The Defeasance of Control Rights

Carsten Bienz,[1,4]

Antoine Faure-Grimaud,[2,4]

and

Zsuzsanna Fluck[3,4]

This version: April 22, 2013

ABSTRACT

Renegotiations of positive covenants in loan contracts and their impact on corporate financing and investment decisions received a lot of attention in the finance literature recently. Action-limiting covenants in bonds, which are different in nature but no less important in terms of their impact, have been much less researched possibly because they are very difficult to renegotiate. This paper shows that an option granted to the issuer to remove the covenants upon exercise can effectively substitute for renegotiation and can implement endogenous control right allocation when no verifiable signal is available. Our model predicts and our empirical analysis documents that (1) with the option to remove covenants, issuers are willing to accept more action-limiting covenants ex ante; (2) the exercise price is set high enough so that the option is only exercised in the good state; (3) financially constrained firms with high growth opportunities and higher degree of uncertainty are more likely to include this option; (4) investors trade off the yield for reduced risk upon exercise in the good state and higher number of covenants in the bad state; (5) investors accept a lower yield on bonds with the option to remove covenants even after controlling for the number of covenants.

JEL Classification Nos.: G32, D86, G12

Keywords: Financial contract design, public bonds, action-limiting covenants, covenant defeasance option, control rights, bond yields.

[1]Department of Finance, Norwegian School of Economics (NHH), Centre for Financial Studies and Financial Markets Group at the London School of Economics (LSE). Email: carsten.bienz@nhh.no

[2]Department of Finance and Financial Markets Group at the London School of Economics.

[3]Department of Finance, Eli Broad Graduate School of Management, Michigan State University and The William Davidson Institute of the University of Michigan. Email: fluck@bus.msu.edu.

[4]We would like to thank Bruno Biais, Patrick Bolton, Catherine Casamatta, Paolo Fulghieri (discussant), Rajna Gibson, Denis Gromb, Alexander Gümbel, Michel Habib, Florian Heider (discussant), Rachel Hayes, Eirik Gaard Kristiansen, Michael Lemmon, Narayan Naik, Daniel Paravisini, Tiago Pinheiro, Rafael Repullo, Michael Roberts (discussant), Jean-Charles Rochet, Suresh Sunderasan, Javier Suarez, Jean Tirole, Karin Thorburn, Walter Torous (discussant), and Michael Winton (discussant) as well as conference and seminar participants at the 2010 AFA Meeting, CEPR 2009 Conference on Financial Markets, the EFA 2009 Meetings, the European Winter Finance Conference 2009 in Klosters, FIRS 2011, the IRMC 2010, the WFA 2010, SUNY Binghampton, CEMFI, Columbia, Dauphine, Development Bank of Japan, Geneva, HEC Paris, Kobe, LSE, Michigan, Nagoya, NHH, Toulouse, Urbana-Champaign, Waseda, BWZ Vienna and WU Vienna for helpful comments. All remaining errors are our responsibility.

The Defeasance of Control Rights

This version: April 22, 2013

ABSTRACT

Renegotiations of positive covenants in loan contracts and their impact on corporate financing and investment decisions received a lot of attention in the finance literature recently. Action-limiting covenants in bonds, which are different in nature but no less important in terms of their impact, have been much less researched possibly because they are very difficult to renegotiate. This paper shows that an option granted to the issuer to remove the covenants upon exercise can effectively substitute for renegotiation and can implement endogenous control right allocation when no verifiable signal is available. Our model predicts and our empirical analysis documents that (1) with the option to remove covenants, issuers are willing to accept more action-limiting covenants ex ante; (2) the exercise price is set high enough so that the option is only exercised in the good state; (3) financially constrained firms with high growth opportunities and higher degree of uncertainty are more likely to include this option; (4) investors trade off the yield for reduced risk upon exercise in the good state and higher number of covenants in the bad state; (5) investors accept a lower yield on bonds with the option to remove covenants even after controlling for the number of covenants.

JEL Classification Nos.: G32, D86, G12

Keywords: Financial contract design, public bonds, action-limiting covenants, covenant defeasance option, control rights, bond yields.

1 Introduction

Negative covenants mitigate the agency conflict between debt and equity holders and lower the cost of debt but come at the cost of reduced flexibility for firms (Myers (1977) and Smith and Warner (1978)). Ideally one would like to design bond covenants to give 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 sales altogether would protect the lender from potential asset stripping. By accepting the covenant, however, the firm would have to give up all returns from future asset sales during the life of the bond.

If there were verifiable signals that could identify states in which asset sales would compromise a lender's interest, then this tradeoff could 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 action-limiting covenants from the borrower. These covenants may prohibit asset sales, new debt issues, dividend payments, transfers between subsidiaries, etc.[1] However, reliance on these covenants may be inefficient when firms are forced to forego valuable investment opportunities ex post in exchange of financing their investments.

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 upon paying the exercise price. By granting the firm the option to take back control, non-contingent control rights can be made state-contingent even when no interim signals are available. The option, if properly designed, is exercised only in states in which the investment opportunity is value-increasing.

We develop a theoretical model to investigate the role of this covenant defeasance option in bond contracts and present an empirical analysis of the model's predictions. Our model predicts that bonds with the option to remove covenants are likely to include more action-limiting covenants ex ante. Issuers are willing to comply with more action-limiting covenants ex ante if they know that they can regain control of the covenant-restricted actions in some states of the world ex post.

While one would expect that defeasible bonds demand higher yield than bonds with irrevocable covenants since they allow the issuer to remove covenants some states of the world, our

[1] 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 that "public debt issues contain covenants that are virtually impossible to negotiate and especially to renegotiate."

theory implies the reverse, namely that defeasible bonds are issued at a lower yield relative to bonds with irrevocable covenants. To explain the lower yield we decompose the yield differential. We show that in the states when the covenant defeasance option is exercised the bond will become less risky (possibly even risk-free) and in states when the covenant defeasance option is not exercised the issuer complies with more action-limiting covenants. Hence, bondholders trade off the yield for the reduced risk upon exercise of the covenant defeasance option in the good state and for the protection they enjoy from the higher number of covenants in the bad state. A novel prediction derived from our theory is that even after controlling for the number of covenants in the bond the inclusion of the covenant defeasance option is associated with lower yield.

Interestingly, not all issuers include the covenant defeasance options. According to our theory, firms are likely to issue defeasible bonds when they are financially constrained; when they have significant growth opportunities and when there is higher degree of uncertainty about their growth prospects. The model predicts that firms with these characteristics can enjoy lower yields on their defeasible bonds. Moreover, it is not the yield differential that drives the decision to include the defeasance option in our model but the presence of financial constraints, uncertainty or lack of verifiability of the firm's growth opportunities and the firm's willingness to exercise the covenant defeasance option in states of the world where it is value-maximizing that guarantees the lower yield. Financially constrained firms are willing take on more state-independent action-limiting covenants. Those with potentially significant growth opportunities and higher degree of uncertainty are the ones that benefit from the covenant defeasance option most. Issuers would exercise the covenant defeasance option when their non-verifiable growth options realize and when they need to control actions limited by negative covenants to realize the value of their growth opportunities. Our model also predicts that firms with limited growth opportunities issue bonds with irrevocable covenants.

In practice, when the issuer exercises the covenant defeasance option, it removes all covenants after placing enough US government securities in a trust account so that all remaining interest and principal payments can be made on schedule. By doing so, the bond becomes risk free: it is fully collateralized by the borrower. As AIG's option states: "We will be released from the restrictive covenants under the notes. This is called covenant defeasance. [...] In that event, you would lose the protection of these restrictive covenants but would gain the protection of having money and securities set aside in trust to repay the notes. In order to achieve covenant defeasance, we must do the following: We must deposit in trust for the benefit of all holders of the notes a combination of money and U.S. government or U.S. government agency notes or bonds that will generate enough cash to make interest, principal and any other payments on the notes on their various due dates. [...] " (American International Group, Inc (2006)).

Consistent with practice, our model predicts that if the exercise is incentive compatible at any price, it is always incentive compatible at the exercise price equal to all remaining principal and interest. For some firms/bonds this may be the only incentive compatible exercise price. The model also implies that the removal of any covenant should be priced the same as the removal of all covenants. Otherwise, if the issuer were allowed to remove individual covenants at lower prices, it could do so even in the low states when the use of those actions would be detrimental to bondholders. In practice issuers remove all covenants upon exercise of the covenant defeasance option.

For our empirical analysis we merged data from the Fixed Income Securities Database (FISD) on all US corporate bond issued between 1980 and 2008 with Compustat data on firm/issuer characteristics. More than 90% of the bond issues in our sample contain at least one covenant. Almost all covenants that we observe are non-contingent covenants that restrict certain actions by the issuer such as asset sales, new debt issues, dividends, mergers, transfers between subsidiaries, etc. Positive covenants, common in loan contracts, are rare. Covenants defeasance options are included in about 70% of the issues.

To investigate the model's prediction about the type of firms that issue defeasible bonds, we run Probit regression with defeasance as the dependent variable. To proxy for growth opportunities we use sales growth and market-to-book as explanatory variables; for financial constraints we use fixed assets, the Kaplan-Zingales index, the Whited-Wu index and firm size; for uncertainty of growth opportunities we include the dispersion of analysts' forecasts from I/B/E/S; and for willingness to exercise growth opportunities we include leverage. Our evidence supports the view that financially constrained firms with high growth opportunities and high degree of uncertainty are more likely include covenant defeasance options in their bonds. Firms with higher Kaplan-Zingales and Whited-Wu indexes for financial constraints and with lower fraction of fixed assets, high sales growth, high dispersion of analysts' forecast and lower leverage are more likely to issue defeasible bonds. The firm characteristics implied by our theory are statistically significant in most of our specifications and explain 36-39% of the R^2 from the regression with year, industry and underwriter controls.

Next we examine the impact of the defeasance option on bond yields. According to our model financially constrained firms are more likely to include covenant defeasance options in their bonds than unconstrained ones. However, a simple comparison of yields on bonds with and without the covenant defeasance option would not give the correct estimate for the yield differential because financially constrained firms also have higher probability of default which would imply higher yields. To overcome this problem, we employ two different methods. The first is the propensity score matching procedure proposed by Rosenbaum and Rubin (1983) that allows for selecting otherwise similar defeasible and non-defeasible bonds and compare yields on these matching pairs. The second is a two-stage estimation procedure first proposed by Lee (1978) and adopted for bond yields by Bradley and Roberts (2004)) and Goyal (2005). This two-stage procedure estimates the counterfactual bond yield, i.e. what the yield would have been on a bond if it had or had not included the covenant defeasance option and computes the yield differential.

The results support the model's predictions that the inclusion of the defeasance option is associated with lower yield. The propensity score matching procedure estimates 28-33 basis points yield differential between non-defeasible and defeasible bonds. In the two-stage procedure the implied yield differential after controlling for the number of covenants ranges between 20 and 33 basis points. Given the average bond issue of $441 million in our sample, a 20 basis point reduction amounts to approximately $1 million in terms of annual interest savings, or 4 percent of the interest expense based on the average yield of 7.13%, or $11 million savings over the life of the average bond of 11 years. A 30 basis point reduction amounts to approximately $1.5 million in terms of annual interest savings, or 6 percent of the interest expense.

In the last stage of the two-stage procedure we run a Probit regression with the inclusion of the covenant defeasance option as the right hand side variable and the implied yield differential as an explanatory variable. Consistent with the model's prediction neither the yield differential nor the number of covenants drive the inclusion of the covenant defeasance option. From the two-stage procedure we report that the defeasibility of a bond is positively and statistically significantly associated with the issuer's financial constraints and the degree of uncertainty about the issuer's growth opportunities.

Consistent with the model's predictions, we document that the number of covenants increase with the covenant defeasance option. They increase by approximately 10 percent or by half a covenant and this increase is economically significant.

One may think that callability and covenant defeasance are substitutes. However, this may not be the case. First, traditional callable bonds are usually issued at a yield premium, not at the yield discount we document for defeasible bonds. The higher yield on callable bonds compensate investors for the expected wealth loss due to early refinancing. Unlike the call, the exercise of the covenant defeasance option does not expose investors to refinancing risk because upon defeasance the bond continues to pay its coupon on schedule until maturity. While we report that 80% of issues in our sample that include the covenant defeasance option are also callable, half of these issues have to be called at a make-whole premium. A make-whole premium is calculated as all the remaining outstanding payments of the bond discounted at a Treasury rate plus a premium of about 33bp (see Table 11). Bondholders are also taxed on any proceeds from the call. The exercise price of the covenant defeasance option is computed as all the remaining outstanding payments discounted at their respective spot rates. In the special case of a flat term structure covenant defeasance would be cheaper for both the issuer and the bondholders since defeasance has no tax implication for the bondholders. Traditional callable bonds may be cheaper to exercise ex-post than defeasible bonds but they usually have an initial quiet period roughly equal to half of the maturity of the bond. We perform several robustness checks to see whether underwriters include covenant defeasance in a boiler-plate fashion and document that it does not appear to be the case.

Asquith and Wizman (1990) are the first to mention covenant defeasance options and discusses their important in the context of LBO deals. Johnson, Pari, and Rosenthal (1989) and Hand, Hughes, 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.[2] 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.

The importance of defeasance options has been highlighted 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 underenforcement 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. This finding is also supported by survey evidence that shows that CFOs are interested in the ability to remove restrictive covenants (Mann and Powers (2003)).

Our theory builds on Aghion and Bolton (1992), Aghion and Tirole (1997), Fluck (1998) and Chemla, Habib, and Ljungqvist (2007). 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 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) illustrate 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

[2]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.

how the assignment of control rights can be made endogenous even when no verifiable signal is available.

Our paper is also related to the literature on renegotiation of loan contracts since we present an alternative to renegotiation for bonds contracts that cannot be renegotiated. Fudenberg and Tirole (1990) and Hermalin and Katz (1991) model the impact of renegotiation on outcomes. Aghion, Dewatripont, and Rey (1994) show how renegotiation design can influence the efficiency of the 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. Roberts and Sufi (2009) show that bank loans are frequently renegotiated and emphasize that covenants can determine parties' outside options during renegotiation. Bolton and Jeanne (2007) and Brunner and Krahnen (2008) demonstrate that debt renegotiation is more complex when many lenders are involved. Our contribution is to show a mechanism to efficiently remove covenants from public bonds when large number of dispersed investors and corresponding regulations make ex post renegotiation impossible.

Our model also contributes to the literature on hold-up problems in financial contracts. Our paper is 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.

The rest of the paper is organized as follows. Section 2 presents legal definitions and institutional details on bond covenants and covenant defeasance options. Section 3 describes the model and derives the theoretical predictions. The empirical analysis is shown in Section 4. Section 4.1 introduces the variables. Section 4.2-4.5 test the model's prediction on our sample of US corporate bonds. Section 4.6 demonstrates the joint determination of the covenant defeasance inclusion and the yield. Section 4.7 further analyzes the robustness of our results. Section 5 presents our concluding remarks.

2 Institutional Background

The term defeasance covers several distinct concepts in the legal terminology of financial contracting. The first concept is covenant defeasance (or "legal" defeasance), which is the focus of our paper. Covenant defeasance is an option granted to the issuer that must be specifically permitted in the bond indenture in order to be exercised. Upon exercise, the debtor is legally released from all terms of the bond covenants in exchange of a pre-specified payment (Johnson, Pari, and Rosenthal (1989)).

An exact definition of 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 the remaining interest and principle payments of the current issue."

Since the bond trustee cannot give permission to remove covenants from bonds or to change the bond contract and the two-third approval requirement in the Trust Indenture Act makes it virtually impossible to renegotiate with bondholders, the covenant defeasance option allows the issuer to take control of its actions in some states of the world after paying the exercise price. This contractual provision in practice is very similar to the option clause that we suggest in our financial contracting model to alleviate the agency problem between lenders and borrowers when contingent contracts cannot be written because no verifiable signal is available.

Covenant defeasance options are frequently included in US corporate bonds. In our sample of US corporate bonds, 70% of the issues include the covenant defeasance option. For the statements and implementation of the covenant defeasance options see Coca-Cola (2005) or the aforementioned American International Group, Inc (2006). It is not uncommon for firms to exercise these options. Kahan and Rock (2009) mentions some examples. Other examples of announcements of covenant defeasance option exercise are Aleris Corp. (2006): "[...] Aleris also today announced that it is depositing funds with JPMorgan Chase Bank, N.A., as trustee under the indenture for the 10 3/8% Notes to effect a covenant defeasance, which terminated its obligations with respect to substantially all of the remaining restrictive covenants on the 10 3/8% Notes, [...]."Greyhound Lines (2005) and Tommy Hilfiger U.S.A. (2006) are additional examples for defeasance exercise.[3] Covenant defeasance options are either exercised for the whole issue or in conjunction with a bond repurchase to remove the covenants on the fraction of the bonds in the issue that were not repurchased and are held by the remaining bondholders.

The term defeasance also refers to what is called economic defeasance. In economic defeasance the issuer can remove the bond from the balance sheet by placing cash and marketable securities with a trustee to cover principal and interest but the covenants remain in effect. Both clauses (covenant and economic defeasance) need to be exercised to completely free the borrower from the bond. Economic defeasance used to be feasible even when it was not specified in the bond indenture, if consent was obtained from the trustee. This informal arrangement was referred to as in-substance defeasance.[4]

[3]We would like to thank an anonymous referee for suggesting these examples.

[4]In in-substance defeasance the debtor does not relinquish ultimate legal obligation for debt payments and bond covenants remain in effect but the underlying accounting numbers (i.e., income and book value of debt) change.

The accounting treatment of economic defeasance has changed during our sample period. The FASB first recognized the use of in-substance defeasance in FASB statement 76 (FASB (1983)) only to reconsider in FASB statement 125 FASB (1996).[5] This implies that after FAS 125 (FASB (1996)) was published, in-substance defeasance was not recognized for accounting purposes.

In contrast to economic defeasance, covenant defeasance is extremely difficult to execute unless a covenant defeasance option is explicitly specified in the contract, since the U.S. Trust Indenture Act forbids the waiver of covenants without explicit approval from at least two thirds of all bondholders (Smith and Warner (1978)).

3 A Model of Bond Covenants.

We present a simple model to study the assignment of control in financial contracts when no verifiable intermediate signal is available. From this model we derive predictions for the inclusion of action-limiting covenants (restrictions on asset sales, mergers, or dividend payments) and covenant defeasance options in bond contracts. Then we test the model's predictions on US corporate bond data.

3.1 Players and Technology.

Consider a firm with an investment project. The project requires an investment outlay, I and generates state-dependent payoffs. Some of the project payoffs are pledgeable, others are non-verifiable by the investors and therefore ex-ante non-pledgeable. The firm can internally fund $0 \leq A < I$. To raise $I - A$, it issues a bond to investors. The bond contract specifies the size of the investment, the allocation of the proceeds and the control rights to investors.

There are two interim states of nature with probability 1/2 each, state H and L. The states differ in the expected project payoffs. At the time of the financing decision neither the investors, nor the firm knows the state of nature. Once the investment outlay is sunk, a signal $s \in \{L, H\}$ is observed. This signal is indicative of the interim state of nature but it is not verifiable. After the signal is observed, the firm can take actions in its control, i.e. it can sell assets, pay dividends, raise additional debt, etc. We denote these actions by a (for the one-action case) or a_i (for the multiple action case), respectively. If some of these actions are restricted by the bond contract via action-limiting (negative) covenants[6], then those actions

[5]FASB statement 140 FASB (2000) modifies FAS 125 (FASB (1996)) but does not change the principles of debt extinguishment.

[6]Action-limiting (negative) covenants are common in US corporate bonds. They restrict asset sales, dividend payments, mergers, acquisitions, new debt issues, etc. Since renegotiation is generally infeasible in dispersedly

cannot be taken by the firm.

Since the interim signal is non-verifiable, the bond contract allocates control independent of the state. If an action in the manager's control increases the project's expected payoff in state H but decreases it in state L and the manager takes this action, then in state H the expected project payoff would be higher but the variance will also be higher and repayment would be more at risk. If the investor is assigned control over a, then expected repayment will be higher in state L and the variance of the payoffs will be lower. Hence, there is a conflict of interest between the manager and the investors: The manager may prefer to take a in both states but investors prefer that the firm refrains from taking the action in either state.

If the firm controls a, the expected project payoffs are as follows. In state L the pledgeable or contractible return of the project is R_M and 0 with probability p_L and $(1-p_L)$. The firm can potentially realize additional growth opportunities, Q_M on top of R_M, but these growth opportunities are non-verifiable and non-contractible[7]. In state H, the pledgeable return is either R_H or 0 with probability p_H and $(1-p_H)$, respectively. Again, the firm can potentially realize additional growth opportunities, Q_H, on top of R_H, but these growth opportunities are non-verifiable and non-contractible. So the non-pledgeable growth opportunities are Q_H with probability p_H in state H and Q_M with p_L in state L. By definition of the states, $R_M < R_H$, $Q_M < Q_H$, and $p_H(R_H+Q_H) \geq p_L(R_M+Q_M)$. We assume that the project is positive net present value, i.e.

$$p_L(R_M+Q_M)+p_H(R_H+Q_H) \geq 2I \tag{1}$$

An action-limiting (negative) covenant protects the bondholder by increasing the lowest returns from 0 to ΔR_L in both states. However, by restricting the issuer's action, it also limits the issuer's ability to realize its growth opportunities and comes at the expense of the project's upside. With the action-limiting covenant in place, the expected non-contractible project returns decrease from Q_M to $Q_M-\Delta Q_M$ in state L, and from Q_H to $Q_H-\Delta Q_H$ in state H. Hence, giving control to the investor increases the repayment by ΔR_L in either state but costs the issuer future growth opportunities ΔQ_H and ΔQ_M in state H and L, respectively. Taking the action increases the payoff in state H if $\Delta Q_H > (1-p_H)\Delta R_L$ and decreases it in state L if $(1-p_L)\Delta R_L > \Delta Q_M$. Naturally, the higher are the issuer's growth prospects, the more valuable it is for the issuer to control its decisions to realize its growth opportunities, so giving away control can cost a lot of upside to the firm. On the other hand, for a firm with limited growth opportunities there is little value to be gained on the upside by controlling its decisions. We model this relationship by assuming that ΔQ_M and ΔQ_H increase with Q_M

held public bonds, the inclusion of a negative covenant is a commitment by the firm not to sell assets or pay dividends, etc. until the bond is paid off.

[7] There are several ways to think about these non-contractible growth opportunities. For example, Q is non-pledgeable because the realization of Q requires effort by the issuer and the issuer's effort is not verifiable.

and Q_H and $\Delta Q_M < \Delta Q_H$.

Without loss of generality, we focus on projects for which investors' control of a decreases social welfare, that is,

$$\frac{(2 - p_L - p_H)\Delta R_L}{p_L \Delta Q_M + p_H \Delta Q_H} < 1 \tag{2}$$

The numerator in (2) is the increase in pledgeable income due to the action-limiting covenant and the denominator is the respective loss in growth opportunities. When (2) holds, investor control of a is inefficient, the increase in pledgeable income falls short of the value of growth opportunities the firm has to forego. Note that this condition puts a lower limit on the issuer's non-contractible growth opportunities Q_M and Q_H relative to ΔR_L. The more limited are the firm's growth opportunities, the more likely that action-limiting covenants are social welfare increasing. We will return to this point later.

From now on, we focus on projects that do not have sufficient pledgeable income to raise financing without accepting an action-limiting covenant on a but can raise financing with such covenant. These projects satisfy

$$\frac{p_L R_M + p_H R_H}{2} < I - A. \tag{3}$$

and

$$\frac{p_L R_M + (1 - p_L)\Delta R_L + p_H R_H + (1 - p_H)\Delta R_L}{2} \geq I - A. \tag{4}$$

The LHS of (3) and (4) are the expected payoff from the project without and with covenant, respectively, and the RHS is the financing bondholders provide.

3.2 State-independent Control Allocation

Assuming, without loss of generality, that R_M is sufficient to make the required payment, R_b^c on the bond with a non-contingent action-limiting covenant and that (2), (3) and (4) are satisfied, then

$$R_b^c = \frac{2(I - A) - (2 - p_L - p_H)\Delta R_L}{p_L + p_H}. \tag{5}$$

This bond payment is obtained by substituting R_b^c for R_M and R_H into (4) and setting the inequality binding.

Note that the payment, R_b^c, on the covenant bond, is lower than the payment, $R_b^{nc} = \frac{2(I-A)}{p_L+p_H}$ on the no-covenant bond, were it possible to issue the no-covenant bond. A firm can issue the latter if the reverse of (3) holds.

3.3 State-contingent Control Allocation

Allocating control to investors increases pledgeable income and funds positive net present value projects that cannot raise financing otherwise. However, when (2) holds, investor control of decision a is not first-best. There is an inefficiency: financially constrained firms are forced to give up disproportionably more valuable growth opportunities in exchange for funding current projects.

Efficiency may be increased if the allocation of control rights could differ across states. As Lemma 1 shows, giving investors more control rights in state L and fewer in state H would increase social welfare.

Lemma 1: If state-contingent control right allocation were possible, then granting investors more control rights in state L and fewer in state H would increase social welfare.

Proof: in Appendix.

In other words, if control rights could be state-contingent, the financier would hold *more* control in state L. This would provide more repayment to the financier when project returns are low and more growth opportunities to the issuer on the upside. Hence, in the context of public bond contracts, our model implies that it would be a Pareto-improvement to have more action-limiting covenants in state L and fewer in state H.

Proposition 1 describes an option mechanism to implement the desired allocation of control when no verifiable interim signal is available. Like the state-independent control allocation, this mechanism also imposes a cost on the financially constrained firm. Instead of giving up future growth opportunities, however, the cost is paid in the form of the exercise price.

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

- give the financier control over decision a;
- give the firm an option to buy back control;
- set the exercise price of this option so that the firm can only exercise it in state H.

Proposition 1 describes an endogenous control allocation mechanism implemented by the issuer exercising an option to reallocate control rights in some state of the world. Upon exercise, the issuer is making a transfer to the bondholders in exchange for removing the covenants. We denote by R_b^d the required payment on the bond with the covenant defeasance option, by E the exercise price of the covenant defeasance option and by $\hat{R}_b^d$ any post-defeasance payment on the bond. Upon exercise of the covenant defeasance option, the bondholders receive E, the exercise price, and depending on the contract, they may receive an additional post-defeasance payment, $\hat{R}_b^d$, if any. In state L (the case of no exercise) the bondholders' expected payment is $p_L R_b^d + (1 - p_L)\Delta R_L$.

What is the exercise price, E of the option to buy back control in Proposition 1? First, the exercise price must high enough so that the issuer will not exercise the option in state L. Second, the exercise price should not be set too high, otherwise the issuer would not be willing to exercise the option even in state H. Third, the exercise price must be high enough for the bondholders to trade it off for control. Fourth, the exercise price should be such that the issuer would prefer the exercise to the buy-back of the bond. Proposition 2 derives the range of exercise prices that implement the constrained-efficient control allocation. We will compute R_b^d after we derive the conditions for the exercise price.

Proposition 2: Assume that (2), (3) and (4) hold. The exercise price, E that implements the mechanism in Proposition 1 satisfies

$$(i)\;\; E + p_L \hat{R}_b^d - p_L R_b^d \geq p_L \Delta Q_M, \tag{6}$$

so the issuer will not exercise the option in state L;

$$(ii)\;\; p_H \Delta Q_H \geq E + p_H \hat{R}_b^d - p_H R_b^d, \tag{7}$$

i.e. the issuer is willing to exercise the option in state H;

$$(iii)\;\; E \geq (1 - p_H)\Delta R_L, \tag{8}$$

$$(iv)\;\; E + p_H \hat{R}_b^d \geq p_H R_b^d + (1 - p_H)\Delta R_L, \tag{9}$$

so the lender is willing to give up control upon exercise;

$$(v)\;\; E + p_H \hat{R}_b^d \leq R_b^d, \tag{10}$$

hence the issuer prefers exercising of the defeasance option to buying back the bond.

Proof: in Appendix.

Charging the lowest possible exercise price given the constraints is the best way to reward the firm in state H. If (6) is satisfied, the issuer will not exercise the option in state L because its gains from exercise are less than the cost of exercise.

The highest possible exercise price that satisfies the constraints is $E = R_b^d$, the payment on the bond with the option to remove covenants. In this case $\hat{R}_b^d = 0$. In state H the issuer would pay R_b^d upon exercise and the bond would become risk-free.[8]

Note that the option to buy back control is exercised by the issuer ex post if the growth opportunities in state H from controlling the corporate actions exceed the exercise price, that is, if (7) holds. The issuer exercises the option if ΔQ_H, the gain from control and/or p_H, the probability of success are relatively large. Of course, if the issuer is not expected to exercise the option ex post, bondholders will require R_b^c instead of R_b^d as payment on the bond.

Needless to say that there may not exist an exercise price that satisfies (6), (7), (8), (9) and (10) for some bonds and firms. For such bonds the mechanism in Proposition 1 cannot be implemented and the issuers will not include defeasance options in their contracts. We will return to the characterization of these bonds later.

The exercise price of the covenant defeasance option in US corporate bonds in practice is set to $E = R_b^d$, the highest possible price predicted by our model that satisfies the incentive compatibility and participation constraints. It is straightforward to see that if there is an exercise price that satisfies the constraints in Proposition 2, so does $E = R_b^d$. Moreover, for some firms/bonds $E = R_b^d$ may be the only incentive compatible exercise price. Because of the importance of this case both for practice and for our empirical analysis, we restate Proposition 2 for $E = R_b^d$ and $\hat{R}_b^d = 0$.

Corollary 1: $E = R_b^d$ implements the state-contingent control right allocation in bonds if it satisfies

$$(i') \;\; E \geq \frac{p_L}{1-p_L}\Delta Q_M, \tag{11}$$

$$(ii') \;\; \frac{p_H \Delta Q_H}{1+p_H} \geq E, \tag{12}$$

$$(iii') \;\; E \geq \Delta R_L \tag{13}$$

[8] Note that the financier may prefer to receive the exercise price in partial payments over time for tax reasons. If so, the issuer can put the exercise price in an escrow to be paid out according to the original payment schedule.

Note that Corollary 1 has fewer conditions than Proposition 2. When $E = R_b^d$, condition (v) in Proposition 2 is automatically satisfied and omitted. Condition (iv) in Proposition 2 collapses into condition (iii') in Corollary 1 which in turn implies condition (iii) in Proposition 2. Notice that condition (i') in Corollary 1 can be equivalently written as $R_b^d \geq \frac{p_L}{1-p_L}\Delta Q_M$.

The ex ante financing condition for a defeasible bond with an action-limiting covenant is

$$\frac{(1-p_L)\Delta R_L + p_L R_M + p_H R_H}{2} \geq I - A. \tag{14}$$

The LHS of the inequality is the pledgeable income from the project taking into account the option exercise in state H. The RHS of the inequality is the financing investors provide. When conditions (6), (7), (8) and (9) are satisfied, the firm will exercise the option in state H and will not exercise it in state L. Note that the LHS of (14) is less than the LHS of (4), the financing constraint for the bond with irreversible action-limiting covenant on a, but it is greater than the LHS of (3), the financing constraint for the no-covenant bond. Hence, if a firm cannot issue a covenant-free bond but can issue a bond with a non-defeasible action-limiting covenant, it may or may not be able to raise financing by defeasible bond.

We now compute the yield on defeasible bonds with action-limiting covenants when (6), (7), (8) and (9) in Proposition 2 hold. We compute the bond payment, R_b^d by assuming that E and $\hat{R}_b^d$ satisfy condition (10) in Proposition 2 and without explicitly specifying E and $\hat{R}_b^d$. The issuer is charged R_b^d ex ante when it is expected to exercise the covenant defeasance option ex post. Otherwise it is charged R_b^c.

Assuming, without loss of generality, that R_M is sufficient to make payment, the payment on the defeasible bond is obtained by solving

$$\frac{p_L R_b^d + (1-p_L)\Delta R_L + E + p_H \hat{R}_b^d}{2} = I - A \tag{15}$$

that is,

$$R_b^d = \frac{2(I-A) - (1-p_L)\Delta R_L - E - p_H \hat{R}_b^d}{p_L}. \tag{16}$$

For the special case when $E = R_b^d$ and $\hat{R}_d^b = 0$, the highest possible exercise price satisfying the constraints, the defeasible bond payment becomes

$$R_b^d = \frac{2(I-A) - (1-p_L)\Delta R_L}{1+p_L}. \tag{17}$$

How do defeasible bonds compare with bonds with irrevocable covenants? First, we show that when covenants are bundled with the option to remove them, the issuer is willing to grant the financier more control ex ante (Proposition 3). Second, we establish that the yield on bonds that include this option is lower than on bonds with irrevocable action-limiting covenants (Proposition 4). We then explain the yield differential by decomposing it into economically meaningful parts (Corollary 2).

For the analysis of more than one covenant, we introduce two decisions, a_1 and a_2. Think of these decisions as restrictions on dividend payments, asset sales, mergers, or new debt issues.

With the inclusion of action-limiting covenants on $a1$ and $a2$, the contractible project returns increase by $\Delta^s R_L = \sum_{i=1}^{2} \Delta^{a_i} R_L$ in state L and H with probability $(1 - p_L)$, and $1 - p_H$, respectively, but at the expense of the non-contractible project returns which decrease by $\Delta^s Q_M = \sum_{i=1}^{2} \Delta^{a_i} Q_M$ with probability p_L in state L and by $\Delta^s Q_H = \sum_{i=1}^{2} \Delta^{a_i} Q_H$ with probability p_H in state H. Compliance with two covenants increases pledgeable income by $\Delta^s R_L$ in either state but costs the issuer future growth opportunities $\Delta^s Q_H$ and $\Delta^s Q_M$ in state H and L, respectively. We assume that (2) holds for both $a1$ and $a2$ and that the subscript of a decision refers to the covenant's efficiency, i.e. $a2$, is less efficient than $a1$.

With respect to Proposition 2, if there are more covenants in the bond, the option is restricted to buying back control of any one covenant at the same price as all of them. Otherwise, if the firm were allowed to remove individual covenants at lower prices, it could do so even in state L.

First, we show that with irrevocable covenants, the issuer would not accept more covenants than necessary to raise financing. Then we establish that for defeasible bonds the issuer is willing to comply with additional covenants.

Lemma 2: When action-limiting (negative) covenants are irrevocable and condition (2) holds for all decisions, $a1$, $a2$, etc. then the issuer prefers to issue bonds with the least number of covenants.

Proof: in Appendix.

When the issuer is granted the option to remove covenants by paying the exercise price, it is willing to comply with more covenants ex ante.

Proposition 3: When the issuer is granted the option to buy back control and the exercise price satisfies (6), (7), (8), (9) and (10), then ex ante it allocates the bondholders at least as many decisions as in the absence of this option, or more.

Proof: in Appendix.

Proposition 3 implies that the issuer is willing to comply with more action-limiting covenants in state L if it expects to remove those covenants in state H. For example, the issuer is willing to accept an additional covenant on the defeasible bond if $p_H \Delta^s Q_H \geq E + p_H \hat{R}_b^{d2} - p_H R_b^{d2}$, i.e. if the issuer is willing to exercise the option and remove the covenants in state H. This condition is the equivalent of (7) for the two-covenant case. Note from Proposition 3 that those projects that satisfy (3) but fail (4) can only include defeasance option if they accept additional covenants.

The main empirical implication of Proposition 3 is the positive association between the number of rights given to the financier and the inclusion of the option to remove covenants in the bond contract. Proposition 3 also establishes a link between the inclusion of the covenant defeasance option and the issuer's financial constraints, growth opportunities, the degree of uncertainty of the growth opportunities and the willingness to exercise the covenant defeasance option.

The next step is to compute the yields for bonds with defeasible and irrevocable covenants. Let B^{d*} denote the issuer's choice among defeasible bonds and B^{c*} the issuer's choice among non-defeasible bonds.

Proposition 4: The bond with the option to remove covenants, B^{d*}, demands a lower yield than the bond with irrevocable covenants, B^{c*}, if conditions (6), (7), (8), (9) and (10) hold.

Proof: in Appendix.

Proposition 4 establishes that investors are willing to accept a lower yield for bonds with the option to buy back control. Investors trade off the yield for reduced risk upon option exercise in state H and higher number of covenants in state L. To explain the source of the premium we decompose the yield differential for the case when the exercise price is set the maximum allowed by the constraints in Proposition 2. This is also the most relevant case for practice and for our empirical analysis.

Let n denote the number of covenants on the defeasible bond and k the number of covenants on the non-defeasible bond where n and k correspond to the issuer's choice to maximize its payoff given the financial constraints. Note from Proposition 3 that $n \geq k$. For the purpose of this corollary we write $R_b^{c_k}$ for the payment on the non-defeasible bond and $R_b^{d_n}$ for the payment on the defeasible bond. Similarly, we use $\Delta^{s_k} R_L$ and $\Delta^{s_n} R_L$ in place of ΔR_L for the non-defeasible and the defeasible bonds, respectively. Here $\Delta^{s_k} R_L$ equals to $\sum_{i=1}^{k} \Delta^{a_i} R_L$ and $\Delta^{s_n} R_L = \sum_{j=1}^{n} \Delta^{a_j} R_L$.

Let h denote the yield differential between bonds with irrevocable and defeasable covenants, i.e. $h = R_b^{c_k} - R_b^{d_n}$. Recall from Proposition 4 that defeasible bonds are issued at a premium, i.e. h is negative. In state H the option is exercised for the defeasible bond and the corresponding yield component is $R_b^{d_n}$. For the bond with irrevocable covenant, holders expect to receive $(1 - p_H)\Delta^{s_k} R_L + p_H R_b^{c_k}$ in state H. In state L there is no exercise. The bondholders' expected payments is $(1 - p_L)\Delta^{s_n} R_L + p_L R_b^{d_n}$ on the defeasible bond and $(1 - p_L)\Delta^{s_k} R_L + p_L R_b^{c_k}$ on the non-defeasible bond.

Corollary 2: For the special case when $E = R_b^d$, the yield differential between bonds with irrevocable and defeasible covenants is

$$h = \frac{(1-p_H)(R_b^{d_n} - \Delta^{s_k} R_L) - (1-p_L)(\Delta^{s_n} R_L - \Delta^{s_k} R_L)}{p_H + p_L} \tag{18}$$

Proof: in Appendix.

As Corollary 2 shows, the yield differential is made up from two components. First, when the issuer exercises the option in state H and pays the exercise price, the bond becomes less risky upon exercise. In the special case when the exercise price is set at the maximum allowed by the constraints, i.e. when $E = R_b^d$, the bond becomes risk-free upon exercise, and this gain/risk-reduction is proportional to

$$(1-p_H)(R_b^{d_n} - \Delta^{s_k} R_L),$$

the first component in the yield differential (18). Secondly, from Proposition 3, $B^{d_n *}$ includes at least as many or more covenants in state L than $B^{c_k *}$. The bondholders' gain from the additional covenants in state L is proportional to

$$(1-p_L)(\Delta^{s_n} R_L - \Delta^{s_k} R_L),$$

the second component in the yield differential (18).

Thus, bondholders are willing to accept a lower yield on the defeasable bond because in state H the exercise the defeasance option makes the bond less risky, and in state L the issuer will comply with additional covenants. Hence, our model predicts that even after controlling for the number of covenants in the bond the inclusion of the covenant defeasance option is associated with lower yield.

One question of course remains. If defeasable bonds enjoy premia, why don't all issuers include defeasance options in their bonds? Lemma 3 and Proposition 5 demonstrate that some issuers choose to issue bonds with irrevocable covenants. Lemma 3 focuses on the one covenant case and shows that firms with limited growth opportunities issue bonds with non-defeasable covenants. It is comprised of two cases. The first case is about affordability. Since the firm may not have sufficient pledgeable income to issue the defeasible bond, it will include an irrevocable covenant. The second case is about efficiency. If it is social welfare increasing to issue a bond with irrevocable covenant, the issuer will not issue the defeasible bond. The proof of Lemma

3 is straightforward and omitted. Proposition 5 generalizes the affordability case for multiple covenants a_1 to a_w.

Lemma 3: The firm will prefer to issue a bond with irrevocable covenants

(a) if (2), (3), (4) and the reverse of (14) hold; or

(b) if (3), (4) and the reverse of (2) hold.

We state Proposition 5 for the case with w decisions.

Proposition 5: Assume that (3), (4) and the reverse of (14) hold for decision $a1$. Assume also that $(1-p_L)(\Delta^{s_n}R_L - \Delta^{a1}R_L) + p_L R_M + p_H R_H \geq 2(I-A)$ holds for some $n \leq w$ where n is the smallest number of decisions for which it is satisfied. Then, the issuer prefers a bond with a single irrevocable covenant on $a1$ to any defeasible bond, if for the same n

$$p_H \Delta^{a_1} Q_H + (1-p_L)(\Delta^{s_n}R_L - \Delta^{a1}R_L) \leq p_L(\Delta^{s_n}Q_M - \Delta^{a1}Q_M) + (1-p_H)\Delta^{a_1}R_L$$

also holds.

Proof: in Appendix.

For completeness, we also present the remaining special case.

Corollary 3: If there does not exist any $n \leq w$ for which $(1-p_L)(\Delta^{s_n}R_L - \Delta^{a1}R_L) + p_L R_M + p_H R_H \geq 2(I-A)$ is satisfied, the firm will issue a non-defeasible bond.

Proof: in Appendix.

As shown above, issuers with limited growth opportunities prefer irrevocable action-limiting covenants. This happens when the action-limiting covenant is social welfare increasing, i.e. when (2) is violated. These firms can raise financing by accepting social welfare increasing covenants because their growth opportunities are limited, so for them giving up control is social welfare increasing. The second case is when the firm cannot afford to issue defeasible bonds. The covenants are social welfare-decreasing but the issuer has to accept additional covenants to be able to issue a defeasible bond. If the issuer's growth opportunities are limited so the gain from the option exercise falls short of the cost of exercise, then the issuer will issue a bond with irrevocable covenants.

Thus, our model predicts that firms with substantial growth options in some states of the world, low pledgeable income and a high degree of uncertainty prefer to issue bonds with defeasable covenants that they are willing to exercise. In contrast, firms with limited growth opportunities prefer to issue bonds with irrevocable covenants.

We derive the following empirical predictions from our theoretical model:

i) In the absence of a state-contingent, verifiable signal financial contracts may grant the issuer an option to remove action-limiting covenants at a predetermined exercise price, E. This prediction is derived from Proposition 1.

ii) The option exercise price will be high enough so that it can only be exercised in the good state. The highest possible exercise price is the remaining payment on the defeasible bond. This prediction is derived from Proposition 2 and Corollary 1.

iii) When there are more covenants in the bond, the option is restricted to buy back control of any one covenant at the same price as all. This prediction is derived from Proposition 2.

iv) There is a positive association between the number of action-limiting covenants in a bond and the inclusion of the covenant defeasance option. This prediction is derived from Lemma 2 and Proposition 3.

v) Financially constrained firms with the potential for high growth opportunities in some states of the world and a higher degree of uncertainty prefer to issue bonds with defeasable covenants, whereas others prefer to issue bonds with irrevocable covenants. This prediction is derived from Proposition 3, Lemma 3 and Proposition 5.

vi) Bonds with the option to remove covenants demand a lower yield than those with irrevocable covenants. This yield differential is partly due to the expected risk reduction by the option exercise in the high state and partly due to the increased number of action-limiting covenants granted to bondholders in the low state. Hence, the inclusion of the covenant defeasance option is associated with lower yield even after controlling for the number of covenants in the bond. This prediction is derived from Proposition 4 and Corollary 2.

(vii) It is not the yield differential that drives the decision to include the defeasance option in our model but the presence of financial constraints, uncertainty or lack of verifiability of the firm's growth opportunities and the firm's willingness to exercise the covenant defeasance option in states of the world where it is value-increasing that guarantees the lower yield. Hence, the inclusion of the covenant defeasance option do not necessarily imply a premium for all defeasible bonds. This prediction is derived from Proposition 4.

4 Empirical Analysis

In this section we present an empirical analysis of bond covenants and the issuer's decision to include covenant defeasance options in US corporate bonds focusing, on the main predictions of our model.

4.1 The Data Set & Variables

4.1.1 Data Source & Sample Construction

We construct a data set of all US corporate bond issues between 01/01/1980 and 31/12/2008 by merging information from the Mergent Fixed Investment Securities Database (FISD, described in Mergent (2004) and in Billet, King, and Mauer (2007), Reisel (2004), and Chava, Kumar, and Warga (2009)) with balance sheet information about issuers from Compustat. 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.[9] 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.[10]

We also merge the dispersion of analysts' forecasts from I/B/E/S and interest rate information from the Federal Reserve Board (Table H.15) with our sample.

4.1.2 Dependent Variables

We construct four dependent variables to test prediction one to three. All of our tests are carried out with the information available at issuance.

To test the first prediction, we compute the number of covenants for our bonds. FISD provides us with a list of covenants, a subset of which we display in Table 2. Definitions for each covenant can be found in Mergent (2004). We construct our dependent variable by counting the number of covenants present. For each issue FISD reports covenants that apply to the whole firm and also reports if there are additional covenants that restrict subsidiaries in particular. We concentrate on the number of covenants at the firm level only.

To test the second prediction we identify the firms that include the covenant defeasance option in their bonds. FISD provides this information in the form of a dummy variable.

Finally, we use the bond's yield. We either use the offering yield calculated by FISD or the yield spread. We refer to the former yield as the yield to maturity. We only use the offering yield and do not use trading data from TRACE since we want to condition on the

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

[10] See also Table 12

firm's information at issuance. To compute the yield spread we look at the difference between the offering yield and the yield of a corresponding Treasury bill or note. In the yield spread we only include maturities up to ten years. Our exact variable definitions are shown in Table 13.

4.1.3 Independent Variables and Summary Statistics

Our model suggests that the inclusion of the covenant defeasance option is driven by the issuer's pledgeable income, its growth opportunities, the uncertainty about the growth opportunities and the issuer's willingness to exercise the covenant defeasance option.

We use the firm's fixed asset ratio as our primary measure for pledgeable income. Additionally, we use the Kaplan-Zingales (KZ) index as proposed by Lamont, Polk, and Saá-Reguejo (2001) as well as the Whited-Wu Index (WW) as proposed by Whited and Wu (2006) to proxy for financing constraints.[11] The standard deviation of earnings forecast from I/B/E/S is our measure of the uncertainty of future growth opportunities. We use two measures for growth options, the market to book ratio and, following Billet, King, and Mauer (2007), sales growth.[12] Using the market to book ratio as a proxy for the firm's marginal q comes with the usual caveats. We include the firm's leverage ratio as a proxy for the willingness to exercise the covenant defeasance option. A higher leverage ratio makes it more likely that a firm has to defease more than one bond to take control and possibly to renegotiate loans at the same time. Moreover, higher leverage ratio can also proxy for the firm's reluctance to exercise future growth opportunities, i.e. for debt overhang which would make it less likely that the issuer would exercise the covenant defeasance option even in good states of the world. Hence the leverage ratio appears to be a reasonable proxy for the ex-ante likelihood of the exercise of covenant defeasance.

Following Billet, King, and Mauer (2007), Reisel (2004), and Nash, Netter, and Poulsen (2003) we employ a number of standard control variables for firm and bond characteristics, including the maturity of the bond, the issuer's EBIT, Cash, market capitalization, fixed assets, investments, leverage and the seniority of the bond. To control for the firm's credit worthiness we use the firm's interest coverage ratio. Our sample contains a relatively large number of unrated firms that we would lose otherwise. Moreover, some unrated firms might also be inclined to include the covenant defeasance option.[13]

To control for the shape of the yield curve, we include both the credit spread and term spread. We control for the term spread by including the yield difference between a Treasury

[11] Note that we estimate the WW index using yearly, not quaterly data so we adjust all flow variable by dividing them by four.

[12] A third measure that is frequently used, R&D relative to sales has too few observations in the data so we refrain from using it.

[13] Again, all variable definitions can be found in table 13.

bill or note whose maturity matches the bond we consider and include the one-year Treasury bill as a proxy for the risk free rate. We also include the spread between a AAA and a BAA rated bond as a control for the credit spread. In addition, we also include the yield on the one-year Treasury bill in our specifications (see our discussion in the last section).

Table 1 presents the summary statistics. The first row of Table 1 shows the distribution of bonds by issuer in our sample. The majority of issuers have only one bond outstanding but some firms have more than 10. The second row of Table 1 shows that the covenant defeasance option was included, on average, in about 70% of the bonds and the fraction of defeasible bonds increased over time. We report a noticeable increase in the inclusion of the covenant defeasance option after FASB announced FAS 125 (FASB (1996)).

4.2 Design of the Covenant Defeasance Option: Predictions I, II & III

As a first step we check whether the bond covenants in our sample are indeed state-independent action-limiting covenants, the type of covenants predicted by the model. The first panel of Table 2 shows the unconditional means for all covenants in our FISD sample of US corporate bonds. We first split the sample into state-dependent positive covenants and state-independent negative covenants.

Almost all bond covenants are state-independent action-limiting covenants. In stark contrast to the bank loans in Nini, Smith, and Sufi (2009), corporate bonds covenants are rarely tied to balance sheet items, 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 the bonds in our sample do not contain such clauses. Instead, we find restrictions on asset sales, new debt issues, dividends and mergers.[14]

The covenant defeasance options in practice are similar to the ones derived in the theoretical model. Covenant defeasance options grant the issuer the right to remove all covenants at a predetermined price (prediction I), they assign one price for removing all covenants at the same time (prediction II) and the payment is set high enough that a firm can only exercise it in the good state (prediction III).

4.3 Defeasible Bonds contain more covenants: Prediction IV

Our model predicts a positive relationship between the inclusion of the covenant defeasance option and the number of covenants in the bond (prediction IV). We test this hypothesis by

[14]Since Nini, Smith, and Sufi (2009) do not report non-contingent loan covenants, we randomly examined 50 loan agreements from Amir Sufi's webpage. We find that non-contingent covenants are also included in loan contracts, in the 50 loans selected 28 restrict the firm's ability to invest or to engage in capital expenditures. We do not find defeasance options in loan agreements, not surprisingly, given the ease of which loans can be renegotiated.

running a univariate t-test first and later running a multivariate analysis.

We split our sample into bonds with and without defeasance. We note that defeasible bonds typically include more covenants than non-defeasible bonds (see Table 2). The rate of increase varies across covenants, and is particularly large for some: for example, the Asset Sale Clause is only included in 5% of the non-defeasable bonds but 27% of the defeasable bonds, and debt issuance restrictions are included in 14% of non-defeasable bonds but in 35% of defeasable bonds.

To test for the positive relationship between the number of covenants and the covenant defeasance option that our theory predicts (see Proposition 3), we regress the number of covenants on defeasance (see Table 3). We perform Poisson regressions (due to the discreteness of the number of covenants) and report average partial effects. Our data 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. Hence, 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)).

We find that the inclusion of the covenant defeasance option is associated with an increase in the number of covenants in a statistically significant way, even controlling for the year, industry and underwriter fixed effects. Consistent with Proposition 3, the issuer of a defeasible bond is 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)). It can be interpreted as the percentage increase in the dependent variable. We find that on average the increase in the number of covenants is around 10% - or half a covenant as on average firms include five covenants per bond - and hence it is economically significant.

4.4 Cross-sectional Prediction about the Type of Firms that Issue Defeasible Bonds: Prediction V

According to our theory, firms are likely to issue defeasible bonds when they are financially constrained; when they have significant growth opportunities and when there is higher degree of uncertainty about their growth prospects. To investigate the model's prediction about the type of firms that issue defeasible bonds, we run Probit regressions with defeasance as the dependent variable. To proxy for growth opportunities we use sales growth and market-to-book as explanatory variables; for financial constraints we use fixed assets, the Kaplan-Zingales index, and the Whited-Wu index; for uncertainty of growth opportunities we include the dispersion of analysts' forecasts from I/B/E/S; and for willingness to exercise growth opportunities we include leverage. We also include the numbers of covenants and the bond's maturity, another proxy for uncertainty on the right hand side. These independent variables control for the covenant structure, the firm's pledgeable income, growth options and uncertainty, respectively. We then gradually add more firm and issue controls as well as time period controls.

Specification (1), (3), (5), and (7) in Table 4 are the base specifications, while (2), (4), (5), and (8) are the extended specifications.[15] Specifications (2) and (4) include the dummy for pre-96 issues while specifications (6) and (8) include year dummies.[16] In specifications (10), (12), (14), and (16) (in Table 5) we include additional controls for financial constraints. Specifications (9), (11), (13), and (15) are identical to (1), (3), (5), and (7) respectively but are restricted to the sample with observations for the KZ and WW indices.

The results are consistent with the model's predictions: Firms with tighter financial constraints, more valuable growth options and higher degree of uncertainty are more likely to issue defeasable bonds. Higher sales growth, high dispersion of analysts' forecast, low leverage, low fixed assets, high KZ and high WW indexes and higher number of covenants are statistically significant for the inclusion of the covenant defeasance option at the 1% or 5% level. The market to book ratio has the right sign as well, and is significant but only in the extended regressions, not the base regressions. Maturity is not significant.

To assess the explanatory power of our model we compare the Mc Fadden's Pseudo R^2 of the different regressions. McFadden's R^2 is defined as $1 - ll_f/ll_c$ where ll_f refers to the log-likelihood function of the model estimated and ll_c refers to a model that is fitted with a constant only. Mc Fadden's R^2 compares the goodness of fit of a model by showing how much the likelihood function of the model increases with more explanatory variables. At the bottom of Table 4 and 5 we display the fraction of the pseudo R^2 explained by the variables predicted in our model. Depending on the specifications our variables explain a substantial fraction in the variation, about one-third of the variation in the R^2.

In the next section we re-estimate the defeasance equation using a two-stage estimation procedure with the yield differential included among the explanatory variables. We do so to correct for a potential omitted variable bias. Since our model is very specific about which firm and bond characteristics drive the inclusion of the covenant defeasance option and the yield differential is not one of those, we do not expect any impact of the yield differential on the defeasability of the bond.

[15]We need to re-estimate each basic specification as the number of observations changes once we include more controls.

[16]The inclusion of covenant defeasance increased steadily over time while interest rates declined. The FASB ruled out the use of *in-substance* defeasance with FASB (1996) in 1996, and following this change the inclusion of *covenant* defeasance has become more prevalent, explaining at least partly the trend. This gives us an almost mechanical link between the inclusion of defeasance and the level of interest rates - measured by the rate on a one-year treasury bill.

4.5 Joint Determination of Covenant Defeasance and Yields: Prediction VI

Our theory implies that defeasible bonds are issued at a lower yield relative to bonds with irrevocable covenants even after controlling for the number of covenants in the bond. We showed that in the states when the covenant defeasance option is exercised the bond will become less risky, with the highest exercise price even risk-free. 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. 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 3 suggests that a second reason for a lower yield: in states when the covenant defeasance option is not exercised the issuer complies with more action-limiting covenants. Hence, bondholders trade off the yield for the reduced risk upon exercise of the covenant defeasance option in the good state and for the protection they enjoy from the higher number of covenants in the bad state.

Since the issuer's decision to include the covenant defeasance options is not random, an OLS regression of bond yields on covenant defeasibility would not estimate the relationship correctly. According to our model financially constrained firms are more likely to include covenant defeasance options in their bonds. However, financially constrained firms also have higher probability of default which would imply higher yields. Secondly, there are also other reasons why issuers choose not to include covenant defeasance option. First, issuers in a strong financial position do not benefit from covenants and therefore would not include covenant defeasance. These are firms for which inequality 3 would not hold in our model. Secondly, it follows from Proposition 5 that some financially constrained firms prefer not to include the covenant defeasance option.

To estimate the difference in yields we need to compare bonds with and without defeasance. Yet we cannot directly estimate the difference between the yield on the same bond with and without the defeasance option, $R^c_{b,i}$ and $R^d_{b,i}$ as we only observe the yield on the defeasible bond, $R^d_{b,i}$ if bond i includes the covenant defeasance option (formally: $D_i = 1$) or the yield on the non-defeasible bond, $R^c_{b,i}$ if bond i does not include defeasance (formally: $D_i = 0$). Standard OLS is inconsistent in this case as $E(R^d_{b,i}) = \beta X + E(\epsilon|\epsilon > -\beta X)$.

We use two different methods to estimate the impact of covenant defeasance on bond yields. The first is the propensity score matching procedure proposed by Rosenbaum and Rubin (1983) that allows us to select otherwise similar defeasible and non-defeasible bonds and compare yields on these matching pairs. The second is a two-stage estimation procedure first proposed by Lee (1978) and adopted for bond yields by Bradley and Roberts (2004) and Goyal (2005). This two-stage procedure estimates the counterfactual bond yield, i.e. what the yield would have been on a bond if it had or had not included the covenant defeasance option and computes the yield differential.

4.5.1 Matching

The matching procedure compares the yields of similar bonds with and without defeasance. It uses the yield from an otherwise similar defeasible bond as the counterfactual. Formally, denote the counterfactual yield $E(R^c_{b,i}|D=1)$ for defeasible bonds. Propensity score matching allows us to replace this unobservable yield with $E(R^c_{b,i}|D=0)$, which we observe, and we estimate $E(R^d_b|D=1) - E(R^c_b|D=0)$ in place of $E(R^c_{b,i} - R^d_{b,i}|D=1)$. The technique and its assumptions are described in detail in Angrist and Pischke (2009). In the finance literature propensity score matching has been used by Drucker and Puri (2005) to study the pricing of concurrent loan issues and by Lemmon and Roberts (2010) to analyze the corporate financing and investment decisions of unrated firms.

The procedure works in the three steps: first, run a Probit regression with the treatment as the dependent variable, defeasance in our case. Next, use the estimated coefficients to compute the propensity score. For each treated bond use the propensity score to find the closest match among all the bonds that are not treated.[17] Last, compute the difference in yields between these two bonds. Our theory predicts that treated bonds (those with defeasance) have a lower yield than untreated bonds (those without defeasance) even after controlling for the number of covenants in the bond.

Since defeasible bonds outnumber non-defeasible bonds in our sample, the number of controls are limited relative to the number of treated observations. In addition there are some time trends in the data that complicate the computation of the propensity matching score. First, the one-year Treasury bill rate falls from about 7% in 1985 to about 2% in 2008 and there is a similar fall in the offering yield. Second the proportion of bonds that include the covenant defeasance option increases steadily through the sample period. Hence, there is a mechanical negative relationship between the offering yield and the inclusion of covenant defeasance. For the matching procedure the implication is that in later years there are fewer potential matches. One solution is to use the yield spread instead of the offering yield. The yield spread is almost flat during our sample period (although it is difficult to compute for maturities above 10 years). A second solution is to use one-to-one matching with replacement, a procedure in which each control (potentially) may be used multiple times. In our matching we use both.

We run Probit regression with the inclusion of the covenant defeasance option as our dependent variable and the number of covenants, firm and issue characterizes as our explanatory variables. We include standard controls for the shape of the yield curve, the term spread, and the credit spread but not the the 1-year Treasury-bill rate as it is used in the construction of the dependent variable. To control for the firm's credit worthiness different papers take

[17] Other matching methods use somewhat different procedures to find the best match.

different approaches. Campbell and Taksler (2003) use the interest coverage ratio, Bradley and Roberts (2004) does not explicitly control for it, and Goyal (2005)) uses broad rating categories. We use the interest coverage ratio rather than ratings because 25% of the observations in our sample have missing values for ratings. We also control for the number of covenants, bond size, maturity and year and use standard errors clustered around years.

We report the results in Table 6. We display diagnostics for the same regression after the matching in Table 7. The first specification includes the market to book ratio and the second includes sales growth. The matching procedure is considered successful if i) individual coefficients are not different from zero and ii) the overall fit of the regression is reduced. We find that after matching the fit of the model falls from 14% to 9% or 8% respectively. We also see a notable reduction in the LR test for joint significance of all variables. The mean and median bias of the dependent variables also falls dramatically.

The outcomes of our matching procedure are reported in Table 8 as the average treatment effect on the treated (ATT). The ATT indicates the causal impact treatment (defeasance in our case) has on the treated observations (in our case those bonds that include defeasance). Our results support the model's predictions. Yields for defeasable bonds are lower by about 33 bp (and significant at the 1% level) if we include the market to book ratio in our initial score regression and by about 28 bp (and significant at the 5% level) if we use sales growth in our initial score regression after controlling for the number of covenants in the bond. Since the average bond is $441 million in our sample, a 28 basis point reduction amounts to roughly $1.2m in terms of annual interest rate savings or 4% of the total interest expense (using the average yield of 7.13%).

4.5.2 Two-stage Estimation of Lee (1978)) and Bradley and Roberts (2004))

In the two-stage estimation procedure we will focus on the following theoretical predictions from the model. Investors are willing to accept a lower yield on defeasible bonds. Investors trade off the bond yield for reduced risk upon exercise of the covenant defeasance option in the good state and a higher number of covenants in the bad state. Hence, the inclusion of the covenant defeasance option is associated with lower yield even after controlling for the number of covenants in the bond. Moreover, the model predicts that it is not the yield differential that drives the decision to include the defeasance option but the presence of financial constraints, uncertainty or lack of verifiability of the firm's growth opportunities and the firm's willingness to exercise the covenant defeasance option in states where exercise is value-increasing that drives the yield.

The decision to include the covenant defeasance option can be formulated as a form of a latent variable model:[18]

[18]See Bradley and Roberts (2004) for a derivation of this equation.

$$D_i^* = \alpha - \beta X_i + \epsilon_{d,i} + \delta(R_{b,i}^d - R_{b,i}^c) - \epsilon_{c,i} \tag{19}$$

where X_i represents firm and bond characteristics (including the number of covenants in the bond). $R_{b,i}^d$ is the yield for the defeasible bond and $R_{b,i}^c$ is the yield of a bond with irrevocable covenants. Furthermore, we assume $\epsilon_i \sim N(0, \sigma^2)$ to be correlated within firms.

If $D_i^* \geq 0$ the firm includes defeasance in its bond issue ($D = 1$) and does not include it otherwise ($D = 0$). Bond yields are then determined as

$$R_{b,i}^d = \alpha_d - \beta_d X_i + \epsilon_{d,i} \tag{20}$$

$$R_{b,i}^c = \alpha_c - \beta_c X_i + \epsilon_{c,i}. \tag{21}$$

The empirical specification of the model consists of these three equations.

How do we estimate the yield equations? We cannot directly estimate $R_{b,i}^c$ or $R_{b,i}^d$ as we only observe $R_{b,i}^d$ if $D_i^* > 0$ and $R_{b,i}^c$ if $D_i^* < 0$. Standard OLS is inconsistent in this case as $E(R_{b,i}^d) = \beta X + E(\epsilon | \epsilon > -\beta X)$.[19] We need to find an expression for the term $E(\epsilon | \epsilon > -\beta X)$ to include it in our regression. For a normally distributed variable, $E(\epsilon | \epsilon > -\beta X) = \sigma\phi(\beta X)/\Phi(\beta X)$[20]. This term is called the inverse Mills ratio, where $\phi(\cdot)$ is the density and $\Phi(\cdot)$ is CDF of the standard normal distribution. By augmenting equations (20) and (21) with the inverse Mills ratio we can consistently estimate the two above equations (Lee (1978)):

$$R_{b,i}^d = \alpha_d - \beta_d X_d + \epsilon_{d,i} + \sigma\phi\left(\frac{\beta X}{\sigma}\right) / \left(1 - \Phi\left(\frac{\beta X}{\sigma}\right)\right) + \eta_{d,i} \tag{22}$$

$$R_{b,i}^c = \alpha_c - \beta_c X_c + \epsilon_{c,i} + \sigma\left(-\phi\left(\frac{\beta X}{\sigma}\right) / \Phi\left(\frac{\beta X}{\sigma}\right)\right) + \eta_{c,i} \tag{23}$$

Our estimation procedure is as follows. First, we estimate the reduced form of equation (19).[21] To get the reduced form equation we substitute equations (20) and (21) into equation (19). Second, we compute the inverse Mills ratio from the results of this regression and include it into the yield equations to get a consistent estimate of the yields with and without defeasance. We then use the coefficients from these equations to compute our counterfactual yields and the yield differential for each bond. Finally, we include the yield differential into equation (19) and

[19]To see this, let's look at the conditional mean of $E(R_{b,i}^d)$. $E(R_{b,i}^d) = E(R_{b,i}^{d,*} | R_{b,i}^{d,*} > 0) = E(\beta X + \epsilon | \beta X + \epsilon > 0) = E(\beta X | \beta X + \epsilon > 0) + E(\epsilon | \beta X + \epsilon > 0) = \beta X + E(\epsilon | \epsilon > -\beta X)$. If we would to try to directly estimate $E(R_{b,i}^d)$ using OLS we would omit the second part of the conditional mean, leading to an omitted variable bias.

[20]The mean of a left truncated standard normal distribution is $E(z|z > c) = \frac{\phi(c)}{(1-\Phi(c))}$ and $E(z|z > -c) = \frac{\phi(c)}{\Phi(c)}$ (Cameron and Trivedi (2005)). Hence $E(\epsilon|\epsilon > -\beta X) = \sigma E\left(\frac{\epsilon}{\sigma} | \frac{\epsilon}{\sigma} > \frac{-\beta X}{\sigma}\right) = \sigma\phi\left(\frac{-\beta X}{\sigma}\right) / (1 - \Phi\left(\frac{-\beta X}{\sigma}\right)) = \sigma\phi\left(\frac{\beta X}{\sigma}\right) / \Phi\left(\frac{\beta X}{\sigma}\right)$.

[21]Note that the reduced form of equation (19) is inconsistent in the initial regression and needs to be re-estimated with the correct $R_b^c - R_b^d$ from equations (22) and (23) in order to interpret the coefficients.

re-estimate this equation to get a consistent estimation of the covenant defeasance inclusion decision. The idea is quite similar to that of a Heckman two-step sample selection procedure and can be interpreted as a form of IV estimation (Bradley and Roberts (2004)).

Wooldridge (2002) notes that the t-statistic of the inverse Mills ratio provides a test for endogeneity in the case of the Heckman two-stage procedure.[22] Applying this logic to the setting of Lee (1978) we can interpret the existence or lack of statistical significance as evidence for or against a selection bias.

Our estimates are presented in Table 9. We follow Bradley and Roberts (2004) and use underwriter characteristics as instruments in our initial estimation of equation (19). Technically this is not necessary as the nonlinear nature of the Probit allows for the identification of our system. Bradley and Roberts (2004) argue that underwriter characteristics do not affect bond yields since the corporate bond market is extremely competitive but they do add heterogeneity regarding the inclusion of covenants.

For the yield differential we report 20 - 33 bp. Note that these estimates are about the same in magnitude as the estimates from the propensity score matching procedure in the previous section. Both the propensity score matching and the two-stage procedure estimate the yield differential around 20-33bp and statistically significant. Since the regression controls for the number of covenants in the bond, our finding of a statistically significant 20bp yield differential supports the model's prediction that the inclusion of the covenant defeasance option is associated with lower yield even after controlling for the number of covenants in the bond.

Note that the coefficients for the inverse Mills ratio are not statistically significant.[23] This finding is persistent across various specifications of the selection equation.

We then re-estimate the defeasance equation with the yield differential included as explanatory variable. The results are reported in Table 10. Consistent with the prediction of the model, the yield differential does not seem to impact the issuer's decision whether to include the covenant defeasance option in the bond. This suggests that the omission of the yield differential from the original regression in Table 4 does not imply an omitted variable bias for the original regression.

The results in Table 10 are more or less similar to Table 4 and Table 5 although the magnitude of the effects are lower. Table 10 shows that higher degree of uncertainty about the issuer's growth opportunities, tighter financial constraints and higher likelihood of option exercise makes it more likely that the covenant defeasance option is included in the bond. The number of covenants and our measures of growth opportunities are not significant in the final-stage estimation. Since these variables are used to estimate the yield differential in the prior stage of the two stage procedure, it is possible that some of the effects of the number of

[22] See Wooldridge (2002) page 564.

[23] Goyal (2005) also reports non-significant inverse Mills ratios.

covenants and the growth opportunities variables are now picked up by the yield differential in the final-stage regression.

4.6 Covenant Defeasance and Callability

In Table 11 we report on the inclusion of the covenant defeasance option and callability. The idea that callability might be used to solve a hold-up problem caused by covenants has been proposed by Smith and Warner (1978) and reemphasized recently by Mann and Powers (2003).[24]

While one may think that callability and covenant defeasance are substitutes, however, our predictions/findings and empirical findings do not necessarily support this view. First, traditional callable bonds are usually issued at a yield premium, not at the yield discount we document for defeasible bonds. The higher yield on callable bonds compensates investors for the expected wealth loss due to early refinancing. Unlike the call, the exercise of the covenant defeasance option does not expose investors to refinancing risk because upon defeasance the bond continues to pay its coupon on schedule until maturity. In our sample 80% of the issues that include the covenant defeasance option are also callable. 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 potentially substitute for covenant defeasance, we check whether there is a penalty (call premium or make-whole premium (Mann and Powers (2003))) to be paid for early bond retirement or whether bonds can be called at par. We find that almost all issues have to be called at the make-whole call price.

A make-whole premium is calculated as all the remaining outstanding payments of the bond discounted at a Treasury rate plus a premium of about 33bp (see Table 11). When the bond is called, the call triggers a tax liability for investors. Second, when credits spreads narrow below the make-whole premium, a bond may be called purely for economic reasons. Hence as Mann and Powers (2003) show, make-whole bonds are usually issued at a premium over bonds without a make whole-clause, whereas the opposite is true for bonds that include a defeasance clause. The exercise price of the covenant defeasance option is computed as all the remaining outstanding payments discounted at their respective spot rates. In the special case of a flat

[24]Typically the literature considers callability as a means to overcome agency problems on the firm's side. Bodie and Taggart (1978) and Barnea, Haugen, and Senbet (1980) show that callability can be used to mitigate agency conflicts caused by asymmetric information or debt overhang. Empirical evidence for this view however, is mixed. While Thatcher (1984) finds evidence in support of this view, Crabb and Helwege (1994) does not. Ever since Kraus (1973) it has been accepted that callability is not simply a bet on interest rates. Julio (2007) shows that bond repurchases may be an alternative to callability to mitigate a debt-overhang problem. However, firms may not vote repurchased bonds so to remove the covenants it either have to repurchase all outstanding bonds, get approval from those bondholders that have not tendered their issues, or defease the covenants. As Aleris (2006) shows, some firms exercise the covenant defeasance option after successfully repurchasing a large fraction of a particular bond issue.

or inverted term structure covenant defeasance would be cheaper for both the issuer and the bondholders since covenant defeasance has no tax implication for the bondholders. Traditional callable bonds may be cheaper to exercise ex-post than defeasible bonds but they usually have an initial quiet period roughly equal to half of the maturity of the bond. In our sample almost all bonds that cannot be called continuously have an initial quiet period during which the issue cannot be called (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 but not at par value. Hence, callability does not appear to be a substitute for the covenant defeasance clause in our sample. We perform several robustness checks to see whether underwriters include covenant defeasance in a boiler-plate fashion and document that it does not appear to be the case.

5 Conclusion

In this paper we present a theoretical model of financial contract design. We show that when no verifiable signal is available to identify opportunistic behavior from the issuer, then the financier may require unconditional control rights (unconditional action-limiting covenants, such as restrictions on asset sales, dividend payments, new debt issues, etc.) and grant the issuer an option to take back those rights after paying a predetermined exercise price.

We show that 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 covenants in the contract at the time of issue. The model predicts that financially constrained firms with substantial potential growth opportunities and high degree of uncertainty that are willing to exercise the covenant defeasance option in some states of the world are likely to include covenant defeasance options in their bonds. Firms with limited growth opportunities prefer to issue bonds with irrevocable action-limiting covenants.

Our theory implies that investors are willing to accept lower yield on defeasible bonds because they internalize the gains from the risk reduction in the bond prepayment upon exercise in the good state and the gains from the issuer's compliance with additional action-limiting covenants in the bad state.

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 US corporate bonds.

We employ two different procedures to estimate the yield differential in our sample. The first is the propensity score matching proposed by Rosenbaum and Rubin (1983) that allows for selecting otherwise similar defeasible and non-defeasible bonds and compare yields on these matching pairs. The second is a two-stage estimation procedure first proposed by Lee (1978) and advanced in the finance literature by Bradley and Roberts (2004). This two-stage procedure estimates the counterfactual bond yield, i.e. what the yield would have been on a bond if it had or had not included the covenant defeasance option and computes the yield differential. Both of these procedures estimate a very similar yield differential to the inclusion of the covenant defeasance option after controlling for the number of covenants and firm characteristics in the issue, a statistically significant 20 basis points reduction.

Our evidence supports the cross-sectional predictions of our theory on the characteristics of firms that issue defeasable bonds. The variables proposed by our model explain about one-third of the variation in the R^2 of the covenant defeasance inclusion. We also show that it is not the yield differential that drives the inclusion of the covenant defeasance option but rather the presence of financial constraints, uncertainty or lack of verifiability of the firm's growth opportunities and the firm's willingness to exercise the covenant defeasance option in states of the world where exercise is social welfare increasing that drives the yield.

Our paper delivers novel insights about a form of endogenous financial contract design which is widely used in practice but has not been investigated in the finance literature. We present an agency model that explains different aspects of the endogenous contract design in depth and offers interesting new cross-sectional predictions about the type of firms that include the covenant defeasance option in their bonds and the corresponding and about the yield differentials on such bonds. Our empirical analysis confirms the importance of financial constraints, growth opportunities, uncertainty of future growth opportunities and willingness to exercise the defeasance option in the decision to include the covenant defeasance option in bonds and estimates a significant 20bp reduction on defeasible bonds after controlling for the number of covenants in the bond.

References

Aghion, P., and P. Bolton (1992): "An Incomplete Contracts Approach to Financial Contracting," *Review of Economic Studies*, 59, 473–494.

Aghion, P., M. Dewatripont, and P. Rey (1994): "Renegotiation Design with Unverifiable Information," *Econometrica*, 62, 257–282.

Aghion, P., and J. Tirole (1997): "Formal and Real Authority in Organizations," *Journal of Political Economy*, 105, 1–29.

Aleris Corp. (2006): "Aleris International, Inc. Announces Completion of Tender Offer," http://investor.aleris.com/releasedetail.cfm?ReleaseID=569483, retrieved 19.04.2013.

American International Group, Inc (2006): "Offer to Exchange," http://www.sec.gov/Archives/edgar/data/5272/000095012306009507/y23034b3e424b3.htm, retrieved 21.04.2013.

Angrist, J., and J.-S. Pischke (2009): *Mostly Harmless Econometrics.* Princeton University Press, Princeton, NJ.

Asquith, P., and T. Wizman (1990): "Event Risks, Covenants, and Bondholder Returns in Leveraged Buyouts," *Journal of Financial Economics*, 27, 195213.

Barnea, A., R. Haugen, and L. Senbet (1980): "A Rationale for Debt Maturity Structure and Call Provisions in the Agency Theoretic Framework," *Journal of Finance*, 35, 1223–1234.

Beneish, M., and E. Press (1993): "Costs of Technical Violation of Accounting-Based Debt Covenants," *The Accounting Review*, 68, 233–257.

Billet, M., D. King, and D. Mauer (2007): "The Effect of Growth Opportunities on the Joint Choice of Leverage, Maturity and Covenants," *Journal of Finance*, 62, 697–730.

Bodie, Z., and R. Taggart (1978): "Future Investment Opportunities and the Value of Call Provisions on a Bond," *Journal of Finance*, 33, 1178–1200.

Bradley, M., and M. Roberts (2004): "The Structure and Pricing of Corporate Debt Covenants," Working Paper.

Cameron, C., and P. Trivedi (2005): *Microeconometrics.* Cambridge University Press, Cambridge.

——— (2009): *Microeconometrics using Stata.* Stata Press, College Station, TX.

Campbell, J., and G. Taksler (2003): "Equity Volatility and Corporate Bond Yields," *Journal of Finance*, 58, 2321–2349.

Chava, S., P. Kumar, and A. Warga (2009): "Managerial Moral Hazard and Bond Covenants," *Review of Financial Studies*, 23, 1120–1148.

Chemla, G., M. Habib, and A. P. Ljungqvist (2007): "An Analysis of Shareholder Agreements," *Journal of the European Economic Association*, 5, 93–121.

Coca-Cola (2005): "Coca-Cola Bottling Co. Consolidated Bond Indenture," Registration No. 333-127047, Retrieved from SEC/EDGAR.

Crabb, L., and J. Helwege (1994): "Alternative Tests of Agency Theories of Callable Bonds," *Financial Management*, pp. 3–20.

Dierker, M., D. Quan, and W. Tourous (2005): "Pricing the Defeasance Option in Securitized Commercial Mortgages ," *Real Estate Economics*, 33, 663–680.

Drucker, S., and M. Puri (2005): "On the Benefits of Concurrent Lending and Underwriting," *Journal of Finance*, 60, 2763–2799.

FASB (1983): *Statement No. 76: Extinguishment of Debt–an amendment of APB Opinion No. 26.* Financial Accounting Standards Board (FASB), Norwalk, CT.

——— (1996): *Statement No. 125: Accounting for Transfers and Servicing of Financial Assets and Extinguishments of Liabilities*. Financial Accounting Standards Board (FASB), Norwalk, CT.

——— (2000): *Statement No. 140: Accounting for Transfers and Servicing of Financial Assets and Extinguishments of Liabilities-a replacement of FASB Statement No. 125*. Financial Accounting Standards Board (FASB), Norwalk, CT.

Fluck, Z. (1998): "Financial Contracting: Debt versus Outside Equity," *The Review of Financial Studies*, 11, 383–419.

Fudenberg, D., and J. Tirole (1990): "Moral Hazard and Renegotiation in Agency Contracts," *Econometrica*, 58, 1279–1319.

Garleanu, N., and J. Zwiebel (2008): "Design and Renegotiation of Debt Covenants," *Review of Financial Studies*, 22, 749–781.

Goyal, V. (2005): "Market discipline of bank risk: Evidence from subordinated debt contracts," *The Journal of Financial Intermediation*, 14, 318350.

Greyhound Lines (2005): "Greyhound Lines Announces Covenant Defeasance of 11.5% Notes Due 2007," http://www.businesswire.com/news/home/20050630005507/en/Greyhound-Lines-Announces-Covenant-Defeasance-11.5-Notes, retrieved 19.04.2013.

Hand, J., P. Hughes, and S. Sefcik (1990): "Insubstance Defeasances: Security Price Reactions and Motivations," *Journal of Accounting and Economics*, 13, 47–89.

Hermalin, B. E., and M. L. Katz (1991): "Moral Hazard and Verifiability: The Effects of Renegotiation in Agency," *Econometrica*, 59, 1735–1753.

Johnson, J., R. Pari, and L. Rosenthal (1989): "The Impact of In-Substance Defeasance on Bondholder and Shareholder Wealth," *Journal of Finance*, 44, 1049–1057.

Julio, B. (2007): "Overcoming Overhang: Agency Costs, Investments and the Option to Repurchase Debt," Working Paper.

Kahan, M., and E. Rock (2009): "Hedge Fund Activsim in the Enforcement of Bondholder Rights," *Northwestern University Law Review*, 103, 281–322.

Kraus, A. (1973): "The Bond Refunding Decision in an Efficient Market," *Journal of Financial and Quantitative Analysis*, 8, 793–806.

Lamont, O., C. Polk, and J. Saá-Reguejo (2001): "Financial Constraints and Stock Returns," *The Review of Financial Studies*, 14, 514–554.

Lee, L.-F. (1978): "Unionism and Wage Rates: A Simultaneous Equations Model with Qualitative and Limited Dependent Variables," *International Economic Review*, 2, 415–433.

Lemmon, M., and M. Roberts (2010): "The Response of Corporate Financing and Investment to Chnages in the Supply of Credit," *Journal of Financial and Quantiative Analysis*, 45, 555–587.

Mann, S., and E. Powers (2003): "Indexing a Bond's Call Price: An Analysis of Make Whole Call Provisions," *Journal of Corporate Finance*, 9, 535–554.

Mergent (2004): “BondSource Corporate Bond Securities Database Dictionary,” .

Myers, S. (1977): “Determinants of Corporate Borrowing,” *Journal of Financial Economics*, 5, 147–175.

Nash, R., J. Netter, and A. Poulsen (2003): “Determinants of Contractual Relations between Shareholders and Bondholders: Investment Opportunities and Restrictive Covenants,” *Journal of Corporate Finance*, 9, 201–232.

Nini, G., D. Smith, and A. Sufi (2009): “Creditor Control Rights and Firm Investment Policy,” *Journal of Financial Economics*, 92, 400–420.

Nöldeke, G., and K. M. Schmidt (1995): “Option Contracts and Renegotiation: A Solution to the Hold-Up Problem,” *Rand Journal of Economics*, 26, 163–179.

Petersen, M. (2008): “Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches,” *The Review of Financial Studies*, 22, 435–480.

Reisel, N. (2004): “On the Value of Restrictive Covenants: An Empirical Investigation of Public Bond Issues,” Working Paper.

Roberts, M., and A. Sufi (2009): “Renegotiation of Financial Contracts: Evidence from Private Credit Agreements,” *Journal of Finance*, 64, 1657–1695.

Rosenbaum, P., and D. Rubin (1983): “The Central Role of the Propensity Score in Observational Studies for Causal Effects,” *Biometrica*, 70, 41–55.

Smith, C., and J. Warner (1978): “On Financial Contracting: An Analysis of Bond Covenants,” *Journal Of Financial Economics*, 7, 117–161.

Thatcher, J. (1984): “The Choice of Call Provision Terms: Evidence of the Existence of Agency Costs of Debt,” *Journal of Finance*, 39, 549–561.

Tommy Hilfiger U.S.A. (2006): “Announces Actions on Debt Tender Offers,” http://www.prnewswire.com/news-releases/tommy-hilfiger-usa-inc-announces-actions-on-debt-tender-offers-69973637.html, retrieved 19.04.2013.

Whited, T., and G. Wu (2006): “Financial Constraints Risk,” *The Review of Financial Studies*, 19, 531–559.

Wooldridge, J. (2002): *The Econometrics of Cross Section and Panel Data*. The MIT Press, Cambridge (Mass.) and London.

A Appendix:

Proof of Lemma 1:

Assume that conditions (2), (3) and (4) hold. If the interim state were verifiable and if it were possible to assign control to the financier in state L and the issuer in state H, then the state-contingent covenant would result in a social welfare increase of $p_H \Delta Q_H - (1-p_H)\Delta R_L$ in state H relative to the unconditional covenant case whenever $p_H \Delta Q_H \geq (1-p_H)\Delta R_L$. The latter condition holds for issuers with high-growth opportunities. There would be no increase for firms with lesser growth opportunities, i.e. for firms with $p_H \Delta R_H < (1-p_H)\Delta R_L$. This social welfare increase is attainable for projects for which the LHS of (4) exceeds the RHS by more than $(1-p_H)\Delta R_L$.

Proof of Proposition 2:

Condition (i): When the issuer does not exercise the covenant defeasance option in state L, it receives $p_L(R_M + Q_M - \Delta Q_M) + (1-p_L)\Delta R_L - p_L R_b^d - (1-p_L)\Delta R_L$. When the issuer exercises the covenant defeasance option in state L, it receives $p_L(R_M + Q_M) - E - p_L \hat{R}_b^d$. The gain(loss) from exercise $p_L \Delta Q_M - E - p_L \hat{R}_b^d + p_L R_b^d$. If $p_L \Delta Q_M < E + p_L \hat{R}_b^d - p_L R_b^d$, then the issuer would not want to exercise the covenant defeasance option in state L.

Condition (ii): When the issuer does not exercise the covenant defeasance option in state H, it receives $p_H(R_H + Q_H - \Delta Q_H) + (1-p_H)\Delta R_L - p_H R_b^d - (1-p_H)\Delta R_L$. When the issuer exercises the covenant defeasance option in state H, it receives $p_H(R_H + Q_H) - E - p_H \hat{R}_b^d$. The gain(loss) from exercise $p_H \Delta Q_H - E - p_H \hat{R}_b^d + p_H R_b^d$. If $p_H \Delta Q_H \geq E + p_H \hat{R}_b^d - p_H R_b^d$, then the issuer wants to exercise the covenant defeasance option in state H.

Conditions (iii) - (iv): By accepting the exercise price for the removal of the covenants, the bondholders give up at least $(1-p_H)\Delta R_L$ in all states of the world. Therefore, if the bondholders receive an exercise price of at least $(1-p_H)\Delta R_L$ and additional post-defeasance payments, $\hat{R}_b^d$ so that $E + \hat{R}_b^d$ exceeds the expected payment they would get with no exercise in state H, then the bondholders would be willing to include the covenant defeasance option in the contract.

Condition (v): Straightforward, proof omitted.

Proof of Lemma 2:

The issuer's payoff with the one covenant non-defeasible bond

$$\frac{1}{2}[p_L(R_M + Q_M - \Delta^{a1} Q_M) + p_H(R_H + Q_H - \Delta^{a1} Q_H)] - [(I-A) - \frac{1}{2}(2 - p_L - p_H)\Delta^{a1} R_L] \quad (24)$$

The issuer's payoff with the two covenant non-defeasible bond

$$\frac{1}{2}[p_L(R_M + Q_M - \Delta^{s} Q_M) + p_H(R_H + Q_H - \Delta^{s} Q_H)] - [(I-A) - \frac{1}{2}(2 - p_L - p_H)\Delta^{s} R_L] \quad (25)$$

where $\Delta^s R_j = \Delta^{a1} R_j + \Delta^{a2} R_j$.

The one covenant bond is preferred by the issuer to the two-covenant bond if

$$p_L \Delta^{a2} Q_M + p_H \Delta^{a2} Q_H > (2 - p_L - p_H) \Delta^{a2} R_L \tag{26}$$

which always holds as a consequence of (2).

Proof of Proposition 3:

Assume that issuing a defeasible two-covenant bond is feasible, that is,

$$(1 - p_L) \Delta^s R_L + p_L R_M + p_H R_H \geq 2(I - A), \tag{27}$$

where $\Delta^s R_L = \Delta^{a1} R_L + \Delta^{a2} R_L$.

The issuer's payoff from financing the project with a one-covenant non-defeasible bond

$$\frac{1}{2}[p_L(R_M + Q_M - \Delta^{a1} Q_M) + p_H(R_H + Q_H - \Delta^{a1} Q_H)] - [(I - A) - \frac{1}{2}(2 - p_L - p_H) \Delta^{a1} R_L] \tag{28}$$

The issuer's payoff from funding the project by a two-covenant defeasible bond

$$\frac{1}{2}[p_L(R_M + Q_M - \Delta^s Q_M) + p_H(R_H + Q_H)] - [(I - A) - \frac{1}{2}(1 - p_L) \Delta^s R_L]. \tag{29}$$

The issuer prefers the two-covenant defeasible bond to the one-covenant non-defeasible bond if

$$p_L \Delta^{a2} Q_M + (1 - p_H) \Delta^{a1} R_L \leq p_H \Delta^{a1} Q_H + (1 - p_L) \Delta^{a2} R_L, \tag{30}$$

as claimed.

Proof of Proposition 4:

We compare the yield on the defeasible and the non-defeasible bond for the case when the issuer of the defeasible bond is willing to exercise the option to remove covenants in state H. Let R_b^{ck} denote the payment on the non-defeasible bond with k covenants and R_b^{dn} denote the payment on the defeasible bond with n covenants where n and k is chosen by the issuer to maximize its payoff given the financial constraints faced. Note from Proposition 3 that $n \geq k$.

Recall from (5) that the payment bondholders require on the non-defeasible covenant bond:

$$R_b^C = \frac{2(I-A) - (2 - p_L - p_H)\Delta^{s_k} R_L}{p_L + p_H}.$$

Recall from (16) that the payment bondholders require on the defeasible bond:

$$R_b^d = \frac{2(I-A) - (1-p_L)\Delta^{s_n} R_L - E - p_H \hat{R}_b^d}{p_L}.$$

From (9) recall that $p_H R_b^d + (1-p_H)\Delta^{s_n} R_L \leq E + p_H \hat{R}_b^d$. Substituting $p_H R_b^d + (1-p_H)\Delta^{s_n} R_L$ into (16) for $E + p_H \hat{R}_b^d$, we get

$$R_b^d \leq \frac{2(I-A) - (1-p_L)\Delta^{s_n} R_L - (1-p_H)\Delta^{s_n} R_L}{p_H + p_L} \tag{31}$$

Since $\Delta^{s_k} R_L = \sum_{i=1}^{s_k} \Delta^{a_i} R_L < \sum_{j=1}^{s_k} \Delta^{a_j} R_L = \Delta^{s_n} R_L$, therefore, $(2 - p_L - p_H)\Delta^{s_k} R_L < (1-p_L)\Delta^{s_n} R_L - (1-p_H)\Delta^{s_n} R_L$, and

$$R_b^d \leq \frac{2(I-A) - (2 - p_L - p_H)\Delta^{s_n} R_L}{p_H + p_L} \leq \frac{2(I-A) - (2 - p_L - p_H)\Delta^{s_k} R_L}{p_L + p_H} = R_b^C, \tag{32}$$

$$R_b^d \leq R_b^C.$$

Note that the inequality is strict when $n > k$, i.e. when the issuer accepts additional covenants with the defeasance option (see Proposition 3), and/or when $E + p_H \hat{R}_b^d > p_H R_b^d + (1 - p_H)\Delta^{s_n} R_L$, i.e. when the exercise price is higher than the lower limit from the incentive compatibility conditions. For the case when $E = R_b^d$, the highest exercise price that satisfies Proposition 2 and the choice in practice in US corporate bonds, inequality (32) is strict.

Proof of Corollary 2:

Assuming that the financier breaks even on both bonds, we set the bondholders' expected payoff on the two bonds equal. That is,

$$1/2[(1-p_H)\Delta R_L^{sk} + p_H R_b^{ck} + (1-p_L)\Delta R_L^{sk} + p_L R_b^{sk}] = 1/2[R_b^{dn} + (1-p_L)\Delta R_L^{sn} + p_L R_b^{dn}]$$

Reorganizing it, we get

$$(p_H + p_L)(R_b^{ck} - R_b^{dn}) = (1 - p_H)R_b^{dn} - (1 - p_H)\Delta R_L^{sk} + (1 - p_L)\Delta R_L^{dn} - (1 - p_L)\Delta R_L^{sk}$$

Substituting h for $R_b^{ck} - R_b^{dn}$, we get

$$h = \frac{(1 - p_H)(R_b^{dn} - \Delta R_L^{sk}) + (1 - p_L)(\Delta R_L^{sn} - \Delta R_L^{sk})}{p_H + p_L}$$

that proves the claim.

Proof of Proposition 5:

Suppose that (3), (4) and the reverse of (14) hold for decision $a1$. Then the firm cannot issue a one-covenant defeasible bond on $a1$. Can it issue a two-covenant, three-covenant, four-covenant, etc. defeasible bond, and if so, would the issuer always prefer those to a one-covenant non-defeasible bond?

If

$$(1 - p_L)\Delta^{a1} R_L + p_L R_M + p_H R_H + (1 - p_L)\Delta^{a2} R_L \geq 2(I - A), \tag{33}$$

then the firm can issue a two-covenant defeasible bond.

Compare the issuer's payoff when funding the project by issuing the two-covenant defeasible bond with covenants on decision $a1$ and $a2$ versus the one-covenant non-defeasible bond with covenant on $a1$. The issuer's payoff from financing the project with the one-covenant non-defeasible bond

$$\frac{1}{2}[p_L(R_M + Q_M - \Delta^{a1} Q_M) + p_H(R_H + Q_H - \Delta^{a1} Q_H)] - [(I - A) - \frac{1}{2}(2 - p_L - p_H)\Delta^{a1} R_L]. \tag{34}$$

The issuer's payoff from funding the project by issuing the two-covenant defeasible bond

$$\frac{1}{2}[p_L(R_M + Q_M - \Delta^s Q_M) + p_H(R_H + Q_H)] - [(I - A) - \frac{1}{2}(1 - p_L)\Delta^s R_L]. \tag{35}$$

The issuer prefers the one-covenant non-defeasible bond to the two-covenant defeasible bond if

$$p_L \Delta^{a2} Q_M + (1 - p_H)\Delta^{a1} R_L > p_H \Delta^{a1} Q_H + (1 - p_L)\Delta^{a2} R_L. \tag{36}$$

Hence, when (36) is satisfied, the issuer will issue the one-covenant non-defeasible bond.

Similarly, if the reverse of (33) holds and the bondholders are not willing to hold the two-covenant defeasible bond, the firm can issue a three-covenant defeasible bond if

$$(1-p_L)\Delta^{a1}R_L + (1-p_L)\Delta^{a2}R_L + (1-p_L)\Delta^{a3}R_L + p_L R_M + p_H R_H \geq 2(I-A). \qquad (37)$$

Nevertheless, not all issuers prefer to issue the three-covenant defeasible bond to the one-covenant non-defeasible bond. In particular, if

$$p_L\Delta^{a2}Q_M + p_L\Delta^{a3}Q_M + (1-p_H)\Delta^{a1}R_L > p_H\Delta^{a1}Q_H + (1-p_L)\Delta^{a2}R_L + (1-p_L)\Delta^{a3}R_L, \quad (38)$$

then the issuer will issue the one-covenant non-defeasible bond.

For the general case, if $0 < n \leq w$ is the smallest integer for which $(1-p_L)(\Delta^{s_n}R_L - \Delta^{a1}R_L) + p_L R_M + p_H R_H \geq 2(I-A)$ is satisfied, then the issuer prefers the bond with the single irrevocable covenant on $a1$ to any defeasible bond, if for the same n

$$p_H\Delta^{a_1}Q_H + (1-p_L)(\Delta^{s_n}R_L - \Delta^{a1}R_L) \leq p_L(\Delta^{s_n}Q_M - \Delta^{a1}Q_M) + (1-p_H)\Delta^{a_1}R_L$$

also holds, as claimed.

Proof of Corollary 3:

If there does not exist any $n \leq w$ for which $(1-p_L)(\Delta^{s_n}R_L - \Delta^{a1}R_L) + p_L R_M + p_H R_H \geq 2(I-A)$ is satisfied, then no matter how many covenants the firm adds to the bond contract bondholders will refuse to hold any bond that includes the defeasance option. Hence, the firm will issue a bond with a single irrevocable covenant to fund the project.

Table 1: Bond Issuance: Summary Statistics

Notes: We present summary statistics, including the mean, the median, the minimum, and the maximum, for a sample of 4651 US 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 from the sample. We provide information about the offering, such as the issue price, the yield as of the offering date, the spread over a comparable Treasury bill or note, whether the bond is callable and whether there are covenants attached to the bond, the year the bond was issued and its maturity in years. We also report corporate information such as its size, whether the firm pays dividends, the book leverage ratio, EBIT, proxies for growth options (WW and KZ indices), and whether the bond can be defeased or not. All balance sheet items (apart from EBIT) have been normalized relative to the firm's total assets (TA). Dummy Pre 96 is a dummy that takes value one if the bond was issued before 1996. Finally, we use data from I/B/E/S to compute the standard deviation of analyst forecasts as a measure for uncertainty around the firm. Detailed variable descriptions can be found in Table 13.

Variable	N	Mean	Std. Dev.	Min	Max
Number of Issues	4651	5.605	6.242	1	49
Year	4544	1998	5.080	1980	2008
Defeasance	4542	72.7%	0.445	na	na
Callable	4544	69.7%	0.460	na	na
Number Covenants	4542	5.648	2.651	0	15
Offering Yield	3122	7.187%	1.777	0.416%	15.25%
Yield Spread	2088	1.870%	1.536	0.04%	13.648%
Term Spread	4536	1.149%	1.288	-1.71%	4.24%
Credit Spread	4532	0.882%	0.317	0.5%	3.47%
Investment Grade	4635	29%	0.455	0	1
Seniority (1=lowest, 5=highes)	4540	3.926	0.401	1	5
Maturity (in yrs)	4544	12.8	11.371	1	100
Offering Amount (in $1000)	4544	441460	2610356	7000	1.00E+08
Bond Size (rel. to TA)	4543	14.9%	0.480	0.00%	17.71%
Interest Coverage Ratio	4563	11.48	110.63	-273.5	5107.4
EBIT	4544	3.881	8.848	-54.59	134.25
Cash (rel. to TA)	4542	5.8%	0.085	0%	1.00%
Sales Growth	4426	1.190	0.646	0.12	18.69
Market to Book	4529	1.754	0.953	0.56	11.46
KZ	4310	-0.502	0.208	-5.77	1.67
WW	3947	-1.877	10.559	-194.56	74.08
Positive Dividends	4525	78.2%	0.413	na	na
log(Market Cap)	4530	3.079	1.807	-4.68	7.72
Fixed Assets (rel. to TA)	4513	42.1%	0.246	0%	96%
Leverage (rel. to TA)	4543	65.9%	0.188	0%	405%
Investments (rel. to TA)	4482	7.6%	0.076	0%	104%
Dummy Pre 1996	4544	29.4%	0.456	na	na
Uncertainty	4180	0.141	0.705	0	35.36

Table 2: Covenants Inclusion: Summary Statistics & Univariate Tests

Notes: This Table shows the distribution of the various covenants in a sample of 4651 US corporate Bonds. Detailed explanations are given in Mergent (2004). We first categorize all covenants whether they are state dependent or not first and then sub-categorize the state-independent ones into four groups. The first group looks at restrictions on asset sales, the second looks at restrictions on the use of the issuer's cash, the third looks at restrictions on (additional) debt issuance, while the fourth category looks at those that do not fall in any of the other four. The last panel presents some aggregate indices for asset sale restrictions, debt restrictions and for all covenants. 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 the means and run a t-test to see if any difference in the means is statistically significant.

	All			**Defeasance**							
				No			**Yes**			**Difference**	
Covenant	Obs	Mean	Std	Obs	Mean	Std	Obs	Mean	Std	Δ	Sig
State Dependent Covenants											
Declining Net Worth	4649	0.009	0.092	1244	0.014	0.014	3405	0.006	0.08	-0.008	**
Maintenance Net Worth	4649	0.008	0.09	1244	0.01	0.01	3405	0.008	0.087	-0.002	
Net Earnings Test Issuance	4649	0.008	0.09	1244	0.027	0.027	3405	0.001	0.038	-0.026	***
Fixed Charge Coverage	4649	0.018	0.132	1244	0.006	0.006	3405	0.022	0.146	0.016	***
Leverage Test	4649	0.002	0.039	1244	0.001	0.001	3405	0.002	0.042	0.001	
State-independent Covenants											
Asset Sale Restrictions											
Asset Sale Clause	4649	0.213	0.409	1244	0.047	0.047	3405	0.273	0.446	0.226	***
Sales Leaseback	4649	0.626	0.484	1244	0.559	0.559	3405	0.65	0.477	0.091	***
Sales Assets	4649	0.937	0.243	1244	0.842	0.842	3405	0.972	0.166	0.13	***
Stock Issuance	4649	0.018	0.133	1244	0.003	0.003	3405	0.023	0.151	0.02	***
Cash Restrictions											
Investments	4649	0.016	0.126	1244	0.012	0.012	3405	0.018	0.132	0.006	
Restricted Payments	4649	0.27	0.444	1244	0.088	0.284	3405	0.337	0.473	0.249	***
Dividend Related Payments	4649	0.047	0.212	1244	0.059	0.059	3405	0.043	0.202	-0.016	**
Stock Transfer	4649	0.041	0.198	1244	0.022	0.022	3405	0.048	0.213	0.026	***
Transaction Affiliates	4649	0.266	0.442	1244	0.092	0.092	3405	0.329	0.47	0.237	***
Debt Restrictions											
Negative Pledge	4649	0.838	0.369	1244	0.789	0.789	3405	0.856	0.352	0.067	***
Funded Debt	4649	0.012	0.11	1244	0.026	0.026	3405	0.007	0.085	-0.019	***
Indebtedness	4649	0.296	0.456	1244	0.141	0.141	3405	0.352	0.478	0.211	***
Senior Debt Issuance	4649	0.01	0.098	1244	0.003	0.003	3405	0.012	0.109	0.009	***
Subordinated Debt Issuance	4649	0.059	0.236	1244	0.024	0.024	3405	0.072	0.258	0.048	***
Liens	4649	0.049	0.217	1244	0.035	0.035	3405	0.055	0.227	0.02	***
Takeover and M&A related											
Economic Defeasance	4649	0.779	0.415	1244	0.218	0.218	3405	0.984	0.125	0.766	***
Cross Default	4649	0.023	0.151	1244	0.045	0.045	3405	0.016	0.124	-0.029	***
Cross Acceleration	4649	0.61	0.488	1244	0.461	0.461	3405	0.665	0.472	0.204	***
Change Control Put	4649	0.354	0.478	1244	0.170	0.011	3405	0.421	0.008	0.251	***
Rating decline	4649	0.018	0.132	1244	0.015	0.015	3405	0.019	0.136	0.004	
Consolidation Merger	4649	0.939	0.239	1244	0.845	0.845	3405	0.974	0.16	0.129	***
Summary Statistics											
Asset Sale Restrictions	4649	1.775	0.653	1244	1.449	0.020	3405	1.895	0.586	0.446	***
Debt Restrictions	4649	0.377	0.604	1244	0.194	0.013	3405	0.443	0.636	0.249	***
All Covenants	4649	5.745	2.703	1244	4.551	0.061	3405	6.181	2.757	1.63	***

Table 3: Defeasance: Number of Covenants

Notes: We run Poisson regressions with the total number of covenants as the dependent variable to test prediction IV of our model. Our model states that firms that include defeasance in their issue should have a higher number of covenants in their bond. Apart from a dummy variable for the inclusion of defeasance we include several other factors that might affect the number of covenants, such as the firm's credit worthiness and the maturity of the issue. We include several additional controls that have been proposed by Billet, King, and Mauer (2007), Reisel (2004) and Chava, Kumar, and Warga (2009) to be relevant for the inclusion of covenants in an issue. Exact variable definitions can be found in Table 13. We report average partial effects. Estimated coefficients can be interpreted as the percentage increase in the dependent variable. Table 1 reports that firms on average include 5.5 covenants in their issue. Standard errors are clustered around firms following Petersen (2008) are in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Poisson	Dependent Variable: Number of Covenants					
	Simple Specification		Extended Specification			
	(1)	(3)	(5)	(6)	(7)	(8)
Defeasance	0.148***	0.149***	0.0720***	0.0848***	0.0689***	0.0583**
	(0.0256)	(0.0256)	(0.0233)	(0.0257)	(0.0232)	(0.0233)
Maturity	-0.00427***	-0.00415***	-0.00523***	-0.00554***	-0.00509***	-0.00496***
	(0.000751)	(0.000744)	(0.00113)	(0.00117)	(0.00111)	(0.00108)
$Maturity^2$			4.80e-05***	4.73e-05***	4.73e-05***	4.45e-05***
			(1.11e-05)	(1.11e-05)	(1.10e-05)	(1.06e-05)
Interest Coverage Ratio	4.24e-05	7.10e-05**	0.000101***	8.38e-05***	9.56e-05***	7.96e-05***
	(2.90e-05)	(3.33e-05)	(3.52e-05)	(1.94e-05)	(3.71e-05)	(2.46e-05)
Bond Size			0.0660**	0.129***	0.0514*	0.0579*
			(0.0298)	(0.0340)	(0.0278)	(0.0299)
log(Market Cap)	-0.141***	-0.136***	-0.128***	-0.0932***	-0.133***	-0.121***
	(0.00611)	(0.00564)	(0.00916)	(0.0128)	(0.00798)	(0.00964)
EBIT			-0.000210	-0.000488	-0.000128	-0.00108
			(0.00155)	(0.00148)	(0.00159)	(0.00159)
Fixed Assets	-0.175***	-0.196***	-0.198**	-0.233***	-0.191**	-0.185**
	(0.0438)	(0.0452)	(0.0792)	(0.0550)	(0.0800)	(0.0767)
KZ			0.000784		0.000911	
			(0.00137)		(0.00140)	
WW				0.534***		0.186
				(0.204)		(0.164)
Uncertainty			0.0768***	0.0749***	0.0761***	0.0669***
			(0.0165)	(0.0224)	(0.0164)	(0.0168)
Market to Book			-0.0144	-0.0213*		
			(0.0104)	(0.0125)		
Sales Growth		0.0379***			0.0282	0.0385**
		(0.0105)			(0.0177)	(0.0193)
Leverage			0.162***	0.229***	0.163***	0.206***
			(0.0501)	(0.0514)	(0.0501)	(0.0495)
Callable	0.164***	0.160***	0.0784***	0.0963***	0.0770***	0.0775***
	(0.0250)	(0.0252)	(0.0223)	(0.0264)	(0.0223)	(0.0240)
Dummy Pre 1996	-0.0753***	-0.0695***				
	(0.0234)	(0.0239)				
Constant	2.013***	2.032***	0.439	1.022***	0.348	0.863**
	(0.0596)	(0.0596)	(0.698)	(0.332)	(0.702)	(0.342)
Observations	4,520	4,404	2,994	3,290	2,994	3,290
R^2	0.122	0.121	0.140	0.151	0.150	0.151
Issue Controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	No	No	Yes	Yes	Yes	Yes
Underwriter Dummies	No	No	Yes	Yes	Yes	Yes
Industry Dummies	No	No	Yes	Yes	Yes	Yes

Table 4: Defeasance Inclusion I

Notes: We run Probit regressions with defeasance as the dependent variable to test prediction V of our model. Defeasance takes value one when such a clause is found in an issue and zero otherwise. We include the variables that drive the inclusion of defeasance into issues as predicted by our model: the number of covenants, our measure for uncertainty - the standard deviation of analyst forecasts. Following Billet, King, and Mauer (2007) we use two different measures for growth options, sales growth and the market to book ratio. We control for financial constraints by including the firm's fixed asset ratio. We compare the initial specifications (1) and (3) to extended ones that additionally contain issue controls, more firm controls and a control for bonds that were issued before 1996 and report the results in specifications (2) and (4). These additional variables are maturity, maturity^2, 1yr Treasury rate, the term spread, the credit spread, bond size, firm size, EBIT, the interest coverage ratio, and a dummy for callability. In a second step we add year dummies, 2-digit SIC dummies and underwriter dummies as well. The results are reported in specification (6) and (8) while specifications (5) and (7) report the base case regressions. As sample size changes we need to repeat these basic regression in order to be able to see how much of R^2 the basic regressions can explain. Finally we compute Mc Fadden's Pseudo R^2 as a measure for the goodness of fit. We compare how much our initial specifications explains relative to the expanded one in the last column labelled "Explained". 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.

Probit	Dependent Variable: Defeasance							
	With Sales Growth				With Market to Book			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All Covenants	0.144***	0.108***	0.142***	0.0771***	0.139***	0.113***	0.136***	0.0827***
	(0.0190)	(0.0216)	(0.0216)	(0.0261)	(0.0190)	(0.0220)	(0.0218)	(0.0265)
Uncertainty	0.283	0.409*	0.406*	0.511**	0.242	0.359*	0.381*	0.426*
	(0.185)	(0.225)	(0.231)	(0.259)	(0.180)	(0.217)	(0.229)	(0.238)
Fixed Assets	-0.697***	-0.722***	-0.658***	-0.593*	-0.805***	-0.795***	-0.723***	-0.600*
	(0.221)	(0.232)	(0.242)	(0.341)	(0.229)	(0.242)	(0.249)	(0.352)
Market to Book	0.0881	0.112*	0.0571	0.180***				
	(0.0559)	(0.0644)	(0.0569)	(0.0698)				
Sales Growth					0.193**	0.138*	0.158*	0.190**
					(0.0906)	(0.0833)	(0.0918)	(0.0945)
Leverage		-0.767***		-1.022***		-0.754***		-0.960***
		(0.258)		(0.286)		(0.264)		(0.285)
Callable		0.187**		0.0936		0.190**		0.0933
		(0.0898)		(0.0960)		(0.0907)		(0.0973)
Constant	-0.0200	1.163***	-0.0297	-1.708	-0.00511	1.052***	-0.0613	-1.806
	(0.205)	(0.384)	(0.223)	(1.370)	(0.163)	(0.387)	(0.183)	(1.377)
Observations	4,149	4,149	3,216	3,216	4,056	4,056	3,107	3,107
Pseudo R^2	0.08	0.11	0.07	0.21	0.08	0.11	0.07	0.21
Explained R^2	71%		33%		73%		34%	
Issue Controls	No	Yes	No	Yes	No	Yes	No	Yes
Firm Controls	No	Yes	No	Yes	No	Yes	No	Yes
Pre 96 Dummy	No	Yes	No	No	No	Yes	No	No
Year Dummies	No	No	No	Yes	No	No	No	Yes
Industry Dummies	No	No	No	Yes	No	No	No	Yes
Underwriter Dummies	No	No	No	Yes	No	No	No	Yes

Table 5: Defeasance Inclusion II

Notes: We run Probit regressions with defeasance as the dependent variable to test prediction V of our model and extend specification (6) and (8) of Table 4 by including two additional controls for financial constraints, the KZ and WW indices. The basic idea is to run two Probit regression: a base specification with only the variables suggested by our model and an extended one that incorporates all other potential factors into the regression. The dependent variable is a dummy for defeasance that takes value one when such a clause is found in an issue and zero otherwise. Each basic specification contains the variables that determine the inclusion of defeasance into issues as predicted by our model: the number of covenants, our measure for uncertainty - the standard deviation of analyst forecasts. Following Billet, King, and Mauer (2007) we use two different measures for growth options, sales growth and the market to book ratio. As sample size changes we need to repeat these basic regression in order to be able to see how much of R^2 the basic regressions can explain relative to the extended regressions. In the extended specification we include all variables included in specification (6) and (8) of table 4 and add the KZ and WW index. We include a full set of firm, issue and macro controls as well as year dummies, 2-digit SIC industry controls, and underwriter dummies. Specifications (10), (12), (14), and (16) contain the results. Finally we compute Mc Fadden's Pseudo R^2 as a measure for the goodness of fit. We compare how much our initial specifications explains relative to the expanded one in the column labelled "Explained R^2". 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.

Probit	Dependent Variable: Defeasance							
	With Sales Growth				With Market to Book			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
All Covenants	0.146***	0.101***	0.141***	0.0848***	0.139***	0.0995***	0.134***	0.0806***
	(0.0242)	(0.0265)	(0.0222)	(0.0259)	(0.0242)	(0.0268)	(0.0217)	(0.0261)
Uncertainty	0.457*	0.641**	0.412*	0.516*	0.394	0.588**	0.362	0.449*
	(0.253)	(0.298)	(0.233)	(0.265)	(0.243)	(0.285)	(0.226)	(0.243)
Fixed Assets	-0.731***	-0.813**	-0.657***	-0.667*	-0.805***	-0.796**	-0.710***	-0.672*
	(0.264)	(0.356)	(0.248)	(0.346)	(0.266)	(0.361)	(0.250)	(0.349)
KZ		0.0115***				0.0109**		
		(0.00437)				(0.00426)		
WW				1.121				1.750*
				(0.784)				(0.937)
Market to Book	0.0766	0.133*	0.0569	0.161**				
	(0.0626)	(0.0791)	(0.0585)	(0.0720)				
Sales Growth					0.191**	0.201**	0.154*	0.193**
					(0.0920)	(0.0952)	(0.0917)	(0.0934)
Leverage		-0.938***		-1.038***		-0.782**		-0.990***
		(0.326)		(0.296)		(0.306)		(0.289)
Callable		0.125		0.0898		0.121		0.0861
		(0.101)		(0.0968)		(0.101)		(0.0964)
Constant	-0.0407	2.925**	-0.0297	-1.326	-0.0510	2.593**	-0.0458	-1.115
	(0.241)	(1.248)	(0.230)	(1.428)	(0.202)	(1.255)	(0.183)	(1.430)
Observations	2,801	2,801	3,080	3,080	2,801	2,801	3,080	3,080
Pseudo R^2	0.07	0.22	0.07	0.21	0.07	0.22	0.07	0.21
Explained R^2	33%		32%		33%		32%	
Issue Controls	No	Yes	No	Yes	No	Yes	No	Yes
Firm Controls	No	Yes	No	Yes	No	Yes	No	Yes
Pre 96 Dummy	No	No	No	No	No	No	No	No
Year Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Industry Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Underwriter Dummies	No	Yes	No	Yes	No	Yes	No	Yes

Table 6: Matching Regressions

Notes: In this regression we compute the propensity score necessary for the matching procedure. We compute the propensity score for two outcome variables, the yield spread and the offering yield. In order to compute the score we regress the independent variables of specification (4) and (8) of Table 4 on defeasance. We use the coefficients of this regression to compute the actual propensity score. Specification (1) reports the result of including the market to book ratio while (2) reports results for sales growth. In contrast to Table 4 we report the results of when we use a sample of firms for which we can observe the yield spread. We compute the yield spread by subtracting the corresponding risk free rate from a bond issue. We only compute the yield spread for maturities less or equal to ten years. Exact variable definitions can be found in Table 13. The sample size differs from Table 4 as we observe yields in fewer cases than defeasance.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Probit	Dependent Variable: Defeasance	
	(1)	(2)
Number Covenants	0.0806***	0.0896***
	(0.0309)	(0.0313)
Interest Coverage Ratio	-0.000402	-0.000333
	(0.000261)	(0.000247)
Investment Grade	0.00268	-0.0362
	(0.125)	(0.128)
Term Spread	0.106**	0.0931*
	(0.0524)	(0.0515)
Credit Spread	-0.198	-0.160
	(0.323)	(0.321)
Bond Size	-0.189	-0.100
	(0.229)	(0.268)
Seniority	-0.411***	-0.405**
	(0.155)	(0.158)
log(Market Cap)	-0.150**	-0.0880
	(0.0687)	(0.0638)
Investments	0.737	0.970
	(0.898)	(1.062)
Cash	-0.227	0.582
	(0.723)	(0.812)
EBIT	0.00399	0.00379
	(0.00915)	(0.00920)
Fixed Assets	-0.701**	-0.776**
	(0.346)	(0.365)
Leverage	-1.036***	-0.957***
	(0.309)	(0.313)
Uncertainty	0.497*	0.430
	(0.289)	(0.277)
Market to Book	0.126*	
	(0.0662)	
Sales Growth		0.0973
		(0.0979)
Callable	0.198	0.187
	(0.126)	(0.128)
Constant	-9.476*	-9.004
	(5.644)	(5.640)
Observations	2,006	1,955
R^2	0.148	0.142
Maturity Dummies	Yes	Yes
Year Dummies	Yes	Yes
Underwriter Dummies	Yes	Yes

Table 7: Matching Diagnostics

Notes: This table shows the diagnostic results for the propensity score matching regressions of Table 6 where defeasance is the treatment. We compute McFadden's Pseudo R^2 before and after matching for each of the two specifications found in Table 6. We also compute the likelihood ratio of a test of joint significance of all regressors. Finally we compute the reduction in mean and media bias due to propensity score matching.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Sample	Pseudo R^2	LR chi2	$p > \chi 2$	Mean Bias	Median Bias
Specification 1: Yield Spread & Market to Book ratio					
Raw	0.148	390.88	0.00	7.4	5.4
Matched	0.095	256.75	0.00	3.6	0.00
Specification 2: Yield Spread & Sales Growth					
Raw	0.142	364.32	0.00	7.4	5.4
Matched	0.082	220.55	0.00	2.7	0.7

Table 8: Matching Results

Notes: This table shows the results of propensity score matching where defeasance is the treatment. We compute the average treatment effect on the treated (ATT) by computing the yield differential between bonds with and without defeasance, both with and without the imposition of common support. We also compute both analytical and bootstrapped standard errors. A negative sign for the ATT with respect to the yield spread means that the decision to include defeasance implies a reduction in the bond's yield. Standard errors are in parentheses. We also reported the number of treated and the number of control observations.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

	Market to Book			
	Without Common Support		With Common Support	
Std. Err.	Analytical	Bootstrapped	Analytical	Bootstrapped
ATT	-0.334***	-0.335***	-0.339***	-0.339***
	(0.124)	(0.125)	(0.116)	(0.116)
Treated	1468	1468	987	987
Control	440	440	303	303
	Sales Growth			
ATT	-0.279**	-0.279**	-0.280**	-0.280**
	(0.131)	(0.133)	(0.118)	(0.118)
Treated	1486	1486	973	973
Control	449	449	300	300

Table 9: Lee and Bradley-Roberts Procedure: Yield Regressions

Notes: In the first panel of this table we run an OLS regression with the offering yield from FISD as the left hand variable. We run separate regressions for bonds with and without defeasance. Each regression includes issue characterizes, firm characteristics and the one year Treasury rate, 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 addition we include IMR ND (for bonds without defeasance) and IMR D (for bonds with defeasance), the inverse Mills ratios from the first stage defeasance regression with defeasance as the left hand variable. The first stage regressions differ with respect to whether we included sales growth or market to book as a control for growth options as well as the KZ or WW indices as additional controls for financial constraints. The heading of each specification indicates what specification we are looking at. We use year clustering for standard errors. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
In the second panel of this table we use the coefficient estimates to compute yield predictions for each bond in our sample. This gives us two predicted yields for each bond, one without and one with defeasance. We report the average yield and the implied yield differential in panel two and run a t-test to see if the difference is statistically different from zero. A negative yield differential indicates that yields with a defeasance clause included demand a lower yield.

OLS	Dependent Variable: Yield to Maturity							
	Market to Book				Sales Growth			
	KZ (1)		WW (2)		KZ (3)		WW (4)	
IMR ND	-0.216		-0.166		-0.167		-0.103	
	(0.168)		(0.156)		(0.166)		(0.148)	
IMR D		-0.155		-0.211		-0.0850		-0.119
		(0.119)		(0.124)		(0.116)		(0.120)
Number Covenants	0.131***	0.316***	0.119***	0.307***	0.129***	0.313***	0.117***	0.304***
	(0.0326)	(0.0269)	(0.0307)	(0.0278)	(0.0331)	(0.0266)	(0.0316)	(0.0274)
Interest Coverage Ratio	-0.0370***	-0.00178	4.72e-05	-0.00218	-0.0379***	-0.00188	6.10e-05	-0.00220
	(0.00900)	(0.00127)	(0.000118)	(0.00133)	(0.00909)	(0.00129)	(0.000118)	(0.00134)
Investment Grade	-0.0400	0.0397	-0.0983	0.0130	-0.0381	0.0410	-0.0956	0.0157
	(0.0650)	(0.0473)	(0.0617)	(0.0383)	(0.0652)	(0.0477)	(0.0622)	(0.0385)
Bond Size	-1.094**	-0.343	-1.547**	-0.376	-1.100**	-0.339	-1.567**	-0.373
	(0.498)	(0.580)	(0.638)	(0.599)	(0.500)	(0.580)	(0.635)	(0.601)
Seniority	-0.590***	-0.0197	-0.654***	-0.0892	-0.588***	-0.0199	-0.653***	-0.0892
	(0.0850)	(0.152)	(0.114)	(0.154)	(0.0863)	(0.153)	(0.116)	(0.154)
log(Market Cap)	-0.266***	-0.221***	-0.300***	-0.235***	-0.264***	-0.219***	-0.297***	-0.232***
	(0.0409)	(0.0364)	(0.0488)	(0.0358)	(0.0409)	(0.0362)	(0.0485)	(0.0356)
Fixed Assets	-0.444	0.0608	-0.376	-0.0173	-0.412	0.0926	-0.333	0.0209
	(0.310)	(0.132)	(0.278)	(0.138)	(0.307)	(0.129)	(0.273)	(0.135)
Leverage	0.0699	1.049***	0.725	0.980***	0.0849	1.072***	0.758	1.009***
	(0.561)	(0.262)	(0.473)	(0.219)	(0.562)	(0.259)	(0.471)	(0.215)
Callable	0.406***	0.344***	0.429***	0.305**	0.403***	0.339***	0.426***	0.297**
	(0.0703)	(0.110)	(0.0673)	(0.119)	(0.0704)	(0.110)	(0.0678)	(0.119)
Constant	4.542***	2.010**	4.811***	1.879**	4.500***	2.057**	4.777***	1.998**
	(0.719)	(0.948)	(0.731)	(0.884)	(0.713)	(0.952)	(0.732)	(0.885)
Observations	717	1,340	795	1,474	717	1,340	795	1,474
R^2	0.813	0.787	0.807	0.784	0.812	0.786	0.806	0.784
Additional Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yield Curve Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Implied Yield Difference							
Implied Yield in Sample	7.38	7.09	7.34	7.01	7.32	7.12	7.27	7.06
Yield Reduction Def		-0.29***		-0.33***		-0.20***		-0.22***

Table 10: Lee and Bradley-Roberts Procedure: Defeasance Inclusion

Notes: This table presents the third stage of the Lee and Bradley-Roberts procedure. We run the same Probit regression as in the first stage with defeasance as the dependent variable. Defeasance takes value one when such a clause is found in an issue and zero otherwise. The regression is amended by the inclusion of the yield differential that we computed in Table 9. In addition to the yield differential we include the same variables as in first stage. These are variables that drive the inclusion of defeasance into issues as predicted by our model: the number of covenants, our measure for uncertainty - the standard deviation of analyst forecasts. Following Billet, King, and Mauer (2007) we use two different measures for growth options, sales growth and the market to book ratio. We control for financial constraints by including the firm's fixed asset ratio and two different indices for financial constraints, the Kaplan-Zingales as well as the Whited-Wu index. To control for the likelihood of exercise we also include the firm's (book) leverage ratio. In addition there are issue controls, and more firm controls. These additional variables are the the interest coverage ratio, maturity, 1yr Treasury bill rate, the term spread and credit spread as well as the firm's size (measured by the log (Market Cap), and EBIT. We also control for callability. In addition we we include year, underwriter and industry dummies as well as a squared term for maturity and a dummy for investment grade bonds. Exact variable definitions can be found in Table 13. 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.

Probit	Dependent Variable: Defeasance			
	(1)	(2)	(3)	(4)
Yield Differential	0.171	0.173	0.172	0.180
	(0.162)	(0.162)	(0.164)	(0.161)
Number Covenants	0.0530	0.0292	0.0510	0.0278
	(0.0418)	(0.0411)	(0.0419)	(0.0410)
Maturity	0.00557	0.00621	0.00607	0.00592
	(0.00606)	(0.00545)	(0.00610)	(0.00547)
$Maturity^2$	-6.67e-05	-5.94e-05	-7.00e-05	-5.62e-05
	(5.86e-05)	(5.37e-05)	(5.90e-05)	(5.41e-05)
Fixed Assets	-1.250***	-1.126***	-1.265***	-1.156***
	(0.345)	(0.316)	(0.349)	(0.320)
KZ	0.0110**		0.0112**	
	(0.00507)		(0.00512)	
WW		1.283*		1.476*
		(0.769)		(0.813)
Uncertainty	0.975**	0.966***	0.974**	0.945***
	(0.385)	(0.375)	(0.381)	(0.367)
Market to Book	-0.0306	0.0469		
	(0.0870)	(0.0838)		
Sales Growth			0.126	0.0983
			(0.109)	(0.110)
Leverage	-0.734*	-0.987***	-0.740*	-0.998***
	(0.424)	(0.347)	(0.418)	(0.350)
Constant	0.603	0.269	0.451	0.211
	(1.140)	(1.220)	(1.140)	(1.239)
Observations	2,020	2,224	2,020	2,224
Pseudo R^2	0.149	0.140	0.150	0.140
Issue Controls	Yes	Yes	Yes	Yes
Issuer Controls	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Maturity Dummies	Yes	Yes	Yes	Yes
Underwriter Dummies	Yes	Yes	Yes	Yes

Table 11: Callability as Substitute for Defeasance?

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 average premium to be paid (in BP). 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. Note that there are a lot of missing values in FISD (1,125 out of 3682 (32%)) with respect to callability. Given the low number of non-callable bonds, we conjecture that issues with missing data on callability are non-callable.

	Defeasance: Yes			
	No		Yes	
	#	%	#	%
Callable	56	0.02	2,557	0.98
Continuously Callable	906	0.35	1,652	0.65
Continuously Callable at premium	6	0.00	1,646	1.00
	#	BP		
Call Premium (in BP) if Continuously Callable	1592	28.19		
	No		Yes	
	#	%	#	%
Not Continuously Callable have Quiet Period upfront	2	0.00	900	1.00
	#	Years		
Length of quiet Period in years	900	4.69		
	#	%		
Length of quiet Period relative to maturity (in %)	900	0.45		

Table 12: Sample Construction

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.

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 (by Cusip)	=4856

Table 13: Variable Definitions

Notes: This table we describe our definitions of various variables. In case our data is from FISD we provide the exact field. In case it is from Compustat we refer to the new Xpressfeed items. All level items are deflated using the All Urban CPI from the Bureau of Labor Statistics.

From FISD	
Defeasance	=Field *Covenant defeas wo tax conseq* in table Bondholder Protective.
Number of Covenants	=Sum of all covenants present in table Bondholder Protective or table Issuer Restrictive. We do not code comments or other types of defeasance.
Offering Yield	=The yield to maturity calculated by FISD in field *offering yield* at issuance.
Yield Spread	=The difference between the offering yield and the yield of a US Treasury bill or note with the same maturity. (Only for maturities <= 10 years.)
Maturity	=The maturity of the issue.
$Maturity^2$	=Maturity squared.
Bond Size	=Taken from field *Offering amt.*
Callable	=Dummy that takes value one if the issue is callable.
Investment Grade	=Dummy that takes value one if the issue is investment grade and zero otherwise.
Seniority	=Categorial variable that codes the field *security level* from 0 ($JUNS = lowest$) to 5 ($SS = highest$).
From Compustat	
log(Market Cap)	=log(prcc_c*csho)
EBIT (Earnings before Interest and Taxes)	=ib
Cash	=che/at
Investments	=capx/at
Leverage	=(at-seq)/at
Market to Book Ratio	=(at-ceq+MarketCap)/at
Sales Growth	$=sale/sale_{(t-1)}$
Fixed Assets	=ppent/at
KZ Index	$= +0.2826389\frac{at+prcc_c*csho-ceq-txdb}{at} +3.139193\frac{dltt+dlc}{dltt+dlc+seq} - 39.3678\frac{dvc+dvp}{ppent_{(t-1)}} -1.314759\frac{che}{ppent_{(t-1)}} - 1.001909\frac{dp+ib}{ppent_{(t-1)}}$
WW Index	$=-0.091\frac{dp+ib}{ppent_{(t-1)}} * 0.25 - 0.062 * divpos +0.021\frac{dltt+dlc}{dltt+dlc+seq} - 0.044 * log(at) +0.102 * \frac{salesG1}{4} - 0.035\frac{salesgrowth}{4}$
Interest Coverage Ratio	=(ib+dp)/ xint
Industry Dummies	=2-digit SIC code
From the Federal Reserve Board (H.15 table)	
Term Spread	=Difference between the 1 yr Treasury yield and the US Treasury yield matched to the issues' maturity.
Credit Spread	=Spread between a AAA and a BAA bond.
1 yr Treasury Yield	=The yield for a one year US Treasury bill.
From other sources	
Uncertainty	=Field *stdev* of EPS directly from I/B/E/S.
Dummy Pre-96	=Dummy that takes value one if the bond was issued before 1996 and zero otherwise.