Covenants and Collateral in Japanese Corporate Straight Bonds: Choice and Yield Spread

Yasuhiko Tanigawa*

Shinichi Katsura†

May 2013

This version: September 30, 2013.

Abstract

How a firm chooses a set of covenants and of collateral to pledge when issuing straight bonds publicly in Japan? Covenants and collateral are contract clauses intended to protect rights of the bondholders. If the protection is priced in the issue, why do firms try to put them all in the issue? Taking it into account that we only observe an endogenously chosen covenants-collateral type for an issue, we estimate a relation between issue prices (yield spreads) and credit risk factors and other firm/issue characteristic variables. We obtained a distinct relationship for each covenants-collateral type from two-step estimations of a Heckman type. In the first step we estimate multinomial logit models of covenants-collateral choice, and found supports for the physical cost hypothesis, the hysteresis hypothesis, and signaling hypothesis. Most notably, however, we found that strategic default concerns involve direct costs in the choice, not through indirect effects on the yield spread.

*Professor, School of Commerce, Waseda University. 1-6-1 Nishiwaseda, Shinjyuku, Tokyo 169-8050, Japan. Email:ytanigawa@waseda.jp

†Professor, Faculty of Business Administration, Kinki University. 3-4-1 Kowakae, Higashi-Osaka, Osaka 577-0818, Japan. Email:s-katsura@bus.kindai.ac.jp

1 Introduction

Covenants are special clauses in bond contracts, which restrict the borrower's specific action after the issue (Smith and Warner [1979]). By limiting an amount of dividend to be paid, for example, a covenant reduces conflict of interests between stockholders and bondholders, and makes the bond be more favourable to investors. When investors perceive potential agency problems with managers, the firm tends to employ more covenants (Chava, Kumar, and Warga [2009]) so that it makes the problem less likely to materialize *ex ante*. Recent theoretical papers on capital structures shed light on *ex post* activities such as renegotiation upon default, to derive an optimal capital and/or debt structure[1]. In these models, covenants affect status of the parties involved when the renegotiation fails, and thus affect negotiation powers of the parties.

This becomes a serious concern when a manager can default strategically, i.e., she intentionally fails to meet promised payments even if she has cash that outside debtholders don't notice, and goes into renegotiation to extract surplus. If investors sense a possibility of strategic default and renegotiation that follows, prices of bonds will reflect this risk. A credit spread of bonds, defined as a difference between corporate bond yields and the government bond yields, will be affected. Davydenko and Strebulaev [2007] empirically investigate effects of strategic defaults on credit spreads, coming from a possibility of renegotiation, the relative bargaining power of debt and equity, and liquidation costs in bankruptcy. They find firm-specific strategic variables, such as CEO shareholding and her tenure (as proxies of bargaining power) and a ratio of the number of bonds outstanding to the total debt (as a proxy of renegotiation frictions, that lowers the possibility of renegotiation), affect prices of US corporate bonds. Although they acknowledge their renegotiation friction proxies can be determined endogenously, they treat, for example, the structure of bonds as given, and they don't test it.

This paper has three objectives. First, by studying Japanese corporate bonds issued publicly, we are going to clarify whether covenants affect credit spread of straight bonds at the time of the issue, paying enough attention to the endogeneity problem. Compared with covenants in loan contracts where case-by-case customizations can be

[1] See Leland [1994], Mella-Baral and Perraudin [1997], Mella-Barral [1999], Fan and Sundaresan [2010], Hackbarth, Hennessy, and Leland [2007], and von-Thadden, Berglöf, and Roland [2010] among others.

made between the firm and the bank, those observed in publicly issued bonds are simple. Just a type is chosen from a few possible alternatives. The problem becomes how to adjust properly selection bias coming from a discrete choice. Estimations without this adjustment can be misleading. We will see that a bond with a maintenance clause is issued at a lower price, for example[2]. We don't want to say that, although the clause offers additional protections to investors, the market doesn't understand its implications, and gives the bond a lower price as if having the clause itself made the bond riskier. Obviously the firm choses to issue the bond with the clause to get a better price, or to make the entire amount of the issue to be purchased by investors. The fact the firm has chosen to include the clause must be taken into account when looking at the issue price.

The second objective is then to model this choice. Although it is a simple choice, it has a structure of an economic choice. As we will see later, 80% of issues are uncollateralized bonds with only a negative pledge clause. Issues with a maintenance clause are rare. If a firm can obtain a lower financial cost by deviating from this standard with additional covenant clauses, then why do all the other firms keep issuing bonds with the standard covenants? A simple answer would be that the additional covenants, which restrict future actions, are costly. Of course, covenants themselves have a merit to enhance credit worthiness of the bonds. They protect bondholders, make the bond less riskier, and thus should bring a higher price. When covenants involve both costs and benefits, the net effect matters for a firm to choose a set of covenants. By modelling the net effect as a latent variable in the choice of covenants, and estimating an issue price for chosen covenants adjusting econometrically selection bias brought by using data of a particular covenants type, we test whether there are 'direct' costs of covenants other than the financial cost. That is, we are going to propose a model of a choice, which enables to see whether effects of covenants are limited to fall on the issue prices or not, or whether a firm only cares for the effects on the issue price when selecting covenants.

[2]A maintenance clause is a promise to keep a specified level for contracted variables such as income, as we will explain more in Section 2.2. When a firm fails to keep the level, it must return the principal of the bond immediately and the bond terminates. Variables that can censor future credit worthiness of the firm are employed in clauses as the contracted variables.

The third objective is to examine its implications of the covenant-collateral choice. Strategic considerations have been a focus so far in the literature, as covenant-collateral clauses change a possibility of strategic actions by restricting behaviours of firms in the future. In other words, covenants are costly because they make strategic actions more difficult. But restrictions are not neccesarily limited to the actions relating strategic behaviours. They can remove some flexibility in general. And it can be costly, not because they restrict firms behaviour, but because it emits a negative signal to the market, advertising it as a risky issue.

We want to verify that strategic considerations are important in publicly issues in Japan. Those bonds, mostly in a denomination of 0.1 billion yen, are targeted for institutional investors, such as pension funds, life and casualty insurance companies, regional banks and other financial institutions. As they trade bonds at the capital market, the firm is uncertain at the time of the issue who the counterparties will be when entering a renegotiation. This does not preclude all strategic actions in the public bonds, but reduces their likelihood. It is an empirical matter whether or not possibilities of strategic defaults are priced at the time of issues, and strategic considerations affect a choice of covenant-collateral. If we find an evidence that strategic defaults are not so much of importance in the case of public bonds, then it provides a clue to discriminate pubic bonds from private loans in debt contracts[3]. Those who are concern with strategic considerations don't come to the public bonds market.

We got the following results. Firstly we obtain distinct credit spread regressions according to the covenant-collateral type of an issue. This implies that characteristics of an issue, volatility of assets representing income risk, for example, have a different implication to the spread when the covenant-collateral of the issue differs, after adjusting selection biases. Secondly we have evidences that covenant-collateral choice involves direct costs other than the financial cost represented by the issue price of bonds. When issuing collateralized bonds, physical costs to pledge assets as collateral and a size of income risk are of course of concern to the firm. Including these costs and risk, all

[3]Shirasu and Xu [2007] treat this issue by analysing changes in corporate debt compositions in the period from 1993 to 1997, which includes a year 1996 when the Japanese bond market experienced a large deregulation. Our sample is from 2000 to 2011, and we will focus on issue prices that Shirasu and Xu don't treat at all.

factors that affect the issue price should affect the choice of a covenants-collateral type. We find, however, some variables that don't affect credit spreads, and yet do affect the choice of a covenant-collateral type. They represent direct costs. Thirdly we find strategic factors are in this kind. They don't affect the issue price, but still are important factors in the choice of a covenant-collateral type. A time trend, indicating a hysteresis effect, is also in this kind. As we mentioned, most of issues are uncollateralized bonds with a negative pledge clause only. Deviating from this "standard" type, by dropping the negative pledge clause, for example, emits message to the market. We may argue that further "deregulation" in the people's mind may be needed, if firms that deviate in this way rely solely on the past history.

The rest of the paper is organized as follows. Section 2 overviews the Japanese corporate bond market, and presents observed patterns of covenants and collateral of our sample, to see selection bias problems in the relation between credit ratings and yield spreads. Section 3 explains a model of covenant-collateral choice, hypotheses in the choice model, a model of yield spreads, and variables to be used. After explaining the estimation procedure, Section 4 reports the estimation results. Section 5 concludes.

2 Features of the Japanese Corporate Bonds Market

2.1 The market after deregulations in 1990's

There had been regulations on the Japanese financial markets, that made them controlled. For a corporate bond issue market, a consortium called 'Kisaikai' had closed opportunities to issue public bonds for most companies until 1996. Only a limited number of eligible companies that satisfied stringent eligibility conditions, such as electric companies and a government-owned telecommunication company, could issue public bonds with collateral. This had been a long tradition, continued after experiencing many defaults in 1930's. Deregulation wave came in 1990's, and uncollateralized bonds were 'allowed' to issue step by step: initially for convertible bonds, and later for straight bonds. However, all *public* domestic issues were still only from high graded companies prior to 1996, and they had to have some covenants as well. A credit rating was determined according to the type of covenants pledged.

Although issues were severely restricted, there occurred a few defaults of public bonds before 1996. When defaulted, a main bank of the issuing company paid back the promised amount to the bondholders. There seemed as if there had been an implicit guarantee. Therefore investors of public bonds had no reason to pay attention to credit worthiness of an issue. It was not so surprising if a credit rating had no informational content as to credit worthiness of the bond. This was totally different from the US corporate bond market where credit ratings had been a good indicator for defaults, and had been an important determinant of market prices.

Due to a deregulation, Japanese firms needed not to observe the eligibility standard any more in 1996, and were required to have two credit ratings instead. Public bonds began to be issued by firms that had never issued before. In September 2001 a straight bond defaulted issued by a company in a retail trade industry, but its main bank did not support it. The investors realised a loss. This incident confirmed that the bond market entered a new stage[4].

Deregulation for the separation of securities business from commercial banking business occurred in 1980's. There can be a conflict of interests between two types of business, so that it was required to establish subsidiary companies in order to create a firewall when entering into the other business. An origin (or the parent company) of an underwriter can affect issue prices of bonds, as Takaoka and McKenzie [2006] observe. It was a certification effect when the underwriter was the main bank of the issuer. McKenzie and Takaoka [2012] study roles of reputation both of issuers and of underwriters in the Japanese straight corporate bond issues in the 1994-2009 period. They provide evidences of the Japanese market becoming more market-oriented in 2000's, as the Japanese bank industry itself experienced a process of consolidation that leaded to three megabanks in 2001.

Since prices of the secondary market may affect prices of the primary market, let us see quickly findings there. Ooyama and Sugimoto [2007] explore determinants of monthly changes in credit spreads in the Japanese corporate bonds market from

[4]The next default after 2001 of publicly issued straight bonds occurred seven years later, in June 2008: actually three issues defaulted in 2008. But in early in 2000's the market seemed to realize that the implicit guarantee by the main bank was really implicit, and that the bank needed not exercise the guarantee.

December 1998 to August 2006. They use average credit spreads for each length of maturities and for each credit rating[5]. They find that perceived improvements in firm's asset value reduce credit spreads, but at the same time they notice some discrepancies from the theory[6]. As they document that only in late 1990's bond prices began to reflect credit ratings, in this paper we are going to use the Japanese data since 2000's.

Using both firm specific and economy-wide variables, Nakashima and Satio [2009] show supportive evidences for a Merton [1974] type model in the secondary market in Japan. The former includes debt-to-equity ratio, volatility of corporate value of a company, and a maturity of a bond. This two-types classification of variables follows from Collin-Dufresne, Goldstein, and Martin [2001], who document validity of both firm specific variables and the spot rate as determinants in US corporate spread changes. But they also stress there remains a single common component unidentified in US. Nakashima and Saito [2009] document "market liquidity" for a financial crisis period from 1997 to 1999, and "aggressive monetary policy" for a slump period from 2001 to 2003, as the more dominant factor than firm specific factors[7].

2.2 Covenants and collateral in our Japanese data

Considering the situation of the secondary market, of the securities and banking industries, and of the primary market, we collect data for corporate bonds publicly issued in Japan by non-bank Japanese firms from January 4, 2000 to December 30, 2011, to have 2,615 issues, of which 342 issues were from electric companies. They are regular issuers, except for a year long halt after the accident in 2011 of the Fukushima nuclear power plant. Our sample does not include privately placed bonds, which typically are issued by non-listed companies with investment (low credit) grades. We drop 19 bonds whose redemption amount was less than 0.5 billion yen or whose maturity was

[5] In Japan both domestic and international rating agencies are active. The latter includes S&P, Moody's and Fitch. Shimoda and Kawai[2007] document rating disagreements among agencies and difference between solicited and unsolicited ratings. Although this is an interesting topic, we disregard the issue since a law requires public bonds to have solicited ratings at the time of issue.

[6] They guess their use of macro variables, not firm specific ones, might cause the discrepancies.

[7] Nakashima and Saito [2009] use economy-wide "liquidity" factors. In the US corporate bond market, Chen, Lesmond, and Wei [2007] find that bond-specific liquidity factors, those measured by bid-ask spread, zero returns proxy for (non-) liquidity, and an estimator based on a market microstructure model of Lesmond, Ogden, and Trzcinka [1999], are also important.

less than a year. Our data are from *Nikkei Financial Quest* and *Nikkei Quick* data services. We supplemented credit ratings data with statistics complied by the Securities Dealers Association, when missing in the Nikkei data services.

*** Table 1 ***

Table 1 indicates distribution of covenants and collateral. Collateralized bonds consist 17.9% in terms of face value (338/2596=13.0% in terms of number of issues, not displayed in the Table). 312 issues of 338 collateralized are from the nine electric companies. The remaining 26 are issued by Nippon Telegraph and Telephone Corporation, and Japan Tabacco. Both had been operated by the Japanese Government, and both privatized in 1985. Laws require the Government to retain over one thirds of their stocks after the privatization. Only a limited number of companies, all of which are government-related, issue bonds with collateral. There was an exceptional issue by a private company, Sumitomo Osaka Cement corporation, of a collateralized issue with a negative pledge clause.

Uncollateralized bonds with a negative pledge clause have the major share of 76.8% in terms of face value (81.8% in terms of number of issues). A negative pledge clause entitles the bondholders to have at least as equal rights over the corporation as the other bonds that will be added later on[8]. In other words, the cash flow right of the debt in concern is protected against securities issued later. With this clause, the credit priority of the bond is protected just as a collateral provides protection in case of default.

Maintenance clauses on income or on net asset are rare. The clauses censor a condition of a company, especially a declining credit worthiness. The company must return the principal immediately when it breaks the maintenance level. They are intended to protect bondholders before the issuer goes into bankruptcy, as smaller income (revenue) or lower net asset is a sign of deteriorating credit condition. Mori

[8]To be more precise, this clause in the Japanese corporate bonds is limited to bonds to be issued or existed, but not to loans to be made or existed. Bondholders are placed lower position than lenders in terms of protection. Furthermore, investors cannot know what kinds of covenants loans have, since they are rarely disclosed anywhere. Publicly issued bonds disclose covenants in prospectus. Practitioners argue that this *weak* protection is a reason for individual investors not to participate in the corporate bond market.

[2009] reports that only 23% of uncollateralized bonds issued between January 1996 and August 1996 had a maintenance clause on income, while 87% of uncollateralized debts had a maintenance clause issued a year earlier when the eligibility standard was still observed. Our data shows 1.0% of issues have a maintenance clause on income. Further reductions occurred in 2000's.

Note that sixty one uncollateralized bonds without any covenant clause are also issued by a limited number of companies. Mitsubishi Corporation (a general trading company) and Mitsubishi Estate issued fifty six bonds out of sixty one, and these two companies have not issued any other type of public bonds. Other two companies issued a bond for each, and they had issued no other types of public bonds, neither. The remaining three bonds were issued by three companies, but they have also issued other bonds of the typical type, i.e., uncollateralized bonds with only a negative pledge clause.

2.3 Credit ratings and covenants

If a credit rating well reflects credit worthiness, then covenant clauses and collateral should not bring any difference in the yield spread if credit ratings are controlled. The yield spread is defined as the difference between the yield to maturity of a bond and the yield of the Japanese Government Bond (hereafter, JGB) with the same maturity as the bond. As the JGB's are considered as risk free, the spread reflects credit worthiness of the bond[9]. That is, the credit rating becomes sufficient statistics for yield spreads. In reality a credit rating determines *a range* for yield spreads; bonds with the same credit rating have a different level of yield spreads. Other characteristics of a bond than the credit rating are also important. This paper's concern is what are the characteristics that determine the spread.

*** Table 2 ***

[9] We understand that the yield spreads, just a difference of yields of bonds with the same maturity, may not be immune to changes in shapes of the yield curve of JGB's. We employ the spread as many literature use it, Collin-Dufresne *et. al*(2001), for example.

Table 2 documents average spreads for each credit rating. It shows that lower grade bonds tend to have a higher yield, which is consistent with a standard finance theory, but AAA-rated bonds have a higher average yield than that of AA-rated bonds, although the standard deviations are large so that differences between ratings may not be statistically significant.

*** Table 3 ***

Decomposing bonds with the same credit rating into several subclasses using protections attached to the bond by collateral and covenant clauses, Table 3 documents the average yield spread of the bonds in a subclass. If other things are equal, protective power would be ranked as follows: Collateralized with A clause, collateralized without any clause, uncollateralized with A, B, and C clauses, uncollateralized with A and either B or C clauses, uncollateralized with only A clauses, and uncollateralized without any clause, omitting patterns that don't exist. We designate here and in the Table the negative pledge as A clause, a net asset maintenance as B clause, and an income maintenance clause as C clause.

Average yield spreads are smaller when the protective power is stronger both within the AAA-rated and within the AA-rated bond classes, although differences of spreads within the AA-rated class may be statistically insignificant. Within the AA-rated bond class, for example, the average spread of uncollateralized bonds with the A clause attached is smaller than that of uncollateralized bonds without any clause. The A clause protects the bondholders' status, so that a price of such bonds become higher (yield be lower), which we observe here.

However, for the A-rated, BBB-rated, and BB-rated bonds, protective power does not conform to the average yield spread. For example, the average yield spread for A-rated uncollateralized bonds with all three covenants clauses is the highest among A-rated uncollateralized bonds. Average yield spreads for bonds with the clause B, i.e., the net asset maintenance clause, tends to be much higher than those without the clause B, except two issues of the A-rated bonds with both A and B clauses.

This indicates a covenant clause is endogenously chosen; investors require a higher yield to compensate the risk inherent in bonds, and the bond also needs a censoring clause attached in order to ”sell” bonds successfully. A covenant clause can be a signal to investors. Having these statistical facts in mind, now we move forward to analyze choice of covenants and of collateral.

3 Model and Hypotheses

Because we observe only a small number of observations in some covenant-collateral choices, we categorize the seven patterns in Table 1 into the following four types: (i) collateralized, (ii) uncollateralized without any covenant, (iii) uncollateralized with a negative pledge clause only, and (iv) uncollateralized with either an income maintenance or a net asset maintenance clause (or both) as well as a negative pledge clause. They are mutually exclusive and cover the entire sample.

This categorization can be read as the follows. Uncollateralized bonds with a negative pledge clause are the typical: the covenant-collateral type (iii). We may refer this as **Typical** in the following. Dropping the covenant clause leads to the covenant-collateral type (ii), **None**, and adding further covenant clause(s) leads to the covenant-collateral type (iv), **Maintenance**. For the Japanese corporate public bonds, additional clauses we observe are maintenance clauses for an income or a net asset. Collateralized bonds are the type (i), **Collateralized**[10].

Table 4 shows distribution of credit rating according to these four types. Figure 1 displays distribution of spreads in the above each covenant-collateral choie types.

*** Table 4 ***

*** Figure 1 ***

[10] As explained, collateralized bonds are issued by specific firms in specific industries without any covenant. However, electric companies who issue collateralized bonds, **Collateralized**, do issue uncollateralized bonds with a negative pledge clause only, **Typical**. Thus the following analysis doesn't mean to discriminate firms who issue collateralized bonds. There is only one exception of a collateralized issue with a negative pledge clause. This issue, by a private company and resulting in BBB grade, surely is heterogeneous within the covenant-collateral type (i). We keep it in the type because it is unlikely to affect statistical inference in the following.

Malitz[1986] is the earliest empirical study in the US we are aware of on determinants of covenants on public bonds. She conducts a discriminant analysis with three explanatory variables, (1) a size of the issuing firm, (2) a relative size of the issuing debt to the outstanding debts in the firm, and (3) leverage, to separate bonds into four categories: with or without a sinking fund, and with or without a dividend restriction. As the four categories are mutually exclusive and exhaustive, we may regard her statistical model as a model of choice.

Reisel[2010] is most closely related to ours in terms of motivation, and has a similarity in empirical methods. She regress issue spreads of US public bonds on characteristic variables of the issuing firm and a type of covenants, with the inverse Mill's ratio for adjusting the selection bias. However her variety of the types of covenants is not mutually exclusive. She picks up three types: (a) negative pledge and sale-leaseback restrictions, (b) restrictions on investment activities, and (c) restrictions of payouts and additional debt. She observes that, of the bonds issued by investment grade companies, 92.32% have the type (a), 90.16% have the type (b), and 5.92% have the type (c) restrictions. Obviously an issue has multiple types simultaneously. She runs a tobit regression for each type separately. And with the induced Mill's ratio from the estimated parameters of the tobit regression, she runs a spread regression for each type of a covenant. Her separation is partial and incomplete, and can not discriminate firms that have both the type (a) and the type (b) from firms that only have the type (a), for example. Our categorisation is mutually exclusive and complete, and we are going to see effects of covenants for having both (a) and (b), having only (a), having only (b), and having neither, if we were using two characteristics that she employs.

In the following we will outline a formal framework of the choice of categories.

3.1 Choice of collateral and covenants

We start with a firm that needs to obtain a specific amount of cash from issuing a public bond of a predetermined length of maturity, meaning that we will not treat choices of maturity structure of bonds, of public vs. private bonds, of bonds vs. bank loans, and of leverage itself. Then the firm's object is to minimize costs regarding the issue, which consist of two parts. The first cost comes directory from chosen covenants (and collateral, if offering). Having an income maintenance clause may result in a technical default, by breaking the promise to keep the income level, even if it can afford to pay the interest. In order to avoid this, the firm may be obliged not to take a risky but promising business chance; if taken, it could result in a smaller income than is promised in the maintenance clause. Note that this cost doesn't imply cash-outflow.

The second cost is a rate of return the bond provides to investors. When a coupon rate is not high enough, an issue price declines so that the investors who is obtaining the bond can expect a higher return. Thus the market determines the required rate of return of an issue, evaluating its risk. A riskier bond needs to offer a higher return. We write the second cost in terms of spread, subtracting a risk free rate r_{JGB} as

$$\text{market spread} \;=\; f(x^1, x^2, z \mid \mathrm{c}) \;-\; r_{JGB}, \tag{1}$$

where x^1 are bond specific variables such as maturity and size, x^2 are firm specific variables such as leverage, volatility of cash flow and so on, z are variables that characterize market conditions such as term structure of interest rates, stock market index, and so on, and r_{JGB} is the risk free interest rate of JGB, the Japanese Government Bond, with the same maturity as the bond in concern. In the above, c denotes a covenant-collateral type (whether the bond has collateral or not, and what kind of covenant clauses it has). The market may require a different rate of return if c differs. In the equation (1) the functional form f can differ according to the type c, with which we intend to express this different requirement from the market.

A firm chooses a type of covenants and collateral so as to minimize the total cost, $TC(c)$, the sum of the above:

$$TC(c) \;=\; \text{market spread}(c) \;+\; \text{covenants/collateral cost}(c). \tag{2}$$

Now we assume linearity in TC and it has an error term following Gumbel distribution. Then we can use the result of McFadden[1973], who shows the choice of covenant-collateral type c leads to the following multinomial logit model:

$$\text{Prob}(c\,|X_i) = \frac{exp(X_i'\gamma_c)}{\Sigma_h exp(X_i'\gamma_h)}, \quad c \ = \text{type (i), (ii), (iii), or (iv)}, \tag{3}$$

where X_i is a vector of observable characteristics of a bond i, γ_c is coefficients to be estimated so that the probability, Prob($c\,|X_i$), of selecting a particular type c (either (i) **Collateralized**, (ii) **None**, (iii) **Typical**, or (iv) **Maintenance**) conditional on X_i, becomes the highest among the other types. The bond specific variables x^1, the firm specific variables x^2, and the market condition variables z and the risk free rate r_{JGB} in the equation (1) consists X, as well as observable variables that are related to the cost of covenants and collateral.

3.2 Factors that affect covenants-collateral costs

Of the total cost TC, here we mention factors related to the covenants and collateral costs in (2). The market required rate of return for a bond, the value of which also depends on the covenant-collateral type c, will be stated in the following section 3.3.

A firm who wants to issue collateralized bonds must have tangible assets to pledge as collateral. A larger firm and a firm with more tangible assets would incur less costs for offering collateral. The variable ***log_asset***, defined as logarithm of the total asset, measuring a size of a firm[11], and the variable ***tangibles_ratio***, defined as a book value of tangible fixed asset to a book value of the total asset, capture physical aspects for offering collateral. Larger these variables are, the more likely a firm chooses **Collateralized**. We call this as a physical cost hypothesis.

A firm can carry out normal operations as long as it pays interests and principal as promised, even if it has been offering some assets as collateral. It faces a difficulty in continuing operation only when bondholders seize the collateral and put it under their control, as it misses an interest payment (and/or the principal) and goes default. This could happen because of a temporal cash shortfall, even if the business goes well. To avoid such situation, a firm offers collateral cash when shortfall is less likely to happen. The variable ***asset_volatility***, defined as a standard deviation of daily stock returns

[11] Table 5 shows description of all variables to be used and their summary statistics.

over past 60 days, measures the business risk of the firm: a size of income fluctuation the stock market perceives. And the variable ***leverage***, defined as a ratio of book value of the total debts to the sum of the book value of the debts and of the market value of the stock, measures financial risk of the firm. For a given size of income fluctuations and a given size of a firm, the effect to the bondholders becomes large if the total size of debts, i.e., the sum of bonds and loans, is large. The variable ***time2maturity***, defined as a number of years to the maturity of the bond, also measures the riskiness of the bond, caused by longer exposure to income fluctuations. Thus larger these three variables are, the less likely a firm chooses **Collateralized**. For given a size of income fluctuations, effects on the claim of the bondholders should be less, if the size of a company is large. Larger the variable ***log_asset*** is, the more likely a firm chooses **Collateralized**. We have argued that ***asset_volatility***, ***leverage***, ***time2maturity***, and ***log_asset***, the variables usually considered as credit factors, affect cost of collateral, since the likelihood of loosing the offered assets is small if the business generates stable cash flows. We call this as an income risk hypothesis for a choice of **Collateralized**.

These income risk factors raise the cost to implement maintenance clauses, by a similar argument stated in the above. When these income risk factors suggest that the credit condition of the firm is weak, the firm is more likely to break the maintenance level. Higher the vulnerability to the technical default is, costlier it is for a firm to have maintenance clauses, and less likely the firm chooses **Maintenance**. We call this as an income risk hypothesis for a choice of **Maintenance**.

We may argue these income risk factors have the opposite effect in choosing **Maintenance** based on a signaling hypothesis. A manager of a firm is so confident, based on inside information she has, that her firm won't get into a technical default, although the observable income risk factors indicate her firm is vulnerable. In order to signal her view, she chooses **Maintenance**, which would hurt the firm if it actually gets into the technical default. Things that can be done without costs don't work as a signal. As it hurts the firm if occurs, outside investors can believe the message of the manager. So more riskier the credit factors indicate a firm is, more likely a firm chooses **Maintenance**. We call this as a singling hypothesis.

Since a manager wants to emit a stronger signal when the degree of informational asymmetry is larger, a variable that expresses the degree of asymmetry, ***log_asset***, would enlarge the signaling effect. We employ product terms of ***log_asset*** and the credit factors in the following estimations. If the cross terms are statistically significant, we regard that as an evidence of signaling, since effects of credit risk factors themselves don't depend on the degree of informational asymmetry.

The cross terms may serve to discriminate an *ex post* disincentive effect as follows. Debtholders with collateral and/or more protective covenant clauses may sleep well, because their claim is protected. They need not watch the firm closely anymore. Then the firm might take riskier actions without noticed from outside, because of the reduced pressure from debtholders[12]. Anticipating this to happen, prices of the bond with collateral, for example, would be more vulnerable to changes in the credit factors. We call this as a disincentive hypothesis. This story requires information asymmetry, so that the cross terms also need to be statistically significant in order to validate it.

We introduce a hysteresis hypothesis. Even if changes are needed, people are reluctant to change just because changing itself is costly. We may argue that the Japanese investors had so accustomed to the regulated market that covenants and collateral appeared after the deregulation in 1996 were the same ones employed before the deregulation. They stick to the accustomed ones, and repeat what they have done before. We include the variable ***time_trend***, defined as a number of months since January 2000, the first month in our data set, to see whether or not this hysteresis effect remains. Especially, we can expect a negative estimate for this variable, if the limited companies keep issuing bonds in the **Collateralized** and **None** categories because of the hysteresis effect.

We employ a dummy variable ***2011earthquake***, indicating that a bond is issued after the March 2011 earthquake and the accident in the Fukushima Daiichi nuclear electric power plant. In addition to the effects on the electric companies,[13] who had been regular public bond issuers but were not able to issue public bonds for a year, it affected the

[12] Rajan and Winton(1995) introduce a model where collateral and covenants give debtholders monitoring incentive. Their model seems to fit a long-term bank loan with collateral and covenants.

[13] The government ordered to stop the operation of all the nuclear plants, and required the electric companies to guarantee their safety. The electric companies had to import crude oil with a higher price to compensate the reduced capability of generating electricity during the investigating halts of the plants.

Japanese economy as a whole. Planned power outages were carried out in the summer 2011, for example. People realised that, an incident can have a significant impact on their daily life, even if it has a very small probability to materialize. This experience might have affected mental aspects of people, and any figures available, including prices in the financial market, might be interpreted differently. Even if the same rate of returns is required in the financial market as before, a firm may choose a different covenant-collateral type after the 2011 earthquake. The variable ***2011earthquake*** is intended to capture this.

Note that no strategic variables in Davydenko and Strebulaev [2007] have not appeared so far. Collateral and covenants determine the complexity of the debt structure and bargaining powers of the parties involved. A negative pledge clause prevents to create a wedge among debtholders, thus keeps the debt structure simple, for example. They take these characteristics of bonds as given, and see effects of strategic factors on yield spreads. We will explain our estimates for relation between yield spreads and strategic factors in the following section.

Econometrically speaking, however, we need to see whether strategic variables affect the choice of collateral and covenants or not, and how. If the choice does not involve strategic considerations, then regressions give unbiased estimates. The results of Davydenko and Strebulaev [2007] imply that strategic factors do affect yield spreads. Since yield spreads are components of total cost (2) in our model, strategic factors should affect the choice of collateral and covenants through the effects on yield spreads. Adjustments are needed in estimating relation between yield spreads and strategic factors.

More interesting question is whether a firm considers *direct* costs, not indirect ones coming through changes in yield spreads, of covenants and collateral, when choosing a type of covenants and collateral. If there are no such direct costs, then effects of strategic factors on the choice are the same as the effects on the yield spreads.

Suppose instead a strategic factor is found to have no effect on spread, but has a positive effect on a choice of a covenant type. The former implies that the factor won't affect bondholders' claim on firm's income, and that the market valuation for the claim is not affected. A change in the strategic factor doesn't increase nor decrease financial cost of the firm, as the required rate of return is the same as before. The fact that the firm is inclined to choose the covenant type even when the financial cost is not affected implies that the strategic factor has other costs (or benefits) than the financial cost to the firm. Thus if strategic variables have different effects on choices of collateral and covenants than those on yield spreads, we come to obtain an evidence for costs of strategic considerations in the choice of collateral and covenants. We call it as a direct cost hypothesis. This channel has not considered in the literature.

The preceding arguments can be summarized as (1) a physical cost hypothesis, (2) an income risk hypothesis, (3) a signalling hypothesis, (4) a disincentive hypothesis, (5) a hysteresis hypothesis, and (6) a direct cost hypothesis.

3.3 Factors that affect the required return on the market

We consider three kinds of variable that affect market required return (1) of corporate bonds. The first kind is income risk factors of the bonds: ***asset_volatility***, ***leverage***, ***time2maturity***, and ***log_asset***. Higher risk would increase the required return. We won't repeat usual explanation of the trade-off between risk and return here.

The second kind is market factors, that capture macroeconomic conditions, as follows. The variable ***riskfree***, defined as the yield of newly issued JGB with 5 years to maturity, captures variations of economic conditions that would reflect income fluctuations of the Japanese economy as a whole. The variable ***slope***, defined as a difference between the yield of 10 year JGB over that of 2 year JGB, captures an expectation for a future level of interest rate. The variable ***topix***, defined as the value-weighted stock market index of firms listed in the first section of the Tokyo Stock Exchange, also captures economic conditions. Usually higher value of ***topix*** indicates the economy is in a good condition, and companies won't get into trouble in terms of earnings. Thus this variable reduces yield spreads. Finally a dummy variable ***2011earthquake*** can be another economic indicator in Japan. The earthquake, tsunami, and the power plant accident made Japanese investors re-evaluate risks. If they are aware of over-sighted risks or they become more sensitive to the risks they have been recognizing, they would require a higher rate of returns not only for bonds issued by the electric companies but also for bonds issued by the other firms.

The third kind is strategic factors that are extensively considered by Davydenko and Strebulaev [2007]. For these, we use the variable ***bond_share***, defined as a ratio of the nominal value of the bond in concern to the total book value of the debts, to capture friction in renegotiations. Upon default, renegotiation occurs among debtholders as to determine weather the firm is liquidated or let it continue to operate. As Bolton and Scharfstein [1996] argue, renegotiation becomes difficult if it involves many parties with different interests. This variable is meant to be a first proxy for such friction in renegotiation. *Ex post* effect of this variable should reduce yields, since a larger value indicates that the bond is dominant, and bondholders encounter less friction. *Ex ante* effect may increase yields, since a larger value indicates that more efficient renegotiation is expected *ex ante* so that the managers or banks pull a trigger toward default more often. In addition to the diversity of parties involved, differences of interests among debtholders are also important in renegotiation. Larger difference implies larger frictions in renegotiation. The variable ***short***, defined as a ratio of short-term debts to the total debts, capture frictions in renegotiations based on the differences on investment horizon. Aiming to capture frictions with banks and financial institutions (lenders to the firm), we use the variable ***long_borrow***, defined as a ratio of long-term borrowing to total debts. The variable ***marketbook***, defined as a ratio of market value of equity to the book value of equity. This is a proxy for liquidation costs as Alderson and Betker [1996] indicate. This market-to-book ratio is also regarded as a proxy for growth option in the literature, that a company must abandon if liquidated. The variable should increase spread.

4 Estimation

4.1 Data

Table 5 reports summary statistics for variables to be used in the estimation, as well as their definition. For credit rating data, we use one from the Rating and Investment

Information Inc., as this has the largest coverage. If this agency doesn't offer a rating, we look for one from the other rating agencies: Japan Credit Rating Agency, and Standard & Poor's.

*** Table 5 ***

4.2 Two step estimation

We observe yield spreads of bonds with a specific covenant and collateral type that a firm *chooses* to issue, which means that we have to take it into account of a selection bias. Here we use a two step estimation procedure of a Heckman [1979] type, following the procedure in Dubin and McFadden [1984].

More precisely, first we estimate a multinomial logit model for covenants-collateral selection (3), from which we have estimated probabilities P_c for selecting a type c in (i) **Collateralized**, (ii) **None**, (iii) **Typical**, or (iv) **Maintenance**:

$$P_c = \frac{exp(X_i'\widehat{\gamma_c})}{\Sigma_h exp(X_i'\widehat{\gamma_h})}, \quad c = \text{type (i), (ii), (iii), or (iv)}, \tag{4}$$

where $\widehat{\gamma_c}$ is a vector of estimated parameters. With P_c we construct auxiliary terms to correct selection bias. We then conduct estimations for market yield spread:

$$y_{c*} = w'\beta_{c^*} + \Sigma_{h \neq c^*} \left(\frac{P_h \ln(P_h)}{1 - P_h} + \ln(P_{c^*}) \right) \beta_h^0 + \varepsilon_{c^*}, \quad c^* = \text{(i), (ii), (iii), or (iv)}, \tag{5}$$

where y_{c^*} is the yield spread observed for bonds with a covenants-collateral type c^*, w is a vector of independent variables, β_{c^*} is a parameter vector to be estimated, β_h^0 is a parameter for the adjustment term (to be estimated also), and ε_{c^*} is an error term. The middle terms on the right hand side in (5) are the adjustment for the selection bias, which we would have used the inverse Mill's ratio if the selection model were a Tobit model.

4.3 Results for collateral and covenant choice

In estimating multinomial logic model (3), we set the pattern (iii), an uncollateralized bond with a negative pledge clause, as the baseline case. We report two models in Table 6: Model 1 without a cross term of the size variable (***log_asset***) and the credit factors, and Model 2 with them. We intend to capture a degree of informational asymmetry with the size variable here, and we argue there is signaling aspect by the choice of covenants-collateral if the cross terms are statistically significant and the effects of credit factors differ according to the degree of informational asymmetry. If significant, we also argue there is a disincentive effect for the bondholders to monitor the firm.

*** Table 6 ***

Let's look at Model 1 in the choice for **Collateralized** (vs. **Typical**). The statistically significant positive effects of ***log_asset*** and ***tangibles_ratio*** variables indicate that the availability of assets for collateral affect the choice. The statistically significant negative effects of credit factors, ***asset_volatility***, ***leverage***, and, ***time2maturity***, provide an evidence that higher financial risk implies higher costs for offering collateral. This also conforms to the interpretation of the variable ***log_asset*** as a measure of risk. Thus both the physical cost and income risk hypotheses are supported.

To see whether the direct cost hypothesis holds or not, let us compare the effects of strategic factors on the choice with those on the yield spreads. As is seen shortly in the next section, Table 8 shows that strategic factors have no significant effects on yield spreads for bonds in **Collateralized**. If the strategic variables affect the choice *only through* the effect on the yield spreads, and the direct cost hypothesis does not hold, then they should not have any impact on the choice either. However, Table 6 shows that a strategic variable ***long_borrow*** has a statistically significant positive effect on the choice of **Collateralized** over **Typical**, and a variable ***marketbook*** has a statistically negative effect on the same choice. Since the choice of **Collateralized** is estimated over **Typical**, we want to see the effects of the strategic variables on the spreads on **Typical** bonds as well. Again as will be seen shortly, Table 7 shows ***long_borrow*** has no significant effect on yield spread on bonds in **Typical**. And Table 7 shows higher ***marketbook*** brings a statistically significant increase in spread. This makes **Typical** unattractive so that it should increase a probability to choose **Collateralized**, which contradicts the evidence in Table 6. These two strategic variables indicate that there are different costs (or benefits) in the choice other than effects on yield spread. The direct cost hypothesis is supported.

Now turn to the choice among uncollateralized bonds. From the baseline case of **Typical**, dropping the negative pledge clause moves to **None**, and adding maintenance clause(s) moves to **Maintenance**. Naturally, the collateral cost related variable ***tangibles_ratio*** doesn't matter here. Comparing two types, we notice statistically significant variables have the opposite sign. Higher ***leverage*** and smaller number of ***log_asset*** imply that a company chooses more likely **Maintenance**, and less likely chooses **None**. Interpreting these as a credit risk factor, we can say the riskier a firm is, more likely it uses covenants in order to protect bondholders. This is consistent with both the disincentive and the signaling hypotheses.

To support both hypotheses, we would like to see the degree of informational asymmetry interacts with strength of the effects. A comparison between Model 1 and Model 2 provides only a weak support. Only the cross product term of the size (***log_asset***) and of ***leverage*** is statistically significant at 5% level among the credit factor variables in the uncollateralized bonds **None** and **Maintenance**. When a firm is large and the degree of informational asymmetry is small, it is inclined to select bonds with more covenants, but the probabilities for the selection are small. Effects of the other credit factor variables are not affected by the degree of informational asymmetry.

Evidence for the income risk hypothesis is mixed. Longer ***time2maturity***, implying larger exposure to income risk, reduces the likelihood to choose **Maintenance**. As we will see in Table 10, maturity doesn't contribute to spreads reduction. The cost of the maintenance clause dominates, which supports the income risk hypothesis. However, the variables ***leverage*** and ***log_asset***, both of which will be shown to have no effect on yield spread, increase the likelihoods to choose **Maintenance**. This doesn't fit with the income risk hypothesis.

The time trend variable shows statistically significant negative effects on **Collateralized** and **None**. This supports the hysteresis hypothesis.

The statistically negative effect of ***2011earthquake*** dummy for the choice of **Collateralized** reflects the suspended issue for the electric companies after experiencing Fukushima Daiichi accident. It has a statistically significant effect on the choice of **None**, which is difficult to interpret.

How about the direct cost hypothesis in the uncollateralized bonds categories? As will be seen in Tables 9 and 10, all strategic variables have no significant effects on yield spreads of the bonds in either **None** or **Maintenance**. Only ***marketbook*** increases spreads of the bonds in **Typical** as Table 7 will show. With these anticipations in mind, let's look at Table 6 on the effects on choices. The statistically significant positive effects on the choice of **None** and of **Maintenance** over **Typical** shows in Table 6 conform to the strategic default story of Davydenko and Strebulaev [2007]. But statistically significant effects of ***bond_share*** and ***long_borrow*** in Table 6 don't. The latter supports the direct cost hypothesis. Although having no effects on yield spreads, a firm chooses a bond with maintenance clause(s) over without, or a bond with a negative pledge clause over without, when the issue is dominant as a higher ***bond_share*** indicates.

In sum, we have found that income risk, physical and direct costs matter to issue collateralized bonds, and that there is the hysteresis effect to issue uncollateralized bonds either dropping a negative pledge clause or adding maintenance clauses, deviating from the standard uncollateralized bonds with only a negative pledge clause. There is a signalling effect to issue bonds in these deviating categories, although the degree of informational asymmetry, measured with the size of the firm, has played almost no role in the size of the signalling effect.

4.4 Results for yield spread

Now let's see the results for yield spread regressions for each covenant-collateral category. The selection biases will be adjusted using those estimates obtained in the precious subsection. Table 7 reports estimated results for the equation (5): regression of yield spreads of **Typical** bonds on credit factors, market factors, strategic factors, credit ratings, and adjustment terms for selection bias. Two models are reported. In constructing the adjustment terms *aux13*, *aux23*, and *aux43*, with estimated probabilities P_c of four types of covenants-collateral choice, Model 1 in Table 7 uses Model 1 in Table 6: a multinomial logit model without the cross product terms of the credit factors and the size variable. Model 2 in Table 7 uses the other: a model with the cross terms. Table 7 indicates statistical inferences don't depend on the selection model used. Although the log-likelihood test in Table 6 says the statistical fit is better for Model 2, we employ Model 1 for the model of covenants-collateral choice in the following yield spread estimations, because it is parsimonious and yet keeps similar statistical inferences.

*** Table 7 ***

We choose the A-rated bonds as a base in creating credit rating dummies, because the number of the samples is the largest. Except for the AAA rating, we obtain statistically significant results for the credit rating. A higher grade reduces yield spreads, and a lower grade increases spreads. The reduction for the AAA-rating may be too small considering the number of AAA-rated issues is not large enough to get a significant result. With a similar number of issues, our statistically significant estimate shows the yield spreads rise by 1.1% for B-rated bonds.

After controlling for the credit ratings, the credit factor variables ***asset_volatility***, ***leverage***, and ***log_asset*** increase yield spreads statistically significantly. Even a higher ***tangibles_ratio*** reduces spreads, although the bonds in this **Typical** category are uncollateralized and seem not to be related with the security that tangible assets could provide. Maturity has no effect on spread; possibly subsumed in the credit rating.

We include three market factors, ***topix***, ***riskfree***, and ***slope***, all of which have a statistically significant effect on spreads. When ***topix*** is high and the economy is in a boom, yield spreads are low. Higher values of ***riskfree*** and lower values of ***slope*** are statistically significantly associated with higher yield spreads in the estimation. Thus we confirm that macroeconomic factors do matter[14]. Firm-specific variables and credit

[14] Note that our macro factors here have no apparent relationship with market liquidity factors in the secondary market.

ratings, both of which indicate credit risk of the bond, are not enough to explain the yield spreads.

The strategic factors representing frictions in renegotiation among debtholders, ***bond_share*** capturing the bond in concern to the total debt, ***short*** capturing the size of short-term debt in the total debt, and ***long_borrow*** capturing the size of (mostly bank) borrowing in the total debt, have no statistically significant effect on the yield spreads. The variable ***marketbook*** has a statistically significant positive effect on the spread. However, this variable has two interpretations: a liquidation cost proxy and a growth option proxy. Although the sign is consistent with the strategic default story, we are inclined to interpret this indicating that the market requires higher rate of returns for bonds issued by firms with a larger growth option. We may conclude that in the typical straight bond issues in Japan a concern for strategic defaults is not priced at the time the issue.

Finally the sign of the 2011 earthquake dummy is the opposite to what we expect. Issues after march 2011 have statistically lower yield spreads than before.

*** Table 8 ***

Now let's see results of spread regression of the collateralized bonds, **Collateralized**. Taking the selection bias into account, we may have a different market required rate of return function f in (1) from that of the other covenant-collateral choices. Table 8 reports the estimated result. We choose the AA-rated bonds as a base in creating credit rating dummies, because its occurrence is the largest. The credit rating dummies are statistically insignificant if we use them simultaneously (in Model 1), maybe because of their small number of occurrences. We have three AAA-rated, and one BBB-rated bonds, respectively. The Models 2 and 3 confirm that the ratings are insignificant even if we use each of them separately.

Except for the variable ***asset_volatility***, which statistically significantly raises the yield spreads, the credit factor variables have no effect on spreads. This is a sharp contrast to the case for **Typical** where credit factors have statistically significant effects on the spreads. We interpret this result as follows. Having chosen to issue a collateralized bond makes the security of the bond very strong. It has reached the highest level so that it doesn't matter what usual credit factors are telling[15].

What would be an interpretation of statistically significant positive effect of ***asset_volatility***, if it is not a credit factor? We are inclined to interpret the statistically significant positive effect of ***asset_volatility*** as a market factor, just as the same as the ***slope*** variable that shows statistically significant negative effects on spreads.

A statistically negative effect of the variable ***time2maturity*** in Table 8, which has no effect for the case of **Typical**, suggests us not to regard it as a credit factor. If it were a credit factor, it should indicate a positive sign, as the longer exposure represented higher risk. Remember that we have taken the maturity structure as given. This result suggests to reconsider this assumption. The statistically significant positive effect of ***tangibles_ratio*** indicates that it serves as a discriminator among the highly secured collateralized bonds.

*** Table 9 ***

Next examine the yield spread regression of Table 9 for the uncollateralized bonds, **None**. We choose the AA-rated bonds as a base, and create a credit rating dummy for A-rated bonds, because the former occurrence is larger. The credit rating dummy shows the expected positive sign, but statistically insignificant because of the small number of occurrences or of a small difference. No bonds with the other ratings were observed.

Since the number of issuers in this category is small, we have to limit the number of firm-specific variables in the regression in order to avoid multicollinearity. Both

[15] Following anecdote may support our interpretation. In the summer 2012, the Japanese government expressed a view that the protection of the bonds issued by the Tokyo Electric Power Company can be too strong. The rights of victims of the 2011 Fukushima Daiichi nuclear power plant accident put behind that of the bondholders, as the electric companies have been pledging a general collateral, which covers the bondholders with all the asset it has, not specifying assets in a clause. All the AAA-rated and the AA-rated bonds in this category turn out to have a general collateral. In addition to the support from collateral, the issuers are a Japanese government operated companies before its privatization in 1985, except for an issue. Investors might expect an implicit support from the Japanese Government. It is natural then that any credit factor has no effects in the yield spread.

asset_volatility and ***leverage*** have statistically significant positive effect on the spread, as is expected since we are estimating required rate of return in the market. In this covenants collateral category, credit factor variables have effects on spread.

As for strategic factors ***marketbook***, ***bond_share***, and ***long_borrow***, we test their significance in the equation separately (Model 2, 3, and 5), to find out that none of them is statistically significant. Although we see the variable ***bond_share*** shows statistically significant effect in Model 4, this would be caused by a correlation between ***asset_volatility*** and ***bond_share***, as the results of Models 3 and 4 indicate. Thus the strategic factors don't affect yield spread in this category.

Among market factors employed, only ***slope*** shows statistically significant positive effect, which is puzzling. This variable shows *negative* effects in the other categories: statistically significant for **Typical** and **Collateralized**, and statistically insignificant effect for **Maintenance** we will see shortly in Table 10.

*** Table 10 ***

Finally the yield spread regression for the uncollateralized with maintenance clause(s), **Maintenance**, is given in Table 10. As the lower right pane of Figure 1 indicates, yield spreads in this category vary a lot. Because of this larger variation, absolute values of the estimated coefficients in Table 10 tend to be larger than those in Tables 7-9. We choose the BBB-rated bonds as a base, and create a credit rating dummy for A-rated bonds, because the number of the occurrences of the former is larger[16]. The credit rating dummy shows statistically significant negative effects for all specifications Models 1 to 4. The direction of the effect is what we expect from the credit ratings, including a statistically insignificant effect in Model 5.

As before, we are forced to use a limited number of explanatory variables here, because of a small sample size. Among credit factor variables, ***asset_volatility*** and ***tangibles_ratio*** show statistically significant effects of the expected direction. As for market factors, ***topix*** and ***riskfree*** show statistically significant effects that are consistent

[16] We lost a BB-rated issue in January 2000 in the regression, because of lack of financial data.

with the yield regression for **Typical** category. Thus both credit and market factors have effects on spreads of bonds in **Maintenance** category, after controlling for credit ratings.

The specifications from Models 3 to 5 are to see an effect of the strategic variables ***market book***, ***bond_share***, and ***long_borrow*** separately[17]. Just as same as the other categories, we can not find statistically significant effects of the strategic variables on the yield spread in **Maintenance**.

4.5 Discussions

We have estimated a multinomial logit model of a choice of a covenants and collateral type on the framework of McFadden[1973], and conducted yield spread regressions adjusting selection biases. Estimating the choices is necessary not only for correcting biases econometrically, but also for interpreting statistical relationships as economic choices of firms. We have found that the strategic default considerations don't affect issue prices of public bonds, but do affect a choice of a covenant-collateral type. In the choice, firms take other "direct" costs into consideration, other than the financial cost which is captured by the yield spread. For some categories of covenant-collateral types, whose issuers are limited to a specific group of companies, we have found a hysteresis effect. Possibly this is related to the history of the Japanese bond market where eligibility conditions were very restrictive and only a handful of companies issued public bonds in the regulated era.

Macroeconomic conditions can have data specific effects in our estimation period. The Bank of Japan have advanced a quantitative easing monetary policy in the period of "lost decades". It especially pulled down the interest rates toward zero from 2001 to 2003. We also experienced a global financial crises from 2007 to 2008, which was then said to be of a scale only once occurs in one hundred years. The upper panes of Figure 2 indicate time series movements of the risk free rate, ***riskfree***, and those of the difference in the JGB term spread, ***slope***. The peak of the former occurred in the financial crisis period, and that of the latter occurred in June 2004. ***Slope*** declines toward the crisis, as the quantitative easing monetary policy was believed to continue further on. From the

[17] To save a space, we are skipping to report a result for ***short***, which is also insignificant.

movement of ***slope*** and the expectation hypothesis of the term structure of interest rates, that future interest rates should decline. In reality the rate increased toward the crisis. Thus ***slope*** may have a different meaning from an indicator of economic conditions, which might cause non-similar effects on the spread regressions for covenant-collateral types.

As the lower left pane in Figure 2 indicates, those two variable has a positive correlation, but the relationship is not stable during our estimation period. The positive relation between ***slope*** and ***topix*** seems to have changed as well, as the lower right pane in Figure 2 shows. We consider that the financial crisis was a cause for the non-stable relationships among the macroeconomic financial variables. Most Japanese companies reported highest profits in a fiscal year ending March 2008, as the easy monetary policy finally leaded the Japanese economy toward a boom. The default of Lehman Brothers in September 2008 came a shock, and yet the Japanese companies didn't understand how large its effect would be at that moment. It took six months to realize that the following global recession hurt them severely. Since it was a shock, the relationship among financial variables destabilized.

5 Conclusion

How a firm chooses a set of covenants and of collateral to pledge when issuing straight bonds publicly in Japan? Covenants and collateral are contract clauses intended to protect rights of the bondholders. If the protection is priced in the issue, why do all firms try to put all possible covenants and collateral in the issue? Taking it into account that we only observe a limited number of covenant-collateral categories, we have estimated a relation between issue prices (yield spreads over the Japanese Government Bond, the safe asset), characteristics of the firm and of the issue, and macroeconomic factors, to see whether protection is priced or not. We obtained a distinct relationship for each covenant-collateral type, indicating that the required rate of returns in the market differs if the covenant-collateral type differs. Thus the choice itself is priced.

In order to adjust the selection bias correctly in the above, we have conducted two-step estimations of a Heckman type. As the first step, we have estimated multinomial logit models of covenant-collateral choice, and found evidences that support the physical cost hypothesis for collateral choice and the hysteresis hypothesis for collateralized and for naked uncollateralized choices. We have found evidences that support both for signaling and for disincentive hypothesis, but they can be weak as a degree of informational asymmetry measured by the size of the firm does not play a large role. Most notably, however, we have found a strong evidence that strategic default concerns, put forward by Davydenko and Strebulaev [2007], involve direct costs in choosing a covenant-collateral type, not through indirect effects on the yield spread.

The deregulations in the Japanese financial market were considered to be completed in 1996, and our data are from January 2000 to December 2011, the market capitalism era. At the same time, however, this period is said to be "lost decades" of the Japanese economy, and the global financial crisis of 2008/2008 happened while a quantitative easing monetary policy had been taken. Further explorations to sample specific characteristics remains to get policy implications.

Acknowledgement

This draft was completed while the first author was visiting the School of Business, University of Iceland. He thanks for the institution and the people there for providing great environment to pursue this research.

An earlier draft has been accepted to the Paris December 2013 Finance Meeting, which will be held on Thursday, December 19, 2013.
(https://www.eurofidai.org/december2013.html)

6 References

Alderson, M. J. and B. L. Betker (1996), Liquidation Costs and Accounting Data, *Financial Management* **25**(2), 25-36.

Bolton, P. and D.S. Scharfstein (1996), Optimal Debt Structure and Number of Creditors, *Journal of Political Economy* **104**(1), 1-25.

Chava, S., P. Kumar, and A. Warga (2009), Managerial Agency and Bond Covenants, *Review of Financial Studies* **23**(3), 1120-1148.

Chen, L., D. A. Lesmond, and J. Wei (2007), Corporate Yield Spreads and Bond Liquidity, *Journal of Finance* **62**(1), 119-149.

Collin-Dufresne, P., R. Goldstein, and J. Martin (2001), The Determinants of Credit Spread Changes, *Journal of Finance* **56**(6), 2177-2207.

Dubin, J. A., and D. L. McFadden (1984), An Econometric Analysis of Residential Electric Appliance Holdings and Consumption, *Econometrica* **52**(2), 345-362.

Davydenko, S. A., and I. A. Strebulaev (2007), Strategic Actions and Credit Spreads: An Empirical Investigation, *Journal of Finance* **62**(6), 2633-2671.

Fan, H. and S. Sundaresan (2010), Debt Valuation, Renegotiation, and Optimal Dividend Policy, *Review of Financial Studies* **13**(4), 1057-1099.

Hackbarth, D., C. Hennessy, and H. Leland (2007), Can the Trade-off Theory Explain Debt Structure?, *Review of Financial Studies* **20**(5), 1389-1428.

Heckman, J. J. (1979), Selection Bias as a Specification Error, *Econometrica* **47**(1), 153-161.

Leland, H. (1994), Corporate Debt Value, Bond Covenants, and Optimal Capital Structure, *Journal of Finance* **49**(4), 1213-1252.

Lesmond, D., J. Ogden, and C. Trzcinka (1999), A New Estimate of Transaction Costs, *Review of Financial Studies* **12**(5), 1113-1141.

Malitz, I. (1986), The Determinants of Bond Covenants, *Financial Management* **15**(2), 18-25.

McFadden, D. L. (1973), Conditional Logit Analysis of Qualitative Choice Behaviour, in P. Zarembka (ed.) *Frontiers in Econometrics* 105-142, Academic Press, US.

Mella-Barral, P. (1999), The Dynamics of Default and Debt Reorganization, *Review of Financial Studies* **12**(3), 535-578.

Mella-Barral, P. and W. Perraudin (1997), Strategic Debt Service, *Journal of Finance* **52**(2), 531-556.

Merton, R. (1974), On the Pricing of Corporate Debt: the Risk Structure of Interest Rates, *Journal of Finance* **29**(2), 449-470.

McKenzie, C. and S. Takaoka (2012), Whose Reputation Talks? Relationship vs. Transaction-Based Matching in the Japanese Corporate Bond Market, presented at the annual meeting of the Japanese Economic Association.

Mori, M. (2009), *Legal Principles of Debtholder Protection* (in Japanese) , Cyuou Keizai-sha, Japan.

Nakashima, K. and M. Saito (2009), Credit Spreads on Corporate Bonds and the Macroeconomy in Japan, mimeo.

Ooyama, S. and T. Sugimoto (2007), What are the Factors that change the Credit Spreads in the Japanese Corporate Bonds Secondary Market (in Japanese:Nihon ni okeru Credit-Spreds no hendo youin), *Bank of Japan Working Paper Series*, No.07-J-01.

Rajan, R. and A. Winton (1995), Covenants and Collateral as Incentives to Monitor, *Journal of Finance* **50**(4), 1113-1146.

Reisel, N. (2010), On the Value of Restrictive Covenants: Empirical Investigation of Public Bond Issues, http://ssrn.com/abstract=6544522.

Shimoda, N. and Y. Kawai (2007), Credit Rating Gaps in Japan: Differences between Solicited and Unsolicited Ratings, and "Rating Splits," *Bank of Japan Working Paper Series*, No.07-E-11.

Shirasu Y. and P. Xu (2007), The Choice of Financing with Public Debt versus Private Debt: New Evidence from Japan after Critical Binding Regulations were Removed, *Japan and the World Economy* **19**, 393-424.

Smith, C. and J. Warner (1979), On Financial Contracting: An Analysis of Bond Covenants, *Journal of Financial Economics* **7**, 117-161.

Takaoka, S. and C. McKenzie (2006), The Impact of Bank Entry in the Japanese Corporate Bond Underwriting Market, *Journal of Banking and Finance* **30**, 59-83.

Von Thadden, E., E. Berglöf, and G. Roland (2010), The Design of Corporate Debt Structure and Bankruptcy, *Review of Financial Studie*s **23**(7), 2648-2679.

Table 1: **Covenants and collateral distribution: public SBs by Japanese non-bank companies from 2000 to 2011**

This table reports what kinds of covenants and collateral the public issues of straight bonds have, those issued domestically by non-bank Japanese companies from the beginning of 2000 to the end of 2011. An issue is either collateralized or uncollateralized, and each has no covenant, a negative pledge clause, or a negative pledge clause and other maintenance clause(s). For the observed seven types of covenants-collateral combinations, the table reports the number of issues (**number of issues**), the total amount in billion yen (**total**), the average amount (**mean**), the standard deviation (**sd**), the largest amount (**max**), and the smallest amount (**min**), for the 2,596 issues those observed from 2001/1/4 to 2011/12/30. It also reports the distribution of types (**share**), based on the total amounts of issues.

collateralized or **uncollateralized***	**covenants clause†**	**number of issues**	**amount issued (billion yen)** total	share	mean	sd	max/min
Col.	none	338	8632.0	17.9%	25.5	19.8	160/ 2
Col.	negative pledge only	1	5.0	0.0%	5.0	-	5/ 5
Unc.	none	61	1314.0	2.7%	21.5	23.0	130/10
Unc.	negative pledge only	2125	36918.5	76.8%	17.4	16.4	200/ 3
Unc.	n.p. & income mnt.	25	458.0	1.0%	18.3	11.0	30/ 4
Unc.	n.p. & net asset mnt.	34	711.5	1.5%	20.9	23.7	130/ 5
Unc.	n.p. & income & asset	12	56.0	0.1%	4.7	2.2	10/ 2
total		2596	48095.0	100.0%	18.5	17.3	200 /2

* Col. indicates collateralized, and Unc. indicates uncollaterized bonds, respectively.

† n.p. indicates negative pledge, which is always attached where there are income and/or net asset maintenance clause(s).

Table 2: **Yiled spread over JGB**

This table reports the average (**mean**), the standard deviation (**sd**), the number of issues (**N**), the largest value (**max**), and the smallest value (**min**), of the yield spreads of the Japanese non-bank public SBs for each credit rating categories. The yield spread (%) is a difference between the yield to maturity of the corporate bond and the yield to maturity of the Japanese Government Bond (JGB) with the same maturity as the corporate bond. A bond is classified to one of the six credit rating categories from **AAA** to **B**, according to a rating given by the following agencies: Rating and Investment Information Inc. (R&I), Japan Credit Rating Agency, Ltd. (JCR), and Standard & Poor's Ratings Japan (S&P).We use the rating given by an agency in a former position in the list; we use one by R&I for most cases, but one by JCR if R&I doesn't give a rating. If neither R&I nor JCR gives a rating, we use one given by S&P if it gives. However, our datasource lacks a rating information for the twenty five issues (n/a).

credit rating†	**mean**	**sd**	**N**	**max**	**min**
AAA	.232	.230	22	0.828	-0.019
AA	.188	.162	913	1.054	-0.396
A	.378	.222	1038	1.785	-0.148
BBB	.804	.512	572	4.337	-0.115
BB	.952	.608	21	2.396	0.164
B	1.603	.371	5	2.015	1.062
n/a	.445	.607	25	2.277	-0.355
total	.412	.388	2596	4.337	-0.396

† n/a indicates bonds for which no credit rating was available on the data source we used.

Table 3: **Yield spread decomposition by covenants and collateral**

Further dividing the credit rating subsets in Table 2 based on a covenants-collateral type, this table reports the the average (**mean**), the standard deviation (**sd**), the number of issues (**N**), the largest value (**max**), and the smallest value (**min**), of the yield spreads of the Japanese non-bank public SBs for each credit rating and each covenants-collateral categories within the rating. The yield spread (%) is a difference between the yield to maturity of the corporate bond and the yield to maturity of the Japanese Government Bond (**JGB**) with the same maturity as the corporate bond. Covenants-collateral types consist of two dimensions; firstly whether the bond is collateralized (Col.) or not (Unc.), and secondly what kind of covenant clause(s) the bond has. Three covenant clauses are observed: a negative pledge (**A**), a net asset maintenance (**B**), and an income maintenance (**C**). In the table '-' indicates bonds don't have the clause specified, and 'Yes' indicates they have. As is shown in the table, only a limited number of types are observed out of all possible number of types (2×2^3).

credit rating	col.†	covenant clause⁺ A	B	C	**yield spread** mean	sd	N	max	min
AAA	Col.	-	-	-	0.096	0.030	3	0.128	0.068
	Unc.	Yes	-	-	0.253	0.242	19	0.828	-0.019
AA	Col.	-	-	-	0.152	0.127	335	0.584	-0.396
	Unc.	Yes	-	-	0.206	0.172	525	0.976	-0.324
	Unc.	-	-	-	0.243	0.208	53	1.054	-0.263
A	Unc.	Yes	Yes	Yes	1.175	0.671	4	1.785	0.293
	Unc.	Yes	Yes	-	0.306	0.397	2	0.586	0.025
	Unc.	Yes	-	-	0.375	0.214	1028	1.549	-0.148
	Unc.	-	-	-	0.428	0.048	4	0.482	0.368
BBB	Col.	Yes	-	-	0.491	-	1	0.491	0.491
	Unc.	Yes	Yes	Yes	1.044	0.237	7	1.396	0.650
	Unc.	Yes	Yes	-	1.461	0.744	31	4.192	0.344
	Unc.	Yes	-	Yes	0.634	0.280	25	1.315	0.295
	Unc.	Yes	-	-	0.770	0.478	508	4.337	-0.115
BB	Unc.	Yes	Yes	Yes	2.396	-	1	2.396	2.396
	Unc.	Yes	-	-	0.880	0.523	20	2.110	0.164
B	Unc.	Yes	-	-	1.603	0.371	5	2.015	1.062
n/a	Unc.	Yes	Yes	-	2.277	-	1	2.277	2.277
	Unc.	Yes	-	-	0.412	0.502	20	1.532	-0.355
	Unc.	-	-	-	0.150	0.327	4	0.639	-0.035
total					0.412	0.338	2596	4.337	-0.396

† Col. indicates collateralized, and Unc. indicates uncollaterized bonds, respectively.

⁺ **A**: with a negative pledge clause, **B**: with a net asset maintenance clause, **C**: with an income maintenance clause.

Table 4: **Spread and number of observations of credit ratings by covenants-collateral type**

This table describes four types of covenants-collateral, (i) - (iv), to be used in the following estimations in Panel B. Panel A reports the average (**mean**), the standard deviation (**sd**) of the yield spreads (%), the total number of bonds (**total**), and numbers of bonds with a credit rating from **AAA** to **B** as well as the number of bonds without credit rating information (**n/a**), of the Japanese public SBs issued by non-bank corporations in each covenants-collateral type.

Panel A: **Spread and distribution of credit rating**

type	**spread**		**credit rating**							**total**
	mean	**sd**	**AAA**	**AA**	**A**	**BBB**	**BB**	**B**	**n/a**	
(i)	0.152	0.128	3	335	-	1	-	-	-	339
(ii)	0.249	0.214	-	53	4	-	-	-	4	61
(iii)	0.434	0.369	19	525	1028	508	20	5	20	2125
(iv)	1.105	0.699	-	-	6	63	1	-	1	71
total	0.412	0.338	22	913	1038	572	21	5	25	2596

Panel B: **Covenants-collateral type**

type	**mnemonic**	**collateral**	**covenant clause**[+]
(i)	Collateralzied	Collateralized	None or A
(ii)	None	Uncollateralized	None
(iii)	Typical	Uncollateralized	A only
(iv)	Maintnance	Uncollateralized	A&B or A&C or A&B&C

[+] A: with a negative pledge clause, B: with a net asset maintenance clause, C: with an income maintenance clause.

Table 5: **Summary statistics**

This table reports descriptive statistics of the variables to be used and their description. The average (**mean**), the standard deviation (**sd**), the smallest number (**min**), the largest number (**max**), and the number of issues the variable is available (**N**) are reported.

variable	mean	sd	min	max	N[†]	description
spread	0.412	0.388	-0.396	4.337	2596	annually compounded yield of the bond - JGB yield with the same maturity (%)
leverage	0.646	0.163	0.044	0.997	2529	book value of debt / (book value of debt + market value of stock)
asset_volatility	0.021	0.009	0.003	0.073	2435	stock historical volatility over past 60 days
log_asset	14.173	1.206	10.561	17.295	2533	log (total assets)
time2maturity	7.053	3.813	2	30	2596	time to maturities (years)
tangibles_ratio	0.474	0.245	0.001	0.927	2533	ratio of tangible fixed asset to total asset
riskfree	0.747	0.362	0.156	1.58	2596	yield of JGB with a maturity of 5 years
slope	1.068	0.233	0.416	1.723	2596	JGB yield with 10 years to maturity - JGB yield with 2 years to maturity
topix	1168.23	321.72	700.93	1814.96	2596	TOPIX (stock market index for the 1st section of the Tokyo Stock Exchange)
marketbook	1.979	2.277	0.009	34.657	2529	market value of stocks / book value of stocks
bond_share	0.699	0.059	0.560	1.039	2533	log(nominal amount of the bond) / log(book value of debts)
short	0.097	0.083	0	0.590	2524	share of short-term debts over total debts
2011earthquake	0.076	0.265	0	1	2596	dummy variable takes value 1 if issued after March 11, 2011, takes value 0 otherwise
long_borrow	0.218	0.127	0	0.709	2528	ratio of long term borrowing to total debt
time_trend	79.69	40.963	1	144	2596	indicating month of the issue: January 2000 takes value 1, February 2000 takes value 2, and so on

[†]Non-listing of companies and lack of financial data cause a reduction of the number of valid data.

Table 6: **Covenants-collateral type selection: Multinomial logit model**

This table reports estimated results for multinomial logic model for the equation (3), where we choose the covenants-collateral type (iii): **Typical**, the most frequently chosen type, as the referent type, so that the coefficients γ_h in the equation (3) are set to 0. For the remaining three covenants-collateral types, the estimated coefficient, the significance level p with asterisks and z-statistics in parenthesis are reported. The asterisk(s) *, **, and *** indicate $p < 0.05$, $p < 0.01$, and $p < 0.001$, respectively. Two models are estimated: Model 1 which doesn't involve cross terms with the informational asymmetry proxy log(size), and Model 2 which involves them. In the bottom of the table, log likelihood and McFadden's pseudo R^2 are reported as well as χ^2 statistics and its significance level for the null hypothesis Model 1 is nested in Model 2.

	(i):**Collateralized**						(ii):**None**						(iv):**Maintenance**					
	Model 1			Model 2			Model 1			Model 2			Model 1			Model 2		
asset_volatility x 10	-16.49	***	(-7.50)	-38.43		(-1.62)	3.94	*	(1.96)	-38.73		(-0.95)	-0.73		(-0.39)	-5.98		(-0.36)
leverage	-6.43	***	(-4.36)	35.21	*	(2.23)	-9.72	***	(-6.29)	-80.38	*	(-2.48)	4.91	***	(3.70)	35.62	**	(2.88)
log_asset (size)	1.77	***	(11.11)	-0.60		(-0.25)	1.59	***	(5.61)	7.28		(0.95)	-0.44	**	(-2.59)	-1.18		(-0.43)
time2maturity	-0.17	***	(-6.53)	-0.86	*	(-2.00)	-0.01		(-0.03)	11.79		(1.22)	-0.68	***	(-6.74)	1.12		(1.03)
riskfree	3.91	***	(5.73)	4.18	***	(5.97)	-0.56		(-0.50)	-0.60		(-0.52)	0.05		(0.05)	0.03		(0.03)
slope	-3.53	***	(-5.95)	-3.77	***	(-6.13)	-1.32		(-1.82)	-1.04		(-1.43)	1.25		(1.90)	1.05		(1.58)
topix/1000	-2.20	**	(-2.74)	-2.40	**	(-2.93)	-1.07		(-0.86)	-0.83		(-0.65)	-0.52		(-0.48)	-0.40		(-0.37)
marketbook	-3.68	***	(-9.62)	-3.90	***	(-9.87)	0.15	**	(3.25)	0.16	**	(3.25)	0.11	***	(3.67)	0.11	***	(3.68)
bond_share	3.80		(1.07)	3.98		(1.05)	-27.28	***	(-4.94)	-24.48	***	(-4.26)	11.40	**	(3.23)	10.91	**	(2.90)
short	-5.12		(-1.66)	-3.09		(-0.96)	-7.75		(-1.75)	-4.22		(-0.87)	1.76		(1.02)	2.47		(1.41)
long_borrow	4.51	***	(3.82)	3.61	**	(2.84)	6.26	***	(3.78)	7.67	***	(4.10)	1.46		(0.96)	1.57		(1.02)
tangibles_ratio	10.15	***	(9.18)	11.27	***	(8.96)	1.075		(1.19)	2.13	*	(2.00)	1.23		(1.54)	1.32		(1.57)
time_trend/100	-2.51	***	(-5.29)	-2.36	***	(-4.78)	-1.97	**	(-2.73)	-1.92	*	(-2.54)	-0.83		(-1.73)	-0.81		(-1.66)
2011earthquake	-2.49	***	(-3.94)	-2.56	***	(-4.09)	1.24	*	(1.99)	1.39	*	(2.18)	-1.69		(-1.56)	-1.78		(-1.62)
size x asset_volatility				1.37		(0.87)				2.72		(1.05)				0.39		(0.31)
size x leverage				-2.93	**	(-2.68)				4.61	*	(2.19)				-2.30	*	(-2.55)
size x time2maturity				0.05		(1.63)				-0.08		(-1.22)				-0.15		(-1.66)
size x log_asset				0.13		(1.71)				-0.26		(-0.97)				0.10		(1.07)
constant	-18.41	***	(-3.93)	-10.77		(-0.50)	-1.71		(-0.27)	-30.43		(-0.53)	-7.00		(-1.43)	-15.44		(-0.71)

	number of observations	log likelihood	McFadden's pseudo R^2	$\chi^2(12)$ statistics for H_0 :	
Model 1(without log_asset cross terms)	2368	-648.60	0.536	(Model 1 nested in Model 2) =	40.16
Model 2 (with log_asset cross terms)	2368	-628.52	0.539	significance level	0.001

Table 7: **Yield spread regression for uncollateralized bonds with a negative pledge covenant (Typical)**

This table reports results of the second step OLS regression (5) for the covenants-collateral type **Typical**. The auxiliary terms in (5), $P_h \ln(P_h)/(1 - P_h) + ln(P_{c^*})$, c^* = (iii), h = (i), (ii), (iv), are written in the table as aux13, aux23, aux43, respectively. In constructing the auxiliary terms, two models in the multinomial logit specification, Models 1 and 2 in Table 6, are used. For each of the two specifications, the estimated coefficient, the significance level p with asterisks and z-statistics in parenthesis are reported. In constructing credit rating dummy variables, the A-rated bonds are taken as the default. The asterisk(s) *, **, and *** indicate $p < 0.05$, $p < 0.01$, and $p < 0.001$, respectively. In the bottom, the sample size and adjusted R^2 are reported.

	Model 1 (Without size cross-term in multinomial logit)			Model 2 (With size cross-term in multinomial logit)		
asset_volatility x 10	0.75	***	(9.97)	0.73	***	(9.71)
leverage	0.37	***	(5.73)	0.40	***	(6.16)
time2maturity	-0.00		(-0.29)	-0.00		(-0.64)
log_asset	-0.03	**	(-2.79)	-0.03	**	(-3.23)
tangibles_ratio	-0.23	***	(-6.65)	-0.22	***	(-6.45)
riskfree	0.15	***	(4.28)	0.15	***	(4.28)
slope	-0.16	***	(-5.93)	-0.15	***	(-5.52)
topix /1000	-0.26	***	(-6.46)	-0.26	***	(-6.47)
bond_share	0.07		(0.38)	0.16		(0.90)
marketbook	0.04	***	(6.78)	0.04	***	(6.53)
short	-0.02		(-0.22)	-0.01		(-0.08)
long_borrow	0.09		(1.56)	0.06		(1.17)
2011earthquake	-0.12	***	(-5.51)	-0.13	***	(-5.83)
AAA dummy	0.03		(0.45)	0.01		(0.15)
AA dummy	-0.08	***	(-4.06)	-0.08	**	(-4.30)
BBB dummy	0.27	***	(16.64)	0.28	***	(17.04)
BB dummy	0.42	***	(7.27)	0.44	***	(7.55)
B dummy	1.11	***	(9.65)	1.14	***	(9.91)
aux13	0.11	*	(2.56)	0.11	*	(2.50)
aux23	0.26	***	(3.70)	0.17	*	(2.54)
aux43	-0.48	***	(-0.71)	-0.40	***	(-6.20)
constant	0.64	**	(2.66)	0.61	*	(2.55)
Sample Size		1881			1881	
Adjusted R^2		0.476			0.478	

Table 8: **Yield spread regression for collateralized bonds (Collateralized)**

This table reports the second step OLS regression results (5) for the covenants-collateral type **Collateralized**. The auxiliary terms in (5), $P_h \ln(P_h)/(1 - P_h) + ln(P_{c^*})$, c^* = (i), h = (ii), (iii), (iv), are written in the table as aux21, aux31, aux41, respectively. In constructing the auxiliary terms, the model without information asymmetry proxy variables in the multinomial logit specification, Model 1 in Table 6, is used. There are three specifications; Model 1 uses all credit rating dummies, Model 2 drops the BBB dummy (one occurrence that the dummy takes value one), and Model 3 drops the AAA dummy (three occurrences that the dummy takes value one). In constructing credit rating dummy variables, the AA-rated bonds are taken as the default. The estimated coefficient, the significance level p with asterisks and z-statistics in parenthesis are reported. The asterisk(s) *, **, and *** indicate $p < 0.05$, $p < 0.01$, and $p < 0.001$, respectively. In the bottom, the sample size and adjusted R^2 are reported.

	Model 1		Model 2		Model 3	
asset_volatility x 10	0.72	***	0.75	***	0.71	***
	(3.61)		(3.78)		(3.60)	
leverage	-0.31		-0.24		-0.32	
	(-1.48)		(-1.15)		(-1.49)	
time2maturity	-0.01	**	-0.01	**	-0.01	**
	(-2.74)		(-2.84)		(-2.82)	
log_asset	0.02		0.02		0.02	
	(0.73)		(0.85)		(0.77)	
tangibles_ratio	0.41	*	0.44	*	0.42	*
	(2.06)		(2.18)		(2.08)	
riskfree	-0.03		-0.03		-0.03	
	(-0.65)		(-0.70)		(-0.60)	
slope	-0.15	***	-0.15	***	-0.16	***
	(-3.63)		(-3.62)		(-3.74)	
topix /1000	0.02		0.03		0.02	
	(0.57)		(0.75)		(0.54)	
bond_share	0.04		0.06		0.05	
	(0.16)		(0.23)		(0.19)	
marketbook	-0.03		-0.02		-0.03	
	(-0.56)		(-0.48)		(-0.61)	
short	-0.41		-0.15		-0.41	
	(-0.98)		(-0.40)		(-0.99)	
2011earthquake	-0.09		-0.11		-0.10	
	(-1.20)		(-1.39)		(-1.23)	
long_borrow	0.03		0.04		0.03	
	(0.23)		(0.33)		(0.24)	
AAA dummy	-0.02		-0.03			
	(-0.34)		(-0.43)			
BBB dummy	0.25				0.23	
	(1.42)				(1.45)	
aux21	-0.09		-0.10		-0.09	
	(-0.74)		(-0.83)		(-0.76)	
aux31	-0.01		0.01		-0.01	
	(-0.10)		(0.09)		(-0.13)	
aux41	0.08		0.06		0.08	
	(0.58)		(0.69)		(0.61)	
constant	-0.09		-0.25		-0.10	
	(-0.17)		(-0.47)		(-0.19)	
Sample size	337		337		337	
Adjusted R^2	0.303		0.301		0.305	

Table 9: **Yield spread regression for uncollateralized bonds (None)**

This table reports the second step OLS regression results (5) for the covenants-collateral type **None**. The auxiliary terms in (5), $P_h \ln(P_h)/(1-P_h) + ln(P_{c^*})$, c^* = (ii), h = (i), (iii), (iv), are written in the table as aux12, aux32, aux42, respectively. In constructing the auxiliary terms, the model without information asymmetry proxy variables in the multinomial logit specification, Model 1 in Table 6, is used. There are five specifications. The strategic factors are mostly firm-specific, and the small number of observations could cause multicollinearity if employed at once. Models 2, 3 and 5 adds one of the strategic factors to the variables in Model 1. Model 4 drops the asset_volatility variable from Model 3. In constructing the credit rating dummy for A-rated, the AA-rated bonds are taken as the default. The estimated coefficient, the significance level p with asterisks and z-statistics in parenthesis are reported. The asterisk(s) *, **, and *** indicate $p < 0.05$, $p < 0.01$, and $p < 0.001$, respectively. In the bottom, the sample size and adjusted R^2 are reported.

	Model 1		Model 2		Model 3		Model 4		Model 5	
asset_volatility x 10	0.77	*	0.82	**	0.58				0.77	*
	(2.66)		(2.71)		(1.10)				(2.63)	
leverage	0.90	***	1.10	**	0.97	**	1.10	***	0.82	
	(3.60)		(2.73)		(3.30)		(4.06)		(1.51)	
riskfree	0.02		0.02		0.04		0.12		0.01	
	(0.13)		(0.14)		(0.25)		(0.74)		(0.06)	
slope	0.40	**	0.42	**	0.44	**	0.50	***	0.41	**
	(3.26)		(3.30)		(2.99)		(3.65)		(3.12)	
topix /1000	0.28		0.19		0.23		0.07		0.28	
	(1.38)		(0.77)		(0.97)		(0.36)		(1.35)	
A dummy	0.27		0.27		0.31		0.38		0.28	
	(1.43)		(1.42)		(1.48)		(1.92)		(1.43)	
marketbook			0.03							
			(0.62)							
bond_share					0.81		2.51	*		
					(0.44)		(2.42)			
long_borrow									0.12	
									(0.18)	
2011earthquake	0.04		0.06		0.01		-0.07		0.04	
	(0.45)		(0.63)		(0.09)		(-0.81)		(0.42)	
aux12	0.30		-0.12		0.66		1.44		0.34	
	(0.40)		(-0.12)		(0.59)		(1.67)		(0.43)	
aux32	0.25		0.29		0.33		0.53		0.24	
	(0.86)		(0.98)		(0.95)		(1.82)		(0.80)	
aux42	-0.52		-0.16		-0.94		-1.88	*	-0.55	
	(-0.64)		(-0.17)		(-0.75)		(-2.05)		(-0.66)	
constant	-0.99	*	-1.15	*	-1.38		-2.08	**	-0.98	*
	(-2.61)		(-2.48)		(-1.41)		(-2.77)		(-2.55)	
Sample Size	56		56		56		56		56	
Adjusted R^2	0.339		0.330		0.327		0.324		0.325	

Table 10: **Yield spread regression for uncollateralized bonds with maintenance clause(s) (Maintenance)**

This table reports the second step OLS regression results (5) for the covenants-collateral type **Maintenance**. The auxiliary terms in (5), $P_h \ln(P_h)/(1-P_h) + ln(P_{c^*})$, c^* = (iii), h = (i), (ii), (iv), are written in the table as aux13, aux23, aux43, respectively. In constructing the auxiliary terms, the model without information asymmetry proxy variables in the multinomial logit specification, Model 1 in Table 6, is used. There are five specifications. The strategic factors are mostly firm-specific, and the small number of observations could cause multicollinearity if employed at once. Models 3, 4 and 5 adds one of the strategic factors to the variables in Model 2, which drops some insignificant variables from Model 1. In constructing the credit rating dummy for A-rated, the BBB-rated bonds are taken as the default. The estimated coefficient, the significance level p with asterisks and z-statistics in parenthesis are reported. The asterisk(s) *, **, and *** indicate $p < 0.05$, $p < 0.01$, and $p < 0.001$, respectively. In the bottom, the sample size and adjusted R^2 are reported.

	Model 1		Model 2		Model 3		Model 4		Model 5	
asset_volatility x10	2.63	**	2.45	**	2.50	**	2.48	**	2.61	**
	(2.74)		(3.07)		(3.07)		(3.05)		(3.29)	
leverage	2.13		1.02		1.08		0.90		0.88	
	(1.24)		(1.51)		(1.54)		(1.11)		(1.31)	
time2maturity	-0.11									
	(-0.49)									
log_asset	-0.02									
	(-0.12)									
tangibles_ratio	-2.63	***	-2.07	***	-2.11	***	-2.09	***	-2.49	***
	(-3.91)		(-4.80)		(-4.72)		(-4.73)		(-4.99)	
riskfree	0.62		0.79	*	0.79	*	0.78	*	0.68	
	(1.54)		(2.18)		(2.16)		(2.15)		(1.86)	
slope	-0.17		-0.36		-0.35		-0.38		-0.41	
	(-0.29)		(-1.18)		(-1.14)		(-1.20)		(-1.36)	
topix /1000	-1.45	**	-1.65	***	-1.66	***	-1.64	***	-1.50	***
	(-3.42)		(-4.23)		(-4.21)		(-4.18)		(-3.81)	
marketbook	0.00				0.01					
	(0.08)				(0.39)					
bond_share	2.18						-0.47			
	(0.62)						(-0.27)			
long_borrow	1.04								1.27	
	(1.08)								(1.61)	
short	-0.94									
	(-0.68)									
2011earthquake	-0.42									
	(-0.68)									
A dummy	-0.58	*	-0.61	*	-0.60	*	-0.62	*	-0.49	
	(-2.02)		(-2.49)		(-2.37)		(-2.48)		(-1.93)	
aux13	0.20		-0.39		-0.67		-0.44		0.34	
	(0.10)		(-0.28)		(-0.43)		(-0.31)		(0.24)	
aux23	-0.26		-0.02		0.22		0.08		0.07	
	(-0.24)		(-0.02)		(0.24)		(0.10)		(0.11)	
aux43	-0.07		-0.08		-0.06		-0.15		-0.67	
	(-0.05)		(-0.13)		(-0.10)		(-0.23)		(-0.94)	
constant	0.20		1.99	**	1.94	**	2.40		1.93	**
	(0.08)		(2.86)		(2.72)		(1.44)		(2.81)	
Sample Size	64		64		64		64		64	
Adjusted R^2	0.500		0.519		0.511		0.510		0.533	

Figure 1: Spread distribution by covenants-collateral type

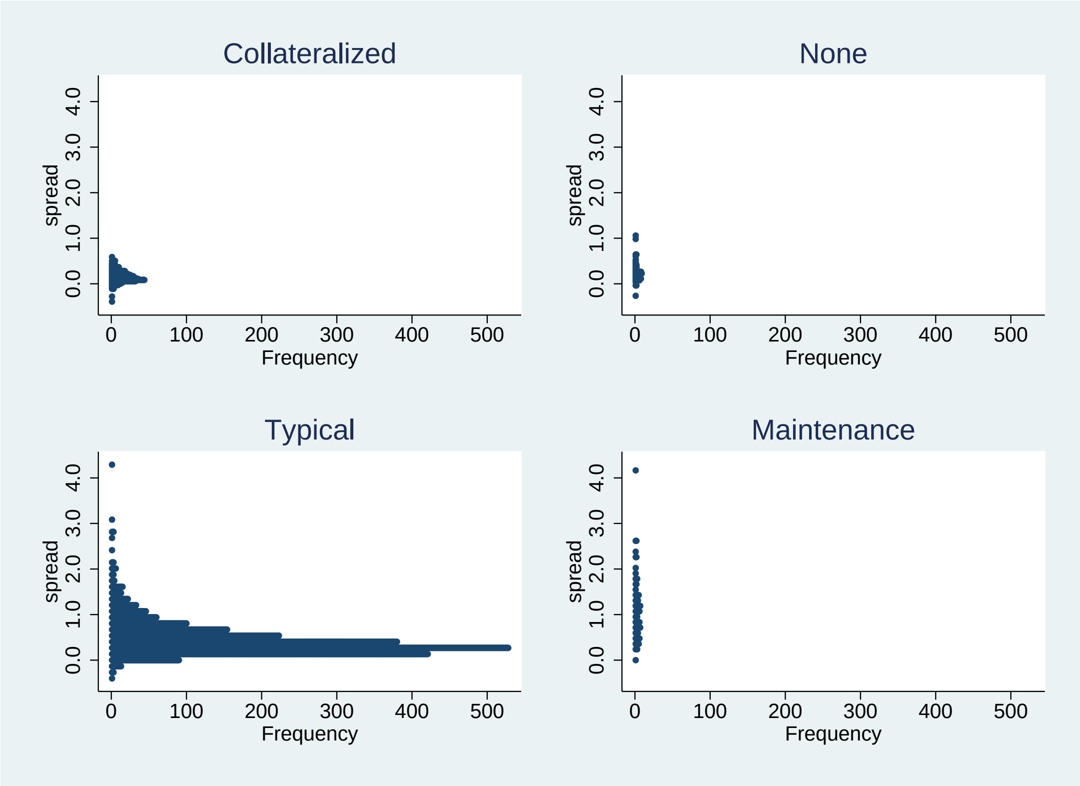

Figure 2: Time series movement of Riskfree rate and Slope, and scatter plots with topix