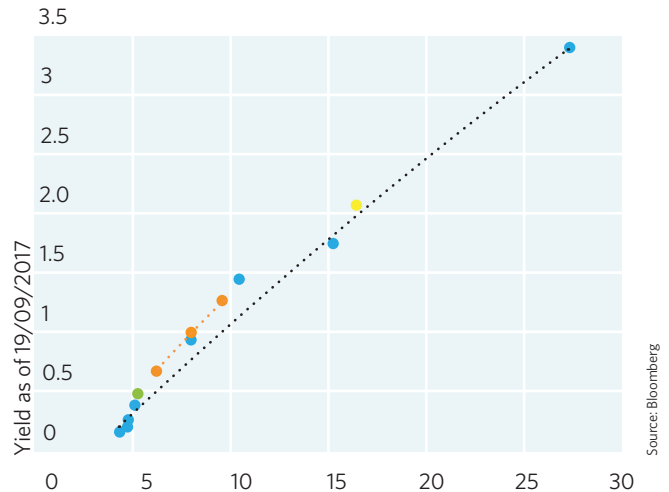
Seven out of the ten issuers featured in this analysis have seasoned green bonds outstanding: five quasi-government issuers: EIB, NRW Bank, SNCF Reseau, Asian Development Bank, KfW and two corporate issuers: Engie and Iberdrola Finanzas. When green bond curves have a handful of maturity points, they could be used as a reference for pricing new green bonds. If green bonds were trading tighter than vanilla bonds, we would reasonably expect to see a consistent greenium emerging. For three of the issuers in our sample - EIB, KfW and SNCF - the secondary market green bonds sit inside the vanilla curves. The newly issued green bonds were priced on or inside the vanilla curves, so we can see some green shoots emerging to support this theory. However, NRW Bank, Asia Development Bank, Engie, and Iberdrola do not exhibit this behaviour, with seasoned green bonds sitting close to or outside vanilla curves.

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

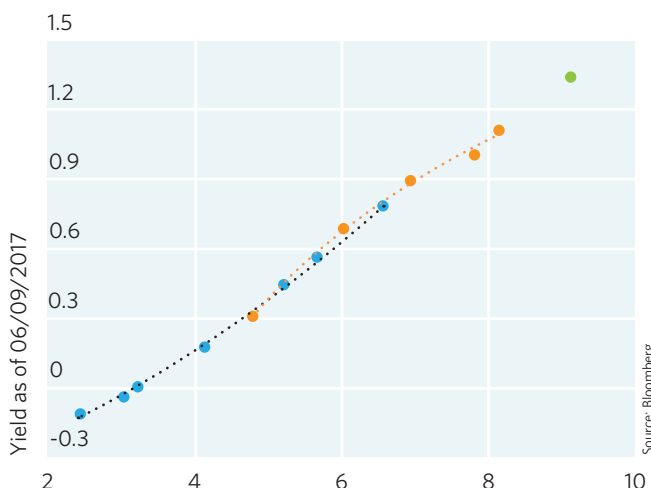
EIB 2047 EUR - Exhibited greenium



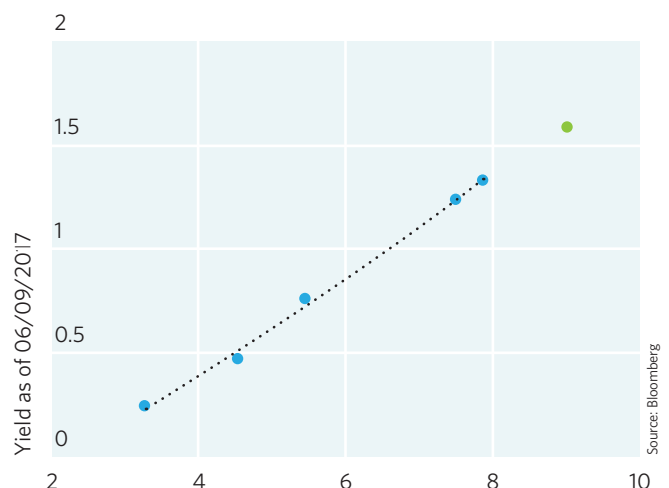
Engie 2023 & 2029 EUR - exhibited new issue premiums



Iberdrola 2027 EUR - exhibited new issue premium



Icade 2027 EUR - on the curve



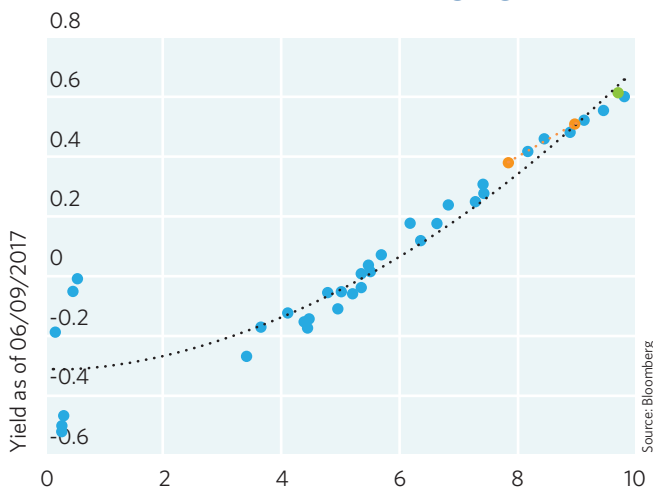
Some bonds in our sample have secondary market green curves, some of which trade inside their vanilla curves, but a secondary green curve does not guarantee a greenium. Since green bond data remains sparse, we will continue to observe these aspects of primary pricing to compile a more robust profile of evidence.

Methodology notes: We use yield on issue date, which reflects the price the green bond

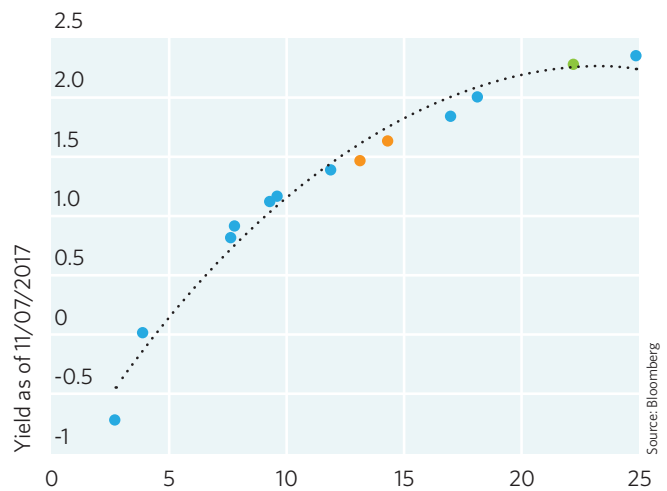
offered on the issue date. For comparable bonds, we have used yield to convention mid. For all bonds, we have used modified duration to mid, and all data is as of the announcement date of the green bond. The modified duration is the percentage price change of a security for a given change in yield. Modified duration increases with risk. First, we plot seasoned vanilla bonds (blue dots), and fit a 2nd order polynomial curve. Next, we overlay any

seasoned green bonds (orange), finally, we add our subject bond (green). We have included bonds in our sample with a minimum of 4 comparable bonds. Comparable bonds used for this analysis must fit the specification for green bond selection described on page 13, except 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.

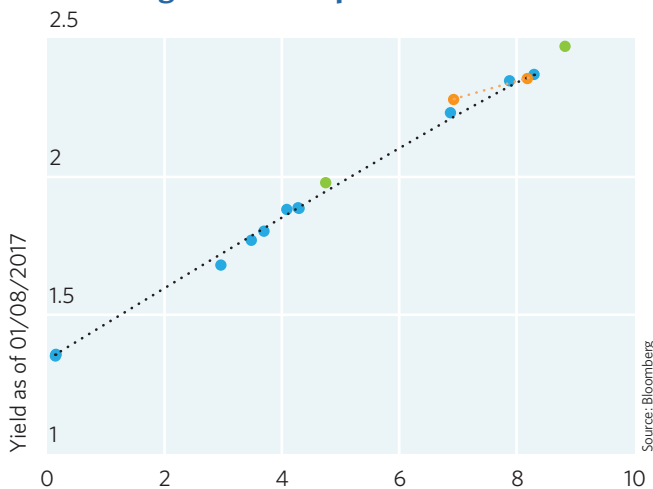
NRW Bank 2027 EUR - exhibited slight greenium



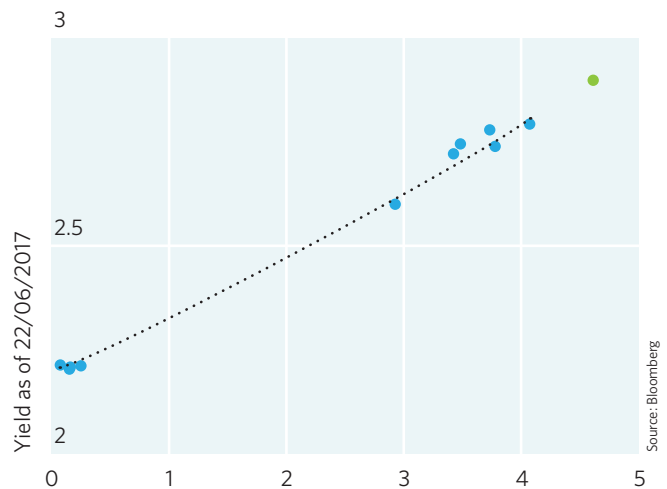
SNCF Reseau 2047 EUR - on the curve



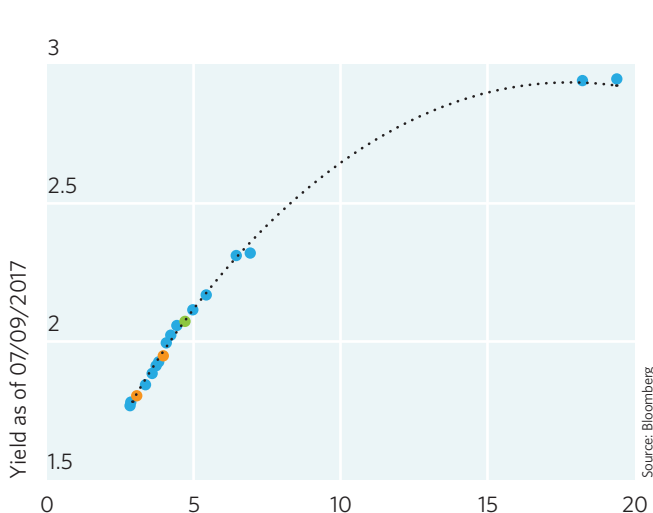
Asian Development Bank 2022 & 2027 USD - exhibited slight new issue premium



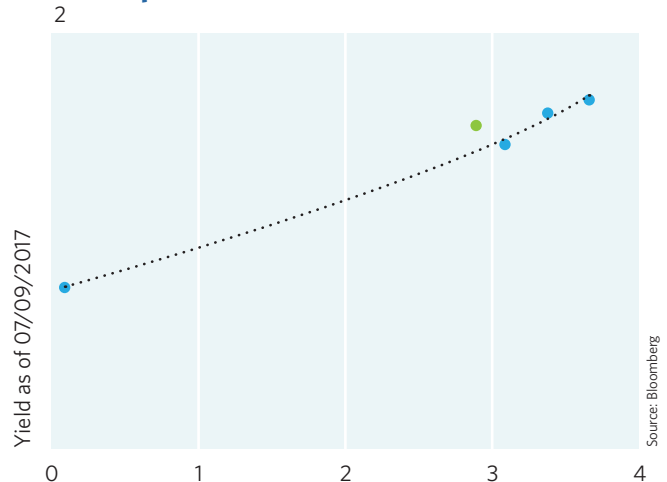
Industrial & Commercial Bank of China 2022 USD - on the curve



KfW 2022 USD - on the curve



Toronto Dominion Bank 2021 USD - exhibited new issue premium



5. Performance against comparison basket: Green bond spreads tighten in the immediate secondary market

- Around half the bonds in our sample had larger price improvements than the vanilla sample after 7 and 28 days

Bond prices generally increase on the 'break', when they start trading in the secondary market. If bonds are issued early in the month, investment managers can chalk up some off-benchmark performance, before bonds enter indices at month end.

90% of our Q3 green bond sample had tightened 7 days after announcement date, and after 28 days, 85%. We have compared these changes to those of our vanilla baskets and in aggregate, the results are similar. This is consistent with our earlier research, which concluded that in this respect, green bonds behave no differently from vanilla bonds.

Our vanilla baskets include bonds that share the same characteristics as the green bonds

in our sample in terms of currency, sector, credit rating, and maturity, and were issued during same the 3-month observation period. The 7 and 28 days periods are not necessarily overlapping, and are calculated for each bond in the basket, and then averaged.

Looking at the relative tightening, just over half (10/19) bonds in our sample had larger price improvements than their basket 7 days after their announcement date, and 28 days after, that figure was just under half (9/19).

Among the EUR green bonds, Municipality Fin. 2027, Hypo Vorarl. 2022, and Lietuvos 2027 did better than their respective baskets after both 7 and 28 days. TD Bank 2020, and Mexico City Airport 2028 and 2047 were the USD green bonds that demonstrated larger price improvements than their baskets on both counts. Except for the Asian Dev. Bank 2022 and 2027, all the USD bonds had larger price improvements than their baskets after 28 days.

Methodology notes: Baskets include bonds issued between 30th June – 30th September 2017 and that fit the parameters described on page 13, except that the use of proceeds is not stated as green. The resulting baskets are a proxy for how else the money could have been invested within the 3-month observation period. The number of bonds in each basket ranges from two to 12 bonds. Summary statistics of the baskets are on pages 13 and 14. We are aware that bonds behave differently according to which part of the month they are issued in and acknowledge that geopolitical events can influence bond prices. We have designed this proxy to circumvent the fact that green and vanilla bonds sharing similar characteristics are rarely issued on the same day.

7 calendar days includes 5 data observations. 28 calendar days includes 20 data observations.

EUR green bonds - Spread changes compared with baskets of vanilla bonds

Ticker	Spread change 1 week	Spread change 1 week basket	Greater than basket?	Spread change 1 month	Spread change 1 month basket	Greater than basket?
EIB 2047	-0.13	-0.78	✗	-5.44	-3.48	✓
SNCF 2047	-1.33	-0.78	✓	-3.45	-3.48	✗
Municipality Fin. 2027	-6.83	-4.14	✓	-12.35	-6.34	✓
NRW Bank 2027	1.50	-4.14	✗	2.23	-6.34	✗
Deutsche Kreditb. 2024	-0.09	-0.59	✗	-0.69	-2.93	✗
Engie 2023	-4.64	-4.26	✓	-3.52	-7.41	✗
SSE 2025	2.02	-4.26	✗	-3.52	-7.41	✗
Engie 2029	-3.23	-7.07	✗	-8.05	-11.33	✗
Hypo Vorarl. 2022	-6.18	-2.16	✓	-8.77	-4.72	✓
Iberdrola 2027	-4.44	-3.12	✓	-4.31	-5.80	✗
ICADE 2027	-3.71	-7.81	✗	-3.52	-10.04	✗
Lietuvos 2027	-17.92	-3.12	✓	-35.27	-5.80	✓

Source: Thomson Reuters

USD green bonds - Spread changes compared with baskets of vanilla bonds

Ticker	Spread change 1 week	Spread change 1 week basket	Greater than basket?	Spread change 1 month	Spread change 1 month basket	Greater than basket?
KfW 2022	-5.00	-7.08	✗	-6.70	-3.07	✓
Asian Dev. Bank 2022	-0.70	-7.08	✗	2.10	-3.07	✗
Asian Dev. Bank 2027	-0.30	0.25	✓	1.80	-1.95	✗
TD Bank 2020	-8.04	-3.36	✓	-17.04	-7.42	✓
ICBC 2022	-0.19	-9.63	✗	-12.99	-4.82	✓
Mexico City Airport 2028	-6.00	1.70	✓	-12.90	-0.75	✓
Mexico City Airport 2047	-16.70	-1.57	✓	-13.90	-4.96	✓

Source: Thomson Reuters

6. Performance against index: green bonds outperform indices in the immediate secondary market

- 7 days after announcement
79% tightened more than corresponding index
- 28 days after announcement
74% tightened more than corresponding index

Comparing bonds to corresponding indices tells us how bonds have performed against “the market”, or seasoned equivalents. 79% of bonds in our sample had tightened by more than their corresponding index 7 days after announcement date, falling to 74% after 28 days. 100% of the EUR bonds tightened by a larger percentage than their index after 7 days, and all but one after

28 days. Municipality Fin. 2027 had the largest movement on a percentage change basis. The issue spread was -7bps to swaps, tightening to -14bps after 7 days, and -19bps after 28 days. Among the USD denominated bonds, KfW 2022 and TD Bank 2020 tightened by a bigger percentage than their index after both 7 and 28 days.

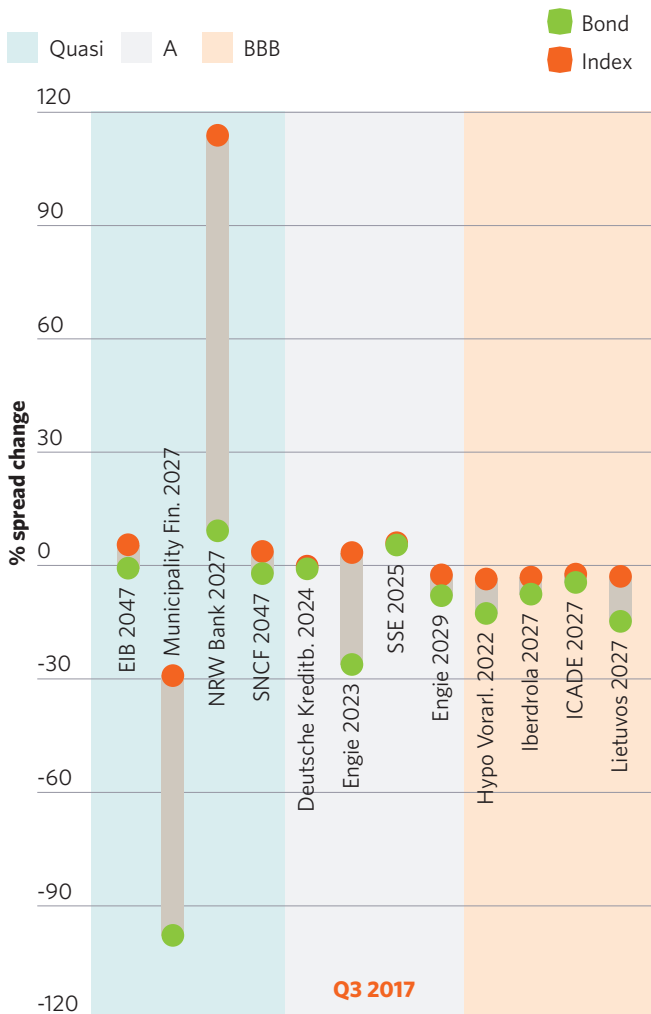
All the research we have done on this topic concludes that green bonds, particularly EUR, have consistently tightened by larger percentages than corresponding indices in the immediate secondary market. This is logical as the transactions were largely oversubscribed, and investors may be looking to top up their allocations.

Methodology notes: To isolate the performance of a green bond we would need to compare it to an index from which green bonds were excluded. In the absence of such indices, we have used standard indices.

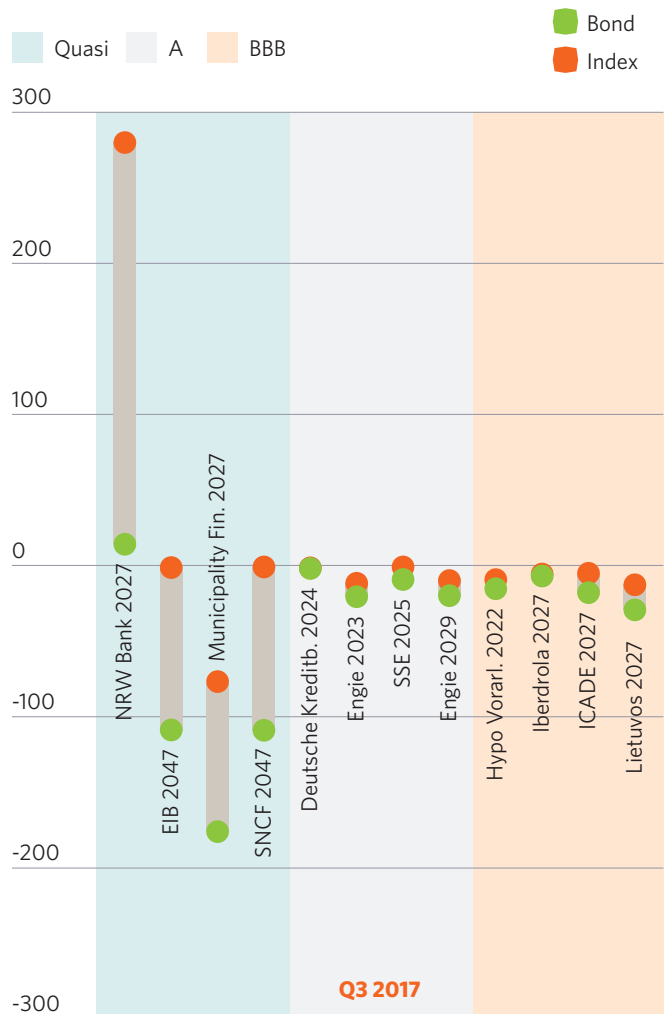
We used standard iBoxx[®] indices partitioned by currency, asset class, credit rating, and tenor, all of which can influence the performance of a bond. As a result, green bonds are compared to an index comprising bonds sharing similar characteristics. For example, EUR Engie 2023 is matched with the iBoxx EUR Corporates A 5-7 Index.

7 calendar days includes 5 data observations. 28 calendar days includes 20 data observations.

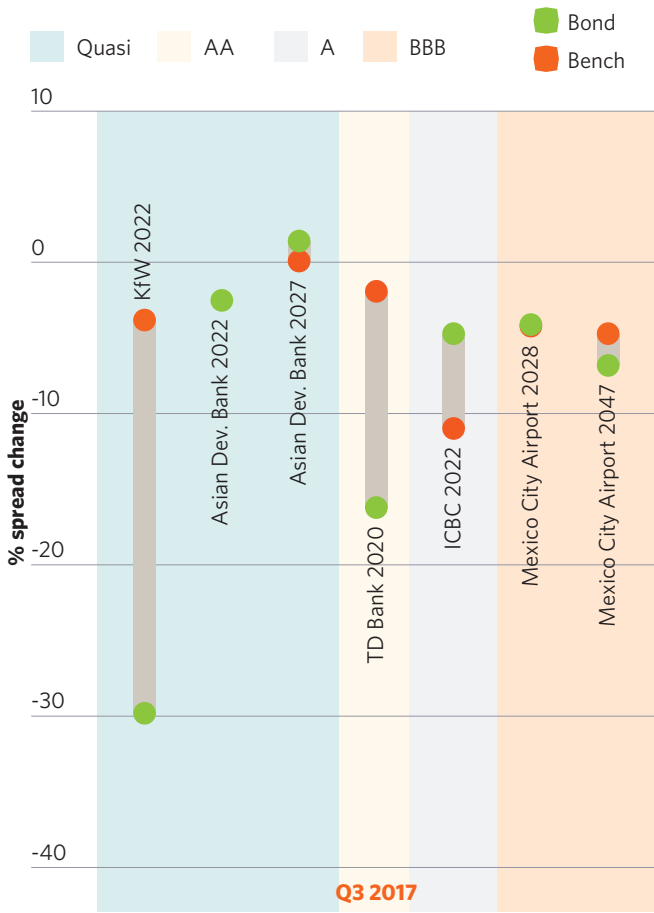
EUR 7 days: 12 out of 12 green bonds tightened by more than their corresponding index



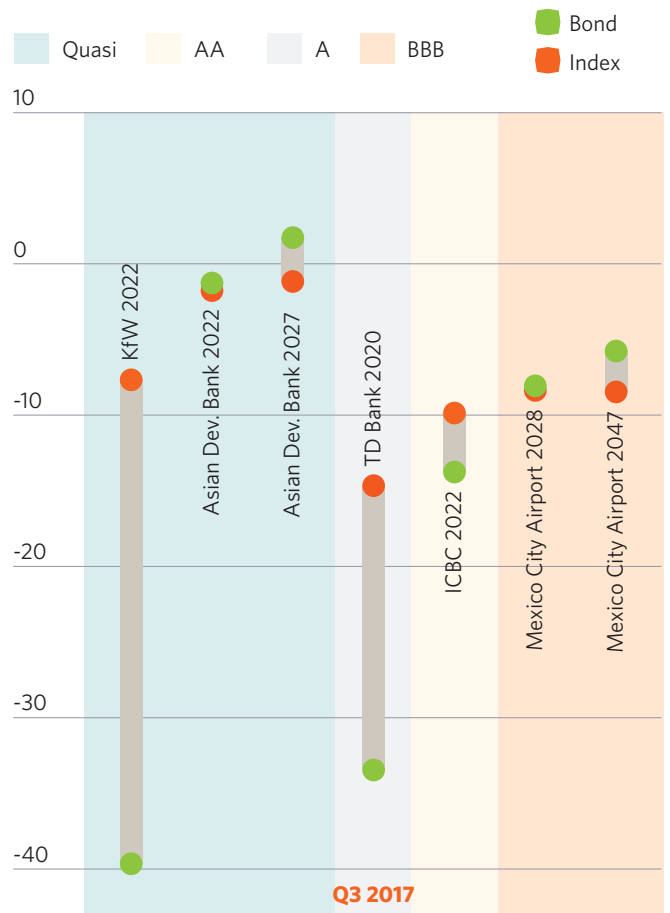
EUR 28 days: 11 out of 12 green bond tightened by more than their corresponding index



USD 7 days: 3 out of 7 green bonds tightened more than their corresponding index



USD 28 days: 3 out of 7 green bonds tightened more than their corresponding index



7. Treasurers see many benefits from issuing green bonds

The distribution of green bonds can be broader than vanilla bonds because of the demand from green bond funds and responsible investors. As we have noted, the green bond market is receiving support from all areas of the market. A diverse investor base can help to stabilise bond prices in times of volatility. In this context, treasurers consistently mention that they are happy with how their green bonds place. In addition to this, for some organisations, printing green bonds is an opportunity to reinforce their commitment to societal responsibility. Below are some of the many positive comments from the websites of issuers included in this publication.

Municipality Finance

0.75% 07/09/2027
announced 26/09/2017
EUR500m

We did expect a marked oversubscription as the demand for responsible investments is currently growing. MuniFin enjoys an excellent reputation among investors, and our green framework received a very positive welcome in investor meetings prior to the issue, says Joakim Holmström, Vice President, Head of Funding at MuniFin.⁹

Iberdrola Finanzas

1.25% 13/09/2027 announced
06/09/2017 EUR750m

Green bonds tend to generate greater demand since they attract the interest of Socially Responsible Investors (SRI). Indeed, a large part of the operation has been subscribed across investors of this sort, enabling Iberdrola to continue diversifying its investment base while increasing demand, which enhances the execution of such operations during volatile periods of trading.¹⁰

Lietuvos Energija UAB

2% 14/07/2027 EUR300m
announced 07/07/2017

In the past three years no company from the CEE region managed to raise funds in the capital markets at a lower interest rate for a ten-year period than Lietuvos Energija. It attracted both international and domestic asset managers and pension funds, banks and insurance companies to actively compete for the securities of this Lithuanian state-owned company.¹¹

Asian Development Bank

1.875% 10/08/2022 EUR750m and 2.375% 10/08/2027
EUR500m announced 01/08/2017

"ABD is responding to the rapidly growing demand for green bonds with our second dual-tranche outing and our first 5-year green bond offering," said ADB Treasurer Pierre Van Peteghem. "We have found the dual-pronged approach taken today to be an efficient means of reaching ethical investors active at different segments of the yield curve. This approach means that ADB is reaching an increasing number of investors who understand the importance of the green label."¹²

Icade

1.5% 13/09/2027 announced
04/09/2017 EUR600m

This issue, which was almost 3 times oversubscribed, was met with great success with French and international SRI investors. It has allowed Icade to broaden its bond investor base and continue its policy of optimising its funding structure (extending the average debt maturity and reducing the average cost of debt).¹³

KfW

2% 29/09/2022 USD1.0bn
announced 27/09/2017

Clearly, we were overwhelmed with demand from green investors, much more than with our last dollar green bond almost a year ago. We have witnessed that stronger green demand in our euro transactions as well. That additional demand could help to drive pricing below our conventional curve in the future too.⁷

Conclusion

Green bond issuance held steady in Q3 2017.

Supranational issuers extended the curve in EUR. Five corporate issuers bringing green bonds for the first time qualified for inclusion in our study. While the choice of individual corporate bond issuers is broadening, we note that they remain largely confined to the utility, bank, and property sectors. Renewable energy may be an obvious use of proceeds for corporate green bonds, but their purpose can extend to a variety of other applications. We are still waiting for issuers in other sectors such as engineering and retail to come to the green bond market with benchmark deals in hard currencies. Apple green bonds are widely discussed because they are an exceptional example. A large retail company could utilise the green bond market as a source of funding to aggregate its own green projects such as greening its supply chain or upgrading its facilities, but this has not happened yet. Green investors would undoubtedly appreciate a broader choice of issuers from which to assemble a diversified portfolio.

Eight of the bonds in our sample were upsized at issue suggesting that there is robust demand for the green bond format. Our research has shown that green bonds are not only bought by green bond funds. **Almost half of the bonds in our sample were allocated to green investors.** The other half were bought by those who prefer green bonds, although they do not have a

specific mandate in place, and those who need to buy bonds, and green bonds happen to be available. At least USD1tn of additional capital per year is required to meet climate change targets. For this to happen, green bonds must appeal to specialist and mainstream investors alike. **Our sample, albeit limited, demonstrates that demand is indeed coming from all areas of the market which is encouraging.** We are pleased to see that the green investor base is expanding, potentially due to the emergence over the past year of several new bond funds from large asset managers, but support for green bonds is coming from all sources.

In terms of performance, it remains challenging to draw conclusions from the limited number of decent sized bonds across the credit curve, and from a mixture of supranational and corporate issuers. Green bonds price tighter than IPT and are oversubscribed, which is no different from vanilla bonds. However, we have used comparable vanilla bond data for the past two quarters, and in both instances, green bonds have achieved on average, the same as, or higher levels of oversubscription than the vanilla cohort. All the EUR corporate green bonds tightened more aggressively from IPT to pricing than their baskets in Q3. This is the first quarter that we have made this observation, and we will continue to monitor this metric. USD green bonds have, on average, tightened more during the bookbuilding process than

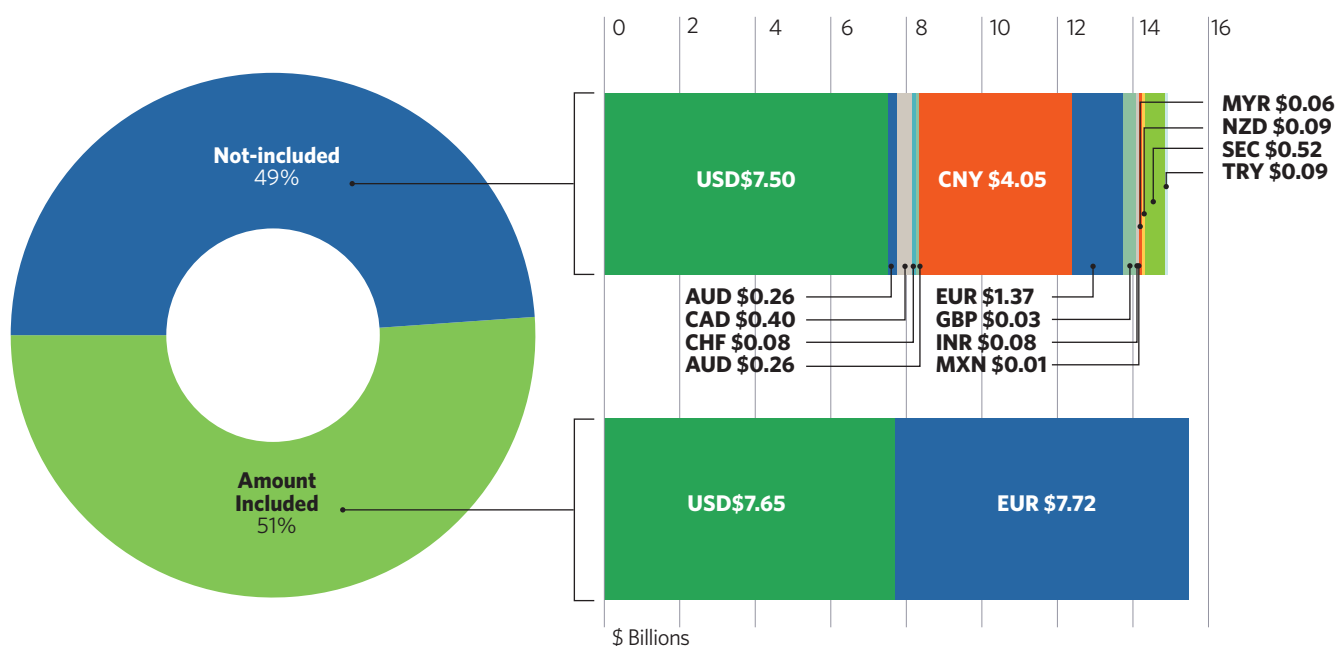
vanilla equivalents during both quarters. These indicators suggest that the green angle could be helping to achieve tighter pricing.

The gradual development of secondary market green issuer curves may lead to a shift in green bond pricing but we have yet to see this happen consistently. For the time being, while we could only see a greenium for two of the bonds in our sample, we note that four more bonds priced on their curves, which is the absence of a new issue premium. Green bond investors cannot automatically expect to receive a new issue premium.

Secondary market performance among green bonds is varied as one would expect for any mixed group of bonds. We note that around half the bonds in our sample tightened more than their corresponding baskets after both 7 and 28 days. When compared to matched indices the EUR bonds in our sample were all tighter after 7 days, and, after 28 days, all except one, were tighter than their indices. This could indicate that investors are looking for green bonds that they missed out on in the allocation process. The USD bonds exhibited more mixed results with two bonds being tighter than their indices after both 7 and 28 days.

Green bonds show signs of benefits to both issuers and buyers. Data remains limited, and we will continue to monitor the market.

Our methodology captures USD46bn of green bonds issued in Q3



Methodology: This paper includes labelled green bonds issued during the third quarter of 2017. We have included all labelled green bonds meeting the following specifications:

- Announcement date between 30/06/2017 and 30/09/2017
- Except for EIB 1.5% 2047, issued 28th June 2017, but not picked up in our last paper
- Denominated either USD or EUR
- Size >= USD 300mm
- Investment grade rated
- Minimum term to maturity of three years at issue
- Consistent with the Climate Bonds Taxonomy
- Amortising, perpetual, and other non-vanilla structures are excluded.

We have set these parameters to capture the most liquid portion of the market, while trying not to limit diversity of issuer type. Paucity of data remains a challenge.

All historical data is based on asset swap spreads for EUR denominated bonds. For USD denominated bonds, spreads are against a US Treasury benchmark, except for KfW 2022 and Asian Dev. Bank 2022 & 2027 which, for the comparable basket data is based on asset swap spreads. All historical spread data is taken from Thomson Reuters EIKON.

Comparable baskets

Baskets for comparison include bonds meeting the above criteria with a use of proceeds which is not stated as green. To be included, bonds must have adequate data available. Baskets are equally weighted, and are organised according to:

- Currency
- Bloomberg Industry Classification Scheme Level 1
- Bloomberg Composite Rating
- Where possible, we have added the maturity dimension.

Composition of sample

EUR	Quasi	AA	A	BBB
1 to 3				
3 to 5				1
5 to 7			2	
7 to 10	2		1	3
10+	2		1	

USD	Quasi	AA	A	BBB
1 to 3		1		
3 to 5	2		1	
5 to 7				
7 to 10	1			
10+				2

USD: Summary statistics of baskets used for comparison

Bonds issued in Q3 2017 sharing similar characteristics to green bonds in our sample

	Number of bonds	Average Coupon (par weighted)	Maturity
Asian Development Bank 1.875% 10/08/2022	1	1.875%	5
Kreditanstalt fuer Wiederaufbau 2% 29/09/2022	1	2%	5
AAA Quasi Government 3-5 Years	8	1.77%	3.88
Asian Development Bank 2.375% 10/08/2027	1	2.375%	10
A+ to A- Quasi Government 10 Years	2	2.78%	10
Toronto Dominion Bank 1.85% 11/09/2020	1	1.85%	3
AA- Banks 3-10 Years	5	2.30%	4.8
Industrial & Commercial Bank of China Ltd/ Lux. 2.875% 12/10/2022	1	2.875%	5
A Banks 3-10 Years	12	2.46%	4.83
Mexico City Airport Trust 3.875% 30/04/2028	1	3.875%	11
BBB+ Non-Financial Corporates 10-15 Years	4	4.59%	14.25
Mexico City Airport Trust 5.5% 31/07/2047	1	5.50%	30
BBB+ Non-Financial Corporates 30 Years	7	4.08%	30

EUR: Summary statistics of baskets used for comparison

Bonds issued in Q3 2017 sharing similar characteristics to green bonds in our sample

	Number of bonds	Average Coupon (par weighted)	Maturity
EIB 1.5% 15/11/2047	1	1.50%	30
SNCF Reseau 2.25% 20/12/2047	1	2.25%	30
AAA-AA Quasi Government 14+ Years	3	1.33%	26.33
Municipality Finance 0.75% 07/09/27	1	0.75%	10
NRW Bank 0.5% 13/09/2027	1	0.50%	10
AA Quasi Government 4+ Years	3	0.76%	13
Deutsche Kreditbank 0.75% 26/09/2024	1	0.75%	7
A+ to A- Banks 3-10 Years	3	0.86%	6.67
Engie 0.375% 28/02/2023	1	0.375%	6
SSE Plc. 0.875% 06/09/2025	1	0.875%	8
A+ to A- Non-Financial Corporate 3-10 Years	9	0.56%	6.67
Engie 1.375% 28/02/2029	1	1.375%	12
A+ to A- Non-Financial Corporate 10-12 Years	3	1.38%	12
Hypo Vorarlberg Bank AG 0.625% 19/09/2022	1	0.625%	5
BBB+ to BBB- Banks 3-7 Years	7	0.78%	5.29
Lietuvos Energija UAB 2% 14/07/2027	1	2%	10
Iberdrola Finanzas 1.25% 13/09/2027	1	1.25%	10
BBB+ to BBB- Utilities 7-12 Years	4	1.41%	10.25
ICADE 1.5% 13/09/2027	1.50	1.5%	10
BBB+ to BBB- Real Estate 7-12 Years	6.00	1.6%	9.33

1. Bloomberg data

2. During Q2 2017, 101 green bonds were issued with a face value of USD30bn

3. <https://www.msci.com/market-classification>. Abbreviations used in this report: DM - developed markets, EM - emerging markets, FM - frontier markets

4. <https://www.globalcapital.com/article/b13vgb2v2q2ygm/sncf-233seau-eur750m-23-dec-47-green-bond> & <https://www.globalcapital.com/article/b13n96dpxm9syk/eib-eur1bn-15-nov-47-green-bond>

5. MSCI classifies Lithuania as a Frontier Market. We note that Lithuania has a composite rating of A- and is a Eurozone country with access to ECB funding.

6. <https://www.forbes.com/pictures/5924acd8a7ea434078d-451ab/2017-global-2000-top-25/#146768537405>

7. <http://www.globalcapital.com/article/b14yfcghstl2rf/kfw-usd1bn-2-sep-22-green-bond>

8. <https://iismarkit.com/products/iboxx.html>

9. <https://www.munifin.fi/recents/news/2017/09/26/extremely-strong-investor-demand-munifins-inaugural-eur-green-bond>

10. <https://www.iberdrola.com/press-room/news/detail/iberdrola-completed-sixth-green-bond-issue-worth-750-million>

11. <https://www.le.it/index.php/news/press-releases/record-investor-attention-to-the-eur-300-million-green-bond-issue-of-lietuvos-energija/3793>

12. <https://www.adb.org/news/adb-dual-tranche-global-green-bonds-spur-climate-financing>

13. <http://www.icade.fr/en/icade/news/icade-has-successfully-launched-its-inaugural-600m-10-year-green-bond-with-fixed-coupon-of-1.50>

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