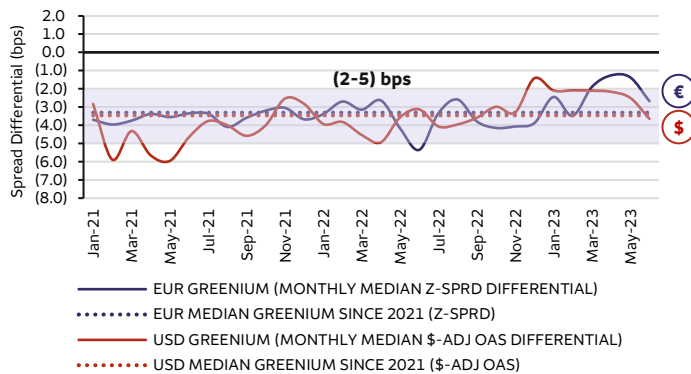


Exploring Evidence of a “Greenium” in IG USD & EUR Corporate Secondary Markets

Sustainable Finance Debt Capital Markets

July 2023

Figure 1: Monthly Median “Greenium” Since 2021



In this briefing, our Sustainable Finance Debt Capital Markets team explores how the “Greenium,” or the amount which Green bonds trade relative their conventional counterparts, has evolved in the secondary market.

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This “Greenium” trading analysis is supplemented by:

- **Appendix I** – *Additional Considerations, Methodology, and Criteria*
- **Appendix II** – *“Greenium” Evidenced in German and Dutch Sovereign “Twin Bonds” with Same Coupon & Maturity* – Green tranches experience 0.5-5 bps savings in primary executions and 2.4-4.9 bps savings in secondary trading
- **Appendix III** – *New Issue Execution Statistics* – GSSS¹-labeled tranches display lower monthly average new issue concessions and higher average oversubscription

- **Green bonds have displayed a 2-5 bps “Greenium” primarily when paired vs. comparable conventional bonds of the same issuer. This advantage has tapered slightly over the past ~6 months but was seen returning to the median in June 2023**
- **USD and EUR IG data sets have displayed similar advantages in secondary trading for Green bonds**
- **Sectors with the deepest data sets – Utilities, Banks, & Real Estate – displayed the strongest “Greeniums”**
- **Social, Sustainability, and Sustainability-linked bonds presented limited data sets, which prevented us from drawing significant conclusions from the analysis**
 - **However, preliminary analysis suggests mixed results for Social & Sustainability bonds but no advantage for Sustainability-Linked bonds**

Analysis Overview & Findings

The “Greenium” analysis observes daily bond trading comparisons for a universe of 88 USD & 166 EUR Investment Grade (“IG”) Corporate Green bonds issued since 2019, each paired versus one or more conventional counterparts from the same issuer. Pairs selected had maturity dates within 2-years and effective duration differences within +/- 1.0. The criteria for pair selection resulted in 254 “like-for-like” pairs, comprising 37% and 32% of all Green bonds issued in the USD & EUR IG Corporate markets since 2019, respectively. Beginning with 405 USD and 701 EUR Green, Social, Sustainability, Transition, and Sustainability-linked labeled tranches, we narrowed the focus of the study to 236 USD and 534 EUR Green tranches before filtering based on the above criteria.

High-Level Takeaway? Green bonds have generally been observed to trade inside their comparable conventional bond counterparts in both the USD & EUR data sets, displaying a monthly median “Greenium” concentrated in the 2-5 bps range, returning to the median in recent months (see *Figure 1*).

Dollar price adjusted Option Adjusted Spread (“\$-ADJ OAS”) is utilized for the USD data set, while Z-Spread (“Z-SPRD”) is utilized for the EUR data set to reflect prevailing methodology for triangulating fair value in each currency’s respective primary and secondary markets. As shown, the USD and EUR “Greeniums” have been similar since 2021, with a **median USD** spread differential of **3.5 bps**, compared with **3.3 bps** for the **EUR** data set over the same time period

For alternative like-for-like USD and EUR spread comparisons, see *Figure 2* and *Figure 3* below for the data sets expressed in Z-Spread and Option Adjusted Spread.

Figure 2: Median Monthly “Greenium” (Z-SPRD)

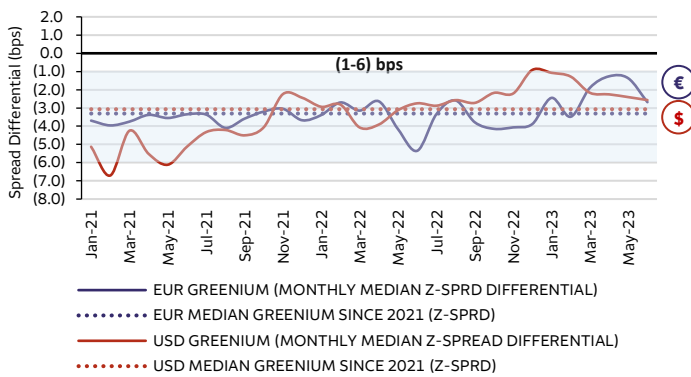
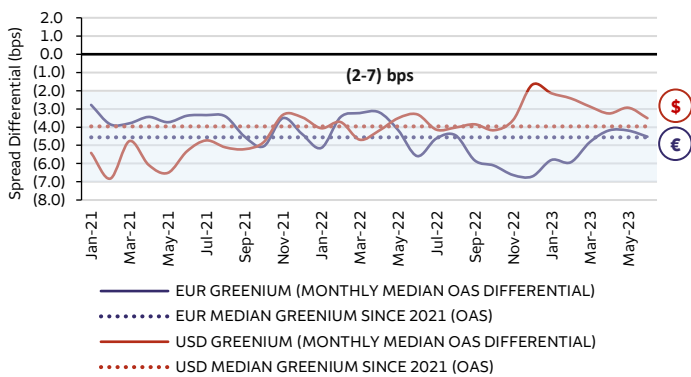


Figure 3: Median Monthly “Greenium” (OAS)



The results differ based on spread type used. For example, when Z-Spread is utilized for both data sets (note that USD bonds are typically not quoted in terms of Z-Spread), the median “Greenium” since 2021 is more robust for the EUR data set (EUR median: 3.3 bps, USD median 3.1 bps). When option-adjusted spread is utilized for both data sets, the EUR data set also displays a more robust median “Greenium” since 2021 (EUR median: 4.6 bps, USD median

4.0 bps). Ultimately, regardless of spread type utilized, a “Greenium” is consistently evident across both data sets, ranging from 1-7 bps, since 2021.

Expanded “Greenium” Results

Figure 4: Expanded “Greenium” Summary Statistics

USD \$-ADJ OAS “GREENIUM” SUMMARY						
	Median Annual “Greenium”			June 2023 Median	Median Since 2021	# of Pairs
	2021	2022	2023			
All USD Data	(4.1)	(3.6)	(2.5)	(3.6)	(3.5)	88
Utilities	(3.8)	(6.3)	(1.3)	(1.7)	(3.9)	21
Banks	(4.0)	(2.9)	(2.3)	(3.9)	(3.2)	17
Real Estate	(2.3)	(2.0)	(0.8)	(0.4)	(1.8)	21

EUR Z-SPREAD “GREENIUM” SUMMARY						
	Median Annual “Greenium”			June 2023 Median	Median Since 2021	# of Pairs
	2021	2022	2023			
All EUR Data	(3.6)	(3.5)	(2.4)	(2.7)	(3.3)	166
Utilities	(2.5)	(6.0)	(2.7)	(2.5)	(3.6)	36
Banks	(4.3)	(2.1)	(2.8)	(4.9)	(3.2)	81
Real Estate	(1.6)	(5.8)	(0.6)	1.3	(3.0)	13

Shown above, the “Greenium” has largely persisted amongst the most heavily represented data sets in our analysis – the Utility, Bank, and Real Estate sectors. Combined, these sectors comprise 74% of the total pairs in the data set across the combined markets. The strength of the “Greenium” in these data sets may be due to issuers’ ability to allocate sizable amounts in straightforward eligible Green project categories such as Green buildings and renewable energy (and investors preferring the credibility and simplicity of such approaches).

The observed full data set “Greenium” measured annually has tapered since peaking in USD in 2021 and in EUR in 2022. Market observers may conjecture that the broader political and legal scrutiny on “ESG” and “Greenwashing” have dampened investor enthusiasm for labeled structures. We would also consider the impact of broader market volatility, evolving sector specific credit considerations (especially in Real Estate and Banks), and potential limitations in data inputs (such as the lack of representation for names who have issued primarily in Green format such as Ørsted AS or TenneT Holding precluding comparison to a conventional security) before making more broad conclusions. Also, the observed “Greenium” is seen returning to the median in June 2023, complicating such a narrative. Ultimately, further observation will be required before making more detailed conclusions beyond acknowledging the historical median 1-7 bps trading advantage for Green labeled securities across both USD and EUR Investment Grade Corporate secondary markets.

We also analyzed results by Duration Difference, Tenor, Credit Rating, and MSCI ESG Rating. Below are preliminary findings with some high-level deductions based on the results:



¹Effective Duration of green bond minus that of conventional counterpart. | Trading data as of 6/30/2023. | Sources: Bloomberg and Wells Fargo Securities

Appendix I: Additional Considerations, Methodology, and Criteria

Additional Considerations? The Sustainable Finance DCM team analyzed more granular results by structure (e.g. Green, Social, Sustainability, Sustainability-Linked) and additional sectors (e.g. Industrials, Technology, Consumer & Retail, Captive Finance, Insurance, Healthcare, and Media & Communications). We elected not to highlight the results from these comparisons in the analysis given it would be premature to extrapolate conclusions from the limited data sets involved (e.g. Social structures account for approximately 8% of all USD & EUR pairs and sectors like Insurance, Healthcare, and Media & Communications only account for less than 3% of all USD & EUR pairs). However, preliminary findings suggest that Sustainability-Linked structures do not trade at an advantage to their conventional counterparts and sectors or issuers with straightforward and sizable investment (e.g. Captive Finance or Verizon) show stronger “Greeniums.”

Pair Selection Criteria? Pairs are identified using the following criteria, in order of significance: (i) same issuer and security-level, (ii) closely aligned maturity (within 2-years), and (iii) effective duration (within +/- 1.0 difference) with consideration given to tranche sizing and coupon/dollar price differences (for USD pairs). Trading history is excluded for bonds maturing in less than 2-years to eliminate technical idiosyncrasies as bonds roll-down-the-curve and approach call and maturity dates.

Spread Measurement Utilized? Dollar price adjusted Option Adjusted Spread (“\$-ADJ OAS”) is utilized for the USD data set and Z-Spread (“Z-SPRD”) is utilized for the EUR data set using daily BVAL as source data. Spread adjustments are made in the USD data set to account for investor expectations and the yield impact of discount/premium securities. Dollar price adjustments are made by adding 0.5-1.0 bps of spread for every \$1.00 below par a bond is trading (or subtracts 0.5-1.0 bps of spread for every \$1.00 trading above par) to account for the value inherent in bonds trading at large discounts or premiums. Ranges of dollar price adjustments are made depending on the severity of discount or premium a bond is trading at and the credit rating at the issuer-level (e.g. bonds at high discounts or high premiums are weighted heavier and bonds with lower credit ratings are weighted heavier than bonds with higher credit ratings to account for value differentials in higher-beta credits).

Limitations? Limitations to the “Greenium” analysis include: (i) differences in maturity and effective duration of paired securities (median 0.2 and 0.1 points of effective duration difference and 0.5 and 0.2 years of maturity difference in the USD & EUR data sets, respectively), (ii) limited or no examples available for certain sectors, and (iii) technical and/or liquidity-related factors that can result in two “like-for-like” bonds having trading discrepancies not attributable to the sustainable finance structure of a bond.

Appendix II: “Greenium” Evidenced in German and Dutch Sovereign “Twin Bonds” with Same Coupon & Maturity

“Twin Bonds” Overview

Examples of “Twin Bonds” in the German and Dutch Sovereign markets provide straightforward “like-for-like” comparisons of Green bonds versus conventional counterparts issued with the same maturity and same coupon. It is evident that these sovereign “Twin Bonds” show an approximately 2.4-4.9 bps “Greenium” since issuance.

The issuance of “Twin Bonds” provides near-perfect transparency on the premium investors ascribe to instruments with dedicated proceeds to Green investments.

Another benefit of the “Twin Bond” format in the sovereign market particularly is that new issue savings (or “Greenium” at-issue) is very clear due to Green government bonds being priced over the existing conventional bond as the “benchmark.”

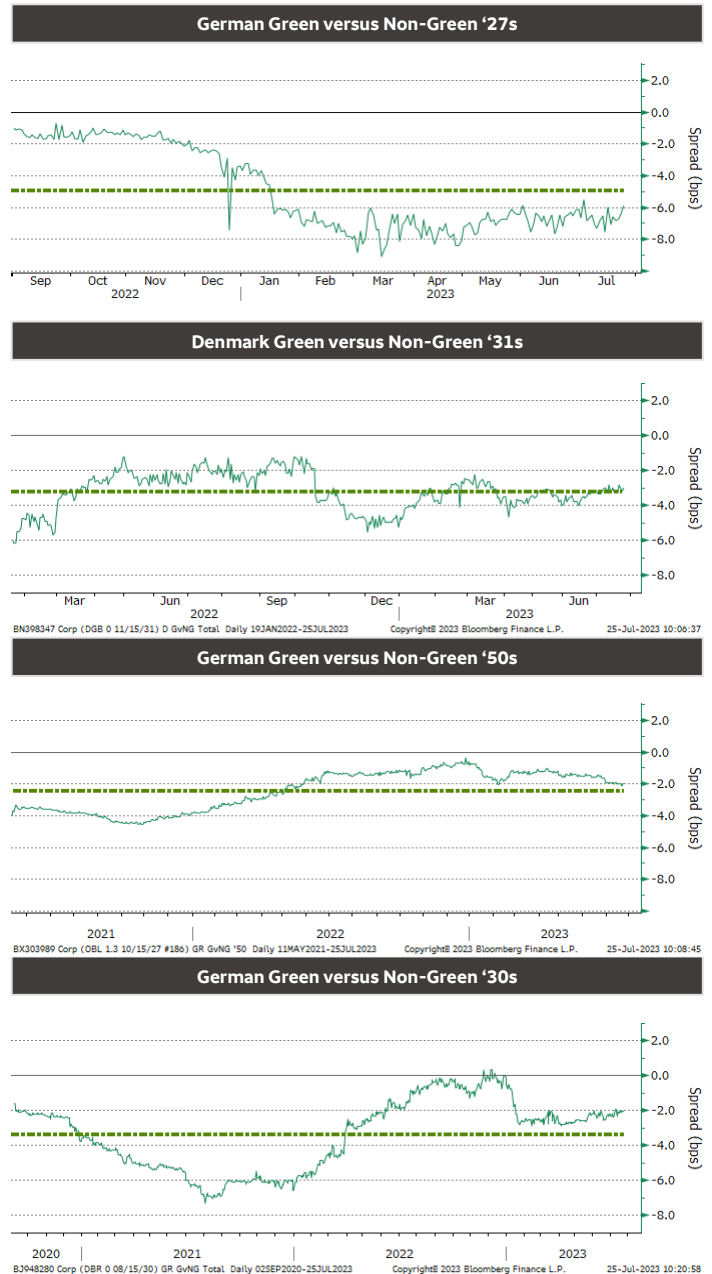
The latest example of a “Twin Bond” is in the German market with the Green ‘53s that priced 0.5 bps tighter than the existing conventional ‘53s on June 13, 2023.

Figure 5: Sovereign “Twin Bond” New Issue Savings

(ranked by date of issuance)

	Pricing Date	Green Bond Size (in Bn)	Maturity	New Issue Savings (bps)
Germany 30yr Green ‘53s	6/13/23	€4.5	8/16/53	(0.5)
Germany 10yr Green ‘33s	4/25/23	€5.3	2/15/33	(0.5)
Germany 5yr Green ‘27s	8/31/22	€5.0	10/15/27	(1.3)
Denmark 10yr Green ‘31s	1/1/22	Kr.5.0	11/15/31	(5.0)
Germany 30yr Green ‘50s	5/11/21	€4.0	8/15/50	(2.0)
Germany 10yr Green ‘30s	9/2/20	€6.5	8/15/30	(1.0)

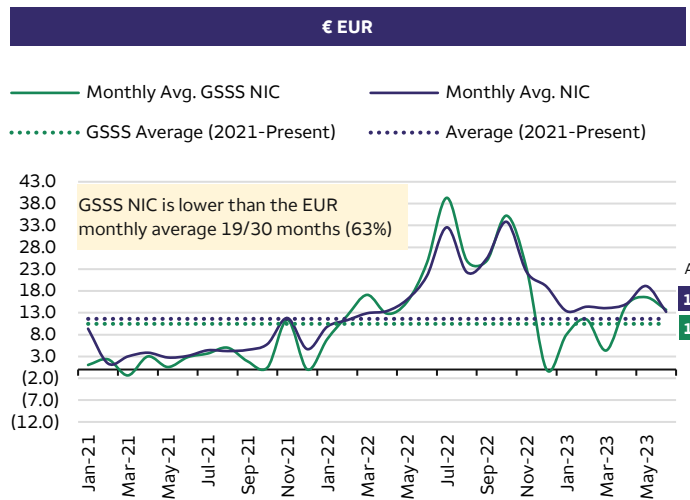
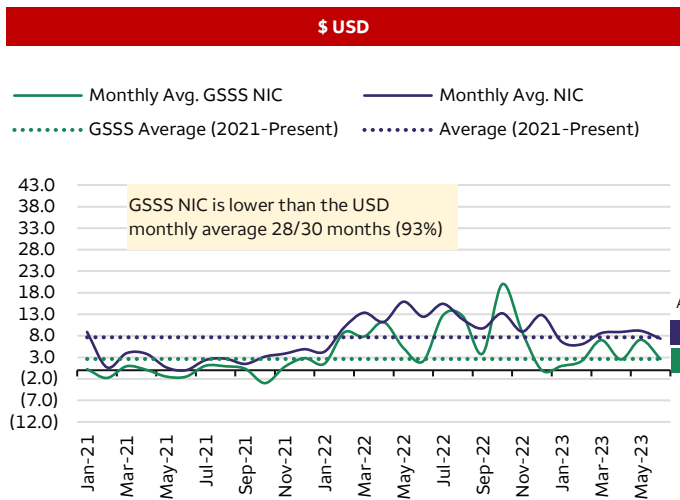
Figure 6: Sovereign “Twin Bond” Daily Trading History Since Issue



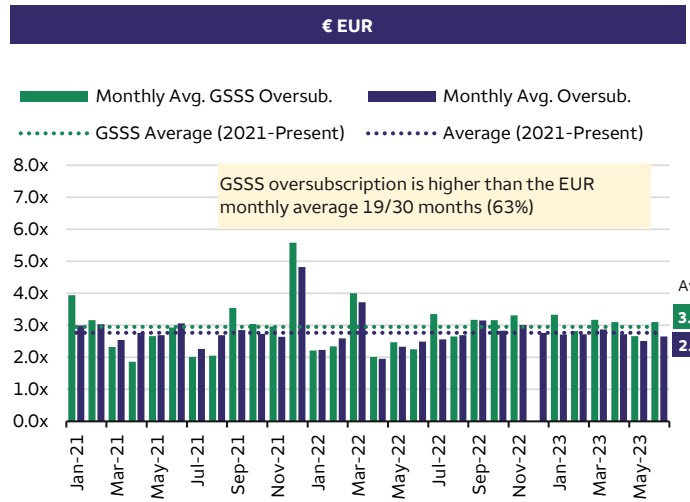
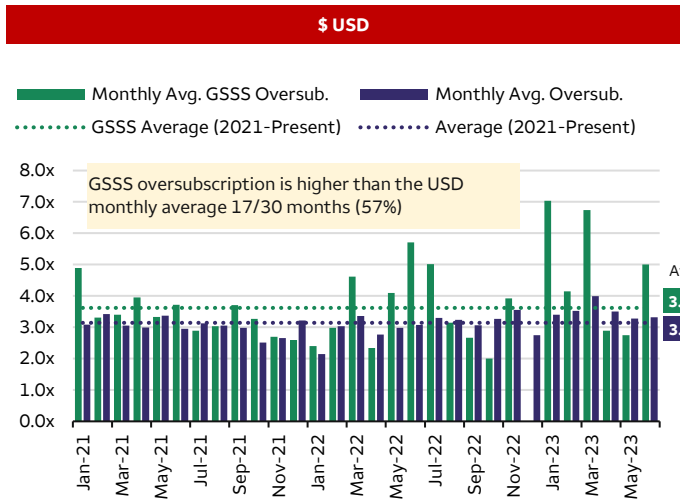
Appendix III: New Issue Execution Statistics

See below for new issue execution statistics – new issue concession (“NIC”) and tranche oversubscription – based on a universe of 295 USD and 550 EUR Green, Social, Sustainability, Transition, and Sustainability-linked (“GSSS”) labeled tranches issued since 2021 compared with the overall IG markets (4,052 USD and 1,923 EUR tranches priced since 2021). As shown below, GSSS-labeled tranches demonstrate, on a monthly average, incremental execution momentum in the new issue market compared with conventional offerings, quantified as lower new issue concessions and higher tranche oversubscription:

Average New Issue Concession – GSSS-Labeled vs. Overall IG



Average Tranche Oversubscription – GSSS-Labeled vs. Overall IG



Sources: Bloomberg and Wells Fargo Securities

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