Do Investors Subsidize Green Debt?

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1 Introduction

Standard asset pricing theory implies that the value of cash flows are independent of their source once timing, and risk are accounted for. I find that this is not true of cash flows explicitly tied to climate protection projects vis-a-vis those that are not, but that they are too small to matter for investment decisions. Specifically, the "green premium", the yield investors forgo to own cash flows explicitly tied to non-polluting activity is 0.02% in the US, 0.37% in the euro, 0.05% in the H.K. dollar in the three month period from April 2021 to June 2021. The sign of the premium is the same across these currencies. Though their magnitudes differ, in levels, they are all too small to matter for capital budgeting decisions.

2 Motivation

- A strand of climate activism are divestment campaigns that socially penalize investments in polluting activities. The rational is that sufficient investor pressure can measurably increase the cost of capital of polluting companies.
- This runs counter to what we would expect from standard asset pricing theory. In a perfectly frictionless world, the presence of a single investor with acesss to leverage and indifferent to such a social penalty will ensure that the "pollution premium" – extra yield on investments that are polluting – is zero.
- The question is: Are there sufficient frictions in asset markets such that such a premium can exist? The existence of such a premium would not say anything about what generated it (i.e. climate activism in finance) but would suggest that the story behind climate activism in finance is plausible.

3 Literature

See MacAskill et al. (2021) for a survey of the empirical literature on the green premium. Kapraun et al. 2021 try to get at this premium by regressing yields at issuance of green and brown bonds of various maturities, and currencies of denominations on a dummy variable for whether it was a green bond or not, and for the following controls: maturity in years, size in issuance volume, credit rating, time (year-month) of issuance, currencies, seniority types, and issuer ids. Notably, their controls are not interacted but enter the regression specification separately, so the comparison of green bonds is not with what we would expect,

which would be a conventional bond of the same maturity, credit rating, issuance volume, currency, etc.

4 Background

The German bank KfW Bankengruppe is one of the largest cross-currency issuers of green and conventional bonds. In 2013, KfW started issuing green bonds whose proceeds were committed to finance environmental and climate protection projects under its "Erneuerbare Energien" ("KfW Renewable Energies Programme – Standard") program, along side conventional bonds whose proceeds are the residual cash flows. Both bonds are pari-passu, and therefore, share identical credit risk. Investments certified the independent, non-profit Center for Solar Energy and Hydrogen Research, Baden-Württemberg (ZSW).

In 2013, the state-owned, German bank KfW Bankengruppe, henceforth referred to as KfW, began to issue "green bonds" whose proceeds were committed to financing environmental and climate protection projects under its "Erneuerbare Energien" ("KfW Renewable Energies Programme – Standard") program.[1] These bonds were issued *pari-passu* conventional bonds whose proceeds were not explicitly committed to non-polluting projects. In the event of default, investors of both bonds would have equal standing in a bankruptcy court. Thus, these bonds have identical crtedit risk.

All KfW are considered High-quality Liquid Assets (HQLA), and from that perspective, have similar collateral value. Anecdotally, green bonds appear to be liquid. The first green bond issue had a maturity of 5 year, and an issuance volume of 1.5 billion euros the largest Green Bond ever at the time of issuance in its segment. In the aftermath of the issue, KfW issued a press release lauding the success of the issuance: "the orderbook grew rapidly, reaching EUR 2.65 billion within a short period of time. The high granularity of the orderbook is particularly impressive: 90 investors participated in the Green Bond with an average ticket size of below EUR 30 mn."

Absent frictions, standard asset pricing theory implies that green and conventional KfW bonds identical in every respect save their "green" designation will trade at the same yield. I find that this is not the case but that the difference is trivial. [2]

5 Green premium

5.1 Zero coupon bond yields estimation error

Typically, one would back out this premium by constructing zero coupon yield curves for both green and conventional bonds and taking their difference for a particular maturity. However, because the few green bonds have been issued, a major concern is that estimation errors in constructing zero-coupon bond yield curves for the green and conventional bonds will generate apparent, but not real, green premium. To address this, I identify three pairs of green and conventional KfW bonds that share the same coupon size, mature within thirty days of each other and have cash flows denominated in a common currency; that is, they have remaining cash flows that are approximately identical in size, timing, and risk. In this setting, the bond premium, that is, the extra yield that investors demand for being paid

[1] Green investments are certified by the independent, non-profit Center for Solar Energy and Hydrogen Research, Baden-Württemberg (ZSW).

[2] https://www.kfw.de/KfW-Group/Newsroom/Latest-News/Pressemitteilungen-Details_214336.html

in polluting cash flows, is approximately the yield to maturity of the conventional bond minus the yield to maturity of the green bond. A premium of 0.5%, for example, implies that conventional bonds must compensate investors with an additional yield of 0.5% over the lifetime of the bond simply for not being designated as "green." The measure yield to maturity is a complex average of returns to the bond investor over the lifetime of the bond; while difficult to interpret exactly, we use it because it gives a sense of a bond's return to the first order and to construct a measure of the premium in a setting in which bonds pairs differ in their maturities and coupon rates.

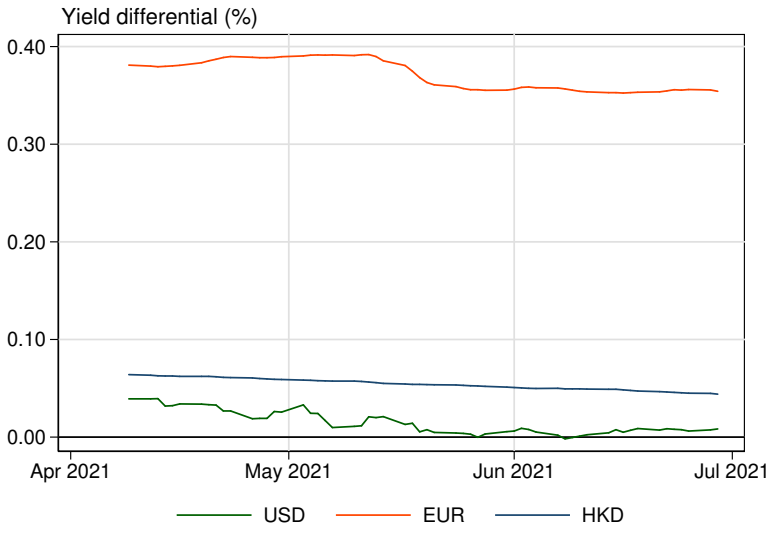
Table 5.1 describes each bond pair, reporting the local currency of denomination of the cash flows, maturity, coupon rate, and outstanding par value of the bond issue in local currency. The first pair is of bonds with U.S. dollar cash flows, and a 2% coupon; the green bond has an outstanding par value of $1 million, and the conventional bond, $3 million. The second pair is of bonds with euro cash flows and a 0% coupon; the green bond has an outstanding par value of $4 million, and the conventional bond, $.13 million. The third pair is of a bond with Hong Kong dollar cash flows, and a 0.05% coupon; the green and conventionnal bonds both have an outstanding par value of $0.2 million.

Figure 5.1 plots the green premium in percentage points for the three pairs over their common sample for a three month period from April 2021 to June 2021. Over this period, there is heteregenneity in the size of the green premium across currencies: the green bond in the U.S. dollar pair has an average premium of 0.02%; the green bond in the euro pair has an average premium of 0.37%; the green bond in the H.K. dollar pair has an average premium of 0.05%. These cross-currency differences may arise from differences in corporate bond market frictions, and conditional on the existence of frictions, the magnitude of pressures driving the premium away from zero.

Table 1: Description of Green-Conventional Bond Pairs

	Maturity		Coupon (%)		Outstanding (M)	
Currency	Green	Conventional	Green	Conventional	Green	Conventional
U.S. dollar	09/29/2022	10/04/2022	2.00	2.00	1.00	3.00
euro	06/15/2029	09/17/2029	0.00	0.00	4.00	0.13
H.K. dollar	01/12/2022	12/14/2021	0.05	0.05	0.20	0.20

Figure 1: Yield differential between pairs of green and conventional bonds



5.2 Convenience yield differentials

One concern may be that the result of a positive premium is driven by convenience yield differentials arising from differences in the pledgeability of green bonds vis-a-vis conventional bonds. Since green bonnds are a newer product, I would expect conventional bonds to have a positive convenience yield vis-a-vis green bonds because of their greater pledgability. Under this reasoning, the convenience yield argument goes in the wrong direction to explain the reported premium.

References

Kapraun, Julia et al. (2021). "(In)-Credibly Green: Which Bonds Trade at a Green Bond Premium?" In.

MacAskill, S. et al. (Jan. 2021). "Is there a green premium in the green bond market? Systematic literature review revealing premium determinants". In: *Journal of Cleaner Production* 280, p. 124491. DOI: 10.1016/j.jclepro.2020.124491.