The Informativeness of Green Commitments across Bond Maturities *

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Abstract

I develop a signaling model of green commitments in corporate bond markets. I derive conditions under which commitments signal favorable information about firms' existing operating efficiency and lower short-term credit spreads, while future abatement expenditures can offset the decline in long-term credit spreads. Using U.S. corporate bond data from 2005 to 2024, I find that credit spreads decline significantly more at short than at long maturities. The long-minus-short difference in customer trading frequency is larger for commitments that mention investment plans than for other commitments, consistent with investors trading on abatement-related cash-flow information whose relevance varies across bond maturities.

Keywords: Green Commitments, Credit Curve, Order Flow, Information

JEL Codes: G12, G30, D82.

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1 Introduction

Green commitments publicly announce firms' objectives for reducing future emissions and often describe plans for achieving them (Bauer et al., 2026). These plans may involve investments extending over several years, and bonds issued by the same firm can mature before, during, or after those investments are undertaken. Consider a firm that announces an emission-reduction plan whose main investment expenditures will occur more than a year later. Its one-year bond may be repaid before the main investment begins, while its ten-year bond remains outstanding as implementation proceeds and the operating consequences unfold. Investors holding bonds of different maturities therefore assess the same announcement for its implications for credit risk at different repayment dates. Motivated by this distinction, I study how the informational value of green commitments varies across bond maturities. I develop a model linking firms' commitment decisions to creditors' repayment expectations and examine credit spreads and customer trading around commitments across maturities to understand how the information conveyed by these announcements is reflected in bond markets.

Existing literature suggests that green commitments convey information. Commitments are associated with subsequent emission reductions, but the decision to commit also reflects firms' characteristics (Bolton and Kacperczyk, 2026). Positive stock market reactions to green commitment announcements are consistent with commitments conveying credible information (Bauer et al., 2026). Related evidence documents positive stock market reactions to announcements of corporate green bond issuance (Flammer, 2021; Tang and Zhang, 2020). In disclosure models, firms choose whether to reveal private information, and investors draw inferences from that choice and update their beliefs (Verrecchia, 1983; Dye, 1985; Banerjee et al., 2024). However, evidence that commitments are informative does not by itself reveal how their information matters for repayment at different horizons. An average credit-spread response can conceal whether favorable repricing extends equally to more distant repayment dates. Moreover, imperfect public disclosure can leave private information relevant for subsequent trading (Diamond, 1985; Banerjee et al., 2023). The relevant distinction is between information

about firms' existing operations and information about the expenditures and benefits of future transition investment. My model connects these dimensions of information to repayment at different dates through firms' endogenous commitment and investment choices. Empirically, I combine comparisons of credit-spread changes across maturities with evidence on firms' pre-existing operating characteristics and customer trading by commitment content.

To guide the empirical analysis, I model how firms' commitment choices reveal information about repayment prospects at different horizons. Managers have private information about their firms' existing operating efficiency and abatement investment costs.[1] Their decisions reflect both expected shareholder payoffs and the firm's current market valuation (Daubanes et al., 2026). I assume that the capabilities supporting efficient operations also reduce the expenditure required to prepare and administer a commitment. Commitment entails this expenditure and potential losses from failing to meet the announced target. Firms can undertake abatement investment with or without a commitment; the commitment changes the payoffs from their investment choices. I derive conditions under which high-efficiency firms face a lower expected shareholder-value cost of commitment and therefore commit more frequently. Heterogeneity in managers' valuation incentives allows both efficiency types to commit, so observing a commitment raises the assessed probability of high efficiency while leaving operating characteristics and investment costs imperfectly observed. Debt prices reflect expected repayment (Duffie and Lando, 2001). Favorable information lowers short-term credit spreads when its contribution to repayment outweighs preparation expenditure and the near-term investment burden. Long-term debt also benefits from improved near-term survival, but its repayment additionally depends on subsequent cash flows. The same improvement in near-term survival contributes less per year to a long-term spread, while news about repayment conditional on survival can reinforce or weaken that contribution. This decomposition explains how a commitment concerning future actions can be reflected more strongly in short-term credit spreads. After disclosure, informed investors receive

[1] Operating efficiency generates cash savings from existing production, whereas the investment-cost parameter determines the expenditure required for additional abatement. Both characteristics affect investment choices and the cash available for repayment.

private signals about operating efficiency and investment costs, and dealers update repayment expectations from their orders, as in Glosten and Milgrom (1985). When these signals also affect assessments of later repayment conditional on near-term survival, investors' trading decisions can differ across maturities.[2] The framework therefore links both credit repricing and customer trading to the relevance of commitment-related information for different repayment horizons.

This framework motivates an empirical analysis of bond prices, commitment choices, and customer trading. I combine the commitment announcements identified by Bauer et al. (2026) with corporate bond transactions from TRACE, bond characteristics from FISD, firm accounting and equity-market data from Compustat and CRSP, and emissions data from Trucost. The news-based commitment data record public announcements of new or strengthened commitments and extend beyond firms participating in the Science Based Targets initiative (SBTi).[3] The full issuer sample contains 2,357 firms, of which 663 make at least one observed green commitment, accounting for 4,822 distinct issuer-date announcements. Among first observed commitments, 79.2% mention investment plans. I use first observed commitments to examine bond repricing, pre-existing organizational and operating characteristics to study commitment selection, and the investment content of announcements to compare customer trading across maturities.

I document four main empirical findings. First, bonds issued by committing firms experience a significant decline in credit spreads around their first observed green commitment. I use nearest-neighbor matching to pair each treated bond with a control bond issued by a firm without an observed commitment, based on credit rating, log principal outstanding, remaining maturity, and the issuer's equity oil beta. Matching characteristics are measured twelve months before the announcement, and bonds are matched within the same calendar month. The main estimation sample contains 1,469 of the 2,858 initially matched bond-event pairs, covering 284 treated and 247 control

[2]The signal technology and the proportion of informed investors are identical across maturities. Differences in trading decisions arise from how private signals affect repayment values at different dates.

[3]The announcement data cover 2005–2023, including the years before the SBTi's launch in 2015. Bond data extend through 2024.

issuers.[4] Over the twelve post-announcement months, credit spreads decline by an average of 55.92 basis points relative to matched controls and the pre-announcement baseline. The corresponding estimate is 57.25 basis points when the observation requirements are relaxed, yielding a sample of 1,625 matched pairs. Both estimates are significant at the 1% level. This repricing is consistent with green commitments conveying favorable information about firms' repayment prospects.

Second, the spread decline is significantly larger for short-maturity bonds. I examine maturity differences using both fixed remaining-maturity groups and maturity terciles within issuers, with classifications determined at month -12. Over the twelve post-announcement months, the estimated spread declines under fixed maturity groups are 78.75 basis points for short-maturity bonds and 18.85 basis points for long-maturity bonds. The corresponding estimates under within-issuer maturity terciles are 67.95 and 19.16 basis points. The long-minus-short differences are 59.91 and 48.79 basis points, respectively, and both are significant at the 5% level. These results establish that green commitments are associated with different credit-spread responses across repayment horizons, with a larger decline at short than at long maturities.

Third, firms with stronger pre-existing operating capacity are more likely to make green commitments. I measure operating capacity using organization capital relative to assets and operating ROA, averaged over years $T-4$ through $T-2$ for commitment year T.[5] A one-standard-deviation increase in organization capital is associated with a 2.14-percentage-point higher annual probability of commitment, while a one-standard-deviation increase in operating ROA is associated with a 1.74-percentage-point higher probability. These associations account for industry-by-year fixed effects, prior commitment status, and firms' historical emissions and operating characteristics. When both measures enter jointly, their coefficients remain positive and are significant at the 5% and 10% levels, respectively. The findings support the model's

[4] Matching is one-to-one with replacement. The announcement month is excluded, and month -12 serves as the reference period. Regressions include bond fixed effects and matched-pair-by-calendar-month fixed effects, together with baseline callable status interacted with event-time bins. Standard errors are two-way clustered by issuer and calendar month.

[5] The annual analysis uses 4,378 firm-year observations from 455 firms over 2008–2023 and includes first and repeat commitments. Standard errors are two-way clustered by firm and year.

selection mechanism, in which firms' existing operating characteristics help determine their willingness to commit.

Finally, the maturity pattern of customer trading differs with the investment content of green commitments. Under fixed maturity groups, commitments that mention investment are associated with a 17.68-percentage-point larger long-minus-short difference in changes in the probability of customer trading than other commitments, with changes measured relative to matched controls. The corresponding contrast is 14.37 percentage points under within-issuer maturity terciles. The same pattern appears in the log-transformed number of customer trade reports and in trading days. PPML estimates of the same investment-minus-other maturity contrast yield exponentiated coefficients of 1.72 under fixed maturity groups and 1.50 under within-issuer terciles. These findings connect the investment content of commitments to the relative trading activity of long- and short-maturity bonds. They are consistent with the model's mechanism through which assessments of future investment expenditures and cash flows shape trading in bonds with different repayment horizons.

The paper makes three contributions. First, I contribute to climate finance by examining the informational role of voluntary corporate commitments across creditors' repayment horizons. Existing research studies firms' commitment choices, equity market reactions, and subsequent environmental outcomes (Bolton and Kacperczyk, 2026; Bauer et al., 2026; Flammer, 2021), while research on corporate bonds examines the pricing of climate news and regulatory risk (Huynh and Xia, 2021; Seltzer et al., 2022). I study information conveyed by firms' own decisions to commit to future emission reductions and examine how the associated credit repricing varies across bond maturities. Combining average spread changes with direct comparisons across maturity groups shows both a favorable overall credit response and a significantly larger decline in short-maturity spreads. Evidence on pre-existing operating capacity and the investment content of commitments connects this maturity pattern to the characteristics of committing firms and the future actions described in their announcements. The analysis brings the timing of debt repayment into the assessment of the information conveyed by corporate transition decisions.

Second, I contribute to the study of disclosure and credit pricing by explaining how a commitment to future action can convey information about existing operations. Related models explain how green financing and disclosure decisions inform investors' assessments of firms (Daubanes et al., 2026; Banerjee et al., 2024). In my model, commitment requires preparation expenditure and creates potential losses from missing a target, while firms choose abatement investment under either commitment decision. Resources supporting existing operations lower preparation expenditure without necessarily lowering abatement investment costs. Under the derived selection conditions, commitment choices therefore convey favorable information about existing operating efficiency while leaving future investment costs imperfectly observed. Building on credit models with incomplete information (Duffie and Lando, 2001), the model separates the information inferred from commitment choices from the cash-flow consequences of those choices. Linking both effects to near-term survival and subsequent repayment explains why the same corporate announcement can have different pricing implications across debt maturities. The evidence that pre-existing organization capital and operating profitability predict commitment provides empirical support for the selection mechanism underlying this analysis.

Third, I contribute evidence on the relation between corporate disclosure and customer trading in bond markets. Existing studies examine information transmission between stock and bond markets and the role of trading frictions in corporate bond prices (Hotchkiss and Ronen, 2002; Bao et al., 2011). I examine how customer trading varies jointly with bond maturity and the investment content of green commitments. The probability of trading, customer trade counts, and trading days reveal a stronger long-versus-short trading pattern for commitments that mention investment than for other commitments. This evidence complements the finding that credit-spread declines are larger at shorter maturities: the investment content of a commitment is associated with a different distribution of trading activity across repayment horizons. By examining both prices and trading, the analysis extends the study of green commitments to how the market response varies with the timing of creditors' claims and the future expenditures described in firms' announcements.

2 Related Literature

This paper relates to three strands of literature. The first studies climate information in asset prices. Existing work examines environmental externalities, emissions, climate news, and regulatory risk (Chava, 2014; Engle et al., 2020; Bolton and Kacperczyk, 2021; Bolton and Kacperczyk, 2023; Huynh and Xia, 2021; Seltzer et al., 2022). Related research studies environmental preferences and green securities (Pástor et al., 2021; Larcker and Watts, 2020; Flammer, 2021), while more recent work examines corporate commitment choices, equity announcement responses, and subsequent environmental outcomes (Bolton and Kacperczyk, 2026; Bauer et al., 2026). I focus on the information conveyed by voluntary commitments and its pricing across an issuer's outstanding debt. The analysis examines what commitment choices reveal about the firm and how that information matters at different repayment dates.[6]

The second strand studies disclosure choices and privately informed trading. Classic models explain how investors infer firm information from disclosure decisions (Verrecchia, 1983; Dye, 1985). Public disclosure can substitute for private research or increase the value of acquiring information before an announcement (Diamond, 1985; McNichols and Trueman, 1994). Differences in investors' interpretation of public news and managers' strategic disclosure choices further shape information asymmetry and prices (Kim and Verrecchia, 1994; Banerjee et al., 2024). Related green finance models examine the signaling role of financing choices and how disclosure affects investor sorting and environmental investment (Daubanes et al., 2026; Kaniel et al., 2026). My model studies a costly commitment that both reveals information and initiates investment. Commitment choices can reveal operating characteristics while leaving information about subsequent investment private; the pricing implications depend on how each affects repayment across maturities.

The third strand studies credit term structures and corporate bond trading. Structural models link credit spreads to default risk and maturity (Merton, 1974; Leland and Toft, 1996). Incomplete accounting information also affects the credit curve (Duffie

[6]Related maturity research examines climate risk disclosure and the CDS term structure (Kölbel et al., 2024), and green preference premia across maturities (D'Amico et al., 2026).

and Lando, 2001), and Yu (2005) documents a stronger association between disclosure quality and spreads at shorter maturities. Information models explain how trading conveys private information (Grossman and Stiglitz, 1980; Glosten and Milgrom, 1985; Kyle, 1985), while empirical studies examine information incorporation and trading around corporate announcements (Hotchkiss and Ronen, 2002; Ronen and Zhou, 2013). Bond prices also reflect liquidity and selling pressure (Longstaff et al., 2005; Bao et al., 2011; Feldhütter, 2012). I connect these perspectives by examining spread changes across maturities following commitments and the relation between customer order flow and subsequent yield adjustment within the same issuer.

3 Model

The model considers a continuum of firms over four dates, $t = -1, 0, 1, 2$. At date -1, each firm observes its private characteristics and chooses whether to make a green commitment to a given abatement target, before future operating cash flows are realized. Both commitment and noncommitment become public at date 0. Investors update valuations, anticipating firms' subsequent investment choices. Firms then choose investment plans that determine the additional abatement delivered at date 2, and outstanding bonds trade. Investment expenditure is paid at dates 1 and 2. To capture installation and commissioning delays, the investment reduces emissions only at date 2.[7] Operating cash flow is realized at both dates. Short-term debt matures at date 1 and long-term debt at date 2. Figure 1 summarizes the timing.

3.1 Firms and information

Let $\bar{E} > 0$ denote emissions intensity without abatement. Each firm has a publicly observed inherited abatement stock $g \in [0, \bar{E})$ and privately observes its existing operating efficiency $\theta \in \{L, H\}$ and abatement investment cost parameter $k \in \{\underline{k}, \overline{k}\}$, where $0 < \underline{k} < \overline{k}$. Greater operating efficiency lowers the cash expenses of existing production,

[7] Majd and Pindyck (1987) study investment requiring sequential expenditure before completion. The payment schedule and the absence of subsequent revision to the investment plan are simplifying assumptions here.

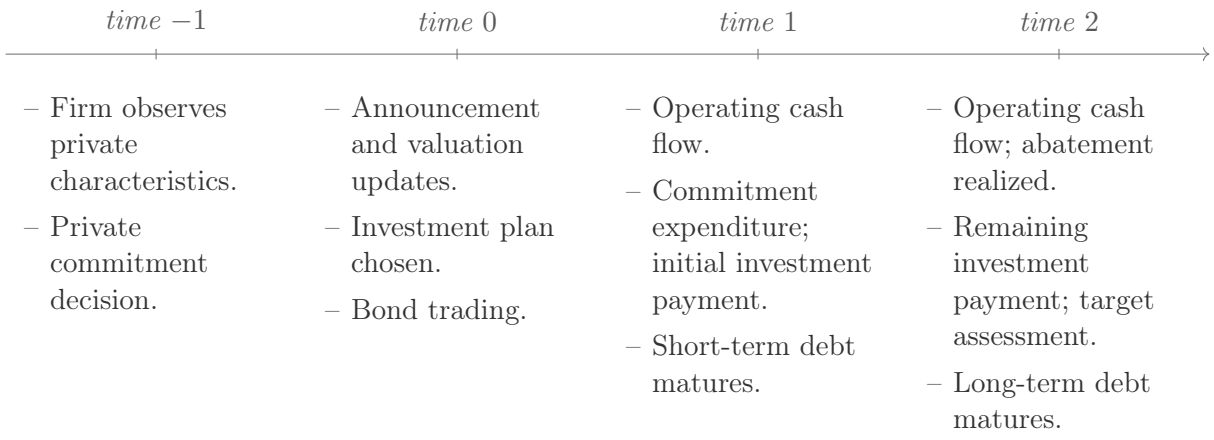


Figure 1: Model Timeline.

generating cash savings that persist over time. The parameter k captures the cost of the technology and equipment needed to implement additional abatement. Two firms may operate their existing plants equally efficiently, yet the same emissions reduction may require a limited retrofit at one plant and extensive equipment replacement at the other. Thus, firms with the same operating efficiency can face different abatement investment costs.

Before commitment, investors do not directly observe θ or k, both of which are known to the firm. This information asymmetry concerns cash savings from existing operations and the resources required for additional abatement. Both the firm and investors also face future operating cash-flow risk, described below. I condition on public information available before the commitment decision, including g and financial disclosures, and display only g in conditioning sets. The prior beliefs are

$$\Pr(\theta = H \mid g) = p, \qquad \Pr(k = \underline{k} \mid \theta = L, g) = q_L, \qquad \Pr(k = \underline{k} \mid \theta = H, g) = q_H, \quad (1)$$

where $p, q_L, q_H \in (0, 1)$. Either cost level is possible at either efficiency level. No ordering is imposed between q_L and q_H.

Let $m \in \{0, 1\}$ indicate commitment. Conditional on g, the additional abatement target $e^{\text{tar}} \in (0, \bar{E} - g]$ is fixed. The firm chooses whether to announce this target for

date 2, taking its level as given. This restriction isolates commitment participation from target ambition.

At date 0, whether or not it commits, the firm chooses an investment plan to deliver additional abatement $e \in [0, \bar{E} - g]$ at date 2. This choice fixes the plan while the firm remains in operation. For a committing firm, e^{tar} is the announced target, whereas e is the abatement delivered by the chosen plan; the two need not coincide. Investment expenditure and the emissions path are

$$I(g, e; k) = k \int_0^e \psi(g, u)\, du, \tag{2}$$

$$\mathcal{E}_1 = \bar{E} - g, \qquad \mathcal{E}_2 = \bar{E} - g - e. \tag{3}$$

Marginal investment expenditure $k\psi(g, e)$ increases with e, so each additional unit of emissions reduction is more costly to implement.[8]

If implemented abatement falls short of the announced target, a committing firm incurs a cash-flow loss at date 2 before debt service:

$$mP_\gamma(e) = m\frac{\gamma}{2}\left[(e^{\text{tar}} - e)^+\right]^2, \qquad \gamma \geq 0, \tag{4}$$

where $x^+ = \max\{x, 0\}$ and γ governs the severity of the loss from missing the target. This loss represents consequences such as lost customer business. It is contingent on the remaining shortfall, so additional investment can reduce it; it is distinct from the expenditure required to install abatement equipment.[9] Preparing and administering a commitment also requires expenditure c_θ, paid at date 1. When $\gamma = 0$, commitment still entails c_θ but no loss from missing the target. Existing operating efficiency generates cash savings b_θ at that date. I assume

$$0 \leq b_L < b_H, \qquad 0 < c_H < c_L. \tag{5}$$

[8]For each g, $\psi(g, \cdot)$ is continuously differentiable, with $\psi(g, u) \geq 0$ and $\psi_u(g, u) > 0$.

[9]Reputational consequences enter P_γ only through corporate cash flows. A nonpecuniary loss borne by the manager would enter the manager's objective.

The second ordering assumes that the organizational capabilities supporting efficient operations also reduce commitment expenditure.[10]

3.2 Debt, cash flows, and repayment

Debt payments $D_1 > 0$ and $D_2 > 0$ are fixed before date -1 and mature at dates 1 and 2. The firm cannot obtain additional debt or equity financing from date -1 onward.[11] Any cash left after paying D_1 is retained without interest. Default ends operations, and outstanding debt has zero recovery.

Let Y_t be the component of operating cash flow unrelated to existing efficiency. Its conditional distribution is publicly known, but its realization depends on future operating shocks that neither managers nor investors observe at dates -1 and 0. Knowledge of the firm's characteristics therefore does not eliminate future cash-flow risk. Conditional on g, (Y_1, Y_2) is independent of (θ, k), although Y_1 and Y_2 may be correlated.[12] Existing efficiency contributes b_θ at date 1 and ηb_θ at date 2, where $\eta > 0$ captures persistence.

Each unit of emissions costs $\tau > 0$, so the emissions expense is $B(g) = \tau(\bar{E} - g)$ at date 1 and $B(g) - \tau e$ at date 2.[13] A fraction $\chi \in [0, 1]$ of investment is paid at date 1 and the remainder at date 2. Cash flows before debt service are

$$X_1 = Y_1 + b_\theta - B(g) - mc_\theta - \chi I(g, e; k), \tag{6}$$

$$X_2 = Y_2 + \eta b_\theta - B(g) + \tau e - (1 - \chi) I(g, e; k) - mP_\gamma(e). \tag{7}$$

[10] Darnall and Edwards (2006) find that publicly traded facilities had stronger complementary capabilities before adopting environmental management systems and incurred lower adoption costs. Applying this mechanism to public climate commitments is a modeling assumption.

[11] Holmström and Tirole (1998) study constraints on liquidity provision. The complete restriction on additional financing is a simplifying assumption here. The model therefore concerns the repricing of outstanding debt; changes in secondary-market prices neither provide investment funds nor alter the firm's contractual debt payments.

[12] The joint distribution has finite first moments and a continuous, strictly positive density on $(0, \infty)^2$.

[13] Output is fixed. Cash flows, expenditures, and debt payments are expressed per unit of output, consistent with measuring emissions as intensity.

Here, X_2 is the cash flow generated if the firm survives date 1; it excludes retained cash. Holding e fixed, a higher χ leaves cumulative cash unchanged but reduces cash available at date 1. The repayment events are

$$\mathcal{S}_1 = \{X_1 \geq D_1\}, \qquad \mathcal{S}_2 = \{X_1 \geq D_1,\ X_1 + X_2 \geq D_1 + D_2\}. \tag{8}$$

Long-term repayment requires both date-1 survival and sufficient cumulative cash. Operating efficiency supports both conditions. Investment uses cash at each payment date, whereas emissions-cost savings and reductions in shortfall losses arise at date 2. For a given investment plan, increasing γ lowers only date-2 cash; changing χ reallocates payments without changing cumulative cash. Both parameters can also affect optimal investment and selection into commitment. Their equilibrium effects therefore need not follow these direct cash-flow effects.

3.3 Managerial incentives

The manager values expected shareholder cash payoffs and the equity valuation following the announcement. At date -1, the manager privately observes $\omega > 0$, which measures the importance of market valuation relative to cash payoffs. Conditional on g, ω is independent of (θ, k, Y_1, Y_2) and has a publicly known distribution F_ω.[14] Managers with the same firm characteristics can therefore differ in their incentives to commit.

Expected shareholder payoffs under commitment decision m and abatement e are

$$W_m(\theta, k; g, e) = \mathbb{E}\big[\mathbf{1}\{X_1 \geq D_1\}(X_1 + X_2 - D_1 - D_2)^+ \mid \theta, k, g\big]. \tag{9}$$

Let $S_m(g)$ denote the equity valuation immediately after the announcement. Investors form this valuation from public information and the commitment decision, anticipating

[14] The distribution has a continuous, strictly positive density on $(0, \infty)$ and a finite mean.

the firm's investment choice. The manager's market-valuation incentive is evaluated at this announcement date.[15]

The manager anticipates the subsequent investment choice when deciding whether to commit. No new private information arrives between these decisions. Given the announcement valuation schedule, the choices can therefore be represented by the joint problem

$$\max_{\substack{m\in\{0,1\}\\ e\in[0,\bar{E}-g]}} \{W_m(\theta,k;g,e)+\omega S_m(g)\}. \tag{10}$$

Although $S_m(g)$ incorporates expected investment, an unobserved deviation in e does not change the announcement valuation. Conditional on m, the manager therefore chooses e to maximize W_m. Let $e_m^*(\theta,k;g)$ be a maximizer and $W_m^*(\theta,k;g)$ the corresponding maximum.[16] Substituting this investment choice into the joint problem, the manager chooses m to maximize

$$U_m(\theta,k,\omega;g)=W_m^*(\theta,k;g)+\omega S_m(g). \tag{11}$$

For an announcement made with positive probability, rational valuation requires $S_m(g)=\mathbb{E}[W_m^*(\theta,k;g)\mid m,g]$. Announcement valuations and commitment decisions are thus jointly determined in equilibrium.

3.4 Investors and bond trading

Investors are risk neutral, and the riskless rate is zero. Let $\mathcal{J}$ denote public information. A bond with face value one maturing at date $T\in\{1,2\}$ pays one on $\mathcal{S}_T$ and zero otherwise. Let M_T be its remaining maturity measured in years at date 0,

[15] Stein (1989) and Daubanes et al. (2024) model managerial concern for current stock prices and future payoffs. Evaluating the valuation incentive at the announcement, and excluding later valuation changes from this component of the objective, are assumptions of the present model.

[16] A maximizer exists under the stated assumptions. If there are several, I select the smallest. This rule is publicly known and depends only on (θ,k,m,g).

with $0 < M_1 < M_2$. The dates index events and need not be one year apart. The value conditional on public information and the associated credit spread are

$$V_T(\mathcal{J}) = \Pr(\mathcal{S}_T \mid \mathcal{J}), \qquad s_T(\mathcal{J}) = y_T(\mathcal{J}) = -\frac{1}{M_T} \log V_T(\mathcal{J}). \tag{12}$$

The yield y_T is continuously compounded. Repayment values are positive under the distributional assumptions. Investors do not directly observe θ, k, or the investment plan e. Transactions occur at dealer quotes, which can differ from V_T.

After the announcement and abatement choice, there are finitely many trading rounds at date 0. One new investor arrives in each bond market in each round and trades only in that market and round. The investor is informed with probability $\mu \in (0, 1)$ and otherwise buys or sells one unit with equal probability for liquidity reasons. Short selling is allowed.[17]

Before submitting an order, an informed investor receives an imperfect private signal $\xi = (\xi_\theta, \xi_k)$ about operating efficiency and the abatement investment cost parameter. The investor updates beliefs using this signal and public information. The two markets have the same signal technology; no ranking of signal accuracy is imposed.[18]

Let $z_T \in \{-1, 0, 1\}$ denote selling, abstaining, and buying. Competitive, risk-neutral dealers take the opposite side. They observe public information and the incoming order in their market, but not the investor's signal or information status. As in Glosten and Milgrom (1985), zero expected profit conditional on an order gives

$$A_T(\mathcal{J}) = \Pr(\mathcal{S}_T \mid \mathcal{J}, z_T = 1), \qquad B_T(\mathcal{J}) = \Pr(\mathcal{S}_T \mid \mathcal{J}, z_T = -1). \tag{13}$$

The price bid–ask spread is $A_T(\mathcal{J}) - B_T(\mathcal{J})$, distinct from the credit spread $s_T(\mathcal{J})$ defined above. Both markets execute simultaneously, before either trading decision is disclosed to the other market. Both decisions, including abstention, become public at the end of the

[17] This abstracts from the constraints studied by Diamond and Verrecchia (1987).

[18] The signal components take values in $\{L, H\}$ and $\{\underline{k}, \overline{k}\}$. Conditional on the firm type, they are independent and correct with probabilities $\rho_\theta, \rho_k \in [1/2, 1)$, respectively. Conditional on (θ, k, g), signal errors are independent across investors and of (ω, Y_1, Y_2). Information status and liquidity decisions are independent across investors and of firm characteristics, signals, and cash shocks.

round. Dealers cannot condition execution on the contemporaneous order in the other market. At the start of each round, public information includes both markets' decisions from all previous rounds.

4 Equilibrium

I characterize perfect Bayesian equilibria in which commitment and noncommitment both occur with positive probability. Managers choose commitment and abatement optimally, informed investors trade optimally, beliefs satisfy Bayes' rule wherever applicable, and dealers earn zero expected profit conditional on each order. The analysis separates the information conveyed by commitment from its cash-flow consequences and from subsequent trading. Unless stated otherwise, the results apply to any $\chi \in [0, 1]$. I condition throughout on g and suppress it when convenient.

4.1 Commitment and market beliefs about operating efficiency

The manager's joint problem in (10) reduces to a comparison of optimally chosen investment plans under the two commitment decisions. For financial type $i = (\theta, k)$, define the expected shareholder cost of commitment as

$$C_i = W_0^*(i; g) - W_1^*(i; g) > 0. \tag{14}$$

A noncommitting firm can implement the same abatement plan while avoiding preparation expenditure and shortfall losses. Reoptimizing abatement can only increase its shareholder payoff. Holding other primitives fixed, a larger γ weakly increases C_i: it lowers commitment payoffs at every investment plan. This does not by itself order equilibrium participation or bond-price responses, since investment, beliefs, and the valuation premium also adjust. Thus, C_i includes both the direct cost of commitment and the effect of adjusting investment; it need not equal expected cash expenditure. Appendix B.1 derives this decomposition and the optimal investment benchmark.

For a candidate announcement equity premium $G > 0$, managerial optimality implies commitment if $\omega G \geq C_i$. Its probability within type i is

$$a_i(G) = 1 - F_\omega(C_i/G), \qquad \bar{a}(G) = \sum_i \pi_i a_i(G), \tag{15}$$

where $\pi_i = \Pr(i \mid g)$. This probability reflects heterogeneity in managerial incentives within a financial type. Each manager makes a deterministic choice, except at the probability-zero indifference point. If $G \leq 0$, no manager commits.

For $G > 0$, all $a_i(G)$ lie strictly between zero and one. Bayes' rule gives

$$\pi_i^1(G) = \frac{\pi_i a_i(G)}{\bar{a}(G)}, \qquad \pi_i^0(G) = \frac{\pi_i[1 - a_i(G)]}{1 - \bar{a}(G)}. \tag{16}$$

Announcement valuations must reflect these same choices. Accordingly, equilibrium requires

$$G^* = \sum_i \pi_i^1(G^*) W_1^*(i; g) - \sum_i \pi_i^0(G^*) W_0^*(i; g) > 0. \tag{17}$$

Each positive solution, together with optimal investment and the trading continuation below, supports an equilibrium of the stated form. I suppress the argument G^* hereafter.

The premium can also be written as

$$G^* = \mathbb{E}[W_0^*(i; g) \mid m = 1, g] - \mathbb{E}[W_0^*(i; g) \mid m = 0, g] - \mathbb{E}[C_i \mid m = 1, g]. \tag{18}$$

Selection into commitment must therefore raise expected shareholder value, evaluated without commitment, by more than the average shareholder cost borne by committing firms. A ranking of commitment costs alone does not establish existence. Appendix B.2 gives sufficient conditions for a positive solution and a nonempty class of primitives satisfying them. Neither existence for every admissible F_ω nor uniqueness is assumed.

Let $a_\theta = \sum_k \Pr(k \mid \theta, g) a_{\theta k}$ denote the commitment probability within efficiency group θ.

Proposition 1 (Commitment and operating efficiency)**.** *In an equilibrium with $G^* > 0$, type i commits more frequently than type j if and only if $C_i < C_j$. In that case,*

$$\frac{\pi_i^1}{\pi_j^1} = \frac{\pi_i}{\pi_j}\frac{a_i}{a_j} > \frac{\pi_i}{\pi_j} > \frac{\pi_i^0}{\pi_j^0}. \tag{19}$$

All four financial types remain possible after either decision. A commitment announcement raises the probability of high operating efficiency if and only if $a_H > a_L$. A sufficient condition is

$$\max_k C_H(k) < \min_k C_L(k). \tag{20}$$

Under this condition, $0 < \Pr(H \mid m = 0, g) < p < \Pr(H \mid m = 1, g) < 1$.

Under the stated cost ordering, commitment provides a favorable signal of existing operating efficiency. Differences in shareholder costs explain why efficient firms commit more frequently; investors need not observe those costs to update their assessment of efficiency. Heterogeneity in managerial valuation incentives leaves both efficiency types possible after either announcement. The strength of this selection is endogenous. Changing the distribution of valuation incentives changes participation and the announcement premium jointly; favorable information need not imply near-complete separation.

The ordering in (20) holds for sufficiently small $c_H > 0$ and $\gamma \geq 0$, holding $c_L > 0$ and all other primitives fixed. At the boundary $c_H = \gamma = 0$, high-efficiency firms incur no commitment cost, whereas low-efficiency firms still incur preparation expenditure. Continuity gives the strict ordering in a neighborhood of that boundary. This is a sufficient case, rather than a restriction imposed throughout the analysis. The inequality $c_H < c_L$ alone does not rank the four shareholder costs.

More generally, the announcement updates beliefs about the joint type (θ, k). It may also change the probability of either abatement investment cost, through both selection within efficiency groups and correlation between the two characteristics. Appendix B.2 derives these marginal updates without imposing independence or a direction for the cost update.

4.2 Commitment announcements and credit spreads

A commitment announcement changes both the composition of firms investors expect to observe and the cash flows associated with their investment and commitment choices. These effects jointly determine repayment values at each maturity.

Let $r_T(i, m; g)$ be the probability of repayment at date T, evaluated at the selected optimal abatement $e^*_m(i; g)$. Let V_T^m denote the bond value immediately after decision m is disclosed and V_T^- its value immediately before disclosure. Then

$$V_T^m = \sum_i \pi_i^m r_T(i, m), \qquad V_T^- = \bar{a} V_T^1 + (1 - \bar{a}) V_T^0. \tag{21}$$

The pre-announcement value anticipates both decisions and their subsequent investment choices. Following a commitment announcement, $V_T^+ = V_T^1$, and

$$\Delta s_T = -\frac{1}{M_T} \log \left(\frac{V_T^+}{V_T^-} \right). \tag{22}$$

Since $V_T^+ - V_T^- = (1-\bar{a})(V_T^1 - V_T^0)$, the announcement response and the difference between the two post-announcement values have the same sign.

Proposition 2 (Information, cash flows, and credit spreads)**.** *For either maturity $T \in \{1, 2\}$, define*

$$\mathcal{B}_T = \sum_i (\pi_i^1 - \pi_i^0) r_T(i, 0), \qquad \mathcal{F}_T = \sum_i \pi_i^1 [r_T(i, 1) - r_T(i, 0)]. \tag{23}$$

A commitment announcement lowers the credit spread if and only if $\mathcal{B}_T + \mathcal{F}_T > 0$, leaves it unchanged if the sum is zero, and raises it if the sum is negative.

The composition effect $\mathcal{B}_T$ evaluates changes in beliefs using noncommitment repayment probabilities as a common benchmark. It is positive precisely when commitment is more prevalent among types with higher benchmark repayment probabilities, in the sense that $\mathrm{Cov}_\pi(a_i, r_T(i, 0)) > 0$. The cash-flow effect $\mathcal{F}_T$ holds financial type fixed and allows commitment and optimal abatement to change. Neither component is restricted to information about a single firm characteristic.

The cash-flow effect can be evaluated directly from the repayment thresholds. For a fixed type, write $e_m = e_m^*(i; g)$ and $I_m = I(g, e_m; k)$. Moving from noncommitment to commitment changes the required date-1 cash flow and cumulative operating cash flow by

$$\delta a_i = c_\theta + \chi(I_1 - I_0), \qquad \delta h_i = c_\theta - \tau(e_1 - e_0) + (I_1 - I_0) + P_\gamma(e_1). \tag{24}$$

A higher date-1 threshold weakly reduces short-term repayment. If both thresholds rise, long-term repayment also weakly decreases; if both fall, it weakly increases. When they move in opposite directions, the joint cash-flow distribution determines the long-term effect. Appendix B.3 states the thresholds and the conditions for strict changes.

When $\chi = 0$, investment does not affect initial liquidity. Optimal abatement maximizes $\tau e - I(g, e; k) - mP_\gamma(e)$, and commitment weakly reduces repayment at both maturities for each financial type. Thus $\mathcal{F}_T \leq 0$ at both maturities in this benchmark: any spread reduction must come from favorable selection strong enough to outweigh the cash-flow cost.

For short-term debt, this benchmark gives a particularly direct comparison. Let $p_m = \Pr(H \mid m, g)$, let $r_{1,\theta}^m$ be repayment conditional on (θ, m), and define $d_\theta = r_{1,\theta}^0 - r_{1,\theta}^1 \geq 0$. Then

$$V_1^1 - V_1^0 = (p_1 - p_0)(r_{1,H}^0 - r_{1,L}^0) - \big[p_1 d_H + (1 - p_1) d_L\big]. \tag{25}$$

An improvement in assessed efficiency supports repayment, while preparation expenditure reduces it. For $\chi > 0$, investment also affects initial liquidity, and (24) replaces this simpler comparison.

To compare maturities, define $K_2^\pm = \Pr(\mathcal{S}_2 \mid \mathcal{S}_1, \mathcal{J}^\pm)$, where $\mathcal{J}^-$ and $\mathcal{J}^+$ denote information immediately before and after commitment disclosure. The nesting of repayment events implies

$$V_2^\pm = V_1^\pm K_2^\pm, \qquad \Delta s_2 = \frac{M_1}{M_2} \Delta s_1 - \frac{1}{M_2} \log\left(\frac{K_2^+}{K_2^-}\right). \tag{26}$$

Proposition 3 (The maturity structure of announcement responses)**.** *Write* $L_1 = \log(V_1^+/V_1^-)$ *and* $L_c = \log(K_2^+/K_2^-)$*. For either sign of the short-term response, the*

long-term credit spread falls if $L_c > -L_1$*, is unchanged if* $L_c = -L_1$*, and rises if* $L_c < -L_1$*. Moreover,*

$$\Delta s_2 - \Delta s_1 = \frac{(M_2/M_1 - 1)L_1 - L_c}{M_2}. \tag{27}$$

Thus the signed response at the longer maturity exceeds that at the shorter maturity if and only if $L_c < (M_2/M_1 - 1)L_1$*. The absolute long-term response is larger if and only if* $|L_1 + L_c| > (M_2/M_1)|L_1|$*.*

The maturity comparison depends on news about repayment conditional on initial survival and on annualization. For example, if $L_1 > 0$, both spreads fall and the long-term decline is smaller precisely when $-L_1 < L_c < (M_2/M_1 - 1)L_1$. If conditional repayment is unchanged, $\Delta s_2 = (M_1/M_2)\Delta s_1$. These are conditional cases of the general comparison.

Conditional repayment reflects the composition of firms that survive date 1, retained cash, and subsequent operating cash flows and expenditures. Both operating efficiency and abatement investment costs can affect it. Consequently, the maturity pattern of credit-spread responses alone does not identify the direction or precision of information about either characteristic. Appendix B.3 proves the results.

4.3 Bond trading after commitments

At a public history $\mathcal{J}$ following a commitment announcement, define the informed investor's private valuation $v_T(\xi) = \Pr(\mathcal{S}_T \mid \mathcal{J}, \xi)$ and conditional repayment probability $\kappa_2(\xi) = \Pr(\mathcal{S}_2 \mid \mathcal{S}_1, \mathcal{J}, \xi)$. Then

$$v_2(\xi) = v_1(\xi)\kappa_2(\xi). \tag{28}$$

The informed investor buys if $v_T(\xi) > A_T$, sells if $v_T(\xi) < B_T$, and otherwise abstains, including at indifference. Let $h(\xi \mid \mathcal{J})$ denote the signal distribution among informed investors. Expected net purchases are

$$Q_T(\mathcal{J}) = \mathbb{E}[z_T \mid \mathcal{J}] = \mu \sum_{\xi} h(\xi \mid \mathcal{J}) \left[\mathbf{1}\{v_T(\xi) > A_T\} - \mathbf{1}\{v_T(\xi) < B_T\}\right]. \tag{29}$$

Trading frequency, measured by the probability that an arriving investor trades, is

$$N_T(\mathcal{J}) = \mathbb{E}[|z_T| \mid \mathcal{J}] = 1 - \mu + \mu \sum_{\xi} h(\xi \mid \mathcal{J}) \left[\mathbf{1}\{v_T(\xi) > A_T\} + \mathbf{1}\{v_T(\xi) < B_T\}\right]. \quad (30)$$

Liquidity trading has zero expected net purchases but contributes $1 - \mu$ to trading frequency. With one investor arriving per market per round, N_T is also the expected number of transactions in that round.

Proposition 4 (Repayment information and trading)**.** *Under the common signal technology and informed-arrival probability, if $\kappa_2(\xi) = \bar{\kappa}_2 > 0$ for every possible signal at a given public history, then*

$$A_2 = \bar{\kappa}_2 A_1, \qquad B_2 = \bar{\kappa}_2 B_1, \qquad Q_2 = Q_1, \qquad N_2 = N_1. \quad (31)$$

The same signal induces the same decision at both maturities.

When conditional repayment assessments vary across signals, trading decisions can differ across maturities as private valuations cross the relevant quotes. Net purchases depend on the balance of buying and selling; trading frequency depends on participation. A difference in trade direction alone need not change frequency. The model imposes no maturity ranking on either outcome. Investors in the two markets receive separate signals; the proposition compares their responses to a given signal. Appendix B.4 derives the quotes, belief updates, and more general trading comparisons.

4.4 Empirical implications

The model motivates comparisons of announcement credit-spread changes across maturities. These changes combine updated beliefs with the cash-flow effects of commitment and investment. Long-term repayment also depends on cash available after initial survival. These effects and yield annualization determine the relative spread responses.

Trading provides a complementary comparison. Net purchases capture order-flow direction; trading frequency captures participation. Repayment differences can generate

different trading decisions across maturities for the same issuer, with no predetermined ranking.[19] Because both θ and k can affect repayment at either maturity, spreads and trading alone do not identify their relative information precision.

5 Data and Measurement

5.1 Data Sources and Sample Construction

I obtain corporate bond transactions from the Enhanced Trade Reporting and Compliance Engine (TRACE) and bond characteristics from the Mergent Fixed Income Securities Database (FISD). Firm accounting data come from Compustat, stock market data from the Center for Research in Security Prices (CRSP), and emissions data from S&P Global Trucost.

The monthly bond panel covers January 2005 through December 2024. I retain U.S. dollar-denominated fixed- and zero-coupon bonds issued by U.S. firms and exclude private placements and Rule 144A securities. Appendix C describes the remaining screens. The panel contains 2,014,880 bond-month observations for 47,044 bonds, including 1,679,044 observations with valid credit spreads. Sample sizes vary with the data required for each analysis.[20]

5.2 Green Commitment Announcements

I use green commitment announcements from Bauer et al. (2026), based on Dow Jones News coverage of U.S. firms during 2005–2023. The announcements concern new plans to substantially reduce future direct greenhouse gas emissions, including stricter targets or new initiatives that update earlier commitments. Simple reaffirmations of existing targets are excluded.[21] I use the announcement dates to examine changes in bond

[19] The trading equilibrium follows disclosure. Predicting announcement-induced changes requires a pre-announcement trading benchmark.

[20] Accounting and emissions coverage is incomplete. Observations with missing values are excluded from analyses requiring those variables; missing emissions are not treated as zero.

[21] The authors classify news articles using a large language model and assess its accuracy against human-coded articles. Relative to records from the Science Based Targets initiative (SBTi), the news announcements cover a longer period and include firms outside the initiative. Their dates align market

spreads around these disclosures. The descriptive commitment sample contains 2,357 bond issuers, of which 663 (28.1%) have at least one observed commitment, accounting for 4,822 distinct announcement events.[22]

Table 1 summarizes the industry distribution, timing, and content of commitments. Panel A reports commitment frequency and incidence alongside average emissions and emissions intensity across the Fama–French 12 industries. Emissions in this panel include Scope 1 and location-based Scope 2. Panel B reports the annual number of firms making their first observed commitment and the total number of announcement events. Panel C classifies these first commitments by their main stated approach to reducing emissions: 79.2% involve investment plans, 18.9% provide little or no implementation detail, and 2.0% involve divestment plans.[23]

5.3 Bond Credit Spreads and Trading

Following Gilchrist and Zakrajšek (2012), I measure credit spreads as corporate bond yields minus the yields on synthetic Treasury securities with identical scheduled cash flows. I construct these benchmarks using the zero-coupon yield curve of Gürkaynak et al. (2007), which provides discount rates at each payment horizon. Bonds with the same maturity can have different coupon schedules; matching the full payment stream therefore avoids cash-flow mismatches in the Treasury benchmark when comparing announcement responses across maturities.[24] Other bond characteristics include credit rating, remaining maturity, modified duration, amount outstanding, coupon rate, and bond age.

reactions with public disclosures. SBTi's commitment and target publication dates need not coincide with these announcements.

[22]I link announcements to bond issuers using security identifiers and historical company links. The descriptive sample is restricted to issuers with a confirmed Compustat identifier (GVKEY). Records for the same issuer and date are combined; announcements on different dates are retained in the descriptive event history.

[23]The categories follow Bauer et al. (2026). Investment covers planned investment in lower-emission production, clean energy, energy efficiency, or carbon capture. Divestment covers sales of emissions-intensive assets or withdrawal from high-emission activities. No specific information denotes targets with little or no explanation of the steps needed to achieve them. Each first announcement enters one category, based on its main stated approach. The labels describe disclosed plans and do not measure realized investment, asset sales, or emission reductions.

[24]Bond yields use the last available daily volume-weighted clean price in each month plus accrued interest. Spreads are reported in basis points and are not option-adjusted.

Trading activity and customer order flow provide complementary evidence on market responses to commitments. I compare monthly total and customer trading volume, trade counts, and trading days across maturities to assess changes in activity. Net customer buying and customer order imbalance (OFI) indicate whether customer trading shifts toward purchases or sales. Appendix A defines these measures, and Appendix C describes the TRACE filters.

5.4 Firm Characteristics and Emissions

Annual Compustat data provide measures of firm size, operating performance, leverage, and cash holdings. These variables serve as issuer-level controls in the bond analysis and help assess pre-announcement differences between issuers of treated and matched control bonds. I also report gross and R&D-adjusted organization capital in the descriptive statistics.

I obtain annual emissions data from Trucost and define firm emissions as the sum of Scope 1 and location-based Scope 2. This measure includes direct emissions from firms' operations and indirect emissions associated with purchased energy. Carbon intensity is the ratio of combined emissions to revenue.

5.5 Summary Statistics and Correlations

Table 2 presents summary statistics for the full sample. Credit spreads vary considerably, with a mean of 235.20 basis points and a standard deviation of 217.71 basis points. The average monthly 25th and 75th percentiles of remaining maturity are 3.68 and 14.58 years, respectively. The sample thus spans substantially different repayment horizons, providing variation for examining how bond prices respond to commitment announcements across maturities.

Issuer characteristics also vary along dimensions relevant to commitment decisions and bond pricing. The dispersion in leverage and cash holdings underscores the need to assess whether committing firms and control issuers have comparable financial conditions before an announcement. Carbon intensity is strongly right-skewed, with a mean of

377.58 and a median of 48.94 tonnes of CO_2 equivalent per USD million of revenue. This heterogeneity is relevant to examining how the propensity to commit varies with firms' emissions intensity.

Trading activity is uneven across bonds: monthly trade counts have a mean of 58.45 and a median of 25.46. Bonds trade on 10.02 days per month on average, indicating that prices are not observed on every trading day for many securities. The availability and timing of these observations matter for measuring spread changes around announcements, while trade counts provide a separate measure of changes in market activity.

Table 3 reports average monthly cross-sectional correlations. The positive correlation between spreads and rating scores (0.69) indicates that lower-rated bonds generally have higher spreads, reinforcing the importance of accounting for credit quality in the announcement analysis. Combined emissions and carbon intensity are positively correlated (0.68), but distinguish the scale of emissions from emissions relative to revenue. Trading volume and trade counts are also positively correlated (0.67); volume reflects transaction size as well as frequency, so the two measures capture different dimensions of trading responses.

6 Empirical Results

6.1 Changes in Credit Spreads around Green Commitments

The model predicts lower credit spreads when the information conveyed by a commitment and its cash-flow consequences jointly improve expected repayment. Favorable information about operating efficiency can support bond values, while commitment expenditure and abatement investment affect the resources available to creditors. I first examine the average spread response for bonds outstanding before a firm's first observed commitment.

I compare bonds issued by committing firms with similar bonds issued by firms with no observed commitment. Following the matching approach of Seltzer et al. (2026), I select the closest control bond for each treated bond based jointly on credit rating,

log principal outstanding, remaining maturity, and the issuer's equity oil beta. All characteristics are measured twelve months before the treated issuer's announcement, and the control bond is selected in the same calendar month. These variables align credit quality, issue size, maturity, and sensitivity to oil-price movements. I then hold the matched pair fixed and compare the two bonds' spread changes over the same calendar months.[25]

Table 4 reports covariate balance for the initial sample of 2,858 matched bond-event pairs, covering 347 treated and 339 control issuers, before imposing the spread-availability requirements for estimation. Both bonds have observed spreads at month -12 in 2,409 of these pairs. The main regression sample applies additional event-date and observation requirements and contains 1,469 pairs, covering 284 treated and 247 control issuers. The matching procedure improves comparability on observed characteristics without eliminating issuer selection.

I estimate the following monthly event-study specification:

$$s_{bpt} = \alpha_b + \lambda_{pt} + \sum_{k \in \mathcal{K}} \beta_k D_{bp} \mathbf{1}\{\tau_{pt} = k\} + \sum_{r \in \mathcal{B}} \theta_r C_b \mathbf{1}\{\tau_{pt} \in r\} + \varepsilon_{bpt}, \tag{32}$$

where s_{bpt} is the credit spread of bond b in pair p and calendar month t, D_{bp} equals one for the treated bond, and τ_{pt} is event time relative to the treated issuer's commitment. The coefficient β_k measures the change in the treated–control spread difference between month -12 and event month k. Bond fixed effects α_b absorb persistent differences in spread levels, and pair-by-calendar-month fixed effects λ_{pt} absorb shocks common to the two bonds. I estimate monthly coefficients for $\mathcal{K} = \{-11, \ldots, -1, 1, \ldots, 12\}$, omitting the announcement month. The specification also includes baseline callable status, C_b, interacted with event-time bins. The bins in $\mathcal{B}$ are $[-11, -7]$, $[-6, -4]$, $[-3, -1]$, and the

[25] I use one-to-one nearest-neighbor Mahalanobis matching with a caliper of one. Matching is with replacement, so a control bond can be matched to more than one treated bond. Issuers with unresolved commitment status are excluded from the control pool.

four post-announcement quarters. Standard errors are two-way clustered by issuer and calendar month.[26]

Table 5 shows that committing firms' bonds experience a sustained decline in spreads relative to their matched controls. The main-sample column reports an average decline of 55.92 basis points over the twelve post-event months, measured relative to the spread difference at month -12 and significant at the 1% level. The quarterly declines range from 35.93 basis points in the first quarter to 70.81 basis points in the third, with a decline of 58.20 basis points remaining in the fourth. The relaxed-sample column eases the observation requirements and yields a similar average decline of 57.25 basis points.[27]

Figure 3 plots the monthly event-time coefficients and their pointwise 90% confidence intervals for the main sample of 1,469 matched pairs. Each coefficient measures the change in the treated–control spread difference relative to month -12, with the announcement month excluded. The spread decline deepens over the first several post-announcement months and persists through the end of the twelve-month window, consistent with the quarterly estimates in Table 5. Relative spreads also decline toward the end of the pre-announcement period. Although the joint test does not reject that the eleven pre-event coefficients are all zero ($p = 0.338$), this earlier movement leaves open the possibility of anticipation or differential pre-existing trends. I therefore interpret the estimates as repricing around commitments over the event window, rather than an isolated announcement-date effect.

The decline is consistent with the model's case in which the combined information and cash-flow implications of commitment are favorable for creditors. The average response alone does not distinguish learning about operating efficiency from changes in expected investment costs and subsequent cash flows. Because the sample follows outstanding bonds, the result concerns the valuation of existing debt. I next examine

[26] The main sample requires observed spreads for both bonds at month -12, at least three additional common pre-event months, and at least three common post-event months. Eligible commitments occur by December 2022. The baseline window retains observations following subsequent commitments.

[27] Quarterly estimates average the monthly coefficients, and the annual estimate equally weights the four quarters. The relaxed sample requires both baseline spreads and at least one common post-event month, without a minimum number of additional common pre-event months; it contains 1,625 matched pairs.

responses across maturities: the model allows news about repayment beyond initial survival to reinforce or offset the short-term response.

Figure 3 plots the monthly event-time coefficients and their pointwise 90% confidence intervals for the main sample of 1,469 matched pairs. Each coefficient measures the change in the treated–control spread difference relative to month −12, with the announcement month excluded. The spread decline deepens over the first several post-announcement months and persists through the end of the twelve-month window, consistent with the quarterly estimates in Table 5. Relative spreads also decline toward the end of the pre-announcement period. Although the eleven pre-event coefficients are jointly insignificant ($p = 0.338$), this earlier movement leaves open the possibility of anticipation or differential pre-existing trends. I therefore interpret the estimates as repricing around commitments over the event window, rather than an isolated announcement-date effect.

6.2 Credit-Spread Repricing across Maturity Groups

I examine whether repricing varies with maturity. I assign bonds to fixed remaining-maturity groups and, in an alternative classification, to maturity terciles within the treated issuer. Both classifications are determined at month −12 and remain fixed over the event window; a matched control inherits the treated bond's group.

Table 6 reports the distribution and baseline balance of the maturity-group rematch used in the within-group robustness analysis. Panel A contains 1,478 pairs in the fixed bands and 1,397 pairs under the within-issuer tercile classification. In the fixed bands, median within-pair maturity gaps range from 0.46 years in the short group to 1.28 years in the long group. Panel B reports treated–control mean differences and standardized mean differences for bond and issuer characteristics. The table describes the maturity-restricted rematch; it is not the estimation sample for the baseline event-study results below.

Table 7 reports quarterly spread changes and their equal-weighted average over months +1 through +12, relative to month −12. Panel A uses fixed maturity groups, and Panel B uses within-issuer maturity terciles. The table reports short- and long-maturity estimates and their long-minus-short difference; middle-group estimates are omitted.

The table reports quarterly estimates for months +1–+3, +4–+6, +7–+9, and +10–+12, along with their equal-weighted average relative to month −12. The average short-maturity spread falls by 78.75 basis points under fixed maturity bands and by 67.95 basis points under within-issuer terciles; both estimates are significant at the 1% level. The corresponding long-maturity estimates are −18.85 and −19.16 basis points and are not statistically significant. The long-minus-short differences are 59.91 and 48.79 basis points, respectively, and are significant at the 5% level. Thus, under both classifications, the spread decline is concentrated at the short end of the maturity distribution.

This maturity gradient is consistent with the model's signaling channel for pre-existing operating efficiency, θ. Information about efficiency affects operating cash flows and repayment at date 1, which short-maturity debt reflects directly. Long-maturity repayment also depends on date-2 cash flows conditional on surviving date 1, including the resources remaining after abatement investment and its implementation costs. The significant short-maturity response, alongside an imprecisely estimated long-maturity response, is therefore consistent with commitment news about existing operating efficiency being reflected more clearly in near-term repayment values, while future investment and cash-flow effects also shape long-term debt values.

6.3 Operating Efficiency and Green Commitments

The model links a firm's commitment decision to its expected shareholder payoffs. Operating efficiency affects cash flows and, in turn, the economic cost of making a commitment. If firms with greater existing operating capacity can absorb commitment-related expenditures more readily, they should be more likely to commit. I examine this implication using organization capital and operating ROA as proxies for firms' existing organizational and operating capacity.

Table 8 reports firm-year linear probability estimates for the likelihood of making a green commitment. The explanatory variables are measured before the commitment year, and all three columns use the same sample of 4,378 firm-year observations from 455 firms. A one-standard-deviation increase in organization capital

is associated with a 2.14-percentage-point higher commitment probability in column (1). A one-standard-deviation increase in operating ROA is associated with a 1.74-percentage-point higher probability in column (2). When both measures enter together in column (3), their estimates remain positive: 1.80 percentage points for organization capital and 1.43 percentage points for ROA. The former is significant at the 5% level and the latter at the 10% level.

The estimates show that organization capital and operating profitability each contain information about firms' commitment decisions. This pattern is consistent with the model's selection mechanism: firms with stronger existing operating capacity may face a lower shareholder-value cost of commitment and therefore be more willing to make one. Organization capital and ROA are empirical proxies for operating capacity; the estimates do not directly measure the model's firm type, θ, or abatement-cost type, k.

6.4 Bond Trading by Commitment Content and Maturity

I examine whether customer trading differs across bond maturities and commitment content. The outcomes capture whether a bond has any customer trade, the number of customer trade reports, and the number of trading days. I compare the long-minus-short maturity difference for investment-mentioning commitments with the corresponding difference for other commitments. The estimates therefore describe differences in maturity-specific trading patterns across commitment types.

Table 9 reports these contrasts. Under fixed maturity groups, other commitments are associated with a 16.36-percentage-point lower probability of customer trading for long- than short-maturity bonds. The investment-minus-other contrast is 17.68 percentage points. The same pattern appears for log customer reports and trading days: the long-minus-short differences for other commitments are -0.74 and -3.11, while the investment-minus-other contrasts are 0.77 and 3.34. Results using within-issuer maturity terciles are similar. These estimates indicate that the decline in long-maturity trading relative to short-maturity trading is substantially smaller for investment-mentioning

commitments than for other commitments. They do not, by themselves, show that trading rises for investment-mentioning commitments.

The PPML estimates provide a count-based comparison. Under fixed maturity groups, the long-to-short customer-report rate ratio for investment-mentioning commitments, relative to other commitments, is 1.72. Under within-issuer terciles, the long-to-short rate ratio within the investment-mentioning group is 1.23, and its rate contrast relative to other commitments is 1.50. Thus, the relative trading difference also appears in the expected number of customer reports, not only in the probability of observing a trade.

These patterns relate to the model's information and repayment channels. Investors trade when their private assessments of a bond's repayment value differ from dealer quotes. Short-maturity repayment primarily reflects whether the firm can meet its date-1 obligations; long-maturity repayment also depends on cash flows and repayment at date 2, conditional on surviving date 1. Investment-related commitment language can make expected abatement expenditures and future cash flows more relevant to assessments of long-maturity debt. The stronger long-versus-short trading contrast for investment-mentioning commitments is consistent with trading responding to maturity-specific assessments of those future repayment consequences. The estimates do not identify whether the underlying information concerns operating efficiency, abatement costs, or both.

7 Conclusion

Green commitments have different implications for credit pricing across repayment horizons. Credit spreads decline around firms' first observed commitments, and the decline is significantly larger for short-maturity bonds. Firms with greater pre-existing organization capital and operating profitability are also more likely to commit. This evidence is consistent with the model's selection mechanism, through which commitment choices can convey information about firms' existing operating capacity. In the model, this information matters for near-term survival, while long-term repayment additionally

depends on cash flows as abatement investment and its operating consequences unfold. The model therefore connects differences in credit repricing across maturities to the repayment implications of the information conveyed by commitment choices.

The trading results show that commitment content also matters for market responses across maturities. Compared with other commitments, those that mention investment are associated with stronger customer trading in long-maturity bonds relative to short-maturity bonds. This pattern appears in the probability of trading, customer trade counts, and trading days. It is consistent with assessments of future investment expenditures and cash flows shaping trading in debt with different repayment dates. The trading evidence complements the larger decline in short-maturity credit spreads by showing how the investment content of commitments relates to market activity at longer horizons. Examining both prices and trading across maturities provides a fuller account of the informational role of green commitments: the market response varies with both the timing of creditors' claims and the investment plans described in firms' announcements.

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Table 1: Green Commitments in the Bond Sample by Industry, Timing, and Content

Panel A. Commitments and Emissions by Industry

Industry	Firms	Commitments/firm	Share committed	Emissions (Mt CO_2e)	Intensity (kt CO_2e/$m rev.)
Utilities	203	5.84	0.40	13.38	2.43
Chemicals	77	3.30	0.40	6.59	0.65
Energy	199	2.25	0.27	5.56	0.56
Other	301	2.23	0.26	3.51	0.42
Manufacturing	254	2.15	0.35	1.94	0.24
Retail	208	1.26	0.25	1.67	0.14
Nondurables	135	2.20	0.38	1.11	0.08
Durables	52	5.40	0.37	1.38	0.04
Finance	518	0.76	0.19	0.27	0.04
Health Care	118	0.48	0.18	0.43	0.04
Business Equipment	169	1.97	0.44	0.50	0.03
Telecommunication	123	0.78	0.11	0.59	0.03
Total	2,357	2.05	0.28	2.75	0.37

Panel B. Commitments by Year

Year	Firms	Share (%)	No. of Commitments	Year	Firms	Share (%)	No. of Commitments
2005	21	3.17	49	2015	11	1.66	111
2006	13	1.96	52	2016	9	1.36	96
2007	28	4.22	148	2017	14	2.11	109
2008	48	7.24	177	2018	20	3.02	147
2009	56	8.45	253	2019	39	5.88	247
2010	51	7.69	222	2020	54	8.14	409
2011	22	3.32	136	2021	96	14.48	836
2012	30	4.52	138	2022	73	11.01	846
2013	18	2.71	112	2023	40	6.03	638
2014	20	3.02	96				
Total	663	100.00	4,822				

Panel C. Commitment Content

Content	Firms	Share (%)
Investment mentioned	525	79.2
No implementation detail stated	125	18.9
Divestment mentioned	13	2.0
Total	663	100.0

Notes: Industries follow the Fama–French 12 classification. Panel A reports 2357 issuers; 663 have confirmed commitments, totaling 4,822 distinct issuer-date events in 2005–2023. Panel B reports the first confirmed commitment year and all annual commitments; shares use 663 firms. Panel C classifies the content of the first confirmed commitment. The event history is the same source used for matching in Table 4. Emissions are Scope 1 plus location-based Scope 2 (Mt CO_2e); intensity is kt CO_2e per USD million of revenue. Annual values are winsorized at pooled P1/P99, averaged within firms, then equally across firms ($N = 1,281$).

Return to text

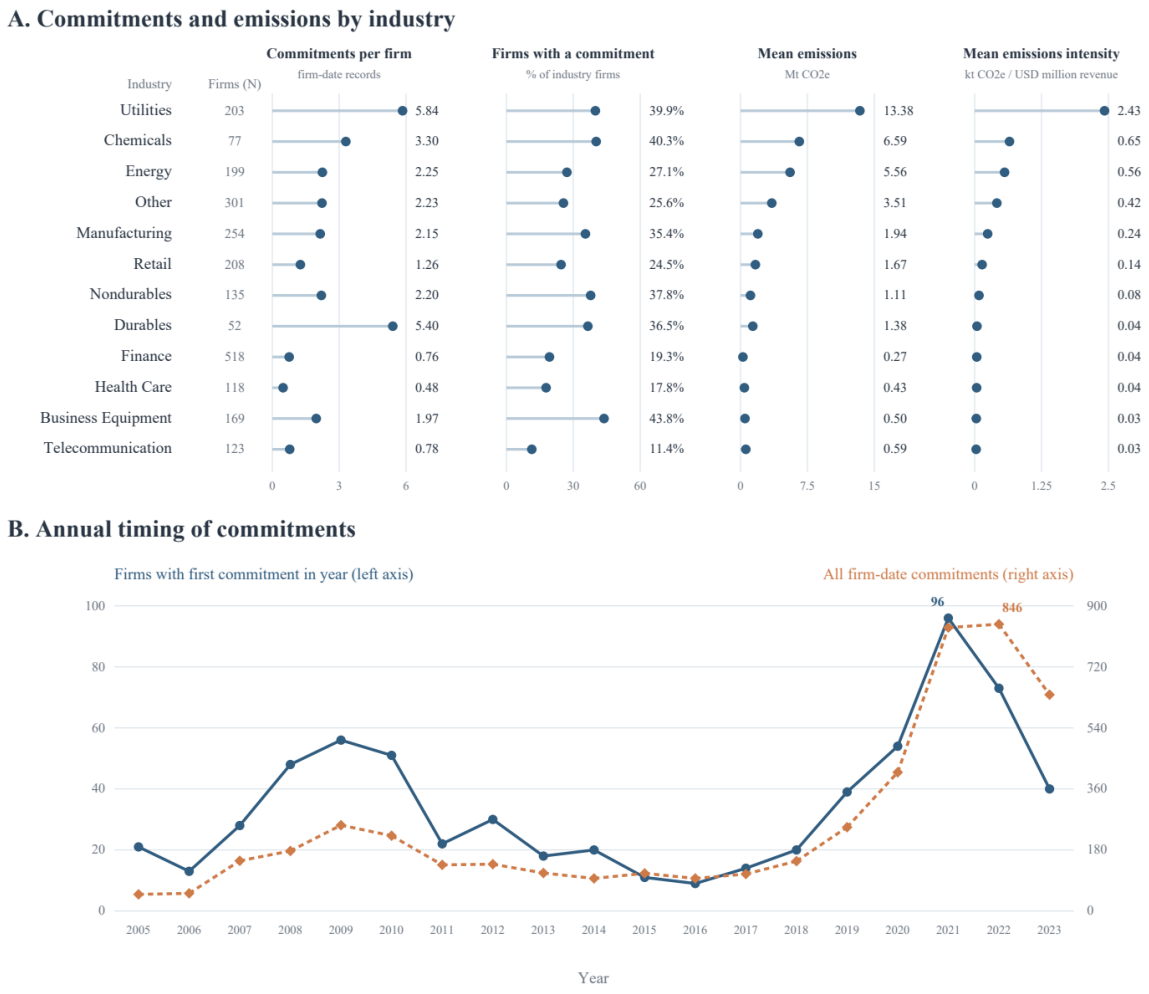


Figure 2: Green Commitments in the Bond Sample

Alt text: Panel A reports commitments per firm, the share of firms with a commitment, emissions, and emissions intensity by industry. Panel B shows first confirmed commitment firms and all issuer-date commitments from 2005 to 2023. Totals are 663 firms and 4,822 commitments, as in Table 1.

Table 2: Summary Statistics

Variable	No. of Obs.	Mean	Median	Std. Dev.	Percentiles 1st	5th	25th	75th	95th	99th
Panel A. Bond Characteristics										
Credit spread (cash-flow matched, bp)	1,679,044	235.20	167.82	217.71	31.81	56.07	111.02	278.23	625.99	1,057.10
Credit rating (1=AAA, 21=C)	1,974,708	8.16	7.64	3.30	1.72	3.17	5.99	9.82	14.59	17.05
Time to maturity (years)	2,014,880	9.94	6.88	8.24	1.06	1.50	3.68	14.58	27.39	30.11
Modified duration (years)	1,694,809	6.64	5.69	4.15	1.01	1.40	3.22	9.68	14.36	15.60
Amount outstanding (USD million)	1,498,418	459.50	319.75	508.36	1.63	7.84	143.79	589.94	1,496.61	2,643.52
Coupon rate (%)	1,997,028	5.23	5.08	1.61	2.04	2.77	4.14	6.19	8.22	9.48
Bond age (years since issue)	2,014,771	5.23	3.87	4.84	0.07	0.36	1.84	6.86	16.71	21.53
Panel B. Firm Characteristics										
Log revenue	140,666	8.69	8.70	1.47	5.30	6.24	7.71	9.63	11.26	12.03
Log total assets	140,876	9.45	9.29	1.51	6.59	7.22	8.37	10.39	12.22	13.77
Operating ROA	132,599	0.12	0.11	0.07	-0.03	0.01	0.07	0.16	0.26	0.34
Operating cash flow/assets	140,699	0.08	0.08	0.06	-0.07	-0.0007	0.04	0.12	0.20	0.26
Debt/assets	140,825	0.34	0.32	0.19	0.02	0.06	0.20	0.44	0.68	0.95
Cash/assets	140,876	0.09	0.06	0.10	0.0007	0.0030	0.02	0.12	0.29	0.47
Organization capital/assets (net)	107,966	0.17	0.11	0.17	0.01	0.01	0.05	0.23	0.54	0.81
Organization capital/assets (gross)	107,966	0.19	0.13	0.18	0.01	0.01	0.05	0.26	0.56	0.83
Scope 1 + 2 emissions (million tonnes CO_2e)	147,900	3.73	0.34	10.56	0.0028	0.01	0.08	1.59	21.19	61.73
Carbon intensity (tCO_2e per USD-million revenue)	147,900	377.58	48.94	1,013.49	1.90	2.55	17.69	174.45	2,406.25	5,528.12
Panel C. Bond Trading Measures										
Trading volume (USD million)	2,013,448	29.62	6.37	58.75	0.02	0.04	0.54	30.24	140.50	340.09
Number of trades	2,013,448	58.45	25.46	89.49	1.12	1.94	8.22	67.75	236.84	477.88
Trading days	2,014,268	10.02	9.41	6.73	1.00	1.00	3.80	15.93	20.60	20.93
Customer trading volume (USD million)	2,014,268	21.81	4.23	43.69	0.01	0.02	0.28	22.18	104.85	250.62
Net customer buying (USD million)	2,014,268	-0.24	-0.0019	7.97	-32.82	-12.58	-0.86	0.65	11.36	29.19
Customer order imbalance (OFI)	2,005,054	-0.006	-0.003	0.494	-1.000	-0.981	-0.243	0.224	0.983	1.000

Notes: The sample covers January 2005–December 2024. Panels A and C use bond-month observations; Panel B uses one observation per identified firm-month. Variables are winsorized at their pooled 1st and 99th percentiles. Statistics are then calculated within each month and averaged equally across months. Observation counts sum nonmissing observations across months. Emissions are the sum of Scope 1 and location-based Scope 2; carbon intensity divides this sum by Trucost revenue. Both emissions components must be observed, and intensity additionally requires positive revenue. See Appendix Appendix A for variable definitions.

Return to text

Table 3: Average Cross-Sectional Correlations

Panel A. Bond Characteristics

Variable	Credit spread	Credit rating	Time to maturity	Amount outstanding	Coupon rate	Bond age
Credit spread (cash-flow matched, bp)	1.00					
Credit rating (1=AAA, 21=C)	0.69	1.00				
Time to maturity (years)	−0.01	−0.18	1.00			
Amount outstanding (USD million)	−0.11	−0.05	0.01	1.00		
Coupon rate (%)	0.46	0.47	0.13	−0.09	1.00	
Bond age (years since issue)	0.09	0.03	0.02	−0.20	0.48	1.00

Panel B. Firm Characteristics

Variable	Log revenue	Log total assets	Operating ROA	Operating cash flow/assets	Debt/ assets	Cash/ assets	Organization capital/assets (net)	Organization capital/assets (gross)	Scope 1 emissions	Carbon intensity
Log revenue	1.00									
Log total assets	0.77	1.00								
Operating ROA	0.14	−0.22	1.00							
Operating cash flow/assets	0.18	−0.13	0.80	1.00						
Debt/assets	−0.28	−0.30	0.11	−0.03	1.00					
Cash/assets	0.16	0.06	0.12	0.20	−0.21	1.00				
Organization capital/assets (net)	0.14	−0.21	0.36	0.29	0.01	0.14	1.00			
Organization capital/assets (gross)	0.17	−0.19	0.37	0.31	−0.02	0.22	0.98	1.00		
Scope 1 emissions (million tonnes CO_2e)	0.22	0.21	−0.04	−0.02	0.03	−0.14	−0.14	−0.15	1.00	
Carbon intensity (tCO_2e per USD-million revenue)	−0.03	0.02	−0.09	−0.06	0.11	−0.18	−0.16	−0.17	0.70	1.00

Panel C. Bond Trading Measures

Variable	Trading volume	Number of trades	Trading days	Customer trading volume	Net customer buying	Customer order imbalance (OFI)
Trading volume (USD million)	1.00					
Number of trades	0.67	1.00				
Trading days	0.54	0.68	1.00			
Customer trading volume (USD million)	0.98	0.63	0.52	1.00		
Net customer buying (USD million)	−0.08	−0.02	−0.01	−0.08	1.00	
Customer order imbalance (OFI)	0.00	0.03	0.03	0.00	0.38	1.00

Notes: Entries are equal-weighted averages of monthly pairwise cross-sectional Pearson correlations, January 2005–December 2024. Variables are winsorized at pooled 1st and 99th percentiles, as in Table 2. Modified duration is omitted because its correlation with maturity is 0.97. Panels A and C use bond-months; Panel B uses firm-months. Each pair uses common nonmissing observations. Variable definitions are in Appendix A.

Return to text

Table 4: Bond Matching and Covariate Balance

Panel A. Matched sample

Bond group	Bond event observations	Unique issuers
Treated bond issues	2,858	347
Control bond issues	2,858	339

Panel B. Characteristics of matched bonds

Variable	Treated bond issues			Control bond issues			Diff. mean
	Obs.	Mean	Std. dev.	Obs.	Mean	Std. dev.	
Credit rating	2,858	15.24	3.24	2,858	15.39	3.04	−0.15
Ln(principal outstanding)	2,858	4.54	2.24	2,858	4.46	2.27	0.08***
Time to maturity (years)	2,858	9.50	7.42	2,858	9.56	7.43	−0.07
Oil beta (×100)	2,858	-0.80	14.67	2,858	-1.78	14.35	0.98
Credit spread (bp)	2,409	192.67	287.67	2,409	201.61	211.70	−8.94

Notes: At $k = -12$, each treated bond issue is matched to one control issue using 1:1 Mahalanobis nearest-neighbor matching with replacement on credit rating, log principal outstanding, remaining maturity, and issuer equity beta to Brent returns (caliper 1, within baseline month). Panel A includes all 2,858 matched bond-event comparisons, before outcome-support screens; control issues may be reused. Differences are treated means minus control means. The matching rating scale is 22=AAA and 1=D; Tables 2–3 use 1=AAA and 21=C. Credit spread is an outcome balance check, not a matching variable; both baseline spreads are observed for 2,409 pairs. Difference tests cluster by treated and control issuers. *, **, and *** indicate 10%, 5%, and 1% significance.

Return to text

Table 5: Bond Spread Changes Around Green Commitments

	Main sample	Relaxed sample
Q1 $(+1, +3)$	-35.93^{***}	-36.82^{***}
	(13.14)	(12.90)
Q2 $(+4, +6)$	-58.76^{***}	-59.59^{***}
	(15.36)	(15.48)
Q3 $(+7, +9)$	-70.81^{***}	-72.39^{***}
	(21.53)	(21.50)
Q4 $(+10, +12)$	-58.20^{***}	-60.20^{***}
	(15.43)	(15.77)
Equal-weighted Q1–Q4 average	-55.92^{***}	-57.25^{***}
	(14.07)	(14.13)
Pre-event joint test: 11 months (p-value)	0.34	0.19
Matched bond-event comparisons	1,469	1,625
Firms with treated / control bonds	284 / 247	301 / 263
Bond-month observations	59,058	61,938
Bond fixed effects	Yes	Yes
Matched pair × calendar month fixed effects	Yes	Yes

Notes: The dependent variable is the cash-flow-matched bond credit spread (bp), without outcome winsorization. The starting matched sample comprises the 2,858 comparisons in Table 4. Both columns require an event by December 2022 and observed spreads for both bonds at $k = -12$. The main sample retains 1,469 pairs with at least three additional common pre-event months and three common post-event months. The relaxed sample retains 1,625 pairs with at least one common post-event month and no minimum number of additional pre-event months. Both columns report unadjusted estimates from:

$$s_{bpt} = \alpha_b + \lambda_{pt} + \sum_{k \in \mathcal{K}} \beta_k D_{bp} \mathbf{1}\{\tau = k\} + \sum_{r \in \mathcal{B}} \theta_r C_b \mathbf{1}\{\tau \in r\} + \varepsilon_{bpt}.$$

Here D_{bp} identifies the treated bond within matched pair p, α_b denotes bond fixed effects, and λ_{pt} denotes matched-pair × calendar-month fixed effects. The event-time indicators cover $\mathcal{K} = \{-11, \ldots, -1, 1, \ldots, 12\}$, with $k = -12$ as the reference and $k = 0$ excluded. C_b is baseline callable status; the callable-control bins $\mathcal{B}$ are $[-11, -7]$, $[-6, -4]$, $[-3, -1]$, and Q1–Q4. Quarterly estimates equally weight the three monthly coefficients within each quarter; the Q1–Q4 average equally weights the four quarterly estimates. Standard errors of these averages use the full covariance matrix. The reported pre-event p-value tests the eleven monthly coefficients jointly:

$$H_0: \quad \beta_{-11} = \beta_{-10} = \cdots = \beta_{-1} = 0.$$

Standard errors in parentheses are double-clustered by issuer and calendar month. *, **, and *** denote 10%, 5%, and 1% significance. Table 6 retains the stricter three-pre/three-post screen.

Return to text

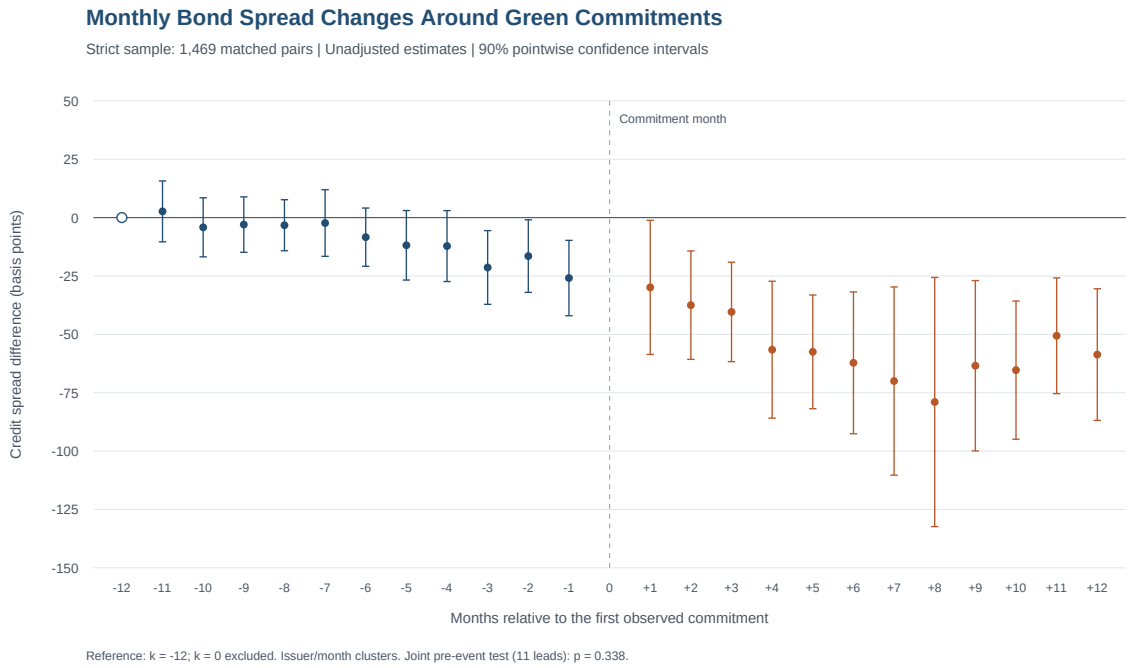


Figure 3: Bond Spread Changes Around Green Commitments

Notes: Monthly event-time estimates for treated bonds relative to matched controls, in basis points and relative to $k = -12$, using the main sample of 1,469 pairs. Blue circles show the eleven pre-event coefficients from $k = -11$ to $k = -1$; orange circles show post-event coefficients from $k = +1$ to $k = +12$. The event month is excluded. Bars are pointwise 90% confidence intervals. The joint test of the eleven pre-event coefficients yields $p = 0.338$. Estimates decline near the event, so non-rejection does not establish parallel trends.

Return to text

Table 6: Maturity Matching and Covariate Balance

Panel A. Distribution of matched pairs at month −12

			Mean maturity (years)		Absolute pair gap (years)	
Maturity group	Pairs	Share (%)	Treated	Control	Median	90th pct.
Fixed maturity groups						
1–<5 years	412	27.876	3.608	3.609	0.463	1.372
5–<10 years	542	36.671	7.277	7.423	0.623	1.826
10–30 years	524	35.453	20.614	20.844	1.281	2.980
All pairs	1,478	100.000	10.983	11.118	0.726	2.292
Within-firm maturity terciles (treated issuer)						
Short	496	35.505	4.673	4.902	0.542	1.696
Middle	475	34.001	10.239	10.303	0.674	2.000
Long	426	30.494	19.747	19.876	1.235	2.851
All pairs	1,397	100.000	11.162	11.304	0.747	2.344

Panel B. Baseline mean differences (treated minus control)

Fixed maturity groups

	1–<5 years		5–<10 years		10–30 years	
Characteristic	Difference	SMD	Difference	SMD	Difference	SMD
Credit rating	0.228***	0.084	0.149***	0.051	-0.052	-0.021
Log principal outstanding	0.034	0.027	0.078***	0.047	0.087***	0.046
Remaining maturity (years)	-0.001	-0.001	-0.145	-0.103	-0.229	-0.044
Oil beta (×100)	0.191	0.013	1.234	0.082	1.074	0.078
Operating ROA (pp)	3.186**	0.396	1.620	0.207	4.271***	0.619
Credit spread (bp)	−19.536***	-0.119	−19.543**	-0.128	−30.917**	-0.291
ROA obs. (treated / control)	154 / 146		170 / 152		107 / 121	

Within-firm maturity terciles (treated issuer)

	Short		Middle		Long	
Characteristic	Difference	SMD	Difference	SMD	Difference	SMD
Credit rating	0.222***	0.085	0.177**	0.068	-0.108	-0.039
Log principal outstanding	0.040	0.024	0.052***	0.029	0.123†	0.067
Remaining maturity (years)	−0.228**	-0.100	-0.064	-0.012	-0.129	-0.018
Oil beta (×100)	0.181	0.012	1.708	0.112	0.316	0.021
Operating ROA (pp)	3.723**	0.474	2.302*	0.296	2.444*	0.341
Credit spread (bp)	−25.258***	-0.203	−20.651**	-0.153	−29.065**	-0.233
ROA obs. (treated / control)	157 / 145		136 / 149		114 / 104	

Return to text

Table 7: Bond Spread Changes Around Green Commitments by Maturity

Panel A. Fixed remaining-maturity groups

	1–<5 years	10–30 years	Long − short
Q1 (+1, +3)	−50.45**	−7.58	42.87*
	(24.69)	(12.91)	(25.79)
Q2 (+4, +6)	−68.28***	−19.62	48.65**
	(21.21)	(14.15)	(22.60)
Q3 (+7, +9)	−120.66*	−23.31	97.35
	(61.52)	(14.84)	(60.81)
Q4 (+10, +12)	−75.62***	−24.87	50.75*
	(25.53)	(16.02)	(27.95)
Equal-weighted Q1–Q4 average	−78.75***	−18.85	59.91**
	(27.04)	(13.32)	(28.99)
Pre-event joint test: 11 months (p-value)	0.272	0.925	0.154
Matched comparisons	402	527	–
Bond-month observations		59,058	
Bond fixed effects		Yes	
Matched pair × calendar month fixed effects		Yes	

Panel B. Within-firm maturity terciles

	Short	Long	Long − short
Q1 (+1, +3)	−65.78***	7.15	72.93***
	(19.48)	(17.68)	(27.24)
Q2 (+4, +6)	−82.13***	−13.80	68.33**
	(22.57)	(16.84)	(27.66)
Q3 (+7, +9)	−63.77***	−32.19*	31.57
	(19.24)	(17.49)	(22.65)
Q4 (+10, +12)	−60.11***	−37.80*	22.31
	(18.13)	(19.24)	(24.24)
Equal-weighted Q1–Q4 average	−67.95***	−19.16	48.79**
	(17.53)	(15.06)	(21.55)
Pre-event joint test: 11 months (p-value)	0.389	0.675	0.296
Matched comparisons	486	425	–
Bond-month observations		55,654	
Bond fixed effects		Yes	
Matched pair × calendar month fixed effects		Yes	

Notes: The strict sample screen follows Table 5. For bond b, matched pair p, and calendar month t:

$$\text{Spread}_{bpt} = \alpha_b + \lambda_{pt} + \sum_{g\in\mathcal{G}}\sum_{k\in\mathcal{K}} \beta_{gk}\,\text{Treat}_{bp}\,\mathbf{1}\{\text{Group}_p = g,\ \tau_{pt} = k\} + \sum_{r\in\mathcal{B}} \theta_r\,\text{Callable}_b\,\mathbf{1}\{\tau_{pt}\in r\} + \varepsilon_{bpt}.$$

Spread is in bp; Treat and Callable indicate treated and baseline-callable bonds. Group is baseline maturity group, inherited by the control bond. α_b and λ_{pt} are bond and pair-by-calendar-month fixed effects; the latter absorb maturity-group fixed effects. τ_{pt} is event month, and $\mathcal{K} = \{-11,\dots,-1,1,\dots,12\}$; $k = -12$ is the reference and $k = 0$ is excluded. Callable-control bins $\mathcal{B}$ follow Table 5. All three groups are estimated jointly; middle-group results are omitted. Panel B requires at least three eligible non-putable bonds per issuer–baseline month. Quarterly estimates average monthly coefficients. Pre-event tests jointly test the eleven lead coefficients, or their long-minus-short differences. Standard errors are clustered by issuer and calendar month, with the Cameron–Gelbach–Miller (2011) negative-eigenvalue correction applied to all reported inference. *, **, and *** denote 10%, 5%, and 1% significance.

Return to text

Table 8: Organization Capital, Operating ROA, and Green Commitments

	(1)	(2)	(3)
	Organization capital	Operating ROA	Both
Organization capital/assets	2.14**	–	1.80**
	(2.41)		(2.20)
Operating ROA	–	1.74**	1.43*
		(2.29)	(1.97)
Prior commitment control	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes
Industry × year fixed effects	Yes	Yes	Yes
Firms	455	455	455
Firm-year observations	4,378	4,378	4,378

Notes: We estimate the following linear probability model:

$$100\,\text{Commit}_{iT} = \alpha_{j(i)\times T} + \beta_{\text{OC}}\,\widetilde{\text{OC}}_{iT} + \beta_{\text{ROA}}\,\widetilde{\text{ROA}}_{iT} + \rho\,\text{PriorCommit}_{iT} + \gamma'\widetilde{\mathbf{X}}_{iT} + \varepsilon_{iT}.$$

Commit_{iT} equals one if firm i makes at least one green commitment in year T, including first and repeat commitments. OC is organization capital divided by real assets, constructed from real SG&A using 15% annual depreciation following Eisfeldt and Papanikolaou (2013). ROA is operating income before depreciation divided by total assets. Both measures average years $T-4$ through $T-2$. PriorCommit_{iT} indicates any commitment before year T. $\mathbf{X}_{iT}$ contains the prior emissions-intensity slope and initial level, revenue slope, and average log revenue and assets. $\alpha_{j(i)\times T}$ denotes industry-by-year fixed effects. Tildes indicate continuous regressors winsorized at the 1st and 99th percentiles and standardized. Columns (1) and (2) include organization capital and ROA separately; column (3) includes both. All columns use the same sample over 2008–2023. Coefficients are percentage-point changes per standard deviation. Parentheses report t-statistics based on standard errors double-clustered by firm and year. Two-sided significance tests use 15 degrees of freedom. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Return to text

Table 9: Trading Evidence by Commitment Content and Bond Maturity

Outcome	Contrast	Estimate (SE)	p-value	Rate ratio
Panel A. OLS: fixed remaining-maturity groups (1,558 matched pairs)				
Any customer trade (pp)	Other: long − short	-16.36^{***} (5.03)	0.001	–
Any customer trade (pp)	Investment − other	17.68^{**} (7.55)	0.020	–
log(1 + customer reports)	Other: long − short	-0.74^{***} (0.20)	< 0.001	–
log(1 + customer reports)	Investment − other	0.77^{***} (0.26)	0.004	–
Trading days	Other: long − short	-3.11^{***} (0.83)	< 0.001	–
Trading days	Investment − other	3.34^{***} (1.02)	0.001	–
Panel B. OLS: within-issuer maturity terciles				
Any customer trade (pp)	Other: long − short	-14.59^{***} (4.43)	0.001	–
Any customer trade (pp)	Investment − other	14.37^{***} (5.01)	0.005	–
log(1 + customer reports)	Other: long − short	-0.78^{***} (0.21)	< 0.001	–
log(1 + customer reports)	Investment − other	0.82^{***} (0.23)	< 0.001	–
Customer reports (count)	Investment − other	9.49^{*} (5.59)	0.091	–
Trading days	Other: long − short	-2.94^{***} (0.79)	< 0.001	–
Trading days	Investment − other	3.05^{***} (0.93)	0.001	–
Panel C. PPML: monthly customer-report counts				
Fixed remaining-maturity groups (1,558 matched pairs)				
Customer reports	Other: long − short	-0.40^{**} (0.16)	0.012	0.67
Customer reports	Investment − other	0.54^{***} (0.18)	0.003	1.72
Within-issuer maturity terciles (1,466 matched pairs)				
Customer reports	Investment: long − short	0.21^{**} (0.09)	0.027	1.23
Customer reports	Investment − other	0.41^{***} (0.15)	0.009	1.50

Return to text

Appendix A Variable Construction

Table A1: Variable Definitions for Table 2

Variable	Definition
Panel A. Bond Characteristics	
Credit spread (cash-flow matched, bp)	Corporate bond promised yield minus the yield on a Treasury portfolio with matching scheduled cash flows, based on the zero-coupon curve of Gürkaynak, Sack, and Wright (2007).
Credit rating (1=AAA, 21=C)	Ordered rating score; higher values indicate lower credit quality.
Time to maturity (years)	Years remaining to contractual maturity at the bond-month observation date.
Modified duration (years)	Modified duration calculated from the bond's scheduled cash flows and observed dirty price.
Amount outstanding (USD million)	FISD outstanding principal, matched by effective date using the next trading day as an availability proxy; USD millions.
Coupon rate (%)	Contractual fixed coupon rate, in percent.
Bond age (years since issue)	Years elapsed from the bond's issue date to the monthly observation date.
Panel B. Firm Characteristics	
Log revenue	Natural logarithm of positive Compustat annual sales (SALE).
Log total assets	Natural logarithm of positive Compustat annual total assets (AT).
Operating ROA	Operating income before depreciation (OIBDP) divided by total assets (AT).
Operating cash flow/assets	Operating cash flow (OANCF) divided by total assets (AT).
Debt/assets	Long-term debt (DLTT) plus debt in current liabilities (DLC), divided by total assets (AT).
Cash/assets	Cash and short-term investments (CHE) divided by total assets (AT).
Organization capital/assets (net)	Net organization capital is the perpetual-inventory stock of real selling, general, and administrative expenses (SG&A), net of reported R&D and adjusted for R&D included in cost of goods sold, following Peters and Taylor (2017). The method capitalizes 30% of expenses and applies 20% annual depreciation; the resulting stock is divided by real assets.

(continued)

Table A1: Variable Definitions, continued

Variable	Definition
Organization capital/assets (gross)	The same perpetual-inventory method applied to gross SG&A, divided by real assets.
Scope 1 emissions (million tonnes CO_2e)	Trucost direct greenhouse-gas emissions, in millions of metric tonnes of CO_2 equivalent.
Carbon intensity (tCO_2e per USD-million revenue)	Trucost Scope 1 emissions per USD million of revenue, in tonnes of CO_2 equivalent.
Panel C. Bond Trading Measures	
Trading volume (USD million)	Monthly par value of eligible TRACE transactions, in USD millions.
Number of trades	Monthly count of eligible trade records included in the volume measure.
Trading days	Number of distinct dates in the month with an eligible TRACE transaction.
Customer trading volume (USD million)	Customer purchases plus customer sales, in USD millions.
Net customer buying (USD million)	Customer purchases minus customer sales, in USD millions; a dealer sale is a customer purchase, and a dealer purchase is a customer sale.
Customer order imbalance (OFI)	Net customer buying divided by customer trading volume; missing when customer volume is zero or direction is unknown.

Notes: Firm characteristics are annual values assigned to firm-months. Each variable is winsorized at its pooled 1st and 99th percentiles before monthly statistics are calculated.

Return to text

Appendix B Proofs and equilibrium construction

B.1 Abatement and the cost of commitment

Fix (θ, k, g). The payoff in (9) is almost surely continuous in e and expenditure parameters, since Y_1 has no atoms. On compact parameter sets it has an integrable bound in $Y_1 + Y_2$. Dominated convergence and compactness therefore establish existence of an optimum and continuity of the maximized value in expenditure parameters.

Write $H_m(e) = \tau e - I(g, e; k) - mP_\gamma(e)$ and let $\widehat{e}_m$ be its unique maximizer. Strict concavity follows from $I_{ee} > 0$ and convexity of P_γ. At $\chi = 0$, initial survival is independent of e and W_m is strictly increasing in H_m, so $e^*_m = \widehat{e}_m$. For $\chi > 0$, replacing any $e > \widehat{e}_m$ by $\widehat{e}_m$ lowers initial expenditure and raises cumulative cash. The payoff rises weakly in every state and strictly on a positive-probability set; hence $e^*_m \leq \widehat{e}_m$.

Adding and subtracting $W_0(e^*_1)$ gives

$$C_i = \underbrace{W_0(e^*_0) - W_0(e^*_1)}_{\geq 0} + \underbrace{W_0(e^*_1) - W_1(e^*_1)}_{>0}. \tag{33}$$

The first inequality follows from optimality. At a common plan, commitment lowers date-1 cash by $c_\theta > 0$ and cumulative cash by $c_\theta + P_\gamma(e)$. Noncommitment therefore weakly increases shareholder payoffs state by state, with a strict increase whenever the committing firm survives and retains positive equity. Positive density on $(0, \infty)^2$ gives such states positive probability, proving $C_i > 0$.

For $\gamma' \geq \gamma$, $P_{\gamma'}(e) \geq P_\gamma(e)$ at every e, so $W_1(e; \gamma') \leq W_1(e; \gamma)$. Maximization preserves this inequality, while W^*_0 is unchanged; hence $C_i(\gamma') \geq C_i(\gamma)$. Commitment probabilities consequently fall weakly at a fixed premium G, but the equilibrium premium and posterior composition also respond.

B.2 Commitment, beliefs, and existence

Proof of Proposition 1. Equation (15) and strict monotonicity of F_ω give $0 < a_i < 1$ and $a_i > a_j$ exactly when $C_i < C_j$. Bayes' rule gives $\pi_i^1 \propto \pi_i a_i$ and $\pi_i^0 \propto \pi_i(1 - a_i)$; taking ratios proves (19) and preserves positive probability for every type.

For any nonempty proper group $\mathcal{G}$ of financial types, write $p_\mathcal{G} = \Pr(i \in \mathcal{G} \mid g)$ and $a_\mathcal{G} = \mathbb{E}[a_i \mid i \in \mathcal{G}, g]$. Bayes' rule also yields

$$\begin{aligned} \Pr(i \in \mathcal{G} \mid m = 1, g) - p_\mathcal{G} &= \frac{p_\mathcal{G}(1 - p_\mathcal{G})(a_\mathcal{G} - a_{\mathcal{G}^c})}{\bar{a}}, \\ \Pr(i \in \mathcal{G} \mid m = 0, g) - p_\mathcal{G} &= -\frac{p_\mathcal{G}(1 - p_\mathcal{G})(a_\mathcal{G} - a_{\mathcal{G}^c})}{1 - \bar{a}}. \end{aligned} \tag{34}$$

Taking $\mathcal{G} = \{\theta = H\}$ proves the efficiency update under (20); taking $\mathcal{G} = \{k = \underline{k}\}$ gives the cost update, allowing either sign.

To establish the sufficient expenditure condition, fix all other primitives and extend c_H continuously to zero. At $c_H = \gamma = 0$, both $C_H(k)$ equal zero, whereas $\min_k C_L(k) > 0$ because $c_L > 0$. Continuity of maximized values and the finite number of types preserve this strict gap for sufficiently small positive c_H and nonnegative γ.

The expenditure ordering alone is insufficient. For $\chi = \gamma = 0$, take $b_L = 0$ and independent exponential cash shocks with mean $\epsilon > 0$. Sufficiently large b_H makes high-efficiency firms always solvent, giving $C_H(k) = c_H$, while $C_L(k) \to 0$ as $\epsilon \downarrow 0$. Thus $c_H < c_L$ can coexist with the reverse shareholder-cost ordering.

Equilibrium existence. For a nonempty proper subset $\mathcal{A}$ of types, define

$$G_\mathcal{A} = \mathbb{E}[W_1^*(i; g) \mid i \in \mathcal{A}, g] - \mathbb{E}[W_0^*(i; g) \mid i \notin \mathcal{A}, g].$$

Suppose some $\omega_0 > 0$ satisfies

$$\max_{i \in \mathcal{A}} C_i < \omega_0 G_\mathcal{A} < \min_{i \notin \mathcal{A}} C_i. \tag{35}$$

Let $\omega = \omega_0 \exp(\sigma Z)$, where Z is standard normal and independent of type and cash-flow shocks. These distributions satisfy the maintained density and moment assumptions for every $\sigma > 0$.

Choose a compact interval around $G_{\mathcal{A}} > 0$ on which the strict inequalities persist when $G_{\mathcal{A}}$ is replaced by G. As $\sigma \downarrow 0$, the commitment probabilities induced by G converge uniformly to $\mathbf{1}\{i \in \mathcal{A}\}$. Both announcement groups have positive limiting mass, so the valuation difference converges uniformly to $G_{\mathcal{A}}$. For sufficiently small $\sigma > 0$, the continuous residual of (17) has opposite signs at the interval endpoints. A positive root follows from the intermediate value theorem.

The condition is attainable: choose $\mathcal{A} = \{\theta = H\}$ and b_H large enough to make $G_{\mathcal{A}} > 0$ at $c_H = \gamma = 0$, since $W_0^*(H, k; g)$ is unbounded in b_H. Small positive c_H and small γ preserve that premium and the strict cost gap, leaving a nonempty interval for ω_0.

At a positive root, managerial optimality and announcement beliefs are consistent. Optimal abatement and the trading continuation below complete the perfect Bayesian equilibrium; conditional beliefs about ω are its prior truncated at C_i/G^*. This construction establishes existence for the specified preference family, without uniqueness.

B.3 Credit spreads

Proof of Proposition 2. For either maturity, (21) and monotonicity of spreads reduce the comparison to the sign of $V_T^1 - V_T^0$. Adding and subtracting $\sum_i \pi_i^1 r_T(i,0)$ gives $\mathcal{B}_T + \mathcal{F}_T$. Moreover, $\mathcal{B}_T = \mathrm{Cov}_\pi(a_i, r_T(i,0))/[\bar{a}(1-\bar{a})]$, establishing the covariance characterization.

For $\chi = 0$, let $r_{1,\theta}^m = \Pr(Y_1 \geq D_1 + B(g) - b_\theta + mc_\theta \mid g)$, $p_m = \Pr(H \mid m, g)$, and $d_\theta = r_{1,\theta}^0 - r_{1,\theta}^1 \geq 0$. Substitution gives the benchmark:

$$V_1^1 - V_1^0 = (p_1 - p_0)(r_{1,H}^0 - r_{1,L}^0) - p_1 d_H - (1 - p_1) d_L. \tag{36}$$

For general χ, write $I_m = I(g, e_m^*; k)$ and define

$$a_i^m = D_1 + B(g) - b_\theta + mc_\theta + \chi I_m, \qquad h_i^m = D_1 + D_2 + 2B(g) - (1+\eta) b_\theta + mc_\theta - \tau e_m^* + I_m + mP_\gamma(e_m^*).$$

Repayment requires $Y_1 \geq a_i^m$ at date 1 and additionally $Y_1 + Y_2 \geq h_i^m$ at date 2. Taking differences gives (24). Nested repayment regions establish the weak comparisons. A comparison is strict when the difference between the regions has positive area in $(0, \infty)^2$; for short debt, the changed threshold interval must intersect $(0, \infty)$.

Proof of Proposition 3. Equation (26) gives

$$\Delta s_1 = -\frac{L_1}{M_1}, \qquad \Delta s_2 = -\frac{L_1 + L_c}{M_2}.$$

Subtracting the two expressions gives (27); their signs and absolute values give the stated comparisons. Positive repayment probabilities ensure that all logarithms are defined.

B.4 Trading and belief updates

Fix a public history and write $\pi_i = \Pr(i \mid \mathcal{J})$. With the signal likelihood $f(\xi \mid i)$ specified in the model, Bayes' rule gives

$$h(\xi) = \sum_i \pi_i f(\xi \mid i), \qquad h(\xi) v_T(\xi) = \sum_i \pi_i f(\xi \mid i) r_T(i, m).$$

All signal likelihoods are positive, and averaging gives $\mathbb{E}_h[v_T] = V_T$.

Competitive quotes. Set $\varepsilon = (1-\mu)/2 > 0$. Using the optimal trading rule, rearrange the zero-profit conditions (13) to obtain

$$\begin{aligned} \varepsilon(A_T - V_T) &= \mu \mathbb{E}_h[(v_T - A_T)^+], \\ \varepsilon(V_T - B_T) &= \mu \mathbb{E}_h[(B_T - v_T)^+]. \end{aligned} \tag{37}$$

The ask residual is continuous and strictly increasing, with opposite weak signs at V_T and $\max_\xi v_T(\xi)$. The bid residual is continuous and strictly decreasing, with opposite weak signs at $\min_\xi v_T(\xi)$ and V_T. Each quote is therefore unique. Nonconstant valuations give $B_T < V_T < A_T$; constant valuations give $B_T = A_T = V_T$.

Proof of Proposition 4. When $v_2 = \bar{\kappa}_2 v_1$, common signal probabilities imply $V_2 = \bar{\kappa}_2 V_1$. Substituting the scaled quotes into (37) and using $[cx]^+ = c[x]^+$ for $c > 0$ verifies both equations. Uniqueness establishes the quote scaling. Strict comparisons and ties are preserved signal by signal, so the common signal distribution and μ imply both $Q_2 = Q_1$ and $N_2 = N_1$.

The same argument applies to $v_2 = \alpha + \beta v_1$, $\beta > 0$, with quotes transformed accordingly. For general valuations, a signal induces short-term buying and long-term selling precisely when $v_1(\xi) > A_1$ and $\kappa_2(\xi) < B_2/v_1(\xi)$, obtained by dividing $v_2(\xi) < B_2$ by $v_1(\xi) > 0$. Neither variation in κ_2 nor opposite trade directions alone establishes a difference in trading frequency.

Sequential beliefs. Let $d_T(\xi, \mathcal{J})$ denote the optimal informed decision. Conditional on type,

$$\ell_T(z \mid i, \mathcal{J}) = \varepsilon \mathbf{1}\{z \neq 0\} + \mu \sum_{\xi} f(\xi \mid i) \mathbf{1}\{d_T(\xi, \mathcal{J}) = z\}.$$

Conditional independence across investors gives, at every positive-probability pair of orders,

$$\Pr(i \mid \mathcal{J}, z_1, z_2) = \frac{\pi_i \ell_1(z_1 \mid i, \mathcal{J}) \ell_2(z_2 \mid i, \mathcal{J})}{\sum_j \pi_j \ell_1(z_1 \mid j, \mathcal{J}) \ell_2(z_2 \mid j, \mathcal{J})}. \tag{38}$$

At zero-probability histories, assign a type posterior and apply the same quote and strategy construction. Recursion over the finite trading horizon completes the continuation because each arriving investor acts only once.

B.5 Numerical illustration

This exercise illustrates how commitment selection and subsequent cash flows shape announcement credit spreads across maturities. The parameters in Table B2 define the benchmark. Table B3 varies managerial valuation incentives, the persistence of efficiency savings, and the consequences of target shortfalls.

Parameterization. I match the 2024 average option-adjusted spreads of the ICE BofA 1–3 Year and 7–10 Year US Corporate indices, 60.88 and 112.94 bp, using

representative maturities of 2.00 and 8.50 years. Cash-flow shocks are independent: Y_2 is unit exponential, while Y_1 is unit exponential with probability ε and otherwise follows $N(a_Y, \sigma_Y^2)$ truncated below at zero. The location a_Y and mixture probability ε are fitted jointly with the commitment equilibrium; the remaining parameters are assigned.

Managerial preferences satisfy $\omega = \omega_0 r_\omega \exp(\sigma_\omega Z)$, where $Z \sim N(0,1)$ and the benchmark has $r_\omega = 1.00$. Each scenario changes the indicated parameter and refits (a_Y, ε) to the same initial spreads. These comparisons therefore include investment, selection, and cash-flow distribution adjustments. Announcement responses are not calibration targets.

Equilibrium outcomes. Stronger valuation incentives broaden commitment participation and weaken efficiency selection in Panel A. As r_ω rises from 0.50 to 1.25, the high-efficiency share among committing firms falls from 95.19% to 75.36%. The long-term response moves from a larger decline than the short-term response to a smaller decline and then an increase.

Higher efficiency persistence directly supports future cash flows. In Panel B, however, it also accompanies broader participation and weaker selection, while the initial spread targets remain fixed. The long-term announcement response consequently depends on more than the direct cash-flow contribution of efficiency.

In Panel C, larger shortfall losses induce investment and selection responses. Mean abatement among committing firms rises from 0.69 to 0.82 across the reported endpoints, and the high-efficiency share rises from 80.05% to 83.78%. The long-term spread decline becomes larger despite the higher loss coefficient. These examples show why future obligations alone do not determine the maturity ranking.

The reported ranges illustrate distinct equilibrium regimes selected after exploratory calculations. Computation uses the largest positive fixed point found, without assuming uniqueness. Finer investment grids, independent cash-flow integration, and equilibrium residuals verify the solutions.

Table B2: Baseline parameter values

Symbol	Description	Value
Assigned parameters		
$(g, \bar{E})$	Inherited abatement and unabated emissions	$(0.00, 1.00)$
(D_1, D_2)	Debt payments	$(1.00, 1.00)$
$\psi(g, e)$	Investment cost schedule	$0.15 + e$
τ	Emissions expense per unit	0.80
χ	Date-1 share of investment payments	0.30
η	Persistence of efficiency savings	0.70
e^{tar}	Additional abatement target	0.70
γ	Shortfall loss coefficient	0.10
(b_L, b_H)	Operating cash savings	$(0.20, 1.30)$
$(c_L, c_H/c_L)$	Preparation expenditure and cost ratio	$(0.50, 0.03)$
$(\underline{k}, \overline{k})$	Abatement investment cost types	$(0.70, 2.00)$
(p, q_L, q_H)	Prior type probabilities	$(0.50, 0.30, 0.70)$
$(\omega_0, \sigma_\omega)$	Median valuation weight and log dispersion	$(0.20, 0.40)$
σ_Y	Normal-component standard deviation	0.25
(M_1, M_2)	Representative maturities (years)	$(2.00, 8.50)$
$(\mu, \rho_\theta, \rho_k)$	Informed share and signal accuracies	$(0.35, 0.80, 0.80)$
Fitted parameters		
a_Y	Normal-component location	3.13
ε	Exponential-component probability	1.87%

Notes: The table reports the benchmark values. The first group contains assigned parameters; (a_Y, ε) are fitted to the two initial spread targets. The benchmark has $r_\omega = 1.00$. Both exponential components have mean one. The source indices provide an effective pricing benchmark; the fitted distribution is not an estimate of physical default risk.

Sources: 2024 observations from FRED series BAMLC1A0C13Y and BAMLC4A0C710Y. Each mean uses 263 nonmissing observations; representative maturities are the index-band midpoints.

Table B3: Commitment selection and announcement credit spreads

Panel A: Managerial valuation incentives

r_ω	$\bar{a}$ (%)	$\Pr(H \mid m = 1)$ (%)	Δs_1 (bp)	Δs_2 (bp)
0.50	52.53	95.19	−14.85	−74.35
0.75	57.48	86.99	−11.83	−33.47
1.00	**62.20**	**80.39**	**−9.49**	**−7.39**
1.25	66.35	75.36	−7.75	6.61

Panel B: Persistence of operating efficiency

η	$\bar{a}$ (%)	$\Pr(H \mid m = 1)$ (%)	Δs_1 (bp)	Δs_2 (bp)
0.10	55.41	90.23	−13.06	−46.05
0.40	58.87	84.94	−11.13	−23.45
0.70	**62.20**	**80.39**	**−9.49**	**−7.39**
1.00	65.32	76.55	−8.13	3.38

Panel C: Consequences of target shortfalls

γ	$\bar{a}$ (%)	$\Pr(H \mid m = 1)$ (%)	Δs_1 (bp)	Δs_2 (bp)
0.00	62.46	80.05	−9.42	−6.72
0.10	**62.20**	**80.39**	**−9.49**	**−7.39**
1.00	60.81	82.21	−9.84	−11.69
3.00	59.26	83.78	−10.02	−16.36

Notes: The table reports equilibrium outcomes following a commitment announcement. Each row uses Table B2, changes the indicated parameter, and refits (a_Y, ε) to initial spreads of 60.88 and 112.94 bp. $\bar{a}$ is the commitment rate and $\Pr(H \mid m = 1)$ is the high-efficiency share among committing firms. Δs_T is the annualized spread change in basis points; negative values denote declines. Bold rows repeat the benchmark. All values are rounded to two decimal places.

Appendix C Bond Sample and TRACE Data

I construct the bond sample using the issue and transaction screens in Duan et al. (2025). I first select eligible FISD issues and then filter TRACE reports. I retain unique CUSIPs issued by U.S.-domiciled firms and restrict the sample to fixed-rate or zero-coupon bonds. I exclude Rule 144A securities and private placements, as well as asset-backed, convertible, exchangeable, and structured issues. The construction code reads the FISD foreign-currency flag but does not use it as a screen; the sample is therefore not restricted to dollar-denominated bonds.

I retain TRACE reports with prices from 5 to 1,000 per 100 of par value, volume of at least \$10,000, and at least one year remaining to maturity. I remove equity, equity-linked, agency, and charitable reports; when-issued and locked-in reports; trades with special sale conditions or modification codes; and as-of reversals. I also require permitted sale-condition codes and trade-status values T, W, or R.

For 2005–2019, the input is the file labeled WRDS Clean Enhanced TRACE. For 2020–2024, I use a separate TRACE extract. The code scans this extract for status values outside T, W, and R and stops if it finds any. The available source files do not document the later extract's full correction and reversal history. Although Dick-Nielsen (2014) describes procedures for reconciling these reports, the project code does not independently reconstruct the message histories for 2020–2024. The status checks alone therefore do not establish that the later extract has undergone the full procedure.

For each bond and trading day, I calculate the volume-weighted average clean price from the retained reports. The monthly price is the last observed daily price in that month; prices are not carried forward across months. I calculate returns only when prices are observed in consecutive calendar months. The resulting panel contains 1,754,371 bond-month observations from January 2005 through December 2024. For Tables 1 and 2, return and spread observations require a verified regular coupon schedule for a fixed-rate or zero-coupon bond. I exclude observations on or after a recorded default date and spreads below -100 or above 3,500 basis points.