Bank Loan Maturity and Priority When Borrowers Can Refinance

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Abstract
This paper describes a theory of how borrowers with private information about their future credit prospects choose seniority and maturity of bank loans and publicly issued bonds. The model implies that short-term bank loans will be senior to public long-term debt. With sufficient public debt, banks will not make concessions when restructuring their debt in response to a borrower's financial distress. Recent evidence on the debt restructuring activities of banks is interpreted in the context of the model.

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1. Introduction

This paper provides a theory of how highly-levered borrowers with private information about their credit prospects choose the seniority and maturity of their debt. The main result is that when different lenders own the short-term and long-term debt issues, short-term debt will be senior to long-term debt. This result follows from the difficulty of restructuring and renegotiating bonds that are held by the public. I develop the implications of choosing an optimal debt structure for the decisions of banks to make concessions on their loans. Recent empirical evidence on debt concessions by banks is discussed in light of the results.

The debt maturity and priority choice trades off protection of the borrower's control rents against increasing the sensitivity of the borrower's financing costs to new information. Short-term debt provides information sensitivity: this is desired because it benefits a borrower who expects his credit rating to improve. If the borrower cannot repay the debt in full, however, the lender has the right to remove the borrower from control (I term this a liquidation), and shorter term debt makes this possibility happen sooner.

Liquidation has beneficial effects, and ought not be eliminated. Lenders, however, may be too prone to liquidate. Some related papers on the effects of debt structure on control are Aghion-Bolton [1988], Harris-Raviv [1990], Hart-Moore [1989, 1990], Jensen [1989], and Jensen-Meckling [1976]. Flannery [1986] examines the effect of debt maturity on information sensitivity.

Lenders might liquidate too often because part of the future returns of the project can be assigned only to the borrower, and not to lenders. The part of the value that must go to the borrower is termed a control rent: it accrues to management (if it keeps control) but cannot be assigned to lenders. Lenders neglect control rents when they choose to liquidate. Lenders can then inefficiently choose to liquidate a solvent but illiquid borrower, when one includes the control rents in the solvency value. There are many motivations for the existence of non-assignable control rents. Moral hazard or future bargaining power of the borrower are two sufficient motivations.1

My previous work on the structure of debt contracts, Diamond[1991a, 1992a], shows how the existence of multiple future lenders can be used to provide some impact of new information on a borrower's cost of finance while allowing the borrower to retain control more often than any single lender would permit. The ability to go to the market and refinance maturing debt from competing lenders serves to limit...
the control that outside lenders have over borrowers. If the contracts are properly structured, the outside lenders will retain control when they need it most. This implies that one can fine-tune the amount of control that lenders possess, using the added freedom of having two types of lender: current and future.

This paper describes the implications of these models for the restructuring actions taken by various types of lenders when the borrower cannot meet its contracted obligations. The model has implications for the maturity structure of debt when a single lender owns all of the debt. When differing lenders own the various debt maturities, and there is some possibility that the lenders cannot renegotiate their contracts, there are implications for debt priority as well. I do not explain why there are various owners of the different maturities. I appeal to the ideas in Diamond [1992b], where only a subset of lenders, those I call banks, have both the timely information required to make liquidation decisions and the specific expertise to implement them. The control right over these liquidation decisions, which is ownership of the short-term debt, ought to be assigned to these lenders. The lenders who do not have the information or expertise to make liquidation decisions should own the publicly traded bonds. Free rider problems and government regulation limit the public's ability to renegotiate their bonds, but do not eliminate this ability. Under the assumption that there is a positive probability, but not a certainty, of renegotiating public bonds, I obtain a strong prediction on priority. Bank loans, which are short-term, should be senior to long-term public bonds.

This paper also illustrates how the ability to refinance from competing future lenders improves the set of contracts available to the borrower. The improvement occurs even if the market for initial financing is competitive. I contrast the contracts available with competing future lenders with those available when the initial lender is the only source of refinancing. In section 8, I interpret some models where the initial lender has an information monopoly, which leads to imperfect competition, in terms of the contrast between these two models.

Section 2 outlines the basics of the model. Section 3 describes the information-contingent payments and liquidation decisions that borrowers would choose if they could write explicitly information-contingent contracts. Section 4 shows how close one can come to the desired policy by contracting with a single lender who faces no competition when the borrower attempts to refinance maturing debt. Section 5
demonstrates how the ability to write contracts that are implicitly contingent on future information is increased when the initial lender faces competition in providing refinancing. Section 6 introduces multiple initial lenders to the model with competing refinancing lenders, and develops the potential effects of debt priority. Section 7 studies the implications of using bank loans together with publicly-traded bonds, if there is uncertain renegotiation of public bonds. This delivers a strong prediction on the priority of these two lenders’ debt. In section 8, I interpret some models where the initial lender has an information monopoly, which leads to imperfect competition, in terms of the contrast between the models in sections 4 and 5. Section 9 concludes the paper, and relates it to recent empirical evidence.

2. The Model

There are three dates, 0, 1 and 2. Long-term debt is issued on date 0 and matures on date 2, with no coupon payment on date 1 (the results do not depend on the zero coupon assumption). Short-term debt is single period. Either or both types of debt can be used. To keep units simple, assume that riskless interest rates are zero. Borrowers and lenders are risk neutral and consume on date 2. Lenders will then lend at an expected rate of return of zero. The model abstracts from unexpected changes in riskless interest rates. One interpretation of this is that the borrower hedges these changes using interest rate futures, options or swaps. Because borrowers have no private information about future riskless interest rates, they could hedge these risks without revealing any information about themselves.

There are many potential lenders who all observe the same information. With all lenders observing the same information, borrowers face a competitive loan market on each date: lenders will lend if they get a competitive (zero) expected rate of return. I examine the case where the date-0 short-term and long-term lenders are different parties, and the case where a single lender owns both maturities. The borrower can borrow from a competitive loan market when refinancing at date 1; the new lender can be a different party from any of the date-0 lenders.

To illustrate the effects of facing a competitive loan market in the future, section 4 contrasts the case where the initial date-0 lender is the only available lender at date 1. The contracts available with this ex-post monopoly are not as desirable for borrowers. In particular, the contract with ex-post monopoly does
not allow borrowers as much benefit if favorable information arrives about them in the future.

There is no outside equity: all equity is owned by the borrower (or, more generally, by those in control). To focus on the refinancing risk of short-term debt, and its effect on the borrower's ability to retain control, assume that projects produce cash flows only on date 2. All short-term debt issued on date 0 must then be refinanced at date 1. New public information arrives to lenders on date 1, but the data cannot be used to condition contingent contracts because the information is not verifiable and is not observed by any court of law. Covenants in the long-term debt cannot depend on this information. The information observed at date 1 is about the continued credit worthiness of the borrower, and this is implicitly information about a borrower's type.

There are two types of borrower who differ in their type of investment project. No one but a borrower knows the type of his project. Borrowers have no capital of their own. Denote the amount of initial capital required for each project by $I > 0$ (projects are indivisible). Each project yields a date-2 cash flow of $X > I$ when successful, returns 0 otherwise, and each project also produces a non-assignable control rent of $C$ if the management has control at date 2. All projects can be liquidated at date 1 for a liquidation value of $L < I$. Liquidation value is the maximum value in alternative use that can be obtained without the management of the borrower, see Diamond [1991a, section IV]. A successful project yields a higher return when not liquidated at date 1, because $L < I < X$. The two types of project differ only in the probability that the return $X$ is received. The two types of borrowers are described as follows.

**Type G**  The project returns a cash flow of $X > I$ for sure at date 2. This is a positive net present value project.

**Type B**  The project returns a cash flow of $X$, with probability $\pi$, and returns zero with probability $1 - \pi$. The project has a negative net present value: $\pi X < I$.

Both types of project also deliver a control rent of $C$ to the borrower if he has control on date 2, but this cannot be assigned to lenders. The value of control, $C$, is large enough that there will never be liquidation when lenders do not have the control right to force liquidation, because borrowers would turn down any deal that lenders would offer. If lenders learn that a borrower has a sufficiently high probability of being of type B, it is in lenders' collective interest to liquidate: I assume that $L > \pi X$.  

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The prior of all lenders on date 0 is that the borrower is of type G with probability f. A borrower's date 0 credit rating is summarized by f. The lower is f, the higher is the promised interest rate, owing to the higher default rate of type B’s. As of date 0, the probability of repayment of a loan maturing on date 2 made to a borrower with credit rating f is: \( q(f) = \pi + f(1-\pi) \).

On date 1, all lenders will observe new information about the type of each borrower. The new information, with realization \( f_1 \), is the conditional probability that a borrower is of type G. To keep this discussion simple, I assume that \( f_1 \) takes on only three possible values: 0, \( f^d \), and 1, where \( f^d \in (0,1) \). Only type B’s receive a \( f_1 \) of 0, only type G’s receive a \( f_1 \) of 1, and both types can receive the value \( f^d \). I refer to \( f^d \) as the downgrade credit rating, but do not assume that \( f^d < f \). From Bayes’s law, if the unconditional probability of a realization \( f_j \) is \( P_j \), then the probability that a type G receives the realization is \( g_j = \frac{P_j f_j}{f} \).

3. **Borrowers’ Desired \( f_1 \)-contingent Contracts**

I assume that contracts that are contingent on the date-1 information, \( f_1 \), are not available. It is useful, however, to examine the contract the borrower would choose if the contingent contracts were available. This allows a comparison of how close to the optimum are some alternative contracts. The contract preferred by type G borrowers is chosen by *all* borrowers. Borrowers offer contracts to lenders, and offering a contract that only type B’s would prefer would reveal that a borrower was of type B, and then no loan would be made. Control rents are sufficiently large that it is impossible to separate the borrower types. Diamond [1991a] discusses the reasonable borrower beliefs that support this outcome.
Given a date-1 credit rating, $f_1$, with probability $f_1$ a borrower is of type $G$. Type $G$'s want to choose make liquidation decisions and required payments contingent on $f_1$. They want to maximize their expected payoff in cash plus control rents, subject to giving lenders a sufficient return to induce them to lend. Let $Z(f_1) \leq X$ be the date-2 promised payment that the borrower makes when there is not liquidation, given $f_1$. This payment is made when the borrower's project returns $X$ (no payment is made if the project returns 0). This gives the lender an expected return of $q(f_1)Z(f_1)$, where $q(f_1) = f_1 + (1-f_1)\pi$ is the probability that a borrower with date-1 information $f_1$ makes the promised payment. A type $G$ borrower's payoff is $X - Z(f_1) + C$ when there is not liquidation given $f_1$, because type $G$'s make the payment with certainty. Let $z(f_1)$ be the date-1 payment to the lender when there is liquidation given $f_1$. When there is liquidation given $f_1$, the control rent $C$ is destroyed, and the payoff of a borrower is $L - z(f_1)$. Let $\mathbb{P}(f_1)$ be the probability of liquidation given a value of $f_1$. A type $G$ chooses $f_1$ contingent payments and liquidation rules that solve:

$$\begin{align*}
\max_{Z(0) \leq X, z(0) \leq L, z(0) \in [0, 1]} &\quad \frac{1}{f} \sum_{f \in J} P(f_i) \left[ L - z(f_i) \right] \\
&\quad + \left[ 1 - \mathcal{L}(f_i) \right] \left[ X - Z(f_i) + C \right]
\end{align*}$$

Subject to $\sum_{f \in J} P(f_i) z(f_i) + \left[ 1 - \mathcal{L}(f_i) \right] \left[ q(f_i) Z(f_i) \right] \geq L$.

There are three possible date-1 realizations of the information $f_1$: $\{0, f^d, 1\}$. This is the set, $J$. When $f_1 = 0$, the cash payments $Z(0)$ and $z(0)$ and the control rent $C$ do not directly enter the objective function, because only type $B$'s can receive a credit rating $f_1 = 0$ (recall that a type $G$ receives information $f^d$ with probability $P(f_i = f^d) = \frac{1-f}{f}$). The liquidation decisions and payments given $f_1 = 0$ are relevant to type $G$'s only through their effect on the budget constraint that lenders receive an expected return of at least $L$. As a result, the decision that results in the maximum payment given $f_1 = 0$ is desired by type $G$'s. This decision is liquidation (because $L > \pi X$), and with liquidation, the payment ought to be $z(0) = L$, to loosen the budget constraint as much as possible. Similarly for a fixed liquidation decision given $f_1 = f^d$, type $G$'s prefer that payments be at their
maximum to allow the payment given \( f_1 = 1 \) to be reduced. A type G prefers high payments for lower values of \( f_1 \) and lower payments for higher values of \( f_1 \) because he is more likely than a type B to receive a high \( f_1 \).

If there is to be liquidation given \( f_1 = f^d \) then \( z(f^d) = L \), and if not then \( Z(f^d) = X \) is preferred.

If lenders are to get an expected return of \( I \), then
\[
I = P^z L + \Phi(f^d) P^d L + \left[ 1 - \Phi(f^d) \right] P^q f^d X + P^u Z(1),
\]
or
\[
Z(1) = \left( \frac{1}{P^u} \right) \left[ I - P^z L - P^d \left( \Phi(f^d) L + \left[ 1 - \Phi(f^d) \right] q(f^d) X \right) \right].
\]
A type G's payoff is then:
\[
(P^d f^d / f) \left[ \left[ 1 - \Phi(f^d) \right] C \right] + \left( P^u / f \right) \left[ X + C - Z(1) \right].
\]
Liquidation given \( f_1 = f^d \) reduces \( Z(1) \) by \( (P^d f^d / P^u) (L - q(f^d) X) \), which a type G borrower loses with probability \( P^d / f \), at the cost, \( C \), in lost control rents, which a type G borrower loses with probability \( (P^d f^d / f) \).

Liquidation is then preferred when \( C \) is less than \( (L - q(f^d) X) / f^d \). This means that a type G desires liquidation given \( f_1 = f^d \) if the expected lost control rents given \( f_1 = f^d \) of the type G are less than the increased return that liquidation provides to lenders, that is if
\[
\int_0^1 C \leq L - q(f^d_1) X.
\]
For sufficiently large control rents, \( C \), type G borrowers will want to avoid liquidation when \( f_1 = f^d \), but they will still desire liquidation when \( f_1 = 0 \). In this case the ex-ante desired liquidation policy is \( \Phi(0) = 1, \Phi(f^d) = \Phi(1) = 0 \). I assume that \( C \) is large enough so that this is the desired liquidation policy.

### 3.1 An Example

To illustrate the contingent policy desired by borrowers, and because no proofs are provided in this paper, the following example is presented. The example will be used throughout the paper, to make points more precise. As of date 0, the lenders believe the borrower is of type G with probability \( f = .7 \). The value of a successful project is \( X = 1.3 \). A type B borrower's project is successful with probability \( \pi = .5 \). Projects require initial capital of \( I = 1 \). Liquidation at date 1 yields \( L = .9 \). The non-assignable value of keeping control until date 2 is \( C = .4 \).

The three possible values of \( f_1 \) are 0, .25, and 1, and the unconditional probabilities of these realizations are, respectively, \( P^z = .15 \), \( P^d = .2 \), and \( P^u = .65 \). The implied conditional probabilities of debt repayment, \( q(f_1) \), are 0, .625 and 1, respectively. The probabilities that a type G borrower receives each realization of \( f_1 \) are, respectively, 0, .07143, and .92857. Recall that the probability that a type G receives the realization is the unconditional probability multiplied by \( f_1 / f \). Consequently, type G borrowers want a larger payment to lenders when \( f_1 \) is smaller. For a fixed liquidation decision, a type G borrower prefers the
payment given \( f_1 = 0 \) to be as high as possible, and that there be liquidation. Liquidation provides lenders with return \( L = 0.9 \), as compared with a maximum without liquidation of \( \pi X = 0.65 \). No type G's receive \( f_1 = 0 \), implying that control rents lost when \( f_1 = 0 \) are not relevant to a type G. This implies \( \xi(0) = 1 \) and \( z(0) = L \) is preferred by type G's. There will not be liquidation given \( f_1 = 1 \), because the cash flow from the borrower's project is more valuable than the liquidation proceeds, \( X > L \), and liquidation is in no one's interest.

For a given liquidation decision, type G's want the maximum payment given \( f_1 = f^d = 0.25 \), to produce a lower payment when \( f_1 = 1 \): type G borrowers prefer \( Z(f^d) = X \) and \( z(f^d) = L \). I showed that liquidation given \( f_1 = f^d \) not desired when \( C > (L - q(f^d)X)/f^d \). Using the parameters from the example, one obtains \( C = 0.35 \) as the maximum \( C \) such that liquidation is preferred given \( f_1 = f^d \). For all \( C > 0.35 \), type G borrowers prefer \( \xi(f^d) = 0 \): no liquidation given \( f_1 = f^d \). For \( C < 0.35 \), type G borrowers prefer \( \xi(f^d) = 1 \): certain liquidation given \( f_1 = f^d \). The example assumes \( C = 0.4 \), implying that the desired liquidation policy is \( \xi(0) = 1 \), and \( \xi(f^d) = \xi(1) = 0 \): liquidate only when \( f_1 = 0 \). The \( f_1 \)-contingent payments desired are \( z(0) = L = 0.9 \), \( Z(f^d) = X = 1.3 \), and \( Z(1) = (1/P^u) \{ I - P^uL - P^u q(f^d)X \} = 1.081125 \).

I will show that this can be implemented with a properly chosen set of debt contracts, with the possibility of refinancing from a competing lender at date 1. In general, however, debt contracts cannot duplicate all contracts available with \( f_1 \)-contingent contracts. To show the importance of refinancing from a competing lender, the next section analyzes the case where the date-0 lender is the only available lender at date 1. With a single lender, the desired payment policy cannot be implemented.

4. Assignment Of Control When \( f_1 \) Is Not Verifiable, And There Are No Competing Future Lenders

Suppose that the assignment of liquidation rights and promised payments cannot depend directly on \( f_1 \). Lenders are willing to lend given an expected return of I, but the lender will face no competition on date 1. The borrower and the lender can assign the unconditional right to liquidate to one party or the other. In addition, they can specify a date-1 payment to the lender, \( z \), if liquidation is chosen, and a date-2 payment to the lender, \( Z \) if there is not liquidation (this is paid only if the borrower's project returns \( X \)). Both the borrower and the lender will know \( f_1 \) on date 1.

The ex-post desire of all borrowers is to avoid liquidation. If borrowers have the right to choose
whether to liquidate, there will never be liquidation. The maximum increase in value from liquidation over date-2 expected value is $L - \pi X$. Because $C > L - \pi X$, borrowers cannot be compensated for their lost control rent and still make lenders better off. When borrowers have control at date 1, the liquidation policy is $\varphi(0) = \varphi(f^d) = \varphi(1) = 0$: never liquidation.

Renegotiation of contracts at date 1 works as follows. The lender can propose an alternative contract, specifying date-1 payments given liquidation and date-2 payments if there is not liquidation. The borrower either accepts the new contract or rejects it. If it is rejected, the original contract remains in force. Then, the lender chooses between liquidation or allowing the borrower to continue, if the lender has that right.

If the lender has the right to choose whether to liquidate, the lender will liquidate given the original contract if $z > q(f_1)Z$, absent renegotiation. If the lender would not liquidate given the original contract, then the borrower will reject any new contract that has a higher value of date-2 payment, $Z$. But the lender has no interest in proposing a contract with a lower value of $Z$. The only situation, therefore, where renegotiation will occur is if the lender would liquidate given the original contract, but can be given enough of the date-2 cash flow to induce him not to liquidate. This requires $z > q(f_1)Z$ (for liquidation given the original contract), and $z \leq q(f_1)X$ (for there to be a way for the borrower to induce the lender not to liquidate).\(^5\) A necessary condition for renegotiation is $Z < X$ (there is future cash to assign to the lender) and $L < q(f_1)X$ (liquidation does not increase the value of cash flow).

Any contract that implements the ex-ante desired liquidation policy of $\varphi(0) = 1$, $\varphi(f^d) = \varphi(1) = 0$ has the payment to the lender given liquidation, $z$, satisfy $z \in [\pi X, q(f^d)X]$. If $z < \pi X$, the lender would not liquidate given $f_1 = 0$. If $z > q(f^d)X$, the lender would liquidate given $f_1 = f^d$. With $z \in [\pi X, q(f^d)X]$, there will be liquidation without renegotiation given $f_1 = 0$, because the borrower's total date 2 cash flow is worth only $q(0)X < q(f^d)X$. When $f_1 = f^d$ liquidation will be avoided, but renegotiation will be required if $Z < X$. Without renegotiation, liquidation will yield the lender $q(f^d)X$, implying that the borrower will accept a contract with $z$ less than or equal to its original value and with $Z = X$. This will induce the lender not to liquidate, and there is no other contract that makes both borrower and lender weakly better off than the original contract.
When $f_1=1$, the lender will not liquidate given the original contract so long as $Z > z = q(f^d)X$. If this condition is true, the contract will not be renegotiated. If, instead, $Z < z$, the contract would need to be renegotiated, and the lender would propose $Z = X$, which the borrower would accept. It is then in the borrower's interest to set $Z > z$, to keep the payment contingent on $f_1=1$ below $X$.

The borrower wants the payments given $f_1=0$ and $f_1=f^d$ to be as large as possible (to reduce the payment given $f_1=1$). This implies that $z = q(f^d)X$ is the choice. This provides lenders with the expected return of $(P^z + P^d)q(f^d)X + P^uZ$, which must be at least equal to $I$ if the project is financed. The desired liquidation policy is then implementable with a single lender when the contract cannot depend on $f_1$ if and only if $Z = \{I - (P^z + P^d)q(f^d)X\} / P^u < X$. Even if the liquidation policy is implementable, no contract with a single lender can achieve the contingent payment policy desired by type G borrowers. Type G borrowers also desire information sensitivity: higher repayments from those who get low future credit ratings. This implies that $z(0) = L$ is desired, and that $Z(1)$ ought to be as small as possible.

The assumption of ex-ante private information of borrowers is critical in only one way. It implies that larger cash payments from borrowers with low $f_1$ are desired. Without private information, only the liquidation decision is relevant. For a given $f_1$-contingent decision, borrowers are indifferent between all cash payments $z(f_1)$ and $Z(f_1)$ with a given expected value. Without private information, the single lender contract is a desirable one for the borrower. If, however, the desired liquidation policy is not implementable with a single lender (because $\{I - (P^z + P^d)q(f^d)X\} / P^u > X$), then the ability to contract with competing future lenders has value even with no private information.

With access to additional lenders in the future, the borrower can raise funds to make date-1 payments. The lender can then be given the unconditional right to liquidate whenever the date-1 payments are not made. This can be achieved without requiring an explicit or verifiable announcement by any new lender on date-1. I do not need to write a contract that is contingent on date-1 announcements by any new lender. The dependence on the information of new lenders is only through the resources that they will lend the borrower to make date-1 payments.
4.1 The Example

With a single lender, the best way to implement the desired liquidation policy \( \mathcal{L}(0) = 1 \), and \( \mathcal{L}(1) = 0 \), is to set \( Z = \{ 1 - (P_z^d + P_z^d)q(f_d^d)X / P_u^d \} = 1.10096 \), and \( z = q(f_d^d)X = .8125 \). This gives a type G borrower an expected payoff of \( (P_d^d f_d^d / f)(C) + (P_u^d / f)(X + C - Z) = .58482 \). The contract assigns a just sufficient portion of the liquidation proceeds to the borrower to deter the lender from liquidation. This claim assigned to the lender results in the desired liquidation policy, but reduces information sensitivity relative to the desired \( f_1 \)-contingent policy: \( z(1) = .8125 \), but \( z(0) = L = .9 \) is desired. As a result, the payment given \( f_1 = 1 \), \( Z(1) \) is 1.10096, rather than the 1.081125 desired by the type G borrower.

5. Competing Future Lenders, Refinancing, and Liquidation Decisions

The ability of the borrower to raise money from competing lenders at date 1 allows the borrower to implement the desired liquidation policy and make the cost of capital depend on the date-1 information in the way desired. In particular, the ability to refinance allows the payment to the lender when liquidation occurs to be larger than is possible in the single-lender case. In the single lender case, to deter liquidation given \( f_1 = f_d^d \), the maximum payment from liquidation the lender can receive is \( z = q(f_1)X < L \). In this section, I examine claims where \( z = L \), and there is no payment to the borrower when there is liquidation.

The right to continue when a new lender will advance the funds to repay fully the maturing debt is given to the borrower. The competitive behavior of the new lender despite the ex-post harm done to the existing lender (who prefers liquidation) is the limit of an implicit game of coalition formation. If the borrower were to offer just above a normal return to the date-1 lender, the new lender would get a small profit. To deter every lender from making the small profit, the existing lender would need to pay this small amount, \( \varepsilon > 0 \), to each potential lender. There are many potential lenders (\( N \to \infty \)), and the existing lender cannot bribe them all (at cost \( \varepsilon N \)) to prevent each from making a profitable loan. I go to the limit where \( \varepsilon \to 0 \).

To implement the desired \( f_1 \)-contingent policy requires a mix of debt maturities. With a single initial lender this is equivalent to a mix of coupon payments on each date of a single security. All long-term debt would then imply no required date-1 payment (this is zero-coupon long-term debt). All short-term debt
would imply that all of the capital is raised with debt that must be repaid on date 1: no debt with date-2 coupons would be sold on date 0. Before examining the proper maturity mix, these two extremes are examined.

5.1 All Long-term Debt

With all long-term debt, no date-1 debt payment is required, and the lender has no right to liquidate. All long-term debt implies that date-1 information does not influence any rate setting or liquidation decisions. Based on date-0 information, a borrower repays long-term debt with probability \( q(f) = f(1 - \Pi) + \Pi \), and pays zero otherwise. To raise initial capital of \( I \) requires long-term debt with face value \( I/q(f) \), if this does not exceed \( X \), which is the most any borrower can repay (if it exceeds \( X \), the borrower cannot borrow long-term because the lender would receive a sub-normal return). This implies no liquidation when \( f_1 = 0 \).

With all long-term debt, \( Z(f_1) = 0 \) for all \( f_1 \), and \( Z(f_1) = I/q(f) \) for all \( f_1 \).

5.2 All Short-term Debt

When there is some short-term debt, the lender will have the right to liquidate at date 1, if not repaid in full. The borrower can issue new debt at date 1, priced in the competitive loan market, to raise funds to repay the maturing short-term debt. The new date-1 information will determine both the amount that the market offers for this new debt, and the liquidation decision that the existing lender makes if the borrower does not repay in full.

Suppose that all the debt issued on date 0 is short-term. On date 1, all lenders and the borrower then know \( f_1 \), the updated credit rating. The borrower can issue new short-term debt with face value \( r_2 \), but \( r_2 \) cannot exceed \( X \) (the most that can be repaid). The new date-1 lenders will pay \( q(f_1)r_2 \) for such a debt issue. If fully repaid, the old lender has no other rights. The old lender knows \( f_1 \), and can choose to accept less than the amount owed, \( r_1 \), or can choose liquidation. The old lender offers to accept less than \( r_1 \) only if the borrower cannot raise \( r_1 \) in the market, or only if \( q(f_1)X < r_1 \). If the borrower cannot raise \( r_1 \), the old lender liquidates if the most that can be raised, \( q(f_1)X \), is less than the proceeds of liquidation, \( L \). If liquidation yields less, and \( L < q(f_1)X \), the old lender settles for \( q(f_1)X \), or equivalently extends maturity to date 2 in exchange for an increase in face value to \( X \). In summary, when the new date-1 lenders will lend
the borrower enough to repay the old lender, there is not liquidation. When less than \( r_1 \) can be raised, the old lender compares the present value of future cash flows with the value of liquidation. The future control rents, \( C \), are not considered by the old lender because they will not be paid to him, but instead to the borrower. If \( r_1 > q(f^d)X \) and \( L > q(f^d)X \), there will be liquidation when \( f_1 = f^d \).

When \( r_1 \) exceeds \( q(f^d)X \), the lender will have the right to liquidate given \( f_1 = f^d \), because the debt will not be able to be refinanced. If the desired liquidation policy is \( \mathbb{L}(f^d) = 0 \), then the borrower will desire a debt structure that is not exclusively short-term debt.

5.3 Multiple Maturities With A Single Initial Lender

In this case, there is a single lender at date 0, and a competitive loan market at date 1. Choosing multiple maturities of initial debt describes the promised time series of cash flows promised to the single lender. Let the promised date-1 payment be \( r_1 \), and the promised date-2 payment be \( \rho \). If there is liquidation on date 1 the payment of the long-term debt is accelerated to date 1. The lender will have the right to liquidate whenever the borrower cannot raise \( r_1 \) on date-1. Because the lender owns all of the initial debt, if the initial lender owns total debt \( r_1 + \rho \) in excess of \( q(f_1)X \), and liquidation is worth more than \( q(f_1)X \), the lender will choose to liquidate.

The debt contracts are as follows. The long-term debt has face value \( \rho \), and prohibits any future debt senior to it.\(^6\) This implies that when refinancing at date 1, the most that the borrower can promise to new lenders is \( X - \rho \). The new lender will lend \( q(f_1)r_2 \) if offered a date-2 claim of \( r_2 \). This implies that the borrower can raise up to \( q(f_1)(X - \rho) \), conditional on \( f_1 \). By refinancing, the borrower can possibly avoid a liquidation that is in the lender's interest, although the project delivers no date-1 cash. If the firm is liquidated at date 1, the long-term debt is accelerated to date 1, giving the lender a claim of \( r_1 + \rho \) (priority of these claims is not relevant because one lender owns both issues).

5.4 The Example

To implement the desired liquidation policy with all liquidation proceeds to the lender, requires that the borrower be able to refinance when \( f_1 = f^d = .25 \); this implies that \( r_1 \leq q(f_1)(X - \rho) \). The borrower must not be able to refinance when \( f_1 = 0 \), because liquidation is desired then. This requires that \( r_1 > \pi(X - \rho) \). If there
is liquidation at date 1, the lender will receive the smaller of $r_1+\rho$ and $L$. When the debt is refinanced, the lender will receive $r_1$, plus he will retain his long-term claim that will then be worth $q(f_d)\rho$. A debt structure that leads to the desired liquidation policy will then raise: $P\min\{r_1+\rho, L\} + P^d(r_1+ q(f_d)\rho) + P^u(r_1+\rho)$. In the example, setting $r_1=.36585$ and $\rho=.715375$ raises exactly $I=1$. To show that it implements the desired liquidation policy, note that $q(f_d)(X-\rho)=.625(1.3=.715375)=.36585=r_1$. The short-term debt can be refinanced given $f_1=f_d$ but not given $f_1=0$. This leads to the desired liquidation policy, and provides information sensitivity: $z(0)=L$, $Z(f_d)=X$, and $Z(1)=1.081125$. This leads to a type G payoff of $(P^d f_d/C) + (P^u/f)(X+C-r_1-\rho)$. When there is a single initial lender, but additional competing future lenders, the ability to reprice and fully repay the maturing debt limits the liquidation rights of the lender. This describes the way in which debt maturity influences the state-contingent control rights. Because a single lender owns all initial debt claims, the priority of these claims will be relevant only through its limit on the amount that new debt issues can raise on date 1. When there are multiple initial lenders, then the priority of their claims might be relevant, depending on the ability of the initial lenders to renegotiate their claims in the future. The next section describes the liquidation decisions with two initial lenders, one owning the long-term debt, the other the short-term debt.

6. **Multiple Initial Lenders and Debt Priority**

I assume that different lenders own the two maturities of the borrower's debt. This is exogenously imposed, and I do not analyze why this would be desirable. In section 7, I examine the effects if one lender, a bank, is better able to exercise the control right to liquidate. In this section, there is no such difference between the two lenders.

The effect of there being two date-0 lenders depends on whether they can reach a renegotiated agreement among themselves on date-1, in circumstances where the short-term lender has the right to liquidate. When the two lenders can negotiate, they will maximize the total value of their claims, and will make the same liquidation decision as a single lender. If they cannot renegotiate, then the priority of their claims might influence the liquidation decision made when the date-1 maturing debt cannot be fully repaid.
The lender who owns the short-term debt will have the right to liquidate, and will then make the decision in his own interest. The short-term lender will have the right to liquidate whenever the short-term debt cannot be fully refinanced, or \( r_t > q(f_t)(X - \rho) \). If renegotiation occurs, lenders prefer to liquidate only if it is in their collective interest, implying \( L > q(f_t)X \). If they cannot renegotiate and the maturing debt cannot be refinanced, the short-term lender receives at most \( q(f_t)(X - \rho) < r_t \), without liquidation. With liquidation, the short-term lender receives \( \min\{L, r_t\} \) if senior, and \( \min\{L - \rho, r_t\} \) if junior. Lemma 1 describes the liquidation policy implied by this situation.

**Lemma 1:** The incentives and rights to liquidate of a short-term lender at date 1, given the face value of short-term debt, \( r_t \), and of long-term debt, \( \rho \), are as follows. The probability of repayment given date 1 information is \( q(f_t) = f_t(1 - \pi) + \pi = q_t \).

<table>
<thead>
<tr>
<th>Conditions for Liquidation at date 1</th>
<th>Right (debt not repaid)</th>
<th>Incentive No Negotiation</th>
<th>Incentive With Negotiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Short-term</td>
<td>( q_t &lt; \frac{r_t}{X} )</td>
<td>( q_t &lt; \frac{L}{X} )</td>
<td>( q_t &lt; \frac{L}{X} )</td>
</tr>
<tr>
<td>All Long-term</td>
<td>No</td>
<td>(not relevant)</td>
<td></td>
</tr>
<tr>
<td>Short Senior, with ( \rho ) of junior long-term</td>
<td>( q_t &lt; \frac{r_t}{X - \rho} )</td>
<td>( q_t &lt; \frac{L}{X - \rho} )</td>
<td>( q_t &lt; \frac{L}{X - \rho} )</td>
</tr>
<tr>
<td>Short Junior, with ( \rho ) of senior long-term</td>
<td>( q_t &lt; \frac{r_t}{X - \rho} )</td>
<td>( q_t &lt; \frac{L - \rho}{X - \rho} )</td>
<td>( q_t &lt; \frac{L - \rho}{X - \rho} )</td>
</tr>
</tbody>
</table>

Without negotiation a junior short lender has less incentive to liquidate than the senior short or all-short lender. With negotiation, the incentive to liquidate is independent of initial debt priority.
When the initial lenders can renegotiate, the priority of their claims does not influence their liquidation decision. As in the case of the single initial lender, the debt priority is irrelevant. If initial lenders cannot renegotiate, priority can influence liquidation decisions when maturing short-term debt cannot be fully repaid by refinancing. The problem with giving the unconditional right to liquidate to lenders is the potential for lost control rents. As a result, it can be useful to choose a structure where the short-term lender would not liquidate given the right, although liquidation is in the collective interest of the two lenders. From lemma 1, this occurs only when the short-term debt is junior to the long-term debt. If renegotiation is impossible, this implies that another way to implement the desired liquidation policy is to make short-term debt junior to long-term debt. This can force the short-term lender to make a unilateral concession, to avoid a liquidation that is not in his interest.

The debt structure with junior short-term debt can implement the same policy as that with senior short-term debt that can be fully repaid given \( f_1 = f_2 \). To make subordination implement the liquidation policy \( \mathcal{L}(0) = 1 \), and \( \mathcal{L}(f_2^0) = \mathcal{L}(1) = 0 \), requires the following. \( \mathcal{L}(0) = 1 \) requires \( \pi < (L - \rho)/(X - \rho) \), or \( \rho < (L - \pi X)/(1 - \pi) \). \( \mathcal{L}(f_2^0) = 0 \) requires \( q(f_2^0) \geq (L - \rho)/(X - \rho) \), or \( \rho \geq (L - q(f_2^0)X)/(1 - q(f_2^0)) \), and this also implies that \( \mathcal{L}(1) = 0 \). These conditions do not put an upper bound on the amount of short-term debt, \( r_1 \), because if the short-term lender makes a concession, the maturing short-term debt does not need to be fully refinanced to avoid liquidation. The next section illustrates this in the example. Section 7 then shows that making short-term debt junior is generally a bad idea when there is a possibility (but not a certainty) of renegotiation.

### 6.1 The Example

The implementation of the desired liquidation policy with full renegotiation is the same as the single-lender case already described: priority is irrelevant. With renegotiation impossible, one can exploit the asymmetric incentives induced by subordination. The asymmetry can induce a short-term lender to make a concession to avoid liquidation even when liquidation is in the collective interest of existing lenders. To implement \( \mathcal{L}(f_2^0) = 0 \) (deter liquidation given \( f_1 = f_2^0 \)) requires that \( \rho \geq (L - q(f_2^0)X)/(1 - q(f_2^0)) \), or in the
example, $\rho \geq 0.2333$. If $\rho = 0.2333$, then liquidation yields the short-term lender $L - \rho = 0.6667$, while refinancing with new debt with face value of $X - \rho = 1.1667$, which is received with probability $q(f^d) = 0.625$: $q(f^d)(X - \rho) = 0.6667$. This will deter liquidation given $f^d$, even if the maturing short-term debt cannot be fully refinanced.

To implement $\xi(0) = 1$ (liquidation given $f_1 = 0$) requires $\rho < (L - \tau X)/(1 - \tau) = 0.5$, and that the maturing debt cannot be refinanced given $f_1 = 0$. The maturing short-term debt cannot be fully refinanced given $f_1 = 0$ if $r_1 > \tau (X - \rho) = 0.5 (1.3 - \rho) = 0.65 - \rho/2$. Any $\rho \in [0.2333, 0.5)$, and $r_1 > 0.65 - \rho/2$ will implement the desired liquidation policy. If, in addition, $r_1 + \rho = Z(1) = 1.081125$, it will also implement the desired $f_1$-contingent payment policy. For example, let $r_1 = 0.847825$ and $\rho = 0.2333$. When $f_1 = 0$, there is liquidation and the long-term lender gets $\rho$ while the short-term lender gets $L - \rho$, implying that $z(0) = L = 0.9$. When $f_1 = f^d = 0.25$, the short-term lender does not liquidate, but accepts a claim with date-2 face value $X - \rho$, implying that date-2 debt given $f_1 = f^d$ is $X$. When $f_1 = 1$, the short-term debt with face value $r_1$ is refinanced in full, with new debt having face value $r_1 = 0.847825$, implying total date-2 debt is $r_1 + \rho = 1.081125$. These are the payments desired when $f_1$ can condition contracts. If renegotiation is impossible, then relying on subordination to induce short-term bank lenders to make concessions is an alternative method of implementing the liquidation policy desired. Even public debt can sometimes be renegotiated, however. The next section shows that making short-term debt junior is undesirable when there is a possibility, but not a certainty, of renegotiation.

7. **Bank (Private) Lenders, and Public Bondholders**

Suppose there are two kinds of lenders which I call banks and the public respectively. I use the term bank loosely, to mean private institutional lenders in general. The public is not able to implement liquidation decisions. This is motivated in Diamond [1992b] by the liquidation decision requiring some specific expertise, or by the public not always observing the information $f_1$ as quickly as other lenders. A bank is delegated the task of monitoring the information about liquidation, as in Diamond [1984, 1991b]. Those lenders who can implement liquidation decisions are banks. In addition, I examine the implications of the public being less able to renegotiate and restructure debt. There are many banks, and they provide
perfect competition for each other. The information about the borrower is observed by many competing banks. If each date-0 bank lender has some information monopoly, they will face imperfect competition. This is discussed in section 8.

Only the bank lenders have the specific expertise to implement a liquidation. They will then be the short-term lenders. Long-term lenders need do nothing on date 1, unless renegotiation is required. When no renegotiation is required, this implies that public lenders can own the long-term debt without distorting date-1 decisions. This could be beneficial by allowing some of the borrower's capital to be raised from the public. The public might require a lower rate of return, for example. I do not explain why the borrower contracts with the public, but simply examine the implications for priority of issuing public bonds.

I follow Diamond [1992b], and assume that the original debt contracts can possibly be renegotiated in the future when new information arrives. Bulow-Shoven [1978] examine bank renegotiation with a borrower when the public can never renegotiate. I assume that there is an exogenous probability \( R \in (0,1) \) that the contracts can be renegotiated and restructured. With probability \( 1 - R \) the contract will not be renegotiated even if it is in everyone's interest to renegotiate. This imperfect renegotiation is motivated by the difficulty of restructuring public debt issues, owing to free-rider problems and information asymmetries where public bondholders do not have rapid access to the information observed by bank lenders. In addition, the US Federal Trust Indenture Act requires unanimous consent for public bondholders to make principal interest or maturity concessions outside the bankruptcy court (see Smith-Warner [1979], Roe [1987] and Gertner-Scharfstein [1991]. Such concessions from publicly-traded bonds require an exchange offer, the success of which is uncertain. One source of uncertainty is the distribution of ownership of the bond when the exchange offer is made.

Lemma 1 describes the incentives of the short-term lender to liquidate with, and without, renegotiation. When the maturing short-term debt is fully repaid, there is not liquidation. The liquidation rule is as follows when the maturing short-term debt cannot be fully repaid. If liquidation is in the short-term lender's interest both with and without renegotiation, there is certain liquidation. If liquidation is not in
the short-term lender's interest either with or without renegotiation, then there is certainly not liquidation. If liquidation is not in the short-term lender's interest without renegotiation, but is with renegotiation, then the probability of liquidation is \( R \). If liquidation is in the short-term lender's interest without renegotiation, but not with renegotiation, then the probability of liquidation is \( 1 - R \).

The uncertain ability to renegotiate with the public makes the liquidation policy random whenever a contract requiring renegotiation is used. Borrowers want to choose contracts that have \( f_1 \)-contingent liquidation probabilities that are either 0 or 1. This rules out many debt contracts.

Contracts where the liquidation decision is different with and without renegotiation are potentially dominated. There are two circumstances where the renegotiated and non-renegotiated liquidation decisions differ. When short-term debt is senior, it has a unilateral incentive to liquidate even when liquidation is worth less than the expected cash flow from continuation. When short-term debt is junior, and there is sufficient long-term debt, the short-term lender has a unilateral incentive not to liquidate when liquidation produces more cash than continuation. If a debt contract is to lead to \( f_1 \)-contingent liquidation probabilities that are either 0 or 1, the maturing short-term debt must be fully refinanced for all possible realizations of \( f_1 \) where renegotiation would otherwise be required.

To implement the liquidation and pricing rule desired by type G's then requires the following. Because it is in the collective interest of lenders to liquidate when \( f_1 = f^d \), ruling out liquidation requires that maturing short-term debt be fully refinanced when \( f_1 = f^d \) (requiring \( r_1 \leq q(f_1)(X - \rho) \)). Making liquidation certain when \( f_1 = 0 \) requires two conditions: that the maturing short-term debt not be fully refinanced when \( f_1 = 0 \), and that the short-term lender have the incentive to liquidate without renegotiation. The former requires \( r_1 > \pi(X - \rho) \) and the condition for the latter depends on the priority of the debt. If the short-term debt is senior, it is satisfied automatically. If the short-term debt is junior, the incentive to liquidate without requiring renegotiation is present only if the face value of long-term debt satisfies \( \rho \leq \frac{L - \pi X}{X - \pi X} \).

The implications of structuring the contract to avoid the undesirable effects of uncertain renegotiation are as follows. The short-term debt must be fully refinanced whenever the borrower wishes to
avoid a liquidation that is in the collective interest of lenders. This imposes an upper bound on the amount of short-term debt no matter what is its priority. In addition, if the short-term debt is junior, there is a separate upper bound on the amount of long-term debt. If this bound is exceeded, the short-term lender will not liquidate, even when it is desirable to do so (when \( f_1 = 0 \)), thus excessively entrenching the borrower. These two conditions impose an upper bound on total debt, long-term plus short-term, that can be less than \( X \) (the amount of cash that a borrower can pay on date 2). When short-term debt is senior, there is no upper bound on the total amount of debt, other than that it not exceed \( X \).

With junior short-term debt, it can be impossible for the borrower to raise sufficient capital to finance his project and simultaneously implement the desired liquidation policy. This is the case in the example.

### 7.1 The Example

The upper bound on long-term debt \( \rho \), such that the short-term lender will liquidate without renegotiation given \( f_1 = 0 \) is \( \rho \leq \frac{L-\pi X}{X-\pi X} = 0.5 \). The upper bound on \( r_1 \) such that maturing short-term debt is refinanced in full is \( r_1 \leq q(f^d)(X-\rho) = 0.625(X-\rho) \). This implies that \( r_1 + 0.625\rho < 0.8125 \).

The total date-2 payment to lenders when \( f_1 = 1 \) will be \( r_1 + \rho \). The maturing short-term debt will be refinanced with new debt with face value \( r_1 \), because given \( f_1 = 1 \), it will be repaid for certain. For lenders to get an expected return of \( I = 1 \) with the liquidation policy \( \mathbb{Q}(0) = \mathbb{Q}(f^d) = 0 \) and \( \mathbb{Q}(1) = 1 \) requires that the payment contingent on \( f_1 = 1 \) be at least \( Z(1) = 1.081125 \). The lender's expected return is then \( p^L + p^d q^d X + p^w Z(1) = I \). Requiring both \( r_1 + 0.625\rho < 0.8125 \), and \( r_1 + \rho > 1.081125 \), implies \( \rho > 0.76428 \). This contradicts \( \rho < 0.5 \). The \( f_1 \)-contingent liquidation policy cannot be implemented by junior short-term debt. The example in section 5.4 shows that it can be implemented with senior short-term debt. The senior debt is fully refinanced given \( f_1 = f^d \) (implying no renegotiation). Given the \( f_1 = 0 \), the short-term debt is not fully refinanced, and the senior short-term lender has the individual incentive to liquidate given \( f_1 = 0 \).
8. **Lender Competition and Dilution**

Competition between lenders implies that the borrower is able to refinance on terms that give no rents to the new lenders. If there is imperfect competition between lenders, they will capture some of the rents. For example, if it costs the borrower a fixed cost, $\varphi$, to verify the original (date-0) lender's information to another lender on date 1, then the original lender can capture some of $\varphi$, because the borrower would need to pay $\varphi$ to attract a competitive bid from the second lender. Alternatively, if two lenders observe information that is imperfectly correlated, then competitive bidding will allow them to capture some rents, because each is afraid to bid aggressively owing to the fear of outbidding the other due to the imperfectly correlated error in their information: see Milgrom-Weber [1982] for a model of bidding in this information setup). This imperfectly correlated (common value) bidding model has each lender bidding a date-1 interest rate a bit above the competitive level given $f_1$. As such, if there are several bidders, it is a minor change from the perfectly competitive setup I use.

A severe limit on competition occurs if only the original lender observes the date-1 information. The only competition in date-1 bidding against the lender then comes from an uninformed bidder, who realizes that he faces a severe adverse selection/ winner's curse problem. With no information the competitor must put in a bid that is not $f_1$-contingent, and will win only when the original lender gets sufficiently bad news. This is the setup in Englebrecht-Wiggans/Milgrom/Weber [1983] and Rajan [1990]. Because the initial lender faces no competition for those borrowers who get good news (high $f_1$), those borrowers get little benefit from the chance to refinance. Information monopoly would be a major change in the model, and it would suggest that private lenders make large ex-post profits from their loan customers who do well, and there would be substantial competition for the ex-ante right to exploit the customers later.

This model is based on the belief that the monopoly in information problem is not severe. Rajan [1990], examines a model with information monopoly leading to imperfect competition. He concludes that bank debt is junior to the public, to control the information monopoly. Rajan's conclusion is opposite to the prediction of this model. One can see a point close to his in the single date-1 lender model of section 4.
The monopolist lender successfully bargains to obtain most of the date-2 cash flow from the borrower, whenever he has a credible threat to liquidate. In section 4, the liquidation incentive of the single lender is limited by giving the borrower a senior claim that assigns to him some liquidation proceeds. Rajan assumes that existing lenders cannot renegotiate, and then limits the bargaining power by making long-term debt senior to the short-term debt that has liquidation rights. In contrast, my approach relies on competition in the refinancing market to limit the lender's bargaining power.

9. Conclusion

The analysis suggests that the structure of debt contracts and the actions that lenders take when the borrower is in financial distress depend on the type of lender providing the funds. If the borrower combines bank loans with public debt, the model predicts that the bank loan will be shorter-term, and senior to the public debt. If the borrower gets into financial distress, the bank will not make concessions. Instead, the bank will use its power to force a restructuring, such as asset sales or liquidation.

If all of the debt is bank debt, possibly owned by different banks, then the priority prediction is not clear. Banks, especially those that are part of a syndicate for a given loan participation, can renegotiate rather easily. Because bank loans often have strict covenants that allow even long-term lenders to have exercise control, banks may always have the “right to liquidate.” The model then predicts that if all of the debt is bank debt, then at times the banks will make concessions, extending maturity or forgiving interest or principal.

Two recent empirical studies present results consistent with this model. Asquith-Gertner-Scharfstein [1991], study the restructuring decisions of firms that have large amounts of public debt. They study firms that issued long-term, junior junk bonds and later experienced financial distress. The theory predicts that in this case, banks would not make concessions. They conclude:

"Outside of bankruptcy proceedings, banks almost never (there is one exception) forgive principal on their loans and they rarely provide new financing. (Banks) often waive covenants and defer principal and interest payments, but they also often force accelerated payments and increase their collateral." [Asquith-Gertner-Scharfstein [1991, p.1].
Gilson-John-Lang [1990] examines a sample of firms in financial distress and examine the characteristics of firms that successfully renegotiate their debt outside of bankruptcy court. Their sample includes firms with and without public debt. They find that a firm with a higher fraction of its debt as bank debt is more likely to renegotiate, with the banks making concessions. This is consistent with the theory discussed in this paper. The bank will make concessions if the amount of bank debt is high enough, and if concessions are in the mutual interest of lenders \((r_1 \geq q(f^u)(X - p)) \text{ and } L \leq q(f^u)X\). They also find that a firm is less likely to reach a negotiated settlement if there are more distinct issues of debt, a proxy for the costs of renegotiation.

A study of the universe of Euromarket syndicated publicly-traded bonds and bank loans by Davis-Mayer [undated], documents that bank loans are of shorter maturity than bonds, even for firms that use both forms of finance. They also find that larger firms and firms that raise less capital have longer maturity bank loans and are more likely to issue publicly traded bonds. If one assumes that the smaller firms are marginal firms that cannot raise sufficient funds if they choose a structure that limits the banks' control right to liquidate when it is in the collective interest of the lenders, this is consistent with the theory in this paper.
REFERENCES


Hart O. and J. Moore, "Default and Renegotiation: A Dynamic Model of Debt," LSE discussion paper 57,
June 1989.


Endnotes

1. The most obvious motivation for control rents is moral hazard. If outsiders receive 100 percent of future cash flows, then management will not act properly if its interests conflict with those of outsiders. The future cash flows that must be pledged to management to provide incentives cannot be assigned to outside investors, see Diamond [1991a]. Similarly, if the manager cannot commit to stay with the firm in the future, there is a state-contingent floor on the manager's compensation, see Hart-Moore [1991].

2. To be concrete in a simple way, assume that lenders use a constant returns to scale investment technology that returns 1 per unit invested per period.

3. There is, implicitly, also a control rent associated with having control from date 0 to 1, but all borrowers who can borrow at date 0 get this. It is therefore a "sunk benefit," and is not explicitly introduced.

4. The lowest possible value of expected cash flow is $\pi X$, and liquidation yields $L$. Assume that $C > L - \pi X$: then borrowers can never be bribed to give up control voluntarily. Without this assumption, borrowers might negotiate a deal to liquidate at date 1 independent of the debt structure.

5. Even if a payment conditional on liquidation could not be specified, the same result can be attained by giving the borrower a senior claim on all cash payments of $L - z$. The lender can then get at most $z$ if liquidation is chosen against the wishes of the borrower.

6. This is without loss of generality given my assumption of the three possible realizations of $f_1$. In Diamond [1992a], there is a continuum of possible realizations of $f_1$. Approaching the desired $f_1$ contingent payments can then require that new refinanced debt be senior to existing long-term debt. Other qualitative implications of the model are preserved in the three-realization case used here.

7. Another model of information monopoly in bank lending is Sharpe [1990].