Corporate green bond summary

A. Summary

1. Signaling

By issuing green bonds, companies can **signal their commitment toward the environment** and reduce information asymmetry.

1.1 stock market reaction to the issuance of green bond

- **1.1.1 Methodology**
  - data set : Bloomberg data base of green bond announcing date
  - CAR : actual return - CAPM return
- **1.1.2 Results**
  - certified (by third party) green bond represent a more credible signal of the company's commitment (stronger effect of signaling) Appendix.Fig1
  - **abnormal returns are large and significant for first-time issuers** but are small and insignificant for seasoned issuers Appendix.Fig1
  - abnormal **returns are only significant in industries where the natural environment is financially material to the firms' operations** Appendix.Fig1

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2. Green washing

If indeed the greenwashing motive prevails, one would not expect any improvement in environmental performance following the issuance of corporate green bonds: $\Longrightarrow \not\exists$ **green washing if there is an actual output of green bond project**

2.1 Corporate green bonds and firm-level outcomes

- **2.1.1 Methodology**
  - Firm outcome
    - environmental rating of ASSET4
    - CO_2 emission / book value of assets
  - Ownership structure
    Whether the issue change the structure of holdings
    - Thomson Reuters
  - Matching

    build a plausible counterfactual of how firm-level outcomes would evolve absent the green bond issue, I use a matching approach (Firms with and without green bond)
    - regression model containing dummy variable (green bond)

- **2.1.2 Results**
    - companies improve their environmental performance following the issuance of green bonds. (inconsistent with green bond is a green washing tool) Appendix.Fig2
    - Institutional ownership increase is insignificant / significant increase in long term investor and green investors Appendix.Fig3
    - the above results are more significant with **certificated** green bond Appendix.Fig4

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3. Cost of Capital

No premium for corporate green bonds

- **3.1.1 Results**
    - there is no noticeable difference between the yields of green versus brown bonds (consistent with the results of asset pricing model)

B. Appendix

Table 7
Cross-sectional heterogeneity.
This table reports the average CAR[−5, 10] from Table 6 for different subsamples. Panel A distinguishes between green bonds that are certified by independent third parties and green bonds that are not. Panel B distinguishes between first-time and seasoned issues of green bonds. Panel C distinguishes between green bond issuers operating in industries with above- versus below-median SASB scores of environment materiality. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	CAR [−5, 10]	Std. err.
Panel A. Certified vs. noncertified		
Certified green bonds (N = 192)	0.710**	0.292
Noncertified green bonds (N = 192)	0.268	0.535
Panel B. First-time issue vs. seasoned issue		
First-time green bond issue (N = 169)	0.798**	0.322
Seasoned green bond issue (N = 215)	0.246	0.512
Panel C. Financial materiality of the environment		
SASB score above median (N = 172)	0.699***	0.143
SASB score below median (N = 212)	0.318	0.303

Fig1

Table 10
Environmental performance following the issuance of green bonds.
This table reports estimates of the difference-in-differences specification in Eq. (1). *Green bond* is a dummy variable equal to one if the firm has issued a green bond. *Green bond (pre-issue year)* is a dummy variable equal to one in the year preceding the green bond issue. *Green bond (short-term, 1 year)* and *Green bond (long-term, 2+ years)* are defined analogously with respect to the year following the green bond issue and the subsequent years, respectively. *Environment rating* is described in Table 5. CO_2 *emissions* is the ratio of CO_2 emissions (in tons) from ASSET4 divided by the book value of assets in US dollars. The sample includes all firm-year observations of the treated and matched control firms from 2010–2018. Standard errors (reported in parentheses) are clustered at the two-digit SIC industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Environmental performance			
	Environment rating		CO_2 emissions	
	(1)	(2)	(3)	(4)
Green bond	6.118**		−10.898***	
	(2.438)		(4.101)	
Green bond (pre-issue year)		1.333		1.083
		(2.502)		(4.229)
Green bond (short-term, 1 year)		4.079		−7.667
		(2.663)		(4.879)
Green bond (long-term, 2+ years)		7.034**		−12.977**
		(3.286)		(5.325)
Firm fixed effects	Yes	Yes	Yes	Yes
Country-year fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
Observations	1466	1466	1196	1196
R-squared	0.88	0.88	0.90	0.90

Fig2

Table 11
Ownership structure following the issuance of green bonds.
This table reports estimates of the difference-in-differences specification in Eq. (1). *Green bond* is a dummy variable equal to one if the firm has issued a green bond. *Green bond (pre-issue year)* is a dummy variable equal to one in the year preceding the green bond issue. *Green bond (short-term, 1 year)* and *Green bond (long-term, 2+ years)* are defined analogously with respect to the year following the green bond issue and the subsequent years, respectively. The dependent variables used in this table are only available for US companies. *Institutional ownership* is the percentage of shares owned by institutional investors. *Ownership by long-term investors (duration)* is the percentage of shares owned by institutional investors whose holding duration (computed as in Cremers and Pareek, 2016, Eq. (2) on p. 292) is above the median across all investors. *Ownership by long-term investors (churn rate)* is the percentage of shares owned by institutional investors whose churn rate (computed as in Gaspar et al., 2005, Eq. (1) on p. 143) is below the median across all investors. *Ownership by green investors* is the percentage of shares owned by "green" institutional investors, that is, investors who are members of the Ceres Investor Network on Climate Risk and Sustainability. The sample includes all firm-year observations of the treated and matched control firms from 2010–2018. Standard errors (reported in parentheses) are clustered at the two-digit SIC industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

			Long-term investors				Green investors	
	Institutional ownership		Ownership by long-term investors (duration)		Ownership by long-term investors (churn rate)		Ownership by green investors	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Green bond	0.011		0.017**		0.014**		0.025**	
	(0.010)		(0.007)		(0.006)		(0.011)	
Green bond (pre-issue year)		−0.001		0.001		0.000		0.002
		(0.010)		(0.006)		(0.004)		(0.008)
Green bond (short-term, 1 year)		0.010		0.011		0.004		0.014
		(0.011)		(0.008)		(0.007)		(0.012)
Green bond (long-term, 2+ years)		0.011		0.022**		0.018**		0.029**
		(0.013)		(0.009)		(0.007)		(0.013)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	361	361	361	361	361	361	361	361
R-squared	0.80	0.80	0.62	0.62	0.56	0.56	0.70	0.70

Fig3

Table 12
Certification.
This table presents variants of the regressions in Tables 10 and 11, interacting *Green bond* with dummy variables that distinguish between green bonds that are certified by independent third parties and green bonds that are not. The sample includes all firm-year observations of the treated and matched control firms from 2010–2018. Standard errors (reported in parentheses) are clustered at the two-digit SIC industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Environment rating	CO_2 emissions	Institutional ownership	Ownership by long-term investors (duration)	Ownership by long-term investors (churn rate)	Ownership by green investors
	(1)	(2)	(3)	(4)	(5)	(6)
Green bond × certified	7.656***	−14.392***	0.012	0.020**	0.018**	0.034***
	(2.737)	(5.154)	(0.013)	(0.010)	(0.008)	(0.014)
Green bond × noncertified	2.224	−2.051	0.010	0.012	0.007	0.015
	(2.445)	(4.476)	(0.011)	(0.009)	(0.008)	(0.012)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country-year fixed effects	Yes	Yes	–	–	–	–
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1466	1196	361	361	361	361
R-squared	0.88	0.90	0.80	0.62	0.56	0.70

Fig4

Table A.1
Covariate balance for the within-issuer matching of green bonds to nongreen bonds.
This table presents descriptive statistics comparing green bonds and matched nongreen bonds of the same issuer. The matching is described in Section 7.1. Log*(amount issued)* is the natural logarithm of the issuance amount. *Maturity* is the maturity of the bond (in years). *Coupon* is the coupon rate. The last two columns report the *p*-value of the difference-in-means and difference-in-medians test, respectively. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

		Obs.	Mean	Median	Std. dev.	*p*-value (diff. in means)	*p*-value (diff. in medians)
Log(amount issued)	Green bond	152	17.909	18.302	2.177	0.792	0.592
	Matched nongreen bond	152	17.844	18.174	2.080		
Maturity (years)	Green bond	152	7.604	7.509	0.775	0.174	0.997
	Matched nongreen bond	152	7.727	7.510	0.792		
Coupon	Green bond	152	0.037	0.036	0.025	0.961	1.000
	Matched nongreen bond	152	0.036	0.036	0.023		

Fig5

C. Paper Cited in the article

Only the article which topic is related to green bond will be listed

Journal name	Year	Article Name	Abstract	Cited reason
Journal of Accounting and Economics	2020	Where's the greenium?	In this study, we investigate whether investors are willing to trade off wealth for societal benefits. We take advantage of unique institutional features of the municipal securities market to provide insight into this question. Since 2013, states and other governmental entities have issued over $23 billion of green bonds to fund eco-friendly projects. Comparing green securities to nearly identical securities issued for non-green purposes by the same issuers on the same day, we observe economically identical pricing for green and non-green issues. In contrast to a number of recent theoretical and experimental studies, we find that in real market settings investors appear entirely unwilling to forgo wealth to invest in environmentally sustainable projects. When risk and payoffs are held constant and are known to investors ex-ante, investors view green and non-green securities by the same issuer as almost exact substitutes. Thus, the **greenium is essentially zero.**	no pricing difference in green and brown bonds (municipal bonds)

Journal name	Year	Article Name	Abstract	Cited reason
JBF	2019	(The effect of pro-environmental preferences on bond prices: Evidence from green bonds) [https://www-webofscience-com.autorpa.lib.nccu.edu.tw/wos/woscc/full-record/WOS:000454465300003]	We use green bonds as an instrument to identify the effect of non-pecuniary motives, specifically pro environmental preferences, on bond market prices. We perform a matching method, followed by a two-step regression procedure, to estimate the yield differential between a green bond and a counterfactual conventional bond from July 2013 to December 2017. **The results suggest a small negative premium: the yield of a green bond is lower than that of a conventional bond.** On average, the premium is -2 basis points for the entire sample and for euro and USD bonds separately. We show that this negative premium is more pronounced for financial and low-rated bonds. The results emphasize the **low impact of investors' pro-environmental preferences on bond prices**, which does not represent, at this stage, a disincentive for investors to support the expansion of the green bond market. (C) 2018 Elsevier B.V. All rights reserved.	study which show related results

Journal name	Year	Article Name	Abstract	Cited reason
JCF	2020	(Do shareholders benefit from green bonds?) [https://www.sciencedirect.com/science/article/abs/pii/S0929119918301664]	The green bond market has been growing rapidly worldwide since its debut in 2007. We present the **first empirical study on the announcement returns and real effects of green bond issuance by firms in 28 countries during 2007–2017**. After compiling a comprehensive international green bond dataset, we document that **stock prices positively respond to green bond issuance**. However, we **do not find a consistently significant premium for green bonds**, suggesting that the positive stock returns around green bond announcements are not fully driven by the lower cost of debt. Nevertheless, we show that institutional ownership, especially from domestic institutions, increases after the firm issues green bonds. Moreover, stock liquidity significantly improves upon the issuance of green bonds. Overall, our findings suggest that the firm's issuance of green bonds is beneficial to its existing shareholders.	Consist with the first part of the study (positive stock shock)

Journal name	Year	Article Name	Abstract	Cited reason
JFE	2021	(Impact investing)[https://www.sciencedirect.com/science/article/abs/pii/S0304405X2030194X]	We show that investors derive nonpecuniary utility from investing in dual-objective Venture Capital (VC) funds, thus sacrificing returns. Impact funds earn 4.7 percentage points (ppts) lower internal rates of return (IRRs) ex-post than traditional VC funds. In random utility/willingness-to-pay (WTP) models investors accept 2.5–3.7 ppts lower IRRs ex ante for impact funds. The positive WTP result is robust to fund access rationing and investor heterogeneity in fund expected returns. Development organizations, foundations, financial institutions, public pensions, Europeans, and United Nations Principles of Responsible Investment signatories have high WTP. Investors with mission objectives and/or facing political pressure exhibit high WTP; those subject to legal restrictions (e.g., Employee Retirement Income Security Act) exhibit low WTP.	set of financial instruments **(i.e green bonds)** which generates 'social xand environmental impact along side financial return '
Journal of Economic Behavior & Organization	1985	The Economic Institutions of Capitalism. Firms, Markets, Relational Contracting	Null	asymmetry information increase transaction cost of identifying companies with desirable characteristics

Journal name	Year	Article Name	Abstract	Cited reason
Econometrica	1979	(Informational Equilibrium)[https://www.jstor.org/stable/1914187?seq=1]	Null	a signal is credible if it's costly to mimic (can be corresponded to the part of bond certificated by third party)

Journal name	Year	Article Name	Abstract	Cited reason
Management Science	2015	Does Corporate Social Responsibility Lead to Superior Financial Performance? A Regression Discontinuity Approach	This study examines the effect of shareholder proposals related to corporate social responsibility (CSR) on financial performance. Specifically, I focus on CSR proposals that pass or fail by a small margin of votes. The passage of such "close call" proposals is akin to a random assignment of CSR to companies and hence provides a quasi-experiment to study the effect of CSR on performance. I find that the **adoption of close call CSR proposals leads to positive announcement returns and superior accounting performance**, implying that these proposals are value enhancing. When I examine the channels through which companies benefit from CSR, I find that labor productivity and sales growth increase after the vote. Finally, I document that close call CSR proposals differ from non-close proposals along several dimensions. Accordingly, although my results imply that adopting close call CSR proposals is beneficial to companies, they do not necessarily imply that CSR proposals are beneficial in general.	corresponding to the part of positive shock of stock market while issuing green bonds

New keywords : impact investing / signal theory