(In)-Credibly Green: Which Bonds Trade at a Green Bond Premium?

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Green bonds

- By the end of 2018: issue volume Green bonds $ 500 bn
- Green bonds: finance or refinance environmentally sustainable projects
- Sustainable projects: renewable energy, energy efficient buildings, clean transport, sustainable water management, ...
- Issuer types:
  - governments and local governments (France, Belgium, Poland, Germany)
  - supranationals (European Investment Bank, World Bank)
  - corporations from different sectors (Tesla, Apple, EDF)

Evidence concerning Green bonds

- Green bond issuance: **positive** effects on **stock prices, liquidity**, and **institutional ownership**

  (Flammer (2018), Glavan (2019), Tang and Zhang (2018))

- Results on Green bond (GB) pricing **mixed**:
  - **lower** yields for GBs

    (Ehlers and Packer (2017), Hachenberg and Schiereck (2018), Zerbib (2019))
  - **higher** yields for GBs

    (Karpf and Mandel (2018), Bachelet et al. (2019))
  - samples **differ substantially** w.r.t. currency, number of bonds, primary/secondary market,...

This paper: New evidence on Green bond premium

1. Is there a **difference in yields** between Green and conventional bonds?

   Definition: **"GB premium"** $\Rightarrow yield(GB) < yield(CB)$

2. Is there **variation** across markets (primary vs secondary), currencies, issuers (corporates vs governments), and time?

3. **"Green credibility"**?

Findings

- Primary market: **GB premium around 24 bps**
- **Substantial variation** across
  - currencies
  - issuer types
  - time
- Secondary market:
  - GBs trade at **14 bps discount**
  - small GB premium **only for government bonds**
  - **credibility** important!

Methodology

- Basic sample: $\approx$ 1,500 GBs, 217,000 CBs (plain vanilla only)
- Regression analysis:

$$Y_{i,t,b} = FE + \beta \cdot Green_{i,t,b} + \gamma \cdot C_{ib} + \epsilon_{i,t,b} \qquad (1)$$

  - $Y_{i,t,b}$: yield at issuance
  - FE: fixed effects (issuer, year-month, currency, seniority, maturity bucket, issue size bucket and issue country)
  - **Green**: dummy ($= 1$ for GBs)
  - C_{ib}: controls (Use of Proceeds, Experienced)
- Subsamples: currencies, issuer types, time periods

Baseline results

- Primary market: **Green bond premium**

	IssueYield				
	(1)	(2)	(3)	(4)	(5)
Green	−0.198***	−0.201***	**−0.238*** **	−0.174***	−0.425***
	(0.058)	(0.063)	(0.061)	(0.051)	(0.124)
Experienced				**−0.092**	
				(0.089)	
Energy Efficiency					**−0.040**
					(0.163)
Alternative Energy					0.108
					(0.170)
Eligible Green Bond Projects					0.175
					(0.136)
Clean Transport					0.227
					(0.202)
FE	YM,I,C	+S,M,IS	+ICon	All	All
Green Bonds	1,520	1,328	1,328	1,328	1,170
Observations	203,914	165,631	165,631	165,631	53,032
R^2	0.771	0.789	0.805	0.805	0.756
Adjusted R^2	0.758	0.774	0.791	0.791	0.734

Currency and issuer effects

- **Substantial variation** across currencies and issuer types

	IssueYield					
	(1)	(2)	(3)	(4)	(5)	(6)
Green	−0.198***	**−0.394*** **	−0.011	−0.295**	0.008	**−0.383*** **
	(0.053)	(0.078)	(0.054)	(0.135)	(0.066)	(0.098)
Subsample	EUR	USD	CNY	OTH	CORP	SOVR+SUPR
FE	All/C	All/C	All/C	ALL/C	All	All
Green Bonds	261	392	180	495	784	544
Observations	32,194	48,952	21,354	63,131	100,174	65,457
R^2	0.653	0.720	0.765	0.867	0.837	0.752
Adjusted R^2	0.620	0.698	0.736	0.857	0.818	0.749

Sample

- Sample: restricted to issuers with **both** GBs and **comparable** CBs
- Comparable CBs:
  - **same** issuer, rating, seniority, currency and bond type
  - and **closest** maturity
- Sample size: $\approx$ 780 GBs, 3,500 CBs

Methodology

1. Regression analysis:

$$Y_{i,t,b} = FE + \beta \cdot \textbf{Green}_{\textbf{i,t,b}} + \gamma \cdot C_{ib} + \epsilon_{i,t,b} \qquad (2)$$

   - $Y_{i,t,b}$: yield to maturity
   - FE: fixed effects (issuer, year-month, currency, rating, seniority, maturity bucket, issue size bucket and issue country)
   - **Green**: dummy ($= 1$ for GBs)
   - C_{ib}: controls (BidAsk spread)

2. Regression analysis:

$$GMC_{i,t,p} = \alpha + \beta \cdot \textbf{GC}_{\textbf{ip}} + \gamma \cdot C_{ip} + \epsilon_{i,t,p} \qquad (3)$$

   - $GMC_{i,t,b}$: Green minus Conventional yield spread
   - GC_{ib}: Green Credibility variables (GreenExchange, E rating, Experience, CPI)
   - C_{ib}: controls (Differences in BidAsk spreads, coupons, maturity, size)

Regression analysis: Yield to maturity

- Secondary market: generally GBs trade at **discount**, except SOVR/SUPR

	Yield to maturity					
	(1)	(2)	(3)	(4)	(5)	(6)
Green	**0.135*****	0.247***	0.119***	0.236***	0.437***	**−0.033*****
	(0.003)	(0.003)	(0.004)	(0.007)	(0.006)	(0.003)
Subsample	FULL	EUR	USD	CNY	CORP	SOVR+SUPR
FE	All	All/C	All/C	All/C	All	All
Green Bonds	777	191	304	49	408	369
Green Observations	394,147	92,736	161,362	13,552	192,188	201,959
Conventional Bonds	3,504	1,136	1,171	163	1,724	1,780
Observations	2,666,070	949,923	861,516	37,316	1,258,488	1,407,582
R^2	0.722	0.688	0.547	0.598	0.654	0.807
Adjusted R^2	0.722	0.688	0.547	0.596	0.654	0.807

ALL: YearMonth, Issuer, Currency, Seniority, Maturity buckets, Issue size buckets, Issue country; ALL/C=no Currency FE

Regression analysis: Green-credibility

	GMC							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.094***	0.057***	0.326***	0.076***	0.102***	0.090***	0.115***	0.212***
	(0.002)	(0.002)	(0.006)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)
greenEX	**−0.076*****	−0.086***	−0.046***	−0.039***	−0.078***	**−0.133*****	0.079***	−0.037***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)
Experienced		0.059***						
		(0.001)						
CPI			**−0.004*****					
			(0.000)					
EScoreHigh								**−0.070*****
								(0.003)
EScoreLow								**0.103*****
								(0.006)
Subsample	FULL	FULL	FULL	EUR	USD	SOVR+SUPR	CORP	CORP
Green Bonds	649	649	287	186	210	344	305	134
Pairs	4,609	4,609	2,144	1,439	1,581	2,560	2,049	947
Observations	1,604,958	1,604,958	685,208	553,594	524,180	951,028	653,930	336,290
R^2	0.416	0.416	0.571	0.704	0.231	0.591	0.161	0.226
Adjusted R^2	0.416	0.416	0.571	0.704	0.231	0.591	0.161	0.226

Controls are differences in BA spreads, coupons, maturity, size

Summary

- Primary market: **GB premium around 24 bps**
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- Secondary market:
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  - **credibility** important!

Thank you for your attention.

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Our data set

- We collected 2,257 green bonds with a total issuance value of $487 bn from three different sources (Climate Bond Initiative, Bloomberg, Reuters)

	25%	50%	Mean	75%	95%	N
Coupon(%)	1.38	3.25	3.40	5.00	8.00	2,069
Experienced	0.00	1.00	0.64	1.00	1.00	2,114
GreenEX	0.00	0.00	0.21	0.00	1.00	2,114
Issue Price	99.86	100.00	100.40	100.00	111.03	1,828
Issue Yield	1.49	3.01	3.27	4.69	7.80	1,787
Maturity(Years)	4.00	5.01	8.75	10.01	29.82	2,100
Volume($Million)	11.02	65.55	234.22	302.07	890.04	2,111