CORPORATE RESTRUCTURING: THE IMPACT OF LOAN SALES AND CREDIT DERIVATIVES

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Abstract

Corporate restructurings involving a redeployment of assets into other activities provide an important way in which firms alleviate financial distress. This paper examines the degree to which loan sales and credit derivatives markets assist or hinder restructurings. We show that loan sales lead to a postponement of restructuring. Furthermore, they may be inefficient in the sense that the initial value of the firm is greater if loan sales are precluded. Credit derivative transactions which permit lenders to adjust their credit exposure without giving up their rights to negotiate in out-of-bankruptcy restructurings accelerate restructurings.

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1 Introduction

1.1 Loan Sales and Credit Derivatives

Loan sales and credit derivative transactions are an increasingly important feature of modern financial markets. The nature of these transactions is described in Gorton and Haubrich (1990), Cantor and Demsetz (1993), Demsetz (1994), in the case of loan sales, and Euromoney (1998) and British Bankers' Association (1999) in the case of credit derivatives.

Both loan sales and credit derivatives provide important benefits to banks which are now able to adjust their credit exposure in an active way in the event of financial distress and in more normal times can better manage credit risk portfolios. However, concerns have been raised that the new instruments may have some adverse consequences. In particular, they may affect borrower-firms' attempts to restructure themselves. A Bank of England official active in the coordination of corporate restructurings writes: "it is possible to conceive circumstances where loan trading so slows down negotiations on the terms of an informal financial support package that they have to be abandoned and a company placed in statutory insolvency to the detriment of everyone concerned", (see Pratt (1997)).

In this paper, we show how marketability of loans leads to the postponement of restructurings and may be inefficient in the sense that the initial of the firm is lower if loans can be subsequently sold. The intuition for our efficiency result is as follows. When firms experience financial distress, lenders have an incentive to sell their loans to specialist lenders or vulture funds which can extract a larger surplus from equity-holders in negotiations on firm restructuring. Since the specialist lenders are not involved in the initial loan agreement between equity-holder and the original lender, the surplus they extract represents a dead-weight loss from the collective point of view of the original two parties. If the initial agreement could preclude loan sales, the dead-weight loss would be avoided and the initial lender and the equity-holder could be collectively better off.

We also analyze the effects of credit derivative transactions such as total return

swaps. These permit lenders to lay-off credit exposure while retaining the right to negotiate corporate restructurings outside formal bankruptcy proceedings.[1] Loan sales with recourse may have a similar effect. One may think of them as permitting lenders to adjust their risk aversion vis-à-vis a given loan while retaining bargaining or control rights. We show that they accelerate restructuring and generate efficiency gains.

1.2 Related Literature

Several studies (see, for example, Pennacchi (1988) and Jones (1998)) argue that loan sales or credit derivative transactions are motivated by the desire of banks to economize on their regulatory capital. The degree to which banks can sell loans, however, is limited by the moral hazard problem that banks lose the incentive to monitor a borrower once its loan has been sold. Pennacchi (1988) and Gorton and Pennacchi (1995) analyse contracts which mitigate these problems and the latter study examines empirical evidence on actual contracts. Rather than focusing on regulatory motivation for loan sales, James (1988) suggests that they allow banks to reduce debt-overhang in the sense of Myers (1977).

None of the above cited studies has looked at the motive for loan sales examined in this paper, namely that they permit a lender to sell on his claim to other lenders specialized in extracting concessions from equity-holders. The fact that the specialist lender extracts some of the surplus associated with debt restructuring, however, means that this type of resale may be inefficient from the ex ante point of view of the equity-holder and initial lender together. Therefore, the latter two parties would be better off if the initial lender could commit not to sell his loan.

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[1]Generally, such transactions mean that the swap counter-party obtains the right to negotiate after bankruptcy has occured since typical contracts transfer ownership of the loan to the swap counter-party if the borrower defaults.

1.3   Structure of the Paper

Section 2 sets out a model in which the equity-holder of a firm negotiates with a lender a restructuring arrangement whereby the latter injects capital and receives in exchange an adjustment in the coupon flow on its loan. Restructuring occurs when a stochastic state variable describing the firm's revenue stream hits some low level. We suppose that the lender has higher risk aversion than the equity-holder. Using Nash's axiomatic approach to bargaining, we derive a stationary solution consisting of (i) a trigger level for the firm's revenue variable at which restructuring takes place and (ii) a supplementary coupon flow to compensate the lender for the capital injection. We show that neither lender nor equity-holder has an incentive to make an acceptable offer to the other agent for levels of the revenue state variable above the equilibrium trigger.

Section 3 of the paper derives comparative static results, showing that raising lender bargaining power leads to a postponement of restructuring and an increase in the supplementary coupon that the lender obtains after restructuring has taken place. Increases in the degree of risk aversion of the lender has a similar impact. In Section 2.2, we show that allowing the initial lender to sell on his loan to other specialized lenders with greater bargaining power vis-à-vis the equity-holder may be inefficient. Section 2.3 discusses the impact of credit derivative transactions which permit lenders to adjust their effective level of risk aversion for a given loan. Section 4 of the paper concludes.

2   The Model

2.1   Basic Assumptions

Consider a firm which possesses an income flow $p_t - w$ where w is a constant, positive parameter, and p_t is a geometric Brownian motion:

$$dp_t = \mu p_t dt + \sigma p_t dB_t \quad . \tag{1}$$

The firm has perpetual debt with a constant coupon payment of b. For simplicity, suppose that the face value of the debt is b/r and bankruptcy occurs when the firm is marginally insolvent, i.e., when $p_t/(r - \mu) - w/r = b/r$. In this case, the default premium on the debt is zero and the debt trades at par. Generalizing our analysis to the case in which bankruptcy occurs when the firm's asset value is less than the face value of the debt would introduce an extra option value in the bond values. The solutions would then be more complex without changing the qualitative implications of our analysis.

Suppose that the firm has the possibility of restructuring. Such restructuring requires the injection of a capital sum k and induces a change in the firm's cash flow process to $\xi p_t - w + \xi_0$, where $0 < \xi_0 < w$, and $0 < \xi < 1$. It is intuitively obvious that a restructuring will be advantageous when p_t is low. We suppose that the equity-holder does not possess the necessary funds to invest and that covenants on the original debt prevent the equity-holder from borrowing from anyone except the holder of that debt. We further suppose that the lender earns an additional coupon flow of b^* after the restructuring.

The cashflows to the different agents may be summarized as follows:

	To equity	To lender	
Before restructuring (per unit time)	$p_t - w - b$	b	
At restructuring	0	$-k$	(2)
After restructuring (per unit time)	$\xi p_t - w - b - b^* + \xi_0$	$b + b^*$	.

We assume that lender and equity-holders have different attitudes to risk. When they price cash-flows involving p_t, they therefore employ different risk-adjusted drift terms μ_V and μ_L. If the lender is more risk averse than the equity-holder, it follows that $\mu_L < \mu_V < \mu$, where μ is the statistically observed drift term of the actual process. The intuition here is that risk averse agents will price payoffs that depend on the stochastic variable p_t *as if* the process grows at a *slower* rate than it actually does. It is, of course, natural to assume that the lender is more risk averse since he holds the less risky payoff.

Using standard methods we obtain:

Proposition 1 *If restructuring occurs when p_t first hits some level p_r, and the lender receives a supplemental coupon flow b^* after that date, the values of equity and debt prior to restructuring are:*

$$V(p) = \frac{p}{r - \mu_V} - \frac{w + b}{r} + \left[\frac{(\xi - 1)p_r}{r - \mu_V} - \frac{b^* - \xi_0}{r}\right]\left(\frac{p}{p_r}\right)^{\lambda_V} \tag{3}$$

$$L(p) = \frac{b}{r} + \left[\frac{b^*}{r} - k\right]\left(\frac{p}{p_r}\right)^{\lambda_L} , \tag{4}$$

$$\text{where} \quad \lambda_i \equiv \frac{-(\mu_i - \sigma^2/2) - \sqrt{(\mu_i - \sigma^2/2)^2 + 2\sigma^2 r}}{\sigma^2} \qquad i = V, L . \tag{5}$$

Note that these values are calculated from the point of view of the equity-holder in the case of V and the point of view of the lender in the case of L. That is why we employ λ_V and λ_V respectively in V and L.

2.2 A Nash Bargaining Solution

Both agents care about the restructuring trigger, p_r and the additional coupon that the lenders obtain after restructuring b^*. We suppose that both agents have veto power over a restructuring. Hence, they must bargain to decide when restructuring takes place and how the surplus will be split between them.

Such bargaining may be modelled in different ways. When there are no stochastic state variables and the bargaining protocol (i.e., who has the right to make offers and counteroffers and in what order) is fully specified, Rubinstein (1982) shows how one may derive non-cooperative bargaining solutions under complete information. This may be generalized to cases in which agents have one-sided or two-sided incomplete information about each other's type. However, extending such non-cooperative bargaining theory to cases with diffusion state variables is not straightforward as is shown by Cripps (1998).

In the current study, our concern is the implications of bargaining for corporate restructuring rather than the bargaining process itself. We employ Nash's axiomatic approach to modelling bargaining (see Nash (1950) and Nash (1953)) rather than more complicated non-cooperative approaches. Although non-cooperative approaches may

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appear more consistent in particular since bargaining power is linked to some exogenous quantity such as agents' discount factors in Rubinstein (1982), the allocation of the surplus is crucially affected by assumptions about the bargaining protocol which are arbitrary.

In contrast, Nash characterizes bargaining solutions which satisfy reasonable axioms[2] without attempting to specify the exact form of the bargaining process. If agents bargain over variables which influence the allocation of a surplus, Nash shows if the solution satisfies his axioms, then the variables in question must maximize the product of power functions of each agent's part of the total surplus.

Nash's approach in the context of our model consists of deriving the (p_r, b^*) pair which maximizes a power function of the surpluses obtained by the equity-holder and the lender. Let $\hat{V}$ and $\hat{L}$ denote the values that the two agents obtain if they do not agree and no restructuring takes place, i.e., $\hat{V}_t = p_t/(r - \mu_V) - (w + b)/r$ and $\hat{L}_t = b/r$. Each agent's part of the surplus, therefore, consists of $V_t - \hat{V}_t$ and $L_t - \hat{L}_t$. The Nash bargaining solution is then:

$$(p_r, b^*) \quad = \quad \mathrm{argmax} \left\{ (V_\tau - \hat{V}_\tau)^\alpha, (L_\tau - \hat{L}_\tau)^{(1-\alpha)} \right\} \quad , \tag{6}$$

for a parameter $\alpha \in [0, 1]$. The α parameter measures the relative bargaining power of the two agents. When $\alpha = 1$, the equity-holder obtains the entire surplus whereas when $\alpha = 0$ all the surplus goes to the lender.

Nash's axiomatic approach to bargaining is generally applied in static models. Our dynamic setting potentially introduces additional complications, however. In equation (6), we assume that bargaining occurs at some time, τ. When is τ? In fact (and perhaps surprisingly), it will turn out that the maximizing arguments, (p_r, b^*), are independent of p_τ and hence of time.

The first order conditions to the maximization in equation (6) are:

$$\begin{cases} \partial V/\partial p_r \; \alpha/(V - \hat{V}) & + & \partial L/\partial p_r \; (1 - \alpha)/(L - \hat{L}) & = & 0 \\ \partial V/\partial b^* \; \alpha/(V - \hat{V}) & + & \partial L/\partial b^* \; (1 - \alpha)/(L - \hat{L}) & = & 0 \end{cases} . \tag{7}$$

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[2]The most important of his axioms is Pareto efficiency.

Rearranging these, one obtains:

$$\begin{cases} \partial V/\partial p_r \ / \ \partial V/\partial b^* &= \ \partial L/\partial p_r \ / \ \partial L/\partial b^* \\ \partial V/\partial b^* \ \alpha/(V - \hat{V}) &= \ - \ \partial L/\partial b^* \ (1-\alpha)/(L-\hat{L}) \ . \end{cases} \quad (8)$$

We refer to the first of the equations in (8) as the Marginal Rate of Substitution Condition (MRSC) and to the second as the Bargaining Condition (BC). Taking derivatives of V and L, substituting in the MRSC, and rearranging, one obtains:

$$\frac{\xi - 1}{r - \mu_V} p_r \ = \ \frac{\lambda_V}{\lambda_V - 1} \frac{b^* - \xi_0}{r} - \frac{\lambda_L}{\lambda_V - 1} \left(\frac{b^*}{r} - k \right) \ . \quad (9)$$

The possibility of restructuring the firm effectively creates a surplus over which the two agents bargain. Since either the equity-holder or lender may veto restructuring, each must receive a value no less than that they would obtain with no restructuring. If $b^*/r = k$, the lender gets none of the surplus. Substituting for b^* in equation (9), one obtains:

$$p_r \ = \ \frac{r - \mu_V}{\xi - 1} \frac{\lambda_V}{\lambda_V - 1} \left(k - \frac{\xi_0}{r} \right) \ \equiv \ p_r^{(V)} \ . \quad (10)$$

One may show that this is the optimal trigger that the firm would choose if were operated by equity-holders on a pure equity basis.

Alternatively, if equity-holders enjoy none of the surplus created by the possibility of restructuring, then

$$\frac{(\xi - 1)p_r}{r - \mu_V} \ = \ \frac{b^* - \xi_0}{r} \ . \quad (11)$$

Solving for b^* and substituting in the MRSC, one obtains:

$$p_r \ = \ \frac{r - \mu_V}{\xi - 1} \frac{\lambda_L}{\lambda_L - 1} \left(k - \frac{\xi_0}{r} \right) \ \equiv \ p_r^{(L)} \ . \quad (12)$$

This is the trigger which the firm would choose if it were operated on a pure equity basis by the lender. Substituting back for p_r in equation (11), one obtains the highest b^* which that the lender can obtain consistent with the equity-holder being no worse off than in the absence of restructuring which we denote $\overline{b}$:

$$\overline{b} \ = \ \frac{\lambda_L}{\lambda_L - 1} k \ + \ \frac{1}{\lambda_L - 1} \frac{\xi_0}{r} \ . \quad (13)$$

Since the lender is more risk averse than the equity-holder, $\mu_L < \mu_V$ (see the Appendix). It follows that $\lambda_L > \lambda_V$ and therefore $p_r^{(V)} > p_r^{(L)}$.

One may summarize the above results as:

Proposition 2 *Feasible restructuring triggers, p_r, and supplementary coupon flows, b^*, lie in the ranges:*

$$p_r^{(L)} \equiv \frac{\lambda_L}{\lambda_L - 1} \frac{r - \mu_V}{\xi - 1} \left[k - \frac{\xi_0}{r} \right] \leq p_r \leq \frac{\lambda_V}{\lambda_V - 1} \frac{r - \mu_V}{\xi - 1} \left[k - \frac{\xi_0}{r} \right] \equiv p_r^{(V)} \quad (14)$$

$$\underline{b} \equiv rk \leq b^* \leq \frac{\lambda_L}{\lambda_L - 1} k + \frac{1}{\lambda_L - 1} \frac{\xi_0}{r} \equiv \overline{b}. \quad (15)$$

Geometrically, the (p_r, b^*) pairs consistent with the MRSC comprise a curve in p_r–b^* space. The set of feasible pairs (i.e., points consistent with the inequalities in Proposition 2) and satisfying the MRSC are shown in Figure 1. From equation (9), it is obvious that the MRSC schedule forms a straight line. One may easily show that this line is downward-sloping.

If equity-holder and lender possess the same degree of risk aversion so that $\lambda_V = \lambda_L = \lambda$, then the MRSC simplifies and one may show that p_r equals the expressions in equation (12) and (10). Geometrically, if $\lambda_V = \lambda_L$, the MRSC schedule shown in Figure 1 becomes horizontal. Equity-holder and lender may then bargain about the level of b^* but there is no interaction with the trigger for rescheduling p_r since both agree what the optimal trigger should be.

2.3 Analysis of (p_r, b^*) Pairs on the MRSC

Before deriving the equilibrium pairs, (p_r, b^*), it is important to understand better some properties of points on the MRSC schedule. To start with, suppose there exists an equilibrium pair, (p_r, b^*). Consider the maximum values that the lender and equity-holder could obtain (denoted $L^*(p)$ and $V^*(p)$ respectively) by making offers which are *acceptable* to the other agent at levels of the state variable p_t higher than the equilibrium trigger p_r. Clearly, for an offer to be acceptable, the other agent must receive a value which is no less than they would obtain under the equilibrium pair (p_r, b^*). Thus, the maximum value that each agent may extract from an early, acceptable offer is the total value of the firm if the restructuring occurs immediately minus what the other agent would have got under the equilibrium pair, (p_r, b^*).

Let V_t^* and L_t^* denote the maximum value that the equity-holder and the lender can extract by making an acceptable early offer at time t. By the arguments of the
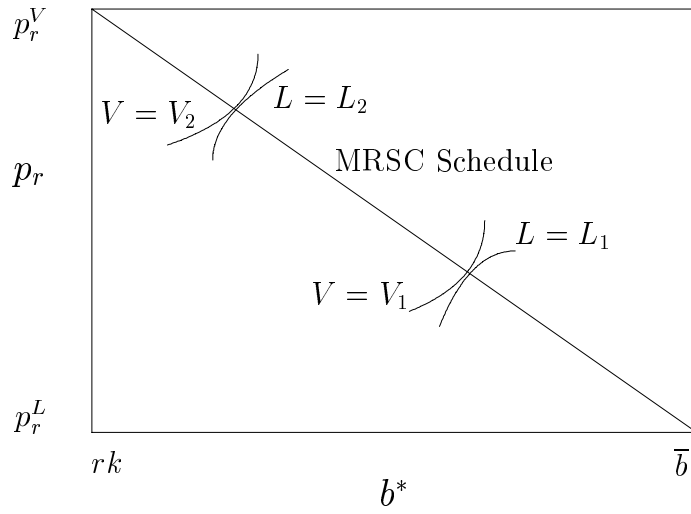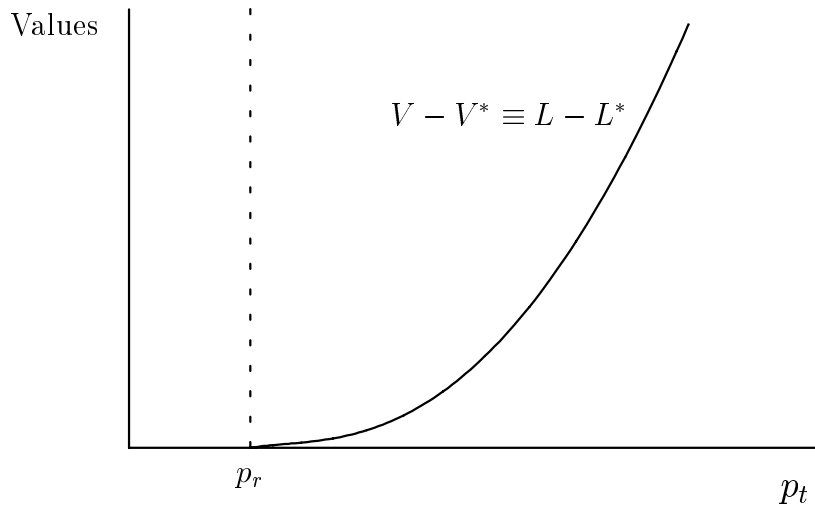
Figure 1: FEASIBLE (p_r, b^*) PAIRS

Figure 2: VALUES LESS 'EARLY EXERCISE' PAYOFFS

last paragraph, V_t^* and L_t^* then equal:

$$V^*(p) = \frac{\xi p}{r - \mu_V} + \frac{\xi_0 - w}{r} - k - \frac{b}{r} - \left[\frac{b^*}{r} - k\right]\left(\frac{p}{p_r}\right)^{\lambda_L} \tag{16}$$

$$L^*(p) = \frac{\xi p}{r - \mu_V} + \frac{\xi_0 - w}{r} - k - \frac{p}{r - \mu_L} + \frac{w + b}{r} -$$
$$\left[\frac{(\xi - 1)p_r}{r - \mu_L} - \frac{b^* - \xi_0}{r}\right]\left(\frac{p}{p_r}\right)^{\lambda_V}. \tag{17}$$

By analyzing $V - V^*$ and $L - L^*$, (where V, V^*, L, and L^* are calculated for the equilibrium pair (p_r, b^*)) we can check whether either agent has an incentive to deviate from an equilibrium by making an acceptable, early offer. In the Appendix, we analyze the first and second derivatives of $V - V^*$ and $L - L^*$, and show that the geometry of the solutions is as shown in Figure 2. In other words, V and L lie everywhere above V^* and L^* for all $p_t > p_r$ and coincide with V^* and L^* only when $p_t = p_r$. This directly implies the following proposition.

Proposition 3 *For any equilibrium pair, (p_r, b^*), which satisfies the Marginal Rate of Substitution Condition, neither equity-holder nor lender will wish to make an acceptable offer to the other agent at a $p_t > p_r$.*

2.4   Bargaining Solutions

To derive the full equilibrium, we must solve the first order conditions given in equation (8). Substituting for the derivatives of V and L in the second first order condition, we obtain the simple linear relation between p_r and b^*:

$$(1 - \alpha)\left[\frac{(\xi - 1)p_r}{r - \mu_V} - \frac{b^* - \xi_0}{r}\right] = \alpha\left[\frac{b^*}{r} - k\right]. \tag{18}$$

Inspection of equations (9) and (18) reveals that both the MRSC and the BC schedules are independent of p and hence stationary over time. Combining the MRSC and the BC, we obtain a bivariate linear system in p_r and b^*. Inverting this yields the proposition:
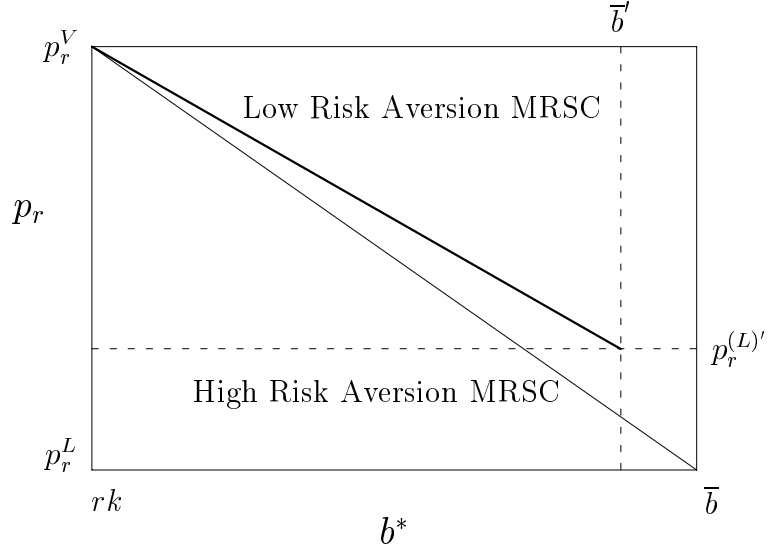
Figure 3: DECREASE IN LENDER RISK AVERSION

Proposition 4 *The equilibrium restructuring trigger, p_r, and supplemental coupon flow, b^*, are:*

$$\begin{bmatrix} p_r \\ b^* \end{bmatrix} = \frac{1}{\Delta} \begin{bmatrix} \frac{\lambda_V - \lambda_L}{r} & \frac{1}{r} \\ \frac{(1-\xi)(1-\lambda_V)}{r-\mu_V} & \frac{(\xi-1)(1-\alpha)}{r-\mu_V} \end{bmatrix} \begin{bmatrix} -\alpha k - (1-\alpha)\frac{\xi_0}{r} \\ \frac{\xi_0 \lambda_V}{r} - \lambda_L k \end{bmatrix} \qquad (19)$$

$$\text{where} \quad \Delta \equiv \frac{(\xi-1)(1-\alpha)}{r-\mu_V}\frac{\lambda_V - \lambda_L}{r} + \frac{(\xi-1)(1-\lambda_V)}{r-\mu_V}\frac{1}{r} \quad . \qquad (20)$$

3 Loan Sales and Credit Derivatives

3.1 Comparative Statics

In this section, we analyze comparative static properties of the model and use these to infer the model's implications for the economic impact of loan sales and credit derivative transactions upon corporate restructurings. The two comparative statics in which we are especially interested are the effects on the restructuring trigger, p_r, and the supplementary coupon, b^*, of *changes in (a) the relative bargaining power*

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and (b) the risk aversion of the lender. These are relatively easy to analyze since changes in lender risk aversion shift the MRSC schedule but not the BC schedule and changes in lender bargaining power generate shifts in the the BC schedule but not the MRSC schedule.

Proposition 5 *Either (a) increases in lender bargaining power (when the lender obtains less than the entire surplus) or (b) increases in lender risk aversion lead to a postponement of restructuring (i.e., p_r falls), and a rise in the coupon lenders earn after restructuring (i.e., b^* rises).*

The results are quite intuitive. Increasing lender bargaining shifts the equilibrium along the MRSC schedule towards the point of maximum lender bargaining power. The restructuring trigger moves closer to the relatively low trigger favoured by the lender and the supplementary coupon the lender earns post-restructuring increases. Holding bargaining power constant and increasing lender risk aversion again pushes the equilibrium away from the equity-holder's favoured combination $(p_r^{(V)}, \underline{b})$, resulting again in lower p_r and higher b^*.

3.2   Multiple Lenders

Thus far, we have presented an analysis of bargaining between an equity-holder and a given lender. What happens if the lender holding the debt can sell his claim to another lender possibly with a different degree of risk aversion and/or a different level of bargaining power vis-à-vis the equity-holder? If (p_{ri}, b_i^*) for $i = 1, 2$ are the restructuring prices and supplementary coupon flows that lenders 1 and 2 could extract from the equity-holder, then we may think of the lenders as bargaining between each other over the *additional* surplus that the second lender could earn if the first sells him the debt. If W_τ is the sale price of the debt agreed by the two lenders at time τ, then the Nash bargaining solution for the negotiation between the two lenders is:

$$W_\tau = \text{argmax}_W \left\{ \left(W - \left[\frac{b_1^*}{r} - k \right] \left(\frac{p_\tau}{p_{r1}} \right)^{\lambda_{L1}} \right)^\beta \left(\left[\frac{b_2^*}{r} - k \right] \left(\frac{p_\tau}{p_{r2}} \right)^{\lambda_{L2}} - W \right)^{1-\beta} \right\},$$

(21)

where the λ_{Li} differ across the lenders since they may have different degrees of risk aversion.

The ability of a lender to sell his loan to another has important implications. To see this, suppose that lenders possess the same degree of risk aversion but that some specialist lenders can extract significantly more surplus from equity-holders than others. An example of such specialists is the so-called vulture funds mentioned in the Introduction. If specialists are few in number and have limited resources, then one would expect to observe the bulk of loans being made by ordinary lenders but that when firms experience financial distress, ownership of their loans would be transfered to a specialist.

What consequences does the marketability of loans have for valuation and the welfare of the parties involved? If the initial loan market is perfectly competitive and k_0 is the amount of the initial capital injection required to set the firm up (over and above any contribution by the equity-holder), then if the loan is not marketable, the coupon flow b will be set to satisfy

$$
\frac{b}{r} \;\; = \;\; k_0 \;-\; \left(\frac{p_0}{p_{r1}} \right)^{\lambda_{L1}} \left[\frac{b_1^*}{r} - k \right] \;\;.
\tag{22}
$$

If the loan can be sold to another specialist lender and the initial lender can extract at least some fraction of the extra surplus created by the specialist's superior bargaining power vis-à-vis the equity-holder, the first lender will accept a smaller coupon flow when the loan is first made. Thus, as one might intuitively expect, liquidity or marketability of a loan reduces the interest rate the borrower has to pay when the loan is initially floated.

The important result of this section, however, is that the equity-holder may be worse off in an ex ante sense if the loan is marketable. By 'ex ante', we mean that the total value that the equity-holder can extract when the firm is initially set up may be reduced. Clearly, after the loan is extended, equity-holders will be in a worse position if the bargaining power of the lender they face increases. It is less obvious, however, that they may be ex ante worse off if a loan is marketable and hence may be transfered to a lender with high bargaining power. We state our result as follows:

Proposition 6 *The value of the equity-holder's claim may be lower in a competitive*

loan market if the firm's loan is marketable. This is likely to be true if specialist lenders have a high degree of bargaining power against other lenders.

We prove the result through an example. Suppose that the specialist lender has complete bargaining power vis-à-vis other lenders while the equity-holder has enough bargaining power against non-specialist lenders to extract some portion of the surplus. In this case, if the debt is non-marketable, the equity-holder will enjoy some of the surplus, whereas if the debt is marketable, a specialist will extract all the surplus from the equity-holder. The equity-holder will not be able to obtain better terms in the original debt contract when the debt is marketable since the original debt holder is no better off that in the non-marketable debt case.

The basic intuition for the result is as follows. Marketed or liquid loans are inefficient from the point of view of the original parties to the loan contract because the surplus that is extracted by the specialist lender or vulture fund is a debt-weight loss to the other agents. The first lender will nevertheless have an incentive in involve the vulture fund because by so doing it can improve its own situation ex post. Contractually ruling out loan sales would lead to more efficient outcomes from the collective point of view of the original lender and the equity-holder.

3.3   Risk Aversion, Loan Sales and Credit Derivatives

So far, we have concentrated on trades between different lenders designed to exploit differences in bargaining power versus equity-holders in out-of-bankruptcy restructurings. When a firm comes close to restructuring, however, the riskiness of debt values increase since the time until restructuring occurs is random. (In a more complicated model which allowed the gains from restructuring to be random, the riskiness of debt payoffs might be further increased as restructuring approaches.) If there exist lenders which are less risk averse than the original lender, scope will exist for loan sales which create value by transfering the risky exposure into less risk averse hands.

The comparative static results of Proposition 5 imply that equity-holders will be better off on an ex post basis[3] if such a transfer occurs since it leads the equilibrium

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[3]By 'benefit ex post', we mean that agents are better off at the time the transaction occurs.

pair (p_r, b^*) to shift up the MRSC schedule towards $(p_r^{(V)}, \underline{b})$, increasing equity value. At the same time, if lenders are willing to engage in the transaction, both initial and new lenders will benefit ex post from the transaction.

An important feature of our model is that it allows one to distinguish between (i) exposure to a particular credit-sensitive cash flow and (ii) being able to negotiate or bargain over the terms of that cash flow. Some typical credit derivative contracts, such as total return swaps, transfer to other agents exposure to credit sensitive cash-flows. Usually, they also transfer negotiating rights in post-bankruptcy settlements because, when bankruptcy is declared, the holder of the credit derivative becomes the beneficial owner of the loan or other security involved. However, many negotiations between distressed borrowers and lenders occur *outside* formal bankruptcy proceedings. In these cases, if the original lender has, say, a total return swap on the loan with some other investor, the credit exposure and the right to bargain, for example, on the terms of a restructuring are in different hands.

By allowing agents to separate credit exposure from responsibility for bargaining, credit derivatives enhance the likelihood that a given initial lender will be able to enhance value by finding counter-parties which can take over the credit exposure and the bargaining role. As should be clear from our discussion above, transactions motivated by the desire to extract more from equity-holders through tougher bargaining may impair efficiency while those motivated by the aim of tranfering risk into less risk averse hands are likely to enhance efficiency.

4   Conclusion

This paper has examined the effects of loan sales and certain credit derivative transactions on corporate restructuring using a model of Nash bargaining between an equity-holder and lenders. Our main conclusions are that loan sales which place loans in the hands of lenders specialized in extracting value from equity-holders may impair economic efficiency. The ex post incentives of lenders to perform such loan sales may mean that we observe such transactions in actual markets, however.

Transactions, involving either loan sales or credit derivatives, which lead to the

transferal of loans into the hands of less risk-averse lenders are likely to increase efficiency, however, making all agents better off even in an ex post sense. The fact that credit derivatives enable lenders to split credit exposures from the bargaining role increases the scope for transactions that seek to exploit differences either in bargaining power or risk aversion. Hence, outcomes, whether they involve increases or decreases in economic efficiency, are likely to be more extreme with credit derivatives.

APPENDIX

Proof of Proposition 1:

Prior to restructuring, V and L satisfy differential equations of the form:

$$rV = p - w - b + \frac{\partial V}{\partial p}\mu_V p + \frac{\partial^2 V}{\partial p^2}\frac{\sigma^2}{2}p^2 , \qquad (23)$$

$$rL = b + \frac{\partial L}{\partial p}\mu_L p + \frac{\partial^2 L}{\partial p^2}\frac{\sigma^2}{2}p^2 . \qquad (24)$$

Solving these using the value matching and no-bubbles conditions: $V(p_r) = \xi p_r/(r - \mu) - (w + b + b^*)/r$, $L(p_r) = (b + b^*)/r$, $\lim_{p\uparrow\infty} V(p) = p/(r - \mu_V) - (w + b)/r$, $\lim_{p\uparrow\infty} L(p) = b/r$ yields the solution shown. □

Proof of Proposition 2:

Proof is sketched in the text. □

Proof of Proposition 3:

Consider the first derivative of $V - V^*$:

$$V(p|p_r, b^*) - V^*(p|p_r, b^*) = \frac{(1 - \xi)p)}{r - \mu_V} - \frac{(1 - \xi)p_r}{r - \mu_V}\left(\frac{p}{p_r}\right)^{\lambda_V} - \frac{\xi_0}{r}\left[1 - \left(\frac{p}{p_r}\right)^{\lambda_V}\right]$$

$$+ \frac{b^*}{r}\left[\left(\frac{p}{p_r}\right)^{\lambda_L} - \left(\frac{p}{p_r}\right)^{\lambda_L}\right] + k\left[1 - \left(\frac{p}{p_r}\right)^{\lambda_L}\right] \qquad (25)$$

which has as first derivative evaluated at p_r:

$$\frac{d}{dp}(V - V^*)\Big|_{p=p_r} = \frac{1}{p_r}\left\{\frac{(1 - \xi)p_r}{r - \mu_V}(1 - \lambda_V) + \lambda_V\frac{\xi_0}{r} - \lambda_L k + (\lambda_L - \lambda_V)\frac{b^*}{r}\right\} . \qquad (26)$$

Substituting for $(\lambda_V - \lambda_L)b^*$ using the MRSC, one obtains: $d(V - V^*)/dp|_{p=p_r} = 0$. Deriving the second derivative of $V - V^*$, one obtains:

$$\frac{d^2}{dp^2}(V - V^*) = \frac{1}{p^2}\left\{\lambda_V(\lambda_V - 1)\left[\frac{(\xi - 1)p_r}{r - \mu_V} + \frac{\xi_0 - b^*}{r}\right]\left(\frac{p}{p_r}\right)^{\lambda_V} + \right.$$

$$\left. \lambda_L(\lambda_L - 1)\left[\frac{b^*}{r} - k\right]\left(\frac{p}{p_r}\right)^{\lambda_L} .\right\} \qquad (27)$$

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The square-bracketed terms in (27) are non-negative (since otherwise either the lender or the equity-holder would receive less than zero surplus). Since $\lambda_V, \lambda_L > 1$, it follows that $d^2(V - V^*)/dp^2 > 0$ for all $p \geq p_r$. But it must then be true that $V > V^*$ for all $p < p_r$ for (p_r, b^*) pairs on the MRSC. One may show that $V - V^* = L - L^*$, so the same result applies for L and L^*, i.e., $L > L^*$ for all $p < p_r$ for all MRSC pairs, (p_r, b^*). Figure 2 shows the form of the V and L solutions one obtains for MRSC pairs. V and L are everywhere at least as great as V^* and L^*. At $p = p_r$, $V = V^*$ and $L = L^*$ and $d(V - V^*)/dp = d(L - L^*)/dp = 0$. $\square$

Proof of Proposition 4:

Proof is sketched in the text. $\square$

Proof of Proposition 5:

First, consider the effects of an increase in lender bargaining power. The BC schedule may be written as:

$$p_r = \frac{r - \mu_V}{(\xi - 1)(1 - \alpha)} \left[\frac{b^*}{r} - k \right] + \frac{r - \mu_V}{(\xi - 1)} \left[k - \frac{\xi_0}{r} \right] . \tag{28}$$

Clearly, this curve is downward-sloping in b^*–p_r space. When $b^* = \underline{b} \equiv rk$, p_r equals the point, call it $p_r^{(M)}$ at which agents would restructure the firm if there were no option value, i.e., at the break-even or 'Marshallian' trigger point for restructuring. Since $p_r^{(M)}$ is clearly greater than $p_r^{(V)}$, if the BC and the MRSC schedules intersect in the interval $[\underline{b}, \overline{b}]$, the BC schedule must cut the MRSC schedule from above. If they do not intersect, the equilibrium is $(p_r^{(L)}, \overline{b})$.

Increasing $1 - \alpha$ leads the BC schedule to swivel in an anti-clockwise direction around the point $(p_r^{(M)}, \underline{b})$. If the initial intersection of the two curves lies above $(p_r^{(L)}, \overline{b})$, then b^* will increase and p_r will fall. Otherwise, they will stay the same.

Now, consider the impact on the MRSC schedule of an decrease in lender risk aversion and a consequent rise in μ_L. Changes in μ_L do not affect the BC schedule. Focus initially on the quantities which define the four corners of the feasible (p_r, b^*) pairs shown in Figure 1, namely $p_r^{(L)}$, $p_r^{(V)}$, $\underline{b}$ and $\overline{b}$. Raising μ_L leads to an increase in $p_r^{(L)}$ since as we noted above higher μ_L induces a rise in $|\lambda_L|/(|\lambda_L| + 1)$. On the other

hand, $p_r^{(V)}$ is clearly unaffected as is $\underline{b} \equiv rk$. Lastly, $\overline{b}$ falls since $|\lambda_L|/(|\lambda_L| + 1)$ rises and $\xi_0/r > k$ since otherwise restructuring would be inefficient in the first place.

Writing the MRSC schedule as:

$$\left[\frac{(\xi - 1)p_r}{r - \mu_V}(1 - \lambda_V) - \left(\frac{\xi_0 - b^*}{r}\right)\lambda_V\right]\left[\frac{b^*}{r} - k\right]^{-1} = \lambda_L \qquad (29)$$

one may see that when λ_L changes, the MRSC schedule swivels anti-clockwise around the point $(p_r^{(V)}, \underline{b})$. Figure 3 shows how the new MRSC schedule runs from $(p_r^{(V)}, rk)$ to $(p_r^{(L)'}, \overline{b}')$ where $p_r^{(L)'}$ is higher than the original $p_r^{(L)}$ and $\overline{b}'$ is lower than the original $\overline{b}$. Whether the initial equilibrium pair (p_r, b^*) lies strictly between $(p_r^{(V)}, \underline{b})$ and $(p_r^{(L)}, \overline{b})$, or whether the initial $(p_r, b^*) = (p_r^{(L)}, \overline{b})$, p_r falls and b^* rises as μ_L increases. $\square$

Proof of Proposition 6:

Proof is sketched in the text. $\square$

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