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The Defeasance of Control Rights

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ABSTRACT

We analyze one frequently used clause in public bonds called *covenant defeasance*. Covenant defeasance allows the bond issuer to remove all of the bond's covenants by placing the remaining outstanding payments with a trustee in an escrow account to be paid out on schedule. Bond covenants are predominantly noncontingent, action-limiting covenants. By giving the issuer an option to remove covenants, noncontingent control rights can be made state-contingent even when no interim signals are available. We provide a theoretical justification for covenant defeasance and show empirically that such a clause allows for the inclusion of more covenants in public bond issues. In line with the model's prediction, our empirical analysis documents a 13-25 basis points premium for defeasible bonds. This premium amounts to an annual saving of about $1m per year, or $11m over the lifetime of an average bond.

JEL Classification Nos.: G32, D86, G12

Keywords: Bonds, Covenants, Defeasance, Renegotiation

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We analyze one frequently used clause in public bonds called *covenant defeasance.* Covenant defeasance allows the bond issuer to remove all of the bond's covenants by placing the remaining outstanding payments with a trustee in an escrow account to be paid out on schedule. Bond covenants are predominantly noncontingent, action-limiting covenants. By giving the issuer an option to remove covenants, noncontingent control rights can be made state-contingent even when no interim signals are available. We provide a theoretical justification for covenant defeasance and show empirically that such a clause allows for the inclusion of more covenants in public bond issues. In line with the model's prediction, our empirical analysis documents a 13-25 basis points premium for defeasible bonds. This premium amounts to an annual saving of about $1m per year, or $11m over the lifetime of an average bond.

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1 Introduction

In their seminal articles, Jensen and Meckling (1976) and Myers (1977) argue that incentive conflicts between equity and debt holders increase the firm's cost of debt. A solution proposed by Myers (1977) and Smith and Warner (1978) to overcome this problem is to restrict the actions of a firm's equityholders by adding debt covenants. The commitment value of these covenants comes at the cost of reduced flexibility for the firm. This may force the firm to forgo value-increasing investment projects (Chava and Roberts (2008)) unless these covenants are waived or removed. In contrast to privately held loans, removing or renegotiating public bond covenants is extremely difficult (Roberts and Sufi (2009) and Bradley and Roberts (2003)). One reason for this is the Trust Indenture Act (TIA) of 1939 that requires the consent of the holders of two thirds of the principal amount of outstanding debt to modify a covenant (Smith and Warner (1978)). Indeed, Bradley and Roberts (2003) state "public debt issues contain covenants that are virtually impossible to negotiate and especially to renegotiate." This view is shared by Bolton and Jeanne (2007) and Brunner and Krahnen (2008) who demonstrate that debt renegotiation is more complex when there are many lenders involved.

In this paper we show that one way to alleviate the incentive problem between debt and equity without foregoing investment opportunities is to grant the issuer an option to remove covenants ex post (covenant defeasance). The option's strike price is to be chosen optimally so that covenants are only removed when it is efficient. We present a theoretical model to analyze the role of this defeasance option in bond contracts and provide empirical evidence that such options are included in more than 60% of all US corporate bond issues. We document that investors are willing to pay a premium of 13-25 basis points for defeasable bonds. This amounts to an annual saving of about US $1m per year on average, implying savings of US $11m over the lifetime of an average bond.

Ideally one would like to design debt covenants that allow firms flexibility to pursue all value-increasing investments while ensuring that equity holders do not take actions detrimental to bondholders. In practice, however, it is not easy to distinguish between the two. Imagine a firm that wants to sell some of its assets. Such asset sale is beneficial to all parties in some states of the world but detrimental to bondholders in some other states. A covenant that forbids asset sale altogether would protect the lender from potential risk-shifting. The firm would trade off valuable investment opportunities since violation of the covenant would trigger default. If there were verifiable signals that could identify states in which asset sales would compromise a lender's interest, then this tradeoff can be reduced by making the asset sale covenant contingent on these signals. However, it is often the case that no meaningful interim signal is available to predict opportunistic behavior by the issuer. Then the lender may have no choice but to demand unconditional covenants from the borrower. These covenants may prohibit asset sales, new debt issues and dividend payments. Such non-contingent covenants are frequently included in public bond issues. Using these covenants, however, results in value losses since the firm may have to forgo valuable investment opportunities ex post.

In this paper we study a mechanism that may help to alleviate the problems of non-contingent covenants. The basic idea for our model is as follows: to reduce its cost of capital, a firm might give certain control rights to a financier. The firm would prefer to transfer state-contingent control rights. However, if there is no verifiable interim signal to identify the states of the lender's concern, then the issuer may have to grant the financier unconditional control rights. If the firm wants to implement a value increasing investment later, the "owners" of these control rights will be able to capture the surplus associated with this investment, as they can hold up the firm ex post. However, if the issuer is granted an appropriately structured option ex ante to take control ex post, then this hold-up problem can be overcome. The option, if properly designed, will be exercised only in states in which the investment opportunity is value-increasing. By giving a firm the option to take back control, non-contingent control rights can be made state-contingent even when no interim signals are available. We show that (i) with such an option, a firm is willing to give away more control rights (covenants) to the financier; (ii) the exercise price will be set to ensure that the option is exercised only when doing so is efficient; (iii) it is not be optimal to include this option for all issuers; (iv) issuers of debt with a defeasance option will be charged lower rates by lenders.

We examine empirical evidence for the use of such options. We use the Fixed Income Securities Database (FISD) to look at all US corporate bonds issues over 1989 - 2006. More than 90% of all issues contain at least one covenant. Almost all bond covenants that we observe are negative covenants, i.e. non-contingent covenants that restrict certain actions by issuers, such as asset sales and additional debt issuance. We find that more than 60% of all US corporate bonds include option style provisions that closely resemble those analyzed in our model. These options (called covenant defeasance clauses) allow the bond issuer to remove covenants, as predicted by our model. The price to be paid for defeasance is a sum of cash or US government securities equal to the remaining outstanding coupon and principal. This amount has to be placed in an escrow account with a trustee, essentially making the issue risk-free. This is consistent with our prediction that the option needs to be costly so that it will not be exercised opportunistically. We also find, in line with the model, that not all corporate bonds include this option. Those that do exhibit characteristics predicted by our model. We further document that issues with defeasance options include more covenants than those without. This finding supports our theory that a covenant defeasance option in the contract induces the firm to give away more control rights to the financier.

When we examine the impact of the defeasance option in the data on bond yields we find that the inclusion of defeasance leads to a 13-25 basis points reduction of yields. We include several robustness checks to test whether underwriters include defeasance in a boiler-plate fashion and find that this is not the case. Since a borrower's ability to call the issue without restrictions could act as a substitute for defeasance, we examine the conditions under which these issues are callable. We report that 65% of all issues that include a defeasance provision in our sample are also callable. We find that these issues either have to be called at a premium over par or have an initial quiet period and thus are not perfect substitutes for defeasance. Hence in the context of our sample callability is an option on interest rates, while defeasance is an option on covenants.

The importance of defeasance options has been highlighted in a recent paper by Kahan and Rock (2009) on contemporary hedge fund activism. The authors demonstrate the recent emergence of a class of hedge funds that acquire public bonds in anticipation of opaque violations of negative covenants by issuers and then enforce those covenants at significant profits. The authors argue that prior to this contemporary hedge fund activism there has been under-enforcement of negative covenants by the trustees of public bonds. Kahan and Rock (2009) predict that the stricter enforcement of negative covenants in public bonds by hedge funds will result in more defeasance option exercise by issuers in advance of a negative covenant violation and a higher usage of defeasance options in public bond contracts.

Johnson, Pari, and Rosenthal (1989) and Hand, Huhges, and Sefcik (1990) investigate the use "in-substance defeasance"on bond and equity prices. "In-substance defeasance"is a situation where the bond issuer does not have a defeasance option but places securities with a trustee in order to mimic regular defeasance. This type of defeasance does not free the firm from any covenants but may improve balance sheet ratios. Both find positive reactions of bond prices to "in-substance defeasance"but no movement in equity prices.

Our theory builds on Aghion and Bolton (1992), Aghion and Tirole (1997), Fluck (1998) and Chemla, Habib, and Ljungqvist (2007). In their pioneering article, Aghion and Bolton (1992) establish that contingent control rights can increase a firm's pledgeable income and alleviate the conflict between shareholders and bondholders. Extending the their work, Aghion and Tirole (1997) demonstrates how multiple control rights can be optimally allocated between an agent and a principal. Chemla, Habib, and Ljungqvist (2007) illustrates how particular allocations of multiple control rights can increase a firm's pledgable income and enable it to raise venture capital financing. For unconditional control rights, Fluck (1998) shows that granting the financier such rights can further increase a firm's pledgeable income but only if the contract is of indefinite maturity. In this paper we demonstrate that when the issuer holds a defeasance option, granting the financier unconditional control rights can increase a firm's pledgeable income even when the contract has a specific expiration date. We also expand on Aghion and Tirole (1997) and show how the number of control rights assigned to the principal can be made endogenous.

The fact that loan and bond covenants influence a firm's strategy is well documented by Chava and Roberts (2008) and Billet, King, and Mauer (2007). Chava and Roberts (2008) show how capital investment decreases sharply following the violation of a positive covenant (a covenant specifying a threshold level for net worth, interest coverage or some financial ratio), in particular, for firms with more severe agency problems. Unlike the positive covenants common in bank loans most bond covenants are so-called negative or action-limiting covenants (these covenants forbid the firm to take certain actions, such as asset sales, mergers, dividend payments). In this paper we focus on the impact of negative or action-limiting covenants in bonds and document how defeasance options can alleviate the underinvestment problem associated with these covenants.

Fudenberg and Tirole (1990) and Hermalin and Katz (1991) model the impact of renegotiation on outcomes. Aghion and Rey (1994) show how renegotiation design can influence the efficiency of outcome. Garleanu and Zwiebel (2008) explicitly model bond covenants and show that under asymmetric information more covenants are allocated to bondholders than under symmetric information. The costs of technical violations of covenants can be quite substantial for firms and can be between 0.84 to 1.63% of a firm's market value according to Beneish and Press (1993). These costs are a lower bound as technical violations are followed by inclusion of more restrictive covenants. Roberts and Sufi (2009) show that bank loans are frequently renegotiated and emphasize the fact that covenants can determine parties' outside options during renegotiation. Our contribution is to show a mechanism to efficiently remove some features of public bonds when ex post renegotiation is not possible because of the large number of dispersed investors.

The commitment value of public bonds relative to bank loans has been documented extensively in the corporate and emerging markets literature: Brunner and Krahnen (2008) and Bolton and Jeanne (2007) respectively show that debt restructuring becomes more difficult the more lenders are involved. The results documented by Roberts and Sufi (2009) that a large fraction of all loan contracts are renegotiated prior to maturity can therefore not easily be transferred to public bonds. We present a different method of solving this issue: giving the issuer the option ex ante to optimally remove covenants ex post. We demonstrate that firms with defeasance options are willing to accept more covenants and document it on our data.

Our model also contributes to the literature on hold-up problems in financial contracts. Our paper is mostly closely related to Nöldeke and Schmidt (1995) that shows how option contracts can overcome hold-up problems induced by contractual incompleteness. We show how option contracts can be used to ensure that control is de-facto state contingent even if there is no interim signal available to verify the state. We also show how the use of defeasance options can alleviate the hold-up problem associated with public bond covenants.

Commercial mortgage backed securities are similar to public bonds since they typically include restrictive covenants (to limit the borrowers' ability to refinance) and also grant the borrower a defeasance option. In line with our predictions, Dierker, Quan, and Tourous (2005) reports evidence on a sample of defeasance exercise in commercial mortgage backed securities that the value of the option to defease critically depends on the rate of return that can be earned on the released equity, the prevailing interest rate conditions and the contractual features of the option.

2 A Model of Multiple Control Rights.

We present a simple model to study the assignment and exercise of multiple control rights when there is no verifiable intermediate signal in the sense of Aghion and Bolton (1992). Our model originates in Tirole (2006) which in turn is based on Holmström and Tirole (1997) and is an extension of Aghion and Bolton (1992) and Aghion and Tirole (1997). We will then apply this model to study action-limiting covenants in bond contracts (restrictions on asset sales, mergers, or dividend payments).

2.1 Players and Technology.

There is a firm that has an investment project. This project requires an investment outlay, I and generates a return Y which is either 0 in case of failure, or R, $R >> 0$. The firm does not have the funds needed to fund the investment. It can only invest $A < I$ and needs a financier for the remainder, $I - A$.

Once the investment is sunk, the manager has to decide on how much effort to exert. The effort choice is a binary variable, $e \in \{0, 1\}$. Exerting no effort ($e = 0$) gives the manager some private benefit, Q but yields zero return with higher probability. After effort has been exerted, but before the final returns are realized, a signal $s \in \{L, H\}$ is observed. This signal is a sufficient statistics for the effort exerted and also indicative of the project's success.

There are 1 to K decisions that can be implemented after the signal is observed. The financial contract assigns control over each decision to one of the two parties. If the financier is assigned decision k, then implementing this decision k results in an increase in the final probability of success τ_k, and of the repayment of debt. However, it costs the firm a "private" disutility γ_k in private benefits of control or unexploited or expired growth opportunities. In the context of bond contracts decisions 1 through k can be interpreted as covenants on asset sales, dividend payments, acquisitions, mergers, new debt issues, etc. If, for example, the bond contract contains a covenant forbidding asset sales, and/or dividend payments, then in the model control over decisions involving asset sales and/or dividend payments is assigned to the bondholders. If renegotiation is infeasible, which is the typical case in dispersedly held public bonds, then a decision assigned to public bondholders is implemented with probability 1, i.e. it commits the firm to give up the option to sell assets or pay dividends until the bond is paid off. The firm benefits from giving up dividend payments, new debt issues, etc. during the life of the bond because this commitment increases the likelihood of the repayment of the bond for the lender and thereby increases the ex ante pledgeable income of the firm. The cost for the firm is a combination of private benefits of control and unexploited or expired growth opportunities.

Following Tirole (2006) we assume that the cost and benefit is independent of the signal realization and rank the decisions by their benefit-to-cost ratio, $\frac{\tau_k R}{\gamma_k}$ with the convention that decision 1 has the highest such ratio. Implementing a particular decision, k by the financier is efficient if and only if $\frac{\tau_k R}{\gamma_k} \geq 1$. We denote by k^* the last (first best) efficient decision (the last decision for which $\frac{\tau_k R}{\gamma_k} \geq 1$ while $\frac{\tau_{k+1} R}{\gamma_{k+1}} < 1$). We denote by d_k the probability of implementing decision k. If renegotiation is infeasible, then a decision assigned to public bondholders is implemented with probability 1.

The ex ante chances of success are formally dependent on effort, interim states and decisions as follows:

$$\begin{aligned} Prob(s|e = e_H) &= \sigma_{Hs} \\ Prob(s|e = e_L) &= \sigma_{Ls} \\ Prob(Y = R|s) &= \nu_s + \sum_{k=1}^{K} d_k \tau_k \end{aligned}$$

Effort is neither observable nor verifiable. Final returns are verifiable. The interim state of the world $s = \{L, H\}$ is not verifiable, although it is observable by both parties.

We assume that without effort, the project has a negative NPV. In addition, we focus on projects for which pledgeable income is insufficient to raise the necessary financing and therefore allocations of control rights are critical. We restrict our attention to projects that satisfy

A1: $A < I - \left(\sigma_{HH}\nu_H + (1 - \sigma_{HH})\,\nu_L + \sum_{k=1}^{k^*} \tau_k d_k\right)\left(R - \frac{Q}{\Delta\sigma\Delta\nu}\right).$

As shown later, assumption A1 implies that the ex-ante expected pledgeable income of the project is not sufficient to compensate investors if they are limited to control only efficient decisions.

2.2 Control Allocation without Defeasance.

Suppose that the financial contract can only specify a final repayment from the firm to the financier and each decision k to be implemented with probability d_k (independent of the interim signal). For the moment we rule out the possibility of interim renegotiation. Under the choice of high effort the firm's payoff is:

$$\max_{R_b, d_k} \quad \sigma_{HH}\left(\left(\nu_H + \sum_{k=1}^{K} \tau_k d_k\right)(R - R_b) - \sum_{k=1}^{K} \gamma_k d_k\right) + (1 - \sigma_{HH})\left(\left(\nu_L + \sum_{k=1}^{K} \tau_k d_k\right)(R - R_b) - \sum_{k=1}^{K} \gamma_k d_k\right)$$

and the incentive constraint requires that:

$$\sigma_{HH}\left(\left(\nu_H + \sum_{k=1}^{K} \tau_k d_k\right)(R - R_b) - \sum_{k=1}^{K} \gamma_k d_k\right) + (1 - \sigma_{HH})\left(\left(\nu_L + \sum_{k=1}^{K} \tau_k d_k\right)(R - R_b) - \sum_{k=1}^{K} \gamma_k d_k\right) \geq$$

$$\sigma_{LH}\left(\left(\nu_H + \sum_{k=1}^{K} \tau_k d_k\right)(R - R_b) - \sum_{k=1}^{K} \gamma_k d_k\right) + (1 - \sigma_{LH})\left(\left(\nu_L + \sum_{k=1}^{K} \tau_k d_k\right)(R - R_b) - \sum_{k=1}^{K} \gamma_k d_k\right) + Q$$

which simplifies to

$$(R - R_b) \geq \frac{Q}{\Delta\sigma\Delta\nu}. \tag{IC}$$

The financier accepts the contract if and only if:

$$\sigma_{HH}\left(\nu_H + \sum_{k=1}^{K} \tau_k d_k\right) R_b + (1 - \sigma_{HH})\left(\nu_L + \sum_{k=1}^{K} \tau_k d_k\right) R_b \geq I - A \tag{IR}$$

The optimal contractual arrangement maximizes the firm's payoff subject to (IC) and (IR). Forming the Lagrange function (where α, and λ, are the multipliers of the (IC), and (IR) constraints, respectively). Taking its partial derivatives yields

$$\frac{\partial L}{\partial R_b} = (\lambda - 1)\left(\sigma_{HH}\nu_H + (1-\sigma_{HH})\nu_L + \sum_{k=1}^{K}\tau_k d_k\right) - \alpha$$
$$\frac{\partial L}{\partial d_k} = \tau_k R - \gamma_k + (\lambda - 1)\tau_k R_b$$

It cannot be that $\alpha = 0$, otherwise $\lambda = 1$, $R_b = R - \frac{Q}{\Delta\sigma\Delta\nu}$ and only the first-best efficient decisions are implemented with probability 1. But if this is the case, the financier can at best get:

$$\left(\sigma_{HH}\nu_H + (1-\sigma_{HH})\nu_L + \sum_{k=1}^{k^*}\tau_k d_k\right)\left(R - \frac{Q}{\Delta\sigma\Delta\nu}\right) < I - A$$

as implied by **A1.**

If $\alpha > 0$, then $\lambda > 1$ and a decision is implemented if and only if:

$$\frac{\tau_k R}{\gamma_k} \geq 1 - (\lambda - 1)\frac{\tau_k R_b}{\gamma_k}.$$

This indicates that the optimal contractual arrangement involves some inefficient control allocations. To increase pledgeable income the firm needs to give up control of some decisions that would be efficient to keep within the firm, i.e. decisions for which $1 > \frac{\tau_k R}{\gamma_k} \geq 1 - (\lambda - 1)\frac{\tau_k R_b}{\gamma_k})$.

A particular mechanism to implement this outcome is to give the financier control over decisions $k = 1, ...\widetilde{k}$ (with $\widetilde{k}$ being the last decision so that $\frac{\tau_{\widetilde{k}} R}{\gamma_{\widetilde{k}}} \geq 1 - (\lambda - 1)\frac{\tau_{\widetilde{k}} R_b}{\gamma_{\widetilde{k}}}$) while the firm keeps control of all other decisions. Until now the argument follows Tirole's (2006) analysis and we record this as a result:

Result 1: If the interim state of the world is non-verifiable, and in the absence of renegotiation, allocating control over decisions 1 to $\widetilde{k}$ to the financier, and the firm controlling the other decisions is optimal. Moreover, $\widetilde{k} \geq k^*$. This inequality is strict when the differences between $\frac{\tau_k R}{\gamma_k}$ and $\frac{\tau_{k+1} R}{\gamma_{k+1}}$ are small enough.

Thus, the financier is granted more control rights than the first-best solution suggests if the interim state of the world is non-verifiable. In this case the only way to increase pledgable income is to impose an additional cost on the firm/manager. This of course results in an inefficiency since the manager and/or the firm loses some private benefits and/or future growth opportunities.

Note that in the context of bond covenants with no possibility of renegotiation, $d_k = 1$ if a particular decision k is under the financier's control. This is equivalent to saying that if the financier is allocated control over certain decisions such as asset sales, new debt issues, and/or dividend payments, then these actions are forbidden or restricted by the covenants placed in the bond. For example, if a covenant stipulates that the firm cannot issue new debt until the bond is paid off and there is no possibility of renegotiation, then the firm cannot make a decision to issue new debt until the bond is paid off.

For the rest of the analysis we assume that there are sufficiently many control rights that can be allocated between the issuer and the financier so the differences between $\frac{\tau_k R}{\gamma_k}$ and $\frac{\tau_{k+1} R}{\gamma_{k+1}}$ are small enough for $\widetilde{k} \geq k^*$ to hold for strict inequality.

2.3 Control Allocation with Defeasance.

Efficiency may be increased if the allocation of control rights could differ across states. We consider this case next. Denote by d_k^ω the probability that the financier controls decision k in state $\omega = H, L$. Then, the optimization problem becomes:

$$\begin{aligned}\max_{R_b, d_k^H, d_k^L} \quad & \sigma_{HH} \left(\left(\nu_H + \sum_{k=1}^{K} \tau_k d_k^H \right) (R - R_b) - \sum_{k=1}^{K} \gamma_k d_k^H \right) + \\ & (1 - \sigma_{HH}) \left(\left(\nu_L + \sum_{k=1}^{K} \tau_k d_k^L \right) (R - R_b) - \sum_{k=1}^{K} \gamma_k d_k^L \right)\end{aligned}$$

and the incentive constraint requires that

$$\begin{aligned}& \sigma_{HH} \left(\left(\nu_H + \sum_{k=1}^{K} \tau_k d_k^H \right) (R - R_b) - \sum_{k=1}^{K} \gamma_k d_k^H \right) + \\ & (1 - \sigma_{HH}) \left(\left(\nu_L + \sum_{k=1}^{K} \tau_k d_k^L \right) (R - R_b) - \sum_{k=1}^{K} \gamma_k d_k^L \right) \geq\end{aligned}$$

$$\begin{aligned}& \sigma_{LH} \left(\left(\nu_H + \sum_{k=1}^{K} \tau_k d_k^H \right) (R - R_b) - \sum_{k=1}^{K} \gamma_k d_k^H \right) + \\ & (1 - \sigma_{LH}) \left(\left(\nu_L + \sum_{k=1}^{K} \tau_k d_k^L \right) (R - R_b) - \sum_{k=1}^{K} \gamma_k d_k^L \right) + Q\end{aligned}$$

which simplifies to

$$\Delta\sigma \left(\Delta\nu \left(R - R_b \right) + \sum_{k=1}^{K} \tau_k \left(d_k^H - d_k^L \right) \left(R - R_b \right) - \sum_{k=1}^{K} \gamma_k \left(d_k^H - d_k^L \right) \right) \geq Q.$$

The financier's IR constraint can be similarly amended. It is straightforward to check that the partial derivatives of the Lagrange function now become:

$$
\begin{aligned}
\frac{\partial L}{\partial R_b} &= (\alpha-1)\left(\sigma_{HH}\left(\nu_H+\sum_{k=1}^{K}\tau_k d_k^H\right)+(1-\sigma_{HH})\left(\nu_L+\sum_{k=1}^{K}\tau_k d_k^L\right)\right)- \\
&\quad \lambda\left(\Delta\sigma\Delta\nu+\Delta\sigma\sum_{k=1}^{K}\tau_k(d_k^H-d_k^L)\right) \\
\frac{\partial L}{\partial d_k^H} &= \tau_k R-\gamma_k+(\alpha-1)\tau_k R_b+\lambda\frac{\Delta\sigma}{\sigma_{HH}}\left(\tau_k\left(R-R_b\right)-\gamma_k\right) \\
\frac{\partial L}{\partial d_k^L} &= \tau_k R-\gamma_k+(\alpha-1)\tau_k R_b-\lambda\frac{\Delta\sigma}{1-\sigma_{HH}}\left(\tau_k\left(R-R_b\right)-\gamma_k\right)
\end{aligned}
$$

Our first lemma establishes the optimal allocation of state-contingent control rights in the good state of nature.

Lemma 1: For the optimal allocation of state-contingent control rights in state H, it must be the case that $d_k^* \geq d_k^{H^*}$. Or, equivalently, $\widetilde{k} > k^* \geq k_H^*$. The inequality will be strict if differences between $\frac{\tau_{k^*}R}{\gamma_{k^*}}$ and $\frac{\tau_{k^*-1}R}{\gamma_{k^*-1}}$ are small enough.

Proof: See Appendix.

This lemma states that if control rights could be made contingent on states, the financier would not receive all efficient control rights. The reason for this apparent inefficiency is that the firm does not reap all financial benefits from implementing decisions $k_H^* - k^*$ but has to bear all the costs. Thus, seen from the firm's point of view it is only efficient to give away k_H^* decisions.[1] The inequalities in Lemma 1 will be strict if differences between $\frac{\tau_{k^*}R}{\gamma_{k^*}}$ and $\frac{\tau_{k^*-1}R}{\gamma_{k^*-1}}$ are small enough. For the rest of the analysis we assume that this is the case.

Our second lemma establishes the optimal allocation of state-contingent control rights in state L.

Lemma 2: For the optimal allocation of state-contingent control rights in state L, it must be the case that for all $k = 1...k_L^*$, $d_k^{L^*} = 1$. Moreover, $k_L^* \geq k^*$. This inequality is strict if differences between $\frac{\tau_{k^*}R}{\gamma_{k^*}}$ and $\frac{\tau_{k^*+1}R}{\gamma_{k^*+1}}$ are small enough.

Proof: See Appendix

Notice that the two lemmas imply that $k_L^* > k_H^*$ when differences between $\frac{\tau_{k^*}R}{\gamma_{k^*}}$, $\frac{\tau_{k^*-1}R}{\gamma_{k^*-1}}$ and $\frac{\tau_{k^*+1}R}{\gamma_{k^*+1}}$ are small enough. Hence, the optimal contract implies that the firm has to give away more control rights in the bad than in the good state of nature or under the first-best. Thus, in the good state of nature, the optimal contract would assign the financier fewer control rights than the first best would dictate, and in the bad state more. In other words, if it were possible

[1] Note that this also means that there is no point in trying to renegotiate this, as the financier will not be able to compensate the firm for its loss of private benefits.

to make control rights state contingent, the financier would hold *more* control in the bad state of nature. In context of public bond contracts, our model implies that if it were possible to make action-limiting covenants state-contingent, then it would be optimal to include more action-limiting covenants in the bad state and fewer in the good state.

We refer to $\{k_H^*, k_L^*\}$ as the constrained-efficient decision rule. It is the decision rule that would be efficient to implement, contingent on the realization of ω, when at the same time the final repayment R_b can only depend on the realization of the final returns Y. Proposition 1 describes a mechanism to implement the desired allocation of control.

Proposition 1: If the interim state is non verifiable, the following mechanism can implement the constrained-efficient decision rule:

- give control to the financier over k_L^* decisions;
- give an option to the firm to buy back control over decisions k_H^* to k_L^*. The cost of exercising this option must be chosen so that the firm can only exercise this option if $\sigma = H$;
- if $k_H^* = 0$, the firm must have the option to buy back control over *all* decisions.

The implication of Lemma 1 and Lemma 2 is $k_H^* < k_L^*$. Notice that a sufficient condition for $k_H^* = 0$ is that $0 \geq \tau_k R - \gamma_k$ for all k, i.e. it is efficient to leave control with the issuer in state H, that is, to remove all covenants in state H.

What is the optimal exercise price of the option to buy back control? Suppose first that the firm has no cash, so that the exercise price is paid by an increase in the financier's share of returns (i.e. an increase in R_b). We call r_b this increase.

The first observation is that the value of buying back control over any decision must be independent of the state. Indeed, the firm's value of removing any decision, k is equal to $\tau_k(R - R_b) - \gamma_k$ regardless whether the state is H or L. What is affected by the interim state of nature is the firm's ability to exercise the option. Secondly, the financier's loss of giving up control of any decision k, $\tau_k R_b$, is also independent of the state nature. The third observation is that if the firm needs to pay some amount P to exercise the option and has no cash of its own, then it can raise up to $(\nu_H + \sum_{k=1}^{K} \tau_k d_k^H) r_b$ in state H when buying back control over decisions k_L^* to k_H^*. If the firm were to exercise the option in state L, it would be able to raise $(\nu_L + \sum_{k=1}^{K} \tau_k d_k^H) r_b$, a lesser amount. Notice that because this option can only be exercised at date 1, after the effort choice has been irrevocably made, the firm can tap into a "fresh" new debt capacity. Proposition 2 characterizes the optimal exercise price of the option.

Proposition 2: An option to take control of *all* decisions k_H^* to k_L^* at price P such that

$$(\nu_H + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b) \geq P \geq (\nu_L + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b) \tag{1}$$

and

$$P \geq \sum_{k=k_H^*}^{k_L^*} \tau_k R_b \tag{2}$$

implements the constrained-efficient decision rule[2] if $(\nu_H + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b) \geq \sum_{k=k_H^*}^{k_L^*} \tau_k R_b$.

Note that if $\sum_{k=k_H^*}^{k_L^*} \tau_k R_b > (\nu_H + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b)$, then there does not exist any exercise price at which the financier would give up control over decisions k_H^* through k_L^*.

Importantly, the option must be restricted to buy back control rights over *all* decisions k_H^* to k_L^*. No "unbundling" of this option should be allowed ex ante. If the firm were allowed to remove individual covenants at lower prices, it would be able to do so even in state L when it can only raise lesser funds. Hence, Proposition 2 must hold for individual covenants.

Corollary 1: It is in the lender's best interest to price the removal of *any individual covenant* so that the borrower can only afford it in state H. That is, if

$$(\nu_H + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b) \geq \sum_{k=k_H^*}^{k_L^*} \tau_k R_b,$$

then, $\forall k \in \{k_L^*, k_H^*\}$

$$(\nu_H + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b) \geq P_{\hat{k}} \geq (\nu_L + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b) \tag{3}$$

and

$$P_{\hat{k}} \geq \sum_{k=k_H^*}^{k_L^*} \tau_k R_b \tag{4}$$

where $P_{\hat{k}}$ denote the exercise price of the option to remove covenant $\hat{k}$.

Whether giving more control rights to the financier together with the option for the firm to remove them is a better arrangement than granting him fewer control rights ex ante with no such option attached depends on the option's exercise price. To see how, we compare the firm's payoff after the realization of each interim state under both mechanisms. As far as the provision of incentives is concerned, it is best that the firm is punished as harshly as possible

[2] Under the standard assumption that indifference are broken in favor of efficiency. If not, the inequalities should be strict.

in state L and is rewarded as generously as possible in state H. The exercise price of the option has no impact on the firm when the option is not exercised, that is in state L. Hence, determining the optimal exercise price, the only consideration is what happens in the H state.

Corollary 2: If $(\nu_L + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b) \geq \sum_{k=k_H^*}^{k_L^*} \tau_k R_b$, then the best option mechanism must have as exercise price $P^* = (\nu_L + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b)$, the minimum price under which the issuer only exercises the option in state H. If the reverse is true, then a higher exercise price is set, $P^* = \sum_{k=k_H^*}^{k_L^*} \tau_k R_b$, to cover the financier's higher costs. Hence,

$$P^* = \max\{(\nu_L + \sum_{k=1}^{k_L^*} \tau_k d_k^H)(R - R_b); \sum_{k=k_H^*}^{k_L^*} \tau_k R_b\}$$

Finally, if $\sum_{k=k_H^*}^{k_L^*} \tau_k R_b \geq (\nu_H + \sum_{k=1}^{K} \tau_k d_k^H)(R - R_b)$, the issuer will not be able to afford the option exercise.

Charging the lowest possible exercise price given the incentive compatibility and individual rationality conditions is the best way to reward the firm in state H. The price cannot be less than P^*, otherwise the option will be exercised all the time. But the need to maximize the firm's reward implies that it should not be more either. So this price works as a cap on the firm's payments, and the firm cannot afford to pay it in state L.

How does a debt contract with covenants and an option to buy back control compare with another that grants irrevocable control rights to the financier? We answer this question in two steps. First we show that when covenants are bundled with an option to remove them, the issuing firm is willing to grant more control to the financier. Second we establish that the yield on covenant bonds which include this option is lower than the yield on bonds which grant irrevocable control rights to the financier.

Proposition 3: When the firm is given the option to buy back control over decisions k_H^* to k_L^*, then the firm will grant the financier control over at least as many decisions ex ante as in the absence of this option: $k_L^* \geq \widetilde{k}$. This inequality is strict if differences between $\frac{\tau_{k_L^*} R}{\gamma_{k_L^*}}$ and $\frac{\tau_{k_L^*-1} R}{\gamma_{k_L^*-1}}$ are small enough.

Proof: See Appendix.

Proposition 3 implies that in state L, the firm is more harshly punished with the option mechanism. The option is not exercised in state L and the financier has more control in this state and implements more decisions. The main empirical implication of Proposition 3 is a positive association between the number of rights given to the financier and the inclusion of an option to buy back control, that is, $k_L^* > \widetilde{k}$.

Proposition 2 and Corollary 2 establish the price at which the firm can only afford to exercise the option to remove covenants in the H state. Given the exercise price, the firm may or may not exercise the option in the H state, however. Whether the firm exercises the option ex post depends on the gains from controlling decisions k_H^* and k_L^* and the cost of the exercise. Proposition 4 identifies conditions under which the option to take control will be exercised by the issuer in state H.

Proposition 4: The option to take back control of decisions k_H^* through k_L^* will be exercised by the issuer in state H, if

$$\sum_{k_H^*}^{\widetilde{k}} \gamma_k d_k^H \geq \max\{(\nu_L + \sum_{k=1}^{k_L^*} \tau_k d_k^H)(R - R_b); \sum_{k=k_H^*}^{k_L^*} \tau_k R_b\} \tag{5}$$

Proof: See Appendix.

The option to buy back control will be exercised by the issuer ex post if the exercise is affordable, i.e. if the growth opportunity, γ_k, from controlling decisions k_H^* through k_L^* is large enough, and/or the probability of success in state L, $(\nu_L + \sum_{k=1}^{k_L^*} \tau_k d_k^H)$, is relatively small and so is the financier's benefit of controlling these decisions in the high state. The issuer will not exercise the option if the gain from controlling decisions k_H^* to k_L^* is relatively small, and/or the probability of success in state L is large, i.e. when the benefits of being in state H are less pronounced.

The next step is to compare the yields for the optimal bonds with state-contingent and irrevocable covenants. Assume, as before, that the interim state is non-verifiable. Let B^{**} denote the optimal one among bonds with state-contingent covenants and let B^* stand for the optimal bond among those with non-contingent covenants. Then,

Proposition 5: The bond with the option to remove covenants, B^{**}, demands a lower yield than B^*, the bond with irrevocable covenants if

$$\sum_{k_H^*}^{\widetilde{k}} \gamma_k d_k^H \geq \max\{(\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H)(R - R_b); \sum_{k=k_H^*}^{k_L^*} \tau_k R_b)\} \tag{6}$$

and

$$(\nu_H + \sum_{k=1}^{k_L^*} \tau_k d_k^H)(R - R_b) \geq \sum_{k=k_H^*}^{k_L^*} \tau_k R_b \tag{7}$$

hold.

Proof: See Appendix.

Proposition 5 establishes that investors are willing to pay a premium for bonds that include the option to buy back control. The intuition for the premium is twofold. First, the optimal bond with the option to remove covenants, B^{**} includes more covenants than the optimal bond with irrevocable control rights, B^{*}, i.e. $k_L^* \geq \widetilde{k}$ as shown by Proposition 3. Secondly, when the issuer exercises the option to take control in the good state and pays the exercise price, $\max\{(\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H)(R - R_b); \sum_{k=k_H^*}^{k_L^*} \tau_k R_b)\}$, it is as if the bond is (partially) prepaid in the good state, so that the expected risk borne by the financier is reduced ex ante. The option will not be exercised in state H unless both (6) and (7) hold.

Next we compute the difference in yields between bonds with irrevocable and defeasible covenants by decomposing it into economically meaningful parts. Let $h = R_{b^*} - R_{b^{**}}$ denote the yield difference between a bond with irrevocable and defeasible covenants. Define $\overline{\nu} = \sigma_{HH}\nu_H + (1 - \sigma_{HH})\nu_L$ and assume in line with our previous discussion on bond covenants that $d_k = 1$. As in Corollary 2 P* stand for the exercise price of the option for removing covenants.

Proposition 6: The yield difference can be decomposed as

$$h = \frac{\sigma_{HH} P^* - \sigma_{HH} \sum_{k=k_H^*}^{\tilde{k}} \tau_k R_{b^{**}} + (1 - \sigma_{HH}) \sum_{k=\tilde{k}}^{k_L^*} \tau_k R_{b^{**}}}{\overline{\nu} + \sum_{k=1}^{\tilde{k}} \quad \tau_k} \tag{8}$$

where the first term in the numerator is the product of the option's exercise price that the lender receives in the good state and the probability of the exercise; the second term is the product, with a negative sign, of the value for the lender of keeping covenants k_H^* through $\tilde{k}$ in the good state and the probability of the state; and the third term is the product of the financier's expected gain from holding additional control rights in state L and the probability of that state. The payments are scaled by the probability of repayment (the denominator).

Proof: See Appendix.

Proposition 6 demonstrates that the premium that investors are willing to pay for a defeasible bond depends on three factors. As the decomposition shows, it depends positively on the expected exercise price, negatively on the financier's expected loss from giving up covenants in state H, and positively on the financier's expected gain from holding additional control rights in state L. (As per Proposition 5, the sum of the first and third component more than offsets the second component.)

Thus, the lender is willing to pay a premium for a defeasible bond because in state H the issuer will exercise the defeasance option and will partially pre-pay the bond making it less risky for the lender, and in state L the issuer will comply with more covenants than otherwise.

One question of course remains. If defeasable bonds enjoy premia, would the issuer prefer to include defeasance options in all bonds? Proposition 7 shows that this is not the case.

Proposition 7: If either (6) or (7) fails, then the firm prefers to issue a bond with irrevocable covenants.

Proof: See Appendix.

Note that if condition (7) fails, then there is no exercise price that the financier can accept and the issuer can afford. If condition (6) fails, then there is an exercise price that the financier would accept and the issuer could afford in state H. However, the issuer will never exercise at this price because the value of the private benefits or growth opportunities from controlling these decisions is not worth the exercise price.

Proposition 7 demonstrates that not all bonds will include an option to buy back covenants. If $\sum_{k_H^*}^{\widetilde{k}} \gamma_k d_k^H < \max\{(\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H)(R - R_b); \sum_{k=k_H^*}^{k_L^*} \tau_k R_b\}$, then the option to take control will never be exercised, and issuing B^{**} would be inefficient because B^{**} gives away more than the optimal number of decisions. The financier would pay a small premium for this bond (conditional on the incentive compatibility conditions being met) because the financier values control over more decisions in state L. But this premium is not sufficient to compensate the issuer for the disutility of giving up control of these decisions in all states. Hence, firms prefer to issue bonds with irrevocable covenants, B^*, if $\sum_{k_H^*}^{\widetilde{k}} \gamma_k d_k^H < \max\{(\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H)(R - R_b); \sum_{k=k_H^*}^{k_L^*} \tau_k R_b\}$ holds.

Thus, our model predicts that firms with substantial growth options, low pledgeable income and high degree of uncertainty prefer to issue bonds with defeasable covenants.

In summary the predictions of our theoretical model are as follows:

i) If the firm's pledgeable income is limited and in the absence of verifiable signals about the state of nature, the issuer of a bond assigns more control rights to the financier than implied by the first best.

ii) In case a state-contingent, verifiable signal is available, the firm gives away fewer rights in the high state and more rights in the low state than in i) above.

iii) In the absence of a state-contingent, verifiable signal an option given to the firm to buy back control over all decisions k_H^* to k_L^* at a predetermined price P implements the outcome in ii).

iv) There exist conditions under which firms issue bonds with the option to buy back control and conditions under which firms issue bonds with irrevocable covenants. In particular, firms with more substantial growth options, less pledgeable income and higher degree of uncertainty prefer to issue bonds with defeasable covenants, whereas firms with lesser growth opportunities, more pledgeable income and less uncertainty prefer to issue bonds with irrevocable covenants.

v) Bonds that grant the issuer the right to take back control will be issued at a premium relative to other bonds. The premium is partly due to the increased number of decisions controlled by the financier in the low state and partly due to the expected risk reduction by the option exercise in the high state.

In the next part of the paper we test the predictions of the model on a sample of US corporate bonds.

3 Empirical Analysis

In this section we present empirical evidence on covenant defeasance options that are widely used in US corporate bonds. These options are remarkably similar to those predicted in our theoretical model.

In the next subsections we introduce our sample, define covenant defeasance from actual bond contracts, describe how it works in practice, and then test the predictions of our theory.

3.1 The Data Set

We build our data set of about 10,584 corporate bond issues from the Mergent Fixed Investment Securities Database (FISD, described in Mergent (2004)) following Billet, King, and Mauer (2007), Reisel (2004), and Chava, Kumar, and Warga (2007).[3] We use all bond issues from 01/01/1980 to 31/12/2008. We only consider regular US corporate bonds, that is we exclude foreign currency denominated bonds or bonds from international issuers in the US. We exclude all government and municipal bonds and any asset-backed bonds, private placements and convertible bonds. To ensure that we have covenant information available, we do not include medium term notes (MTN) as FISD does not collect covenant information for these types of bonds. Finally, we exclude bonds for which the subsequent information flag in FISD is not set.[4] This leaves 10,584 corporate issues. In a second step we merge this data with balance sheet information taken from Compustat by CUSIP and use the last balance sheet prior to the bond's issuance. The resulting sample has 4,856 observations. We use rating information from FISD to compute the average rating for each traded bond. As most bonds have several ratings available we use the rating closest to the bond issue for each rating agency included in FISD.

3.2 What is defeasance?

Defeasance comes in several flavors. There are two types of defeasance options in corporate bonds. One is an option to remove the bond from the issuer's balance sheet, while the other, more importantly, is to remove the covenants from the bond. The first is called "economic"defeasance, the second is called "legal"or "covenant"defeasance (Johnson, Pari, and Rosenthal (1989) and Hand, Huhges, and Sefcik (1990)).

An exact definition of legal or covenant defeasance is provided by FISD (Mergent (2004)): "[Covenant Defeasance] gives the issuer the right to defease indenture covenants without tax consequences for bondholders. If exercised, this would free the issuer from covenants set forth in the indenture or prospectus, but leaves them liable for the remaining debt. The issuer must also set forth an opinion of counsel that states bondholders will not recognize income for federal tax purposes as a result of the defeasance. [..] defeasance occurs when the issuer places in an escrow account an amount of money or U.S. government securities sufficient to match

[3]See table 10 for more details.

[4]According to FISD this includes bonds that were announced but not subsequently issued for example.

the remaining interest and principle payments of the current issue."We also verified that this definition of legal or covenant defeasance is the one used in real indenture agreements. For one such example please see Coca-Cola (2005).

Hence legal defeasance is defined as the right of the issuer to remove the covenants from the bond in exchange of a pre-specified payment. This is one of the few rights *not* allocated to the bondholder. Mergent (2004) classifies a bond to contain covenant defeasance if the borrower has the option to remove the covenants. In practice, the defeasance option specifies that all covenants be removed at the same time and the defeasance is irrevocable, making the bond riskless. We focus on "legal defesance" in our empirical analysis since this option is the one that is more or less equivalent to the defeasance option derived in our model. It is a special case of the defeasance option derived in our model because in our model all covenants do not have to be removed at the same time. Of course, in our model we only have two states, whereas in practice there are many relevant states of nature for the lender and the borrower. If we define the state in which the removal of all covenants is desirable as state H (which is a special case of the general setup), then the defeasance option in our model will perfectly match the one observed in US corporate bond issues.

Is such an explicit defeasance option necessary? Generally, the answer is yes. "In-substance" defeasance is a potential alternative when the bond issuer does not have a defeasance option. In this case the issuer places securities with a trustee in order to mimic economic defeasance. This type of defeasance however does not free the firm from any covenants but may improve balance sheet ratios (Hand, Huhges, and Sefcik (1990)). The reason for this difference lies in the U.S. Trust Indenture Act that forbids the waiver of covenants without explicit approval from at least two thirds of all bondholders (Smith and Warner (1978)).

We make three key observations from the study of defeasance clauses in US corporate bonds. First, defeasance options in US corporate bonds are very similar to the option to remove covenants predicted in our optimal contracting model. Second, defeasance options in practice specify the removal of all covenants at the same time, similar to our proposition that all state-relevant covenants should be removed together. Third, in line with our model, the defeasance option sets the exercise price ex ante, and sets it high enough so that the exercise can only be afforded in the high state. In practice the issuer deposits cash and marketable securities in an escrow account sufficient to pay the principal off and interest on the bond on the scheduled due dates, thereby making the issue risk-free upon exercise.

In a next step we report summary statistics for our sample. Then we present several hypotheses based on the propositions in our theoretical model. We will show that the inclusion of a defeasance option is positively related to the number of covenants in a bond. We also show that the inclusion of a defeasance clause leads to a decrease in the yield to maturity between 13 to 25 basis points. We will present supporting evidence that underwriters do *not* include defeasance options in a boiler-plate fashion, but seem to add them deliberately and that callability is not a direct substitute for defeasance.

3.3 Summary Statistics

Panel 1 of table 1 shows the distribution of US corporate bonds by issuer. In our sample the majority of issuers has only one bond outstanding but some firms have more than 10 outstanding. In the remainder of table 1 we present summary statistics for our sample of 10,584 bond issues between 1980 and 2008.[5] We divide the full sample into two subsamples of bonds with and without defeasance. The first thing we notice is that covenant defeasance is an important clause, we document it in roughly about 68% of all corporate bonds in our sample. Nevertheless, as predicted in our model, many corporate bonds do not include a covenant defeasance option.

The summary statistics show that bonds with and without covenant defeasance option are substantially different from each other. Bonds with defeasance options have higher yields, lower ratings, higher treasury spreads, and shorter maturities than bonds without a defeasance clause. The difference in yields is about 25 basis points, roughly consistent with 40 basis points difference in the treasury spread. The difference in ratings is roughly three rating categories, the difference in levels is between BBB+ (Baa1) to BBB- (Baa3), measured on a scale that converts ratings into numerical values (AAA=1, C=21). Both subsamples of bonds have covenants attached, however, bonds that include defeasance options seem to include substantially more covenants per bond. This is so by the total number of covenants or by specific subclasses of covenants on asset sale or additional debt, and is consistent with Proposition 3. The majority of bonds in our sample are callable. There seems to be no difference with respect to callability between defeasable and non-defeasible bonds.

3.4 Action-limiting covenants and the covenant defeasance option

In this section we compare covenants in defeasible and non-defeasible bonds. Table 2 shows the use of all covenants in our FISD sample for bonds with and without defeasance. Table 3 presents the definitions for each covenant.

The first part of table 2 shows the unconditional means for all covenants included in the issues in our FISD sample of US corporate bonds. As reported in the table, some covenants are frequent (ir1 Consolidation Merger is present in 90% of the issues), others are rare (bh12 Declining Net Worth has virtually no presence).

As expected, almost all bond covenants are state-independent, negative or action-limiting covenants. In stark contrast to the bank loans in Nini, Smith, and Sufi (2009), in corporate bonds covenants are rarely tied to balance sheet items, in other words, there are very few positive or state-contingent covenants in bonds. For example, in the data of Nini, Smith, and Sufi (2009) 25% of all loans contain Net Worth Covenants, whereas bonds do not contain such clauses. Instead, in corporate bonds we find state-independent restrictions on additional debt

[5] We concentrate on the larger sample of firms that have issued public debt and not only those that are also publicly listed.

issues, asset sales, payout policy and mergers. As our theory predicts, the defeasance option is used in conjunction with state-independent (or unconditional) covenants.

Panels 2 and 3 of table 2 show that bonds with a covenant defeasance option include significantly more covenants than bonds without, although the opposite can (occasionally) also occur. The increase varies across covenants, and is particularly large for some: the asset sale clause (bh18) is included in 6% of non-defeasible bonds but 40% of defeasible bonds, and restrictions on new debt issues (ir4) are included in 15% of non-defeasible bonds but in 49% of defeasible bonds. The increases are lower for the few balance sheet related state-contingent covenants than for either the asset sale restrictions or the cash restrictions, implying that the covenant defeasance option allows the firm to include more non-contingent covenants, as predicted by the model.

In table 4 we regress the number of covenants on defeasance. To do so we now consider the reduced sample of firms that are publicly listed by merging issue information with balance sheet data from Compustat. First we look at two measures, the number of restrictions on debt issuance and the number of restrictions on asset sales, then at the total number of covenants. Following Billet, King, and Mauer (2007), Reisel (2004), and Nash, Netter, and Poulsen (2003) we employ a number of standard control variables to proxy for firm and bond characteristics, including the issue's maturity, EBIT, Cash, the firm's market capitalization, the return on assets, the volatility of the return on assets, fixed assets, seniority, investments and leverage.[6]

For each dependent variable we first run a Poisson regression where we report average partial effects and second a standard pooled OLS regression that controls for year, industry and ratings. Our estimation strategy is necessitated by the very particular structure our sample has. It is neither a full panel as we do not observe every firm multiple times, nor a pure cross-section as we observe some firms multiple times. Following Petersen (2008) we use standard errors clustered at the firm level. In the case of the Poisson regressions robust standard errors also take care of any existing overdispersion (Cameron and Trivedi (2009)), however as we have multiple observations by some firms we do not use simple robust standard errors but instead cluster standard errors around firms.

We find that the presence of a defeasance option is associated with an increase in the number of covenants in a statistically significant way. Regardless of the inclusion of year and industry fixed effects, the number of covenants still increases when defeasance is included in the contract. This result is consistent with Lemma 2 and Proposition 1, that is, the inclusion of a covenant defeasance option makes the issuer willing to include more covenants in the bond.

Economic effects are also significant. In the Poisson case, the economic effects can be interpreted as a semi-elasticity and in our case of a Poisson model with a constant included, the average partial effect becomes $APE = \widehat{\beta_j}\overline{y}$, the average of the dependent variable times the estimated coefficient for the independent variable of interest (Cameron and Trivedi (2009)).

[6] Since these variables are not central to our results we refer the reader to the above papers for an interpretation of their economic effects.

We find that the increase is between 15% (for debt issuance restrictions) and 91% (for the total number of covenants) and hence is highly economically significant.

3.5 Which bonds include a covenant defeasance clause?

In table 5 we document the use of defeasance clauses by firm type. Recall from Proposition 7 that if both conditions (6) and (7) are satisfied, then the firm is better off by including a covenant defeasance option in its bond, and if either of these conditions fail, the firm is better off by issuing a bond with irrevocable covenants. If condition (7) is violated, then the firm cannot afford the cost of exercising the option. On the other hand, if condition (6) is violated, then the expected value of the growth opportunities that the issuer can exploit by removing covenants and taking control of certain decisions is less than the option's exercise price. If both conditions (6) and (7) are satisfied, then not only can the firm afford the exercise of the covenant defeasance option in state H, but by taking control, the firm gains more than the exercise price.

We can see from Proposition 7 that whether conditions (6) and (7) hold or fail, depends upon i) the firms' pledgeable income, ii) the number of covenants, iii) the size of the issue, iv) the value of taking control and exploiting the firm's growth opportunities, and v) the degree of cash flow variability or the degree of uncertainty. Hence, in our empirical specification for the inclusion of the covenant defeasance clause we want to use measures that capture firms' future profitability/growth opportunities, uncertainty, pledgeable income, etc. as well as covenants most relevant for growth opportunities, such as asset sale and debt issuance restrictions. Future profitability of course depends on the return on assets and the firm's growth options. In line with our model's predictions and following Nash, Netter, and Poulsen (2003)[7], we include the market-to-book ratio in our regressions. Plausible measures of uncertainty are ROA Volatility and standard deviation of equity returns, while pledgeable income can be proxied by the fixed asset ratio.

The degree of uncertainty can be also proxied by maturity since it is likely to increase with maturity. The longer the maturity, the more likely that covenants may restrict flexibility to such extent that it may be desirable for the firm to keep the option to remove them later. Issue size can also be viewed as a proxy for the growth opportunities of the firm, and for the degree of dispersion of bondholders and the resulting difficulty of renegotiation. We also add firm characteristics from table 4, where we look at factors influencing the number of covenants, as explanatory variables.

First we run a Logit regression in which we control for the number debt-issuance restrictions, asset-sale restrictions, and the total number of covenants present (excluding those that bind subsidiaries) respectively and report average partial effects. We also include the bond's maturity, size, the firm's EBIT, cash, cash flow, market capitalization, market to book ratio,

[7]Nash, Netter, and Poulsen (2003) studies the use of action-limiting (negative) covenants in corporate bonds and finds that firms with growth opportunities seem to be more likely to omit dividend or debt restrictions from their issues.

RoA, investment, leverage ratio and RoA volatility among our explanatory variables and control for both the term and credit spread. Model 1, 3, and 5 of 5 document our results. We find that the number of debt-issuance restrictions, asset-sale restrictions and the total number of covenants are positively associated with the covenant defeasance clause and are both statistically and economically significant. An additional asset sale restriction increases the probability for the defeasance option by 14%. Fixed assets are significant and have a negative sign, supporting our model's prediction that the covenant defeasance clause is more likely to be included by issuers with low pledgeable income. RoA Volatility is significant and positive in most specifications without bond characteristics as explanatory variables indicating that firms with higher degree of uncertainty are more likely to include a covenant defeasance clause in their bond issue. Log(Market Cap) is negative and significant, suggesting that smaller firms (which of course also includes firms in their high growth phase) are more likely to issue defeasible bonds. Market-to-Book does not show up as significant, which is surprising as Nash, Netter, and Poulsen (2003) finds that exactly these types of firms are concerned with keeping their operational flexibility. One possible explanation for this result may be that firms with a large market-to-book ratio will rather not include covenants at all than incurring the potentially large cost that defeasance may bring along.

Next we run OLS regressions with year, rating and industry fixed effects. Following Billet, King, and Mauer (2007) and Chava, Kumar, and Warga (2007) we include bond characteristics into our regressions together with firm characteristics used in the Logit specification. Model 2, 4, and 6 of 5 document our results. We find that issue size is positive and significant. Since issue size can be viewed as a proxy for the growth opportunities of the firm (note that we already control for firm size), and for the dispersion of bondholders and the resulting difficulty of renegotiation that our Proposition 7 predicts both to be positively associated with the issuers' willingness to write a covenant defeasance clause in their bond, we interpret the positive and significant coefficient in our regression in support for the prediction of our theory. Maturity has an inverted U-shaped relationship. Hence, the covenant defeasance clause is more frequently included, the longer is the maturity of the bond but this effect tapers off at the longest maturities.

In unreported regressions we also run robustness checks where we include value-weighted equity returns and standard deviation instead of the ROA and ROA volatility but our results do not change. We also use alternative measures for growth options, sales growth and the ratio of R&D expenditures to sales suggested by Billet, King, and Mauer (2007) but do not find qualitatively different results.

3.6 Pricing

Proposition 5 of our theoretical model predicts that the inclusion of the covenant defeasance option has an impact on bond yields. To see this, consider covenant defeasance as an American-style call-option held by the borrower: any time during the life of the bond, it may be valuable for the firm to remove the covenants in exchange of an escrow payment that makes the bond risk-free to the bondholders. The value of such an option can be considered in the following way:

$$Ev_d = (YTM_{Bond} - YTM_{Treasury}) \cdot p, \tag{9}$$

where Ev_d stands for the expected value of the defeasance option and p stands for the probability of defeasance. As this potential risk reduction in some states of the world will be anticipated by both bondholders and bond issuer, one would expect to see a lower yield for defeasable bonds, ceteribus paribus. Moreover, Proposition 5 suggests that there is another source for a reduction in the bond's yield: defeasable bonds also allow the inclusion of more covenants in an issue without restricting the firm's flexibility in the good state when the bond is defeased.

Testing this prediction is important as it provides evidence whether defeasance actually matters: whether investors take the inclusion of a covenant defeasance clause into account when pricing an issue.[8]

In table 6 we run a simple t-test on the difference in yields between bonds that include a defeasance option and those that do not. Consistent with our predictions we find a significant reduction in yields up to BBB rated bonds. For BB and B rated bonds there are no significant differences. Interestingly, for bonds that have defaulted in some way, that is C and D rated bonds, we find the reverse, an increase in yields.

To see whether our results hold when we control for more factors, we turn to a multivariate setting. Our methodology is simple, following Campbell and Taksler (2003) and others, we run the a pooled OLS regression:

$$YTM = \beta_1 \cdot defeasance + \beta_2 \cdot FirmControls + \beta_3 \cdot IssueControls + \delta_1 \cdot OtherControls + \epsilon_i. \tag{10}$$

We now use standard errors clustered around years and around issuers and report both. As we are considering yields rather than covenants, it is possible that factors that vary over time, such as credit spreads, rather than factors that vary across firms determine yields. However we find that there are no significant differences between the type of clustering we employ [9]

We control for the term structure of interest rates by including the spread between a one year treasury bill and a treasury bond whose maturity matches the bond we consider. We also include the spread between a AAA and a BAA rated bond as a control for the credit spread.

[8] Johnson, Pari, and Rosenthal (1989) find at least 49 instances of legal defeasance of US corporate bonds in their sample of defeased bonds between 1980 and 1985. The FISD lists 9 bonds as defeased, 7 economic cases of defeasance and 2 cases of legal defeasance. Given the relative high number of cases found by Johnson, Pari, and Rosenthal (1989) we assume that FISD does not seem to be an accurate source of information about the actual occurrence of defeasance. Johnson, Pari, and Rosenthal (1989) and Kahan and Rock (2009) also mention the occurrence of covenant (legal) defeasance, but do not mention any numbers.

[9] We cannot run Fama MacBeth Regressions for two reasons. First, we do not have time invariant independent variables (see Cochrane (2001) for a discussion). Second, even if that were the case we have firms in our sample that issue several bonds within the same year. This implies that there may be correlation in the error terms that we cannot pick up using a Fama MacBeth regression.

Similarly we control for the number of covenants, the firm's rating, the size of the bond issue and the maturity of the bond in all regressions.

Table 7 presents our results. Model 1 shows large pricing effects: we find that the inclusion of the covenant defeasance clause comes along with a reduction in the yield to maturity of 22 basis points. This means that investors are willing to accept a significant decrease in the yields in exchange for the possibility to receive risk-free bond payments in the high state and for the commitment to comply with more covenants in the low state.

We then run a series of robustness checks. In model 2 we include firm level controls. We find that the presence of a covenant defeasance option is significant and is associated with a 17 basis point reduction in the yield to maturity. Model 3 includes dummies for each maturity and dummies for each rating category. Again, the inclusion of the covenant defeasance clause is significant and leads to a 25 basis reduction in yields. In model 4 we also include year fixed effects. We find that including year dummies reduces our coefficient on covenant defeasance to about 13 basis points. Nevertheless, our result is still statistically significant. Finally, we include the mean and standard deviation of daily excess returns for the CRSP value-weighted index in model 5 instead of using the RoA and RoA Volatility as proposed by Campbell and Taksler (2003). Our estimates of the discount in YTM actually improves to 18 basis points and is statistically significant.

A simple back of the envelope calculation shows that a 25 basis point reduction in yield implies roughly a USD $0.94m reduction in annual interest rate payments given an average rate of 7.6% and an average issue size of US $375m. If we consider the average reduction in yield (over all 5 estimates) we are looking an an annual saving of US $0.71m. This amounts roughly to a US $10.8m or US $8.2m reduction in lifetime payments respectively for the average lifetime of a bond (using the average maturity of 11.5 years).

3.7 Endogeneity

Our model predicts that in equilibrium defeasable bonds are associated with an increase in the number of covenants relative to bonds with no defeasance clause. Hence the firm's covenant structure and the inclusion of the covenant defeasance option are determined at the same time. This relationship is also suggested in table 4 and table 5 where the defeasance option and the number of covenants both show up as regressors and exogenous variables, respectively.

Hence we have to ask the question whether we are properly controlling for the effects of this simultaneous decision. Interestingly however, there is *no* simultaneity bias because we are simply considering the outcome of one single optimization problem. The fact that this outcome has multiple aspects, i.e. the decision for the number of covenants and the decision to include covenants, does not invalidate this point (Wooldridge (2002)). In an econometric sense, the equations are not autonomous as they have no economic meaning in isolation from each other. The failure of autonomy also means that the two equations in table 4 and table 5 should not be interpreted in a causal way.

Why is that the case? Wooldridge (2002), Chapter 9, page 209, makes the following point: “An equation in an simultaneous equation model should represent a causal relationship; therefore we should be interested in varying each of the explanatory variables - including any that are endogenous - while holding all the others fixed. Put another way, each equation in a simultaneous equation model should represent some underlying conditional expectation that has a causal structure.” The best example for such a system of simultaneous equations that satisfies these two requirements is represented by the standard demand and supply equations framework. Each equation represents the outcome of one distinctive optimization problem.

However, things are different once we consider the output of one single optimization problem: “Examples that fail the autonomy requirement often have the same feature: the endogenous variables in the system are all choice variables of the same economic unit (Wooldridge (2002), Chapter 9, page 210).” Clearly, in our setting the issuer chooses both defeasance and the number of covenants, but they are, as argued above, the outcome of the *same* optimization problem and hence there is no point in estimating a simultaneous equation model. Put differently, we are estimating the shape of a multivalued supply equation that is governed by one single underlying optimization problem and hence we do not face a simultaneity bias in our regressions.

Instead Wooldridge (2002) recommends to simply estimate both regressions in a stand alone way, which we have already done[10]

3.8 Robustness

3.8.1 Boilerplate Contracts

One central question with respect to any bond indenture is how standardized these agreements are. One possibility is that all these covenants are "boiler-plate" in the sense that there are no individual variations across covenants. Alternatively, the inclusion of a particular covenant may be the outcome of deliberate negotiations between the issuer, the underwriter and the rating agency. A third possibility is that the wording of each covenant is done in a "boiler-plate" manner, but not the inclusion decision. To shed light on this question and rule out that some underwriters operate in a "boiler-plate" fashion, we look at how often underwriters include defeasance provisions in their issues. If covenant defeasance were boilerplate, we would expect underwriters to always or never include it, hence our distribution would resemble a bi-modal distribution.

In table 8 we look at the empirical distribution of covenant defeasance clauses across underwriters.[11] For each underwriter we compute the mean for the inclusion of the covenant defeasance clause across all issues underwritten by this particular entity. We then consider the empirical distribution function across all underwriters. We find that the inclusion of the

[10] For another example of the same issue see Hochberg and Westerfield (2010).

[11] This information is included in the original FISD Mergent data but not in the WRDS version. We use the original data with information on issues up to 2007 for this analysis.

covenant defeasance option varies greatly across underwriters. This suggests that the defeasibility of a bond is the outcome of deliberate decision. In contrast, if the clause were "boiler-plate", the distribution would have been bi-modal with most mass concentrated around zero and one. FIGURE 1 displays the average use of the defeasance clause across underwriters and visualizes the fact that the inclusion of the clause is deliberate rather than boilerplate.

3.8.2 Covenant Defeasance and Callability

In table 9 we report how callability and covenant defeasance interact. We find that conditional on defeasance, most bonds can be called (81%). When we split the sample between bonds that are continuously callable (similar to an American Call) and those that are not, we find roughly 52% can always be called. As continuous callability can substitute for covenant defeasance, we look at whether there is a penalty (call premium or make-whole premium (Mergent (2004))) to be paid for early bond retirement. We find that indeed almost all issues have to be called at a premium. This make whole call premium is quite substantial, on average there is a 33 basis point premium on the call amount. Finally, we look at those bonds that cannot be called continuously. We find that almost all of them have an initial quiet period through which the issue cannot be called at all (2696 out of 2733). The length of the quiet period is on average 4.43 years or 45% of the average maturity of bonds in our sample. After the quiet period almost all bonds can be called at market prices, not at par value. Moreover, as it well-known that callable bonds pay higher rates than non-callable, whereas, as we have shown, defeasible bonds pay a lower yield. Hence, in summary, callability does not appear to be a substitute for the covenant defeasance clause in our sample.

4 Conclusion

In this paper we present a theoretical model and an empirical analysis of action-limiting covenants and covenant defeasance options in corporate bonds. We show that when there is no verifiable interim signal available, unconditional control rights can be made state-contingent by granting the issuer the option to take control from the investor. For the contract to be optimal, the exercise price must be set high enough so that the option is only exercised in the good state of nature. The presence of this option makes control allocation ex post endogenous. Moreover, our model predicts that the inclusion of the option to remove covenants makes issuers willing to commit to more action-limiting or negative covenants in the contract at the time of issue.

Our theory implies that investors are willing to accept lower yield on a bond with such option because they internalize the gains from the (partial) pre-payment of the bond upon exercise in the good state and the gains from the issuer's compliance with additional action-limiting covenants in the bad state. Moreover, we identify issuer/bond characteristics that predict the inclusion of a covenant defeasance clause in the bond contract.

Our empirical analysis of the covenant defeasance option in US corporate bonds supports the predictions of our model in multiple ways. In particular, we find that the inclusion of a covenant defeasance option is associated with significantly more state-independent action-limiting covenants in our sample of issuers of US corporate bonds. We also document that the presence of the covenant defeasance option reduces the issue's yield-to-maturity by 13 to 25 basis point on average. We report evidence supporting the predictions of our theory on the characteristics of firms that issue defeasible bonds. We argue that defeasance options are particularly important for firms with significant growth opportunities and for corporate bonds for which renegotiation is very difficult.

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Appendix

Proof of Lemma 1:

Define $p_i \equiv \sigma_{iH}\left(\nu_H + \sum_{k=1}^K \tau_k d_k^H\right) + (1-\sigma_{iH})\left(\nu_L + \sum_{k=1}^K \tau_k d_k^L\right)$. Denote by $q_i = \nu_i + \sum_{k=1}^K \tau_k d_k^i$.

Then $p_H - p_L = \Delta\sigma\Delta\nu + \Delta\sigma \sum_{k=1}^K \tau_k (d_k^H - d_k^L)$ and we have:

$$\begin{aligned}
\frac{\partial L}{\partial R_b} &= (\alpha-1)p_H - \lambda\Delta p \\
\frac{\partial L}{\partial d_k^H} &= (\tau_k R - \gamma_k)\left(1 + \lambda\frac{\Delta\sigma}{\sigma_{HH}}\right) + (\alpha-1)\left(1 - \frac{p_H}{\Delta p}\frac{\Delta\sigma}{\sigma_{HH}}\right)\tau_k R_b \\
\frac{\partial L}{\partial d_k^L} &= (\tau_k R - \gamma_k)\left(1 - \lambda\frac{\Delta\sigma}{1-\sigma_{HH}}\right) + (\alpha-1)\left(1 + \frac{p_H}{\Delta p}\frac{\Delta\sigma}{1-\sigma_{HH}}\right)\tau_k R_b
\end{aligned}$$

The equation implies that $\lambda = (\alpha-1)\frac{p_H}{\Delta p}$. Similarly to before $\lambda = 0$ is impossible and $\alpha > 1$. Let us substitute λ in the other partial derivatives,

$$\begin{aligned}
\frac{\partial L}{\partial d_k^H} &= \tau_k R - \gamma_k + (\alpha-1)\left[\tau_k R_b + \frac{p_H}{\Delta p}\frac{\Delta\sigma}{\sigma_{HH}}\left(\tau_k\left(R - R_b\right) - \gamma_k\right)\right] \\
\frac{\partial L}{\partial d_k^L} &= \tau_k R - \gamma_k + (\alpha-1)\left[\tau_k R_b - \frac{p_H}{\Delta p}\frac{\Delta\sigma}{1-\sigma_{HH}}\left(\tau_k\left(R - R_b\right) - \gamma_k\right)\right]
\end{aligned}$$

Let us show that $1 < \frac{p_H}{\Delta p}\frac{\Delta\sigma}{\sigma_{HH}}$. Indeed, this is equivalent to:

$$\begin{aligned}
\Delta p \sigma_{HH} &< p_H \Delta\sigma \\
&\Leftrightarrow p_H\sigma_{LH} < p_L\sigma_{HH}
\end{aligned}$$

This is equivalent to:

$$(q_L + \sigma_{HH}(q_H - q_L))\, \sigma_{LH} < (q_L + \sigma_{LH}(q_H - q_L))\, \sigma_{HH}$$

or $\sigma_{LH} < \sigma_{HH}$, which is true. As $\frac{\partial L}{\partial d_k^H} \geq 0$, iff

$$(\tau_k R - \gamma_k) \left(1 + (\alpha - 1)\frac{p_H}{\Delta p}\frac{\Delta\sigma}{\sigma_{HH}}\right) + (\alpha - 1)\left(1 - \frac{p_H}{\Delta p}\frac{\Delta\sigma}{\sigma_{HH}}\right)\tau_k R_b \geq 0$$

$$\Leftrightarrow \frac{\tau_k R}{\gamma_k} \geq 1 - (\alpha - 1)\frac{1 - \frac{p_H}{\Delta p}\frac{\Delta\sigma}{\sigma_{HH}}}{\left(1 + (\alpha - 1)\frac{p_H}{\Delta p}\frac{\Delta\sigma}{\sigma_{HH}}\right)}\frac{\tau_k R_b}{\gamma_k}$$

there will some decisions for which $\frac{\tau_k R}{\gamma_k} \geq 1$ and $\frac{\partial L}{\partial d_k^H} \leq 0$. ■

Proof of Lemma 2:

- Take:

$$\frac{\partial L}{\partial d_k^L} = \tau_k R - \gamma_k + (\alpha - 1)\left[\tau_k R_b - \frac{p_H}{\Delta p}\frac{\Delta\sigma}{1 - \sigma_{HH}}\left(\tau_k\left(R - R_b\right) - \gamma_k\right)\right]$$

  This can be rewritten as

$$\frac{\partial L}{\partial d_k^L} = (\tau_k R - \gamma_k)\left(1 - (\alpha - 1)\frac{p_H}{\Delta p}\frac{\Delta\sigma}{1 - \sigma_{HH}}\right) + (\alpha - 1)\left(1 - \frac{p_H}{\Delta p}\frac{\Delta\sigma}{1 - \sigma_{HH}}\right)\tau_k R_b$$

  and so $\frac{\partial L}{\partial d_k^L} \geq 0$, iff

$$(\tau_k R - \gamma_k)\left(1 - (\alpha - 1)\frac{p_H}{\Delta p}\frac{\Delta\sigma}{1 - \sigma_{HH}}\right) \geq -(\alpha - 1)\left(1 - \frac{p_H}{\Delta p}\frac{\Delta\sigma}{1 - \sigma_{HH}}\right)\tau_k R_b$$

  Notice first that

$$1 - \frac{p_H}{\Delta p}\frac{\Delta\sigma}{1 - \sigma_{HH}} \geq 0 \Leftrightarrow$$
$$(p_H - p_L)(1 - \sigma_{HH}) - p_H \Delta\sigma \geq 0 \Leftrightarrow$$
$$\Delta\sigma\Delta q(1 - \sigma_{HH}) - p_H \Delta\sigma \geq 0 \Leftrightarrow$$
$$\Delta q(1 - \sigma_{HH}) - (q_L + \sigma_{HH}\Delta q) \geq 0 \Leftrightarrow$$
$$q_H - q_L - \sigma_{HH} q_H + q_L \sigma_{HH} - q_L - \sigma_{HH} q_H + \sigma_{HH} q_L \geq 0 \Leftrightarrow$$
$$q_H \geq 0$$

  which is true. There are potentially two cases to consider.

- Case 1: $1 - (\alpha - 1)\frac{p_H}{\Delta p}\frac{\Delta\sigma}{1 - \sigma_{HH}} \geq 0$. Then, we have that $\frac{\partial L}{\partial d_k^L} \geq 0$, iff

$$\frac{\tau_k R}{\gamma_k} \geq 1 - \frac{(\alpha - 1)\left(1 - \frac{p_H}{\Delta p}\frac{\Delta\sigma}{1 - \sigma_{HH}}\right)\tau_k R_b}{\left(1 - (\alpha - 1)\frac{p_H}{\Delta p}\frac{\Delta\sigma}{1 - \sigma_{HH}}\right)\gamma_k}$$

  There will decisions for which $\frac{\tau_k R}{\gamma_k} < 1$ but still $d_k^L = 1$. This implies $k_L^* > k^*$.

- Case 2: $1-(\alpha-1)\frac{p_H}{\Delta_p}\frac{\Delta\sigma}{1-\sigma_{HH}}<0$. Then, we have that $\frac{\partial L}{\partial d_k^L}\geq 0$, iff

$$\frac{\tau_k R}{\gamma_k}\leq 1-\frac{(\alpha-1)\left(1-\frac{p_H}{\Delta p}\frac{\Delta\sigma}{1-\sigma_{HH}}\right)\tau_k R_b}{\left((\alpha-1)\frac{p_H}{\Delta p}\frac{\Delta\sigma}{1-\sigma_{HH}}-1\right)\gamma_k}$$

and then we would give in fact control over the decisions from $\widehat{k}$ to K, with $\widehat{k}>k^*$. Notice though that for all k,

$$\sigma_{HH}\frac{\partial L}{\partial d_k^H}+(1-\sigma_{HH})\frac{\partial L}{\partial d_k^L}=\tau_k R-\gamma_k+(\alpha-1)\tau_k R_b$$

Therefore,

$$\sigma_{HH}\frac{\partial L}{\partial d_k^H}+(1-\sigma_{HH})\frac{\partial L}{\partial d_k^L}\geq 0\Leftrightarrow$$
$$\frac{\tau_k R}{\gamma_k}\geq 1-\frac{(\alpha-1)\tau_k R_b}{\gamma_k}$$

Take a decision k for which $\frac{\tau_k R}{\gamma_k}\geq 1$. Then we cannot have both $d_k^H=0$ and $d_k^L=0$ as the last inequality implies that at least one of the partial derivative must be positive. But we have seen that necessarily $k_H^*\leq k^*$. Moreover if case 2 obtains, we would have decisions between k^* and $\widehat{k}$ where $d_k^L=0$. So for those decisions, we would have both $d_k^H=0$ and $d_k^L=0$, a contradiction. ■

Proof of Proposition 3:

Suppose this is not true, i.e. $k_L^*<\widetilde{k}$. Since $\widetilde{k}>k^*\geq k_H^*$, this implies that the financier has control over fewer than $\widetilde{k}$ decisions in both states of the world. This contradicts that $\widetilde{k}$ is the optimal number of decisions over which the financier should have control. ■

Proof of Proposition 4:

Suppose first that

$$(\nu_H+\sum_{k=1}^{k_H^*}\tau_k d_k^H)(R-R_b)>\sum_{k=k_H^*}^{k_L^*}\tau_k R_b$$

The expected payoff to the firm in the the high state if the firm exercises the option to remove covenants is the firm's gross profit minus the payment to the lender, minus the price of the exercise.

$$(\nu_H+\sum_{k=1}^{k_H^*}\tau_k d_k^H)(R-R_b)+\sum_{k=1}^{k_H^*}\gamma_k d_k^H-(\nu_L+\sum_{k=1}^{k_H^*}\tau_k d_k^H)(R-R_b)=\Delta\nu(R-R_b)-\sum_{k=1}^{k_H^*}\gamma_k d_k^H$$

If the firm did not exercise the option, it would receive

$$(\nu_H + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H)(R - R_b) - \sum_{k=1}^{\widetilde{k}} \gamma_k d_k^H$$

The firm prefers to exercise the option if

$$\Delta\nu(R - R_b) - \sum_{k=1}^{k_H^*} \gamma_k d_k^H \geq (\nu_H + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H)(R - R_b) - \sum_{k=1}^{\widetilde{k}} \gamma_k d_k^H \tag{11}$$

,or

$$\sum_{k_H^*}^{\widetilde{k}} \gamma_k d_k^H \geq (\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H)(R - R_b) \tag{12}$$

The same logic completes the proof for the case when

$$\sum_{k=k_H^*}^{k_L^*} \tau_k R_b \geq (\nu_H + \sum_{k=1}^{k_H^*} \tau_k d_k^H)(R - R_b). \quad \blacksquare$$

Proof of Proposition 5:

Compare the individual rationality conditions for B^* and B^{**} and assume that R_b^* and R_b^{**} are equal (we denote them by R_b.

The individual rationality condition for B^*,

$$\sigma_{HH} \left(\nu_H + \sum_{k=1}^{\widetilde{k}} \tau_k d_k \right) R_b + (1 - \sigma_{HH}) \left(\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k \right) R_b \geq I - A. \tag{13}$$

For B^{**},

$$\sigma_{HH} \left(\nu_H + \sum_{k=1}^{k_H^*} \tau_k d_k^H \right) R_b + \sigma_{HH} \max\{ \left(\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H \right) (R - R_b); \sum_{k=k_H^*}^{k_L^*} \tau_k R_b\}$$

$$+(1 - \sigma_{HH}) \left(\nu_L + \sum_{k=1}^{k_L^*} \tau_k d_k^L \right) R_b \geq I - A. \tag{14}$$

Since $P \geq \sum_{k=k_H^*}^{k_L^*} \tau_k R_b$, the sum of the first two components on the left-hand side in (14) exceeds the first component on the left-hand side of (13).

It is straightforward to see that if $\sum_{k=k_H^*}^{k_L^*} \tau_k R_b \geq \left(\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H\right)(R - R_b)$, then the difference, $\sigma_{HH} \sum_{\widetilde{k}}^{k_L^*} \tau_k R_b$ is positive since $k_L^* > \widetilde{k}$, and if $\sum_{k=k_H^*}^{k_L^*} \tau_k R_b < \left(\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H\right)(R - R_b)$, then the difference

$$\sigma_{HH}(\left(\nu_L + \sum_{k=1}^{\widetilde{k}} \tau_k d_k^H\right)(R - R_b) - \sum_{k=k_H^*}^{k_L^*} \tau_k R_b) + \sigma_{HH}(\sum_{k=1}^{k_L^*} \tau_k R_b - \sum_{k=1}^{\widetilde{k}} \tau_k R_b),$$

is even more positive.

Moreover, since $k_L^* > \widetilde{k}$, third (and last) component on the left-hand side of (14) exceeds the second (and last) component on the left-hand side of (13).

Hence, if R_B is the same for both bonds, then the left-hand side of (14) exceeds the left-hand side of (13). Since optimality (efficiency) requires that the financier's individual rationality constraint be binding, B^{**} must promise a lower yield than B^*, $R_b^* \geq R_b^{**}$. ■

Proof of Proposition 6:

Assuming that the financier breaks even on both bonds, and setting the left-hand sides of the corresponding individual rationality conditions equal, we get

$$\sigma_{HH}(\nu_H + \sum_{k=1}^{\tilde{k}} \tau_k)R_{b*} + (1 - \sigma_{HH})(\nu_L + \sum_{k=1}^{\tilde{k}} \tau_k)R_{b*} =$$

$$\sigma_{HH}(\nu_H + \sum_{k=1}^{k_H^*} \tau_k)R_{b**} + \sigma_{HH}P^* + (1 - \sigma_{HH})(\nu_L + \sum_{k=1}^{k_L^*} \tau_k)R_{b**},$$

or

$$\sigma_{HH}(\nu_H + \sum_{k=1}^{\tilde{k}} \tau_k)(R_{b*} - R_{b**}) + (1 - \sigma_{HH})(\nu_L + \sum_{k=1}^{\tilde{k}} \tau_k)(R_{b*} - R_{b**}) =$$

$$-\sigma_{HH} \sum_{k=k_H^*}^{\tilde{k}} \tau_k R_{b**} + \sigma_{HH}P^* + (1 - \sigma_{HH}) \sum_{k=\tilde{k}}^{k_L^*} \tau_k)R_{b**}$$

Denote by h the difference between R_{b*} and R_{b**} and define $\overline{\nu} = \sigma_{HH}\nu_H + (1 - \sigma_{HH})\nu_L$. Then, the above expression can be rewritten as

$$h(\overline{\nu} + \sum_{k=1}^{\tilde{k}} \tau_k) = -\sigma_{HH} \sum_{k=k_H^*}^{\tilde{k}} \tau_k R_{b**} + \sigma_{HH}P^* + (1 - \sigma_{HH}) \sum_{k=\tilde{k}}^{k_L^*} R_{b**}$$

Then, solving for h, we get

$$h = \frac{\sigma_{HH}P^* - \sigma_{HH}\sum_{k=k_H^*}^{\tilde{k}} \tau_k R_{b**} + (1-\sigma_{HH})\sum_{k=\tilde{k}}^{k_{L*}} \tau_k R_{b**}}{\overline{\nu} + \sum_{k=1}^{\tilde{k}} \tau_k}.$$

as claimed. ■

Proof of Proposition 7:

Assume that either (6) or (7) is violated. Then, compare the individual rationality conditions for B^* and B^{**} as in Proposition 5 assuming that R_B is the same. The individual rationality condition for B^* is identical to (13) in the proof of Proposition 5.

Since either (6) or (7) is violated, the option in B^{**} will never be exercised. To distinguish this bond from the one with a potentially exercisable option, we introduce the notation B^{N**} for this bond. The individual rationality condition for the financier of B^{N**} becomes

$$\sigma_{HH}\left(\nu_H + \sum_{k=1}^{k_L^*} \tau_k d_k^H\right) R_b + (1-\sigma_{HH})\left(\nu_L + \sum_{k=1}^{k_L^*} \tau_k d_k^L\right) R_b \geq I - A. \tag{15}$$

If R_B is the same for both bonds, the left-hand side of (15) exceeds the left-hand side of (13). Since optimality requires that the financier's individual rationality constraint be binding, B^{N**} will promise a lower yield than B^*, that is, $R_b^* \geq R_b^{N**}$. A further comparison of the individual rationality conditions for B^{**} and B^{N**} shows that the yield on a bond with a potentially exercisable option to take control is at least as low or lower than the yield on a bond with an option that will never be exercised, i.e. $R_b^{N**} \geq R_b^{**}$.

Next we show that regardless of $R_b^* \geq R_b^{N**}$, firms will issue bonds with irrevocable covenants, B^* when either (6) or (7) is violated. Since the optimal among bonds with irrevocable covenants grants $\widetilde{k}$ decsions to the financier, giving control the financier over $k_L^* \geq \widetilde{k}$ is suboptimal.

By granting k_L^* decisions to the financier the issuer gains the difference between the left-hand sides of (15) and (13), which is $\sum_{k=\widetilde{k}}^{k_L^*} \tau_k d_k^H R_b^*$. In exchange they give up $\sum_{k=\widetilde{k}}^{k_L^*} \gamma_k$. Since $\gamma_k \geq \tau_k R$ for all $k > k^*$ and $\widetilde{k} \geq k^*$, the issuer prefers the optimal bond with irrevocable covenants, B^*. ■

Tables

Table 1: Bond Issuance: Summary Statistics

Number of Bonds per Firm					
N	1	2	3	4	> 4
Firms	5138	1267	441	161	154

Issue Characteristics					
Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Full Sample					
Amount	358216	1873551	1	100000000	10584
Price	98.31	7.44	17.04	109.73	6750
Offering Yield	7.5	2.17	0	25.75	6590
Treasury Spread	128.45	113.55	0	1501	6166
Callable	0.73	0.45	0	1	10584
Offering Year	1999	5.05	1981	2008	10584
Maturity (in Years)	12.65	10.42	1	100	10584
Rating	17.67	7.36	1	27	9306
Defeasance	0.68	0.47	0	1	10582
Asset ale Restrictions	1.66	0.8	0	3	10582
Debt Issuance Restrictions	0.49	0.65	0	3	10582
Total Number of Covenants	6.10	3.05	0	17	10582
No Defeasance					
Amount	321386	1376286	2250	55000000	3392
Price	99.14	4.54	19.87	108.49	2901
Offering Yield	7.35	1.97	0	25.75	2806
Treasury Spread	103.55	85.21	0	1362.3	2673
Callable	0.58	0.49	0	1	3392
Offering Year	1997	5.23	1981	2008	3392
Maturity (in Years)	15.13	11.89	1	100	3392
Rating	15.73	8.27	1	27	2833
Asset ale Restrictions	1.12	0.81	0	3	3392
Debt Issuance Restrictions	0.21	0.48	0	3	3392
Total Number of Covenants	4.31	2.35	0	14	3392
Defeasance					
Amount	375637	2067118	1	100000000	7190
Price	97.68	8.98	17.04	109.73	3847
Offering Yield	7.60	2.31	0	18.5	3782
Treasury Spread	147.54	127.94	0	1501	3492
Callable	0.81	0.4	0	1	7190
Offering Year	2000	4.62	1985	2008	7190
Maturity (in Years)	11.48	9.43	1	100	7190
Rating	18.52	6.75	1	27	6471
Asset ale Restrictions	1.92	0.65	0	3	7190
Debt Issuance Restrictions	0.62	0.68	0	3	7190
Total Number of Covenants	6.95	2.97	0	17	7190

Notes: In this table we look at a sample of 10584 US long-term industrial corporate bonds found in the FISD database issued between 1980 and 2008. The data excludes issues for which no covenant information was available, such as medium-term notes. Also, financial firms or utilities are excluded form the sample. In the first panel we present information about how frequently firms issue bonds. In the second panel we present summary statistics for the complete sample. We then split the sample into two parts, the third panel shows the subsample of bonds that come with a covenant defeasance clause, while the fourth panel shows the subsample of bonds that come without defeasance. We provide information about the offering amount, the issue price, the yield as of the offering date, the spread over a comparable treasury bond, whether the bond is callable and whether there are covenants attached to the bond. the year the bond was issued, its maturity in years, it's rating on a numerical scale from 1 (AAA) to 21 (C) and whether the bond can be defeased or not.

Table 2: Covenants Inclusion: Summary Statistics

		All			**Defeasance**						**Diff**	
					No			**Yes**				
FISD Code	Variable	Obs	Mean	Std	Obs	Mean	Std	Obs	Mean	Std	Δ	Sig
					Asset Sale Restrictions							
bh18	Asset Sale Clause	10582	0.29	0.45	3392	0.06	0.24	7190	0.40	0.49	0.34	***
ir9	Sales Leaseback	10582	0.48	0.50	3392	0.35	0.48	7190	0.54	0.50	0.19	***
ir10	Sales Assets	10582	0.89	0.31	3392	0.71	0.45	7190	0.98	0.15	0.27	***
ir12	Stock Issuance	10582	0.03	0.16	3392	0.01	0.07	7190	0.04	0.19	0.03	***
					Balance Sheet Restrictions							
bh12	Declining Net Worth	10582	0.01	0.08	3392	0.01	0.10	7190	0.01	0.07	0.00	***
ir7	Maintenance Net Worth	10582	0.09	0.28	3392	0.06	0.23	7190	0.10	0.3	0.04	
ir16	Net Earnings Test Issuance	10582	0.05	0.22	3392	0.15	0.36	7190	0.00	0.05	-0.15	***
ir17	Fixed Charge Coverage	10582	0.02	0.15	3392	0.01	0.07	7190	0.03	0.18	0.02	***
ir18	Leverage Test	10582	0.00	0.05	3392	0.00	0.02	7190	0.00	0.05	0.00	***
					Cash Restrictions							
ir5	Investments	10582	0.09	0.29	3392	0.14	0.35	7190	0.07	0.25	-0.07	***
ir8	Restricted Payments	10582	0.03	0.18	3392	0.03	0.16	7190	0.04	0.19	0.01	***
ir2	Dividend Related Payments	10582	0.01	0.09	3392	0.01	0.08	7190	0.01	0.09	0.00	***
ir13	Stock Transfer	10582	0.06	0.24	3392	0.02	0.15	7190	0.08	0.27	0.06	***
ir15	Transaction Affiliates	10582	0.36	0.48	3392	0.12	0.32	7190	0.48	0.50	0.36	***
					Debt Restrictions							
bh2	Negative Pledge	10582	0.73	0.45	3392	0.57	0.49	7190	0.80	0.40	0.23	***
ir3	Funded Debt	10582	0.02	0.12	3392	0.03	0.18	7190	0.01	0.08	-0.02	***
ir4	Indebtedness	10582	0.38	0.49	3392	0.15	0.35	7190	0.49	0.50	0.34	***
ir11	Senior Debt Issuance	10582	0.02	0.13	3392	0.01	0.07	7190	0.02	0.14	0.01	***
ir14	Subordinated Debt Issuance	10582	0.07	0.26	3392	0.03	0.16	7190	0.09	0.29	0.06	***
					Others							
bh5	Cross Default	10582	0.73	0.44	3392	0.18	0.39	7190	0.99	0.12	0.81	***
bh6	Cross Acceleration	10582	0.07	0.26	3392	0.19	0.40	7190	0.01	0.11	-0.18	***
bh7	Change Control Put	10582	0.61	0.49	3392	0.36	0.48	7190	0.73	0.44	0.37	***
bh10	Rating decline	10582	0.02	0.14	3392	0.02	0.14	7190	0.02	0.14	0.00	
ir1	Consolidation Merger	10582	0.89	0.31	3392	0.72	0.45	7190	0.98	0.15	0.26	***

Notes: This table shows the distribution of the various covenants in a sample of 10584 US corporate Bonds. Detailed explanations are given in table 3. We categorize all covenants according to their function into five categories. The first category looks at restrictions on asset sales, the second looks at restrictions that are based on balance sheet items, the third looks at restrictions on the use of the issuer's cash, the fourth looks at restrictions on (additional) debt issuance, while the fifth category looks at those that do not fall in any of the other four. The four digit codes in the first column are the unique FISD identifiers.

Next we split the sample into two parts, depending on whether a defeasance clause is included in the issue or not. We compute the difference in means and run a t-test to see if any difference in the means is statistically significant.

Table 3: Covenant Definitions

FISD Code	FISD Name	Description
		Asset Sale Restrictions
bh18	Asset Sale Clause	Covenant requiring the issuer to use net proceeds from the sale of certain assets to redeem the bonds at or above par.
ir9	Sales Leaseback	Restricts issuer to the type or amount of property used in a sale leaseback transaction and may restrict its use of the proceeds of the sale.
ir10	Sales Assets	Restricts an issuer's ability to sell assets or restricts the issuer's use of the proceeds from the sale of assets. Requires the issuer to apply some or all of the sales proceeds to the repurchase of debt through a tender offer or call.
ir12	Stock Issuance	Restricts issuer from issuing additional common stock.
		Balance Sheet Restrictions
bh12	Declining Net Worth	If issuer's net worth (as defined) falls below minimum level, certain bond provisions are triggered.
ir6	Maintenance Net Worth	Issuer must maintain a minimum specified net worth.
ir16	Net Earnings Test Issuance	To issue additional debt the issuer must have achieved or maintained certain profitability levels.
ir17	Fixed Charge Coverage	Issuer is required to have a ratio of earnings available for fixed charges, of at least a minimum specified level.
ir18	Leverage Test	Restricts total-indebtedness of the issuer.
		Cash Restrictions
ir2	Investments	Indicates that payments made shareholders or other entities may be limited to a percentage of net income or some other ratio.
ir5	Restricted Payments	Restricts issuers investment policy to prevent risky investments.
ir7	Dividend Related Payments	"Restricts issuer's freedom to make payments (other than dividend related payments) to shareholders and others."
ir15	Transaction Affiliates	Issuer is restricted in certain business dealings with its subsidiaries.
ir13	Stock Transfer	Restricts the issuer from transferring, selling, or disposing of its own common stock or the common stock of a subsidiary.
		Debt Restrictions
bh2	Negative Pledge	The issuer cannot issue secured debt unless it secures the current issue on a pari passu basis.
ir3	Funded Debt	Restricts issuer from issuing additional funded debt. Funded debt is any debt with an initial maturity of one year or longer.
ir4	Indebtedness	Restricts issuer from incurring additional debt with limits on absolute dollar amount of debt or percentage total capital.
ir11	Senior Debt Issuance	Restricts issuer to the amount of senior debt it may issue in the future.
ir14	Subordinated Debt Issuance	Restricts issuance of junior or subordinated debt.
		Others
bh5	Cross Default	Allows holder to activate an event of default in their issue, if default has occurred for any other debt of the company.
bh6	Cross Acceleration	Allows holder to accelerate their debt, if any other debt of the issuer has been accelerated due to an event of default.
bh7	Change Control Put	Upon a change of control in the issuer, bondholders have the option of selling the issue back to the issuer (poison put). Other conditions may limit the bondholder's ability to exercise the put option.
bh10	Rating decline	A decline in the credit rating of the issuer (or issue) triggers a bondholder put provision.
ir1	Consolidation Merger	Indicates that a consolidation or merger the issuer with another entity is restricted. of

Notes: This table presents explanations for the various covenants in a sample of 10584 US corporate Bonds. We categorize all covenants according to their function into five categories. The first category looks at restrictions on asset sales, the second looks at restrictions that are based on balance sheet items, the third looks at restrictions on the use of the issuer's cash, the fourth looks at restrictions on (additional) debt issuance, while the fifth category looks at those that do not fall in any of the other four. The four digit codes in the first column are the unique FISD identifiers.

Table 4: Defeasance: Number of Covenants

Notes: We run Poisson and OLS regressions with the number of covenants as the dependent variable. Following Billet, King, and Mauer (2007) we aggregate related covenants. We focus on three specifications: First we consider debt issuance restrictions where we consider the sum of the following debt issuance restrictions: (max 4, sum of Funded Debt (ir3), Indebtedness (ir4), Senior Debt Issuance (ir11), and Subordinated Debt Issuance (ir14)). Second we consider asset sale restrictions (maximum 3, sum of Asset Sale Clause (bh18), Sales Leaseback (ir9), and Sales Assets (ir10)). Finally we focus on the total number of covenants found in the bond. In specification 1, 3, and 5 we run a poisson regression and report average partial effects. In specification 2, 4, and 6 we run an OLS model with year, rating and industry controls (1-digit SIC codes). We relate our dependent variables to explanatory factors that have been proposed by Billet, King, and Mauer (2007), Reisel (2004) and Chava, Kumar, and Warga (2007) to be relevant for the inclusion of covenants in an issue. We report McFadden's Pseudo R^2 for the Poisson regressions and Adjusted R^2 in the case of OLS. Following Petersen (2008) standard errors clustered around firms are in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

	Debt Issuance		Asset Sale		Number of Covs	
	Poisson	OLS	Poisson	OLS	Poisson	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Defeasance	0.15***	0.07***	0.33***	0.24***	0.91***	0.51***
	(0.04)	(0.03)	(0.05)	(0.04)	(0.14)	(0.12)
Term Spread	0.01	0.02*	-0.009	0.02	-0.05*	0.16***
	(0.008)	(0.01)	(0.01)	(0.02)	(0.03)	(0.05)
Credit Spread	-0.02	0.06	0.04	-0.03	0.07	-0.29*
	(0.05)	(0.05)	(0.05)	(0.06)	(0.15)	(0.18)
Maturity	0.005	-0.005***	-0.006**	-0.0004	-0.05***	-0.02***
	(0.02)	(0.001)	(0.003)	(0.002)	(0.007)	(0.005)
Maturity^2	-.0007	0.0000332***	0.0000652***	0.000011	0.0004***	0.0002***
	(0.0008)	(0.0000119)	(0.0000249)	(0.0000186)	(0.0000704)	(0.000048)
Issue Size	0.0000907*	0.0003***	0.0000665	0.0000919	0.0009**	0.001***
	(0.000049)	(0.0001)	(0.0001)	(0.0001)	(0.0004)	(0.0005)
RoA	-0.23*	-0.42**	-0.07	-0.068***	-1.41*	-2.93***
	(0.12)	(0.19)	(0.24)	(0.23)	(0.78)	(0.87)
RoA Volatility	-0.20	0.04	1.16***	0.42	0.87	0.57
	(0.24)	(0.38)	(0.38)	(0.39)	(1.33)	(1.55)
Cash	0.31***	0.21	0.28	0.54***	2.53***	2.64***
	(0.11)	(0.14)	(0.2)	(0.19)	(0.66)	(0.68)
Cash Flow	0.007**	0.006	-0.003	-0.003	0.03*	0.02
	(0.003)	(0.004)	(0.004)	(0.004)	(0.02)	(0.02)
Market to Book	0.06	0.46	0.51	0.74	1.10	2.19
	(0.16)	(0.3)	(0.37)	(0.47)	(1.38)	(1.77)
log(MarketCap)	-0.10***	-0.11***	-0.05***	-0.04**	-0.59***	-0.52***
	(0.009)	(0.01)	(0.02)	(0.02)	(0.05)	(0.04)
EBIT	-0.007***	0.002**	-0.004	-0.002	-0.01	-.001
	(0.002)	(0.0009)	(0.002)	(0.002)	(0.006)	(0.004)
Investments	0.26**	0.32*	0.58*	0.62*	1.95***	1.52*
	(0.12)	(0.18)	(0.32)	(0.32)	(0.71)	(0.83)
Fixed Assets	-0.04	-0.010	-0.47***	-0.25**	-0.70**	-0.63**
	(0.06)	(0.06)	(0.12)	(0.1)	(0.3)	(0.28)
Book Leverage	-0.008	-0.31	-0.69*	-0.85*	-0.99	-1.73
	(0.17)	(0.31)	(0.38)	(0.46)	(1.38)	(1.72)
Seniority	-0.29***	-0.47***	0.02	0.09*	-1.05***	-0.91***
	(0.03)	(0.04)	(0.05)	(0.05)	(0.12)	(0.14)
Rating	0.01***		0.003		0.04***	
	(0.002)		(0.003)		(0.009)	
Year FE	No	Yes	No	Yes	No	Yes
Rating FE	No	Yes	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes	No	Yes
N	4070	4070	4070	4070	4070	4070
R^2	0.25	0.56	0.01	0.30	0.13	0.60

Table 5: Inclusion of Defeasance

Notes: We run Logit and OLS regressions with the defeasance as the dependent variable. Defeasance takes value one when such a clause is found in an issue and zero otherwise. Our main independent variables are debt issuance restrictions, asset sale restrictions as well as the total number of covenants included in the issue. We follow Billet, King, and Mauer (2007) and first consider only related covenants: Debt Issuance Restrictions (maximum 4, sum of Funded Debt (ir3), Indebtedness (ir4), Senior Debt Issuance (ir11), and Subordinated Debt Issuance (ir14)) and Asset Sale Restrictions (maximum 3, sum of Asset Sale Clause (bh18), Sales Leaseback (ir9), and Sales Assets (ir10)). In specification 1, 3, and 5 we run a logit regression and report average partial effects. In specification 2, 4, and 6 we run an OLS model with year, rating and industry controls (1-digit SIC codes). We relate our dependent variable to explanatory factors that have been proposed by Billet, King, and Mauer (2007), Reisel (2004) and Chava, Kumar, and Warga (2007) to be relevant for the inclusion of covenants in an issue. We report McFadden's Pseudo R^2 for the Logit regressions and Adjusted R^2 in the case of OLS. Following Petersen (2008) standard errors clustered around firms are in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

	Defeasance					
	Logit	OLS	Logit	OLS	Logit	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Debt Issuance Restrictions	0.11***	0.04*				
	(0.03)	(0.02)				
Asset Sale Restrictions			0.14***	0.13***		
			(0.02)	(0.02)		
Total Number of Covenants					0.04***	0.02***
					(0.006)	(0.006)
Term Spread		0.01		0.01		0.01
		(0.01)		(0.01)		(0.01)
Credit Spread		0.003		0.01		0.01
		(0.04)		(0.04)		(0.04)
Maturity	-0.0007	0.002	-0.0009	0.002	-0.0004	0.003*
	(0.0007)	(0.001)	(0.0007)	(0.001)	(0.0007)	(0.001)
Maturity^2		-0.000029*		-0.0000283*		-0.0000312*
		(0.0000169)		(0.0000167)		(0.0000168)
Issue Size		0.0001**		0.0001**		0.0001*
		(0.0000671)		(0.000062)		(0.0000631)
Seniority		-0.04		-0.07***		-0.03
		(0.03)		(0.02)		(0.02)
RoA	0.23	0.13	0.16	0.2	0.24	0.18
	(0.2)	(0.15)	(0.19)	(0.15)	(0.18)	(0.15)
RoA Volatility	0.97**	0.29	0.6	0.23	0.77*	0.27
	(0.49)	(0.27)	(0.44)	(0.27)	(0.45)	(0.26)
Cash	0.22	0.04	0.2	-0.03	0.13	-0.02
	(0.18)	(0.13)	(0.19)	(0.13)	(0.18)	(0.13)
Cash-Flow	-0.01	-0.008	-0.008	-0.007	-0.01	-0.008
	(0.008)	(0.007)	(0.006)	(0.006)	(0.007)	(0.007)
Market to Book	-0.13	0.04	-0.13	-0.04	-0.19	0.005
	(0.26)	(0.18)	(0.24)	(0.18)	(0.28)	(0.18)
log(MarketCap)	-0.03***	-0.02*	-0.04***	-0.002*	-0.02	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
EBIT	0.0007	0.0004	0.002	0.0008	0.0008	0.0005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Investments	0.17	0.33	0.17	0.25	0.08	0.3
	(0.23)	(0.2)	(0.21)	(0.19)	(0.22)	(0.2)
Fixed Assets	-0.27***	-0.22**	-0.19**	-0.18**	-0.22**	-0.20**
	(0.09)	(0.09)	(0.08)	(0.09)	(0.09)	(0.09)
Book Leverage	-0.04	-0.19	0.02	-0.09	0.02	-0.16
	(0.28)	(0.2)	(0.26)	(0.2)	(0.28)	(0.19)
Rating	-0.002		-0.002		-0.003	
	(0.002)		(0.002)		(0.002)	
Year FE	No	Yes	No	Yes	No	Yes
Rating FE	No	Yes	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes	No	Yes
N	4087	4070	4087	4070	4087	4070
R^2	0.07	0.14	0.09	0.16	0.09	0.14

Table 6: Yield Difference: T-tests by Rating Class

	No Def.			Def.					Prob.		
RC	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Δ	t-value	$d < 0$	$d \neq 0$	$d > 0$
AAA	17	5.768	1.592	8	5.537	1.492	0.231	0.3535	0.64	0.73	0.36
AA	159	6.721	0.937	80	5.766	1.278	0.955	5.9339	1.00	0.00	0.00
A	390	6.353	1.232	313	6.003	1.129	0.350	3.9281	1.00	0.00	0.00
BBB	331	6.627	1.271	490	6.440	1.231	0.187	2.0945	0.98	0.04	0.02
BB	129	7.152	0.992	193	7.271	1.372	-0.119	-0.9033	0.18	0.37	0.82
B	219	7.084	1.275	294	7.197	1.635	-0.113	-0.8849	0.19	0.38	0.81
C	395	7.332	1.457	866	7.597	1.904	-0.265	-2.7054	0.00	0.01	1.00
D	68	8.862	2.818	360	9.819	2.852	-0.957	-2.5641	0.01	0.01	0.99
NR	606	8.608	2.596	683	8.878	2.494	-0.270	-1.8938	0.03	0.06	0.97
SUSP	492	7.303	1.920	495	7.109	2.284	0.194	1.4503	0.93	0.15	0.07

Notes: In this table we consider the yield to maturity of bonds for 10584 long-term industrial US corporate bonds. We sort issues according to their rating class and the inclusion/exclusion of defeasance in the issue. The first column notes the rating category (RC), the next three present the number of observations, the mean yield to maturity (YTM) and its standard deviation statistics for the sample with no defeasance clause include, while the next three repeat the same variables for the sample with defeasance clauses included. Finally we present the difference in the YTM, t-stats, and p-values to see if the difference in yields is statistically different.

Table 7: Yield Regressions

Notes: Following the methodology in Campbell and Taksler (2003), we run an OLS regression with the Yield to Maturity (YTM) from FISD as the left hand variable and defeasance as the right hand variable. Each regression includes issue characterizes, firm characteristics and both the term and credit spread: $YTM = \beta_1 \cdot defeasance + \beta_2 \cdot FirmControls + \beta_3 \cdot IssueControls + \delta_1 \cdot OtherControls + \epsilon_i$. In Model 1 we only include issue characteristics, including the firm's rating and both the term and credit spread. We use pre-issue ratings. Model 2 also includes firm characteristics. Model 3 includes a FE for each rating category and a FE for each maturity. Model 4 includes a year fixed effect and includes a pre-1996 dummy, controlling for changes in the accounting treatment of in-substance defeasance (as described in FASB (1996)). Finally, model 5 differs from model 4 as we replace RoA and RoA Volatility with Equity returns and the standard deviation of equity returns. Following Petersen (2008) we report standard errors clustered around years and at the issuer level in parentheses, where the first row reports standard errors corrected for year clustering. Significance levels are indicated for standard errors clustered around issuers.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

	Yield to Maturity				
	Base1	Base2	Full	Time	TimeAlt
	(1)	(2)	(3)	(4)	(5)
Defeasance	-.22**	-.17*	-.25**	-.13*	-.18**
	(0.12)	(0.11)	(0.1)	(0.07)	(0.08)
	(0.1)	(0.1)	(0.1)	(0.07)	(0.08)
Term Spread	0.04	-.01	-.09	0.34*	0.34***
	(0.11)	(0.1)	(0.1)	(0.18)	(0.18)
	(0.03)	(0.03)	(0.1)	(0.18)	(0.05)
Credit Spread	-.24	-.11	0.3	0.91***	0.93***
	(0.41)	(0.4)	(0.37)	(0.2)	(0.22)
	(0.18)	(0.17)	(0.37)	(0.2)	(0.25)
log(Maturity)	0.73***	0.67***			
	(0.22)	(0.22)			
	(0.11)	(0.09)			
Issue Size	0.002***	0.0002	0.0001	0.0003	-.0003
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0009)
	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.001)
Seniority	0.22	-.07	-.08	-.03	-.21
	(0.17)	(0.17)	(0.19)	(0.19)	(0.17)
	(0.18)	(0.2)	(0.19)	(0.19)	(0.21)
Number of Covenants	0.35***	0.21***	0.2***	0.25***	0.24***
	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)
	(0.03)	(0.02)	(0.04)	(0.03)	(0.03)
Rating	0.07***	0.06***			
	(0.02)	(0.01)			
	(0.008)	(0.007)			
RoA		-4.16***	-4.38***	-3.78***	
		(0.79)	(0.64)	(0.5)	
		(0.81)	(0.64)	(0.5)	
RoA Volatility		-.98	0.02	0.41	
		(1.62)	(1.75)	(1.44)	
		(1.85)	(1.75)	(1.44)	
Equity Returns					0.14
					(0.12)
					(0.15)
Equity SD					0.65***
					(0.12)
					(0.19)
Firm Level Controls	No	Yes	Yes	Yes	Yes
Rating FE	No	No	Yes	Yes	Yes
Maturity FE	No	No	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes
N	1980	1863	1863	1863	1437
R^2	0.46	0.52	0.56	0.7	0.7

Table 8: Defeasance: Usage across underwriters

Obs	318	Percentiles	Value	Percentiles	Value
Min	0	1%	0.00	75%	0.47
Max	1	5%	0.09	90%	0.51
Mean	0.38	10%	0.23	95%	0.54
Std. Dev.	0.13	25%	0.29	99%	0.60
		50%	0.42		

Notes: We look at the empirical distribution of defeasance across underwriters. For each underwriter we compute the mean for the use of defeasance across all issues underwritten by this particular entity. We then consider the empirical distribution function across all underwriters.

Figure 1: The Average Use of Defeasance across Underwriters

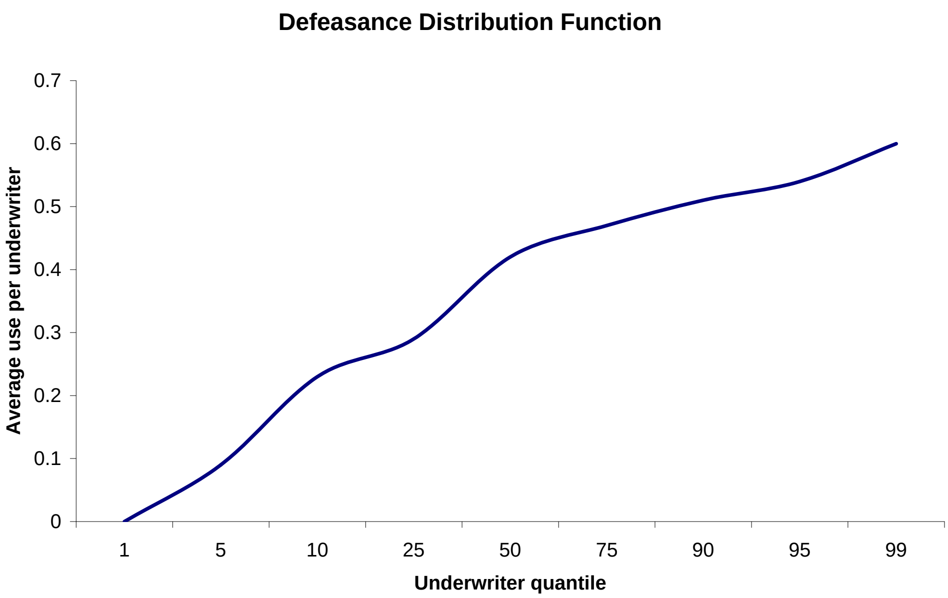

Table 9: Callability as Substitute for Defeasance?

	Defeasance: Yes (7190)			
	No		Yes	
	#	%	#	%
Callable	1406	0.19	5784	0.81
Continuously Callable	2733	0.48	3022	0.52
Continuously Callable at premium	43	0.00	2979	1.00
	#			
	#	Mean	Median	
Call Premium = Make Whole Spread in BP	2911	33.26	30	
	No		Yes	
	#	%	#	%
Not Continuously Callable have Quiet Period upfront	37	0.00	2696	1.00
	#	Mean	Median	
Length of quiet Period in years	2696	4.43	4.60	
	#	%		
Length of quiet Period relative to maturity (in %)	2696	45%	47%	
		Market Price	Par	Others
Call Price	2979	2750	127	102

Notes: In this table we look at how callability and defeasance interact. Conditionally on defeasance being present we first check how many bonds are callable. We then check whether we have an American Exercise setup (continuous) or a European (discrete). For those issues that are continuously callable we check whether this comes with a prepayment penalty (call premium or make-whole premium (Mergent (2004)). Finally, we look at the premium to be paid. For those issues that are not continuously callable we check whether they have a quiet period before the call can be exercised for the first time. We then compute the length of the quiet period in years and as a percentage of the issue's maturity.

Table 10: Sample Construction

Sample construction	
All FISD Issuesr (31/12/2008)	11837
Keep Industrials and Telecom Firms	-4207
Keep US Issuers	-1896
	=5734
Match with corresponding issues	=33401
- Drop Canadian Issues in the US	-8
- Drop Non-US issues in the US	-4
Keep Debentures	-7109
Keep if Subsequent Info available	-6040
Keep if Public Issue (no rule 144 PP)	-3655
Use Bond Type table to eliminate:	
Remaining MTNs:	-5341
Private Placements	-25
No Preferred Securities	-2
US Corporate Debentures	=10584
Merge with rating table	=9596
Merge with Compustat (Cusip)	=4856
Compustat variable definitions	
EBIT (Earnings before Interest and Taxes)	=ib
Cash	=che/at
Cash Flow	=(ib+dp)/ppe
Market Capitalization	=prcc_c*csho
RoA (Return on Assets)	=oibdp/at
Investments	=capx/at
Leverage	=(at-seq)/at
Market-to-Book Ratio	=(at-ceq+MarketCap)/at
Fixed Assets	=ppent/at
Z-Score	= 3.3*EBIT/at+sale/at+1.4*re/at+
	1.2*(act-lct)/at+0.6*MarketCap/(dltt+dlc)

Notes: This table describes how we construct our sample from the universe of bond issues collected in FISD. As we are only interested in public (non-convertible) corporate US debentures issued we eliminate various Non-US and Non-Corporate issues. In the second part of the table we describe our definitions of various variables based on Compustat items. We use the new Xpressfeed definitions rather than the old numerical data items.