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RAIDERS, JUNK BONDS, AND RISK

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Abstract

This paper examines the effect of financing on risk in a disciplinary takeover. The famous Modigliani-Miller theorem on the irrelevance of the firm's financial structure assumes agents possess full information about the activities of the firm. We assume only insiders have full knowledge of the activities of the firm. Asymmetric information creates the opportunity for a rational disciplinary takeover and makes the debt-to-equity ratio and the operating strategy endogenous and interdependent.

The buyers of junk bonds financing a takeover precommit to a risk premium and then the raider chooses an operating strategy. The sequential decision pattern induces a game between the raider and the lenders with a second best rational expectations equilibrium. The raider has an incentive to precommit, but no feasible instrument. Instead he sends a credible signal to lenders by increasing the equity stake in the takeover.



Introduction

In the past decade the value of transactions from takeovers, acquisitions, and mergers has grown rapidly relative to the value of all equities. According to Morck, Shleifer, and Vishny (1987), forty of the Fortune 500 firms were the target of hostile takeover attempts between 1981 and 1985. Federal Reserve officials, including ex-chairman Paul Volcker, and various Wall Street luminaries voiced concern that "junk" bond financing of takeovers creates potential financial instability. In January of 1986 the Fed moved to block Mesa's run on Unocal. The Fed ruled that margin requirements apply to bonds issued by shell corporations to finance takeovers.

This paper examines the effect of a "disciplinary" takeover on the probability distribution of a firm's earnings and whether the form of financing, debt versus equity, affects the earnings distribution. Any financial restructuring that increases the debt-to-equity ratio increases the default risk of the debt. But the justly famous Modigliani-Miller theorem demonstrates that a financial restructuring does not change agents' opportunity sets or the market value of the firm.

The Modigliani-Miller theorem rests on two assumptions: (i) perfect capital markets and (ii) agents having complete knowledge of the activities of the firm. In this paper we relax the assumption that all agents have complete knowledge of the firm's activities. The probability distribution of a firm's earnings depends on the management's operating strategy. Only insiders know the operating strategy. Outsiders can neither observe nor verify the operating strategy. Excessively risky policies (policies that lead to a very diffuse distribution

of earnings) or excessively conservative policies (policies that lead to a very concentrated distribution) reduce the potential value of the firm.

The asymmetric information creates the opportunity for a rational profitable takeover by an insider when management pursues an inefficient operating strategy. To capture the rent on his inside information the raider must take over the firm and change the operating strategy. To finance the takeover the raider must issue bonds and/or cut in equity partners. Asymmetric information and moral hazard create a game situation between the raider and the lenders. In a Nash equilibrium it is optimal for the raider to choose an operating strategy that is riskier than the one that would maximize the market value of the firm and to choose some bond financing. The bonds carry a "junk" bond risk premium that correctly prices the riskier operating strategy.

Debt usually leads to a conflict of interest between the lenders and the borrower. A riskier distribution of payoffs can increase the expected value of the payoff to the borrower. Black and Scholes (1973) labeled this the "limited liability option" in their classic option pricing paper. In our model the credit market is characterized by asymmetric information and moral hazard. The lenders (bond buyers) precommit to an interest rate and then the raider chooses the operating strategy. In a Nash equilibrium the lenders charge a risk premium to price the "limited liability option". The risk premium reduces the raider's potential gain so he has an incentive to convince lenders he will choose a less risky operating strategy, but he has no credible precommit instrument. The Nash equilibrium for debt financing is analogous

to the time-inconsistent policy first illustrated by Kydland and Prescott (1977) and Calvo (1978) in the macroeconomic literature.

The raider can send a credible signal to bond buyers by adding equity partners (increasing the collateral). Jaffee and Russell (1976), Leland and Pyle (1977), Milde and Riley (1988) and others analyze models where a borrower's actions signal project quality. Chan and Thakor (1987) show that in some cases unlimited collateral can eliminate the welfare loss from asymmetric information and moral hazard. A larger equity stake in the takeover reduces the value of the limited liability option and the risk premium on the debt. But the raider must share the gains from signalling **and the rent on his inside information** with the equity partners. In equilibrium the raider balances the gains from signalling against the loss from diluting his share.

The takeover leads to some improvement in welfare in the sense that the operating strategy moves toward the first best solution. But the asymmetric information which allows management to follow an inefficient operating strategy and makes a profitable takeover by insiders possible, also prevents a one-step move to the first best equilibrium.

Section 1: The Problem

Informational asymmetries are responsible for the results in this paper. The information structure laid out in this section is very stylized, but it captures the essential elements for a rational takeover based on asymmetric information.

1.1 Asset Valuation and Notation

Ross (1976, 1978, 1987), and Harrison and Kreps (1979), in a sequence of important papers show that any asset can be valued as a shadow price weighted sum of payoffs. And they show that a simple transformation of the shadow prices induces a probability distribution so that the market value of the asset equals the discounted "certainty equivalent" of the payoff stream.

Suppose a firm generates a random nonnegative bounded payoff, P , ($0 \leq P \leq b$) with the cumulative probability distribution $G(P)$ and the density function $g(P)$. Using the popular consumption capital-asset-pricing valuation equation, e.g., Lucas (1978), Breeden (1979), the competitive market value of the firm is,

$$1.1.1 \quad MV(P) = E[P\{U_c(c(P))/U_c(c(P_0))\}] = \int_0^b Pq(P)dP,$$

where, $q(P) \equiv \{U_c(c(P))/U_c(c(P_0))\}g(P)$,

the shadow price weighted integral of payoffs. The shadow prices, $q(P)$, are the marginal rates of substitution for consumption, $\{U_c(c(P))/U_c(c(P_0))\}$, between the current state, P_0 , and

the random payoff state, P , weighted by the probability, $g(P)$.¹

1.2 Certainty Equivalence Asset Valuation

Following Ross (e.g. 1987, p. 374) we can use the shadow prices and the risk free rate to define a probability distribution. Define the risk free return factor, RF , as,

$$1.2.1 \quad RF = 1 / \int_0^b q(P) dP,$$

the reciprocal of the integral of the shadow prices. The risk free rate is the return on a certain payoff.

The shadow prices are all positive² so normalizing the shadow prices by the risk free return factor induces a "probability distribution,"

$$1.2.2 \quad f(P) \equiv RFq(P) = RF\{U_c(c(P))/U_c(c(P_0))\}g(P) > 0, \text{ and,}$$

$$\int_0^b f(P) dP = 1.$$

Let $F(P)$ denote the induced cumulative probability distribution.

¹ If markets are complete the shadow prices are the Arrow-Debreu contingent-claim prices.

² Ross and Harrison and Kreps show that the absence of arbitrage profit opportunities implies that the shadow prices are positive. Using the utility based shadow price from the consumption capital-asset pricing model free disposal implies the shadow prices are positive.

Substituting for the shadow prices in the asset valuation formulas gives the "certainty equivalence" valuation of the random payoff. The market value of the firm equals,

$$1.2.3 \quad MV(P) = RF^{-1}EP$$

$$= RF^{-1} \int_0^b Pf(P)dP = RF^{-1} \int_0^b [1 - F(P)]dP.^3$$

Financial assets are claims to payoffs drawn from a portion of the distribution. Let $V(P)$ denote the competitive market value of equity holders' claims on the firm,

$$1.2.4 \quad V(P) = RF^{-1} \int_R^b \{P - R\}f(P)dP = RF^{-1} \int_R^b [1 - F(P)]dP.$$

where R is the debt service payment. Equity holders receive the maximum of net earnings, $P - R$, or zero if the firm defaults. Let $B(P)$ denote the competitive market value of bond holders' claims on the firm,

$$1.1.3 \quad B(P) = RF^{-1} \int_0^R Pf(P)dP + R \int_R^b f(P)dP = RF^{-1} \int_0^R [1 - F(P)]dP.$$

Bond holders receive the minimum of the fixed debt service payment, R , or residual value of the firm, $P < R$. The market value of the firm equals the value of debt plus equity, $MV(P) = B(P) + V(P)$.

The induced probabilities, $f(P)$, do **not** equal the probabilities of the payoffs, $g(P)$, unless the agent is risk neutral. We will use a bolded E to denote the "certainty equivalent" value of the payoff taken with respect to the induced probability distribution.

³ Using the change of variables $u = [1-F(P)]$ and $v = P$ and integrating by parts $udv = uv \Big|_0^b - \int vdu$ gives the alternative formula for the expectation of a nonnegative random variable $EP = \int_0^b [1-F(P)]dP.$

1.3 Information Structure

The Modigliani-Miller theorem rests on the assumption that all agents have complete knowledge of the activities of the firm. We replace this stringent assumption with the assumption that only insiders have complete knowledge of the activities of the firm and that outsiders never know exactly what decisions led to the observed payoff patterns.

The random payoff depends on the firm's technology, and management's decisions and effort. Assume that the set of feasible stochastic payoffs are described by the probability densities, $g(P,x)$, indexed by x . Management chooses a particular payoff distribution by selecting an operating strategy from the bounded set X , $x \in X$. Outsiders cannot observe the operating strategy. Only insiders know the operating strategy, x_0 .

Stock holders and debt holders are outsiders. The management are insiders, but maximizing the market value of the firm is not necessarily in their interest. Management can follow an inefficient operating strategy that diverts some of the payoffs into perks. We assume that markets are not complete enough for outsiders to infer the operating strategy from market prices, and that outsiders can't verify the operating strategy ex post from the realizations. The assumption that outsiders can neither observe, infer, nor verify the operating strategy is essential for the results in this paper.⁴ The assumption is also realistic. If profitable takeover opportunities exist because the management does not act in the share holders' interest (the so-called agency problem), then either the owners must not be able to observe

⁴ It is also an explicit, or implicit, assumption in any model where asymmetric information has important consequences, e.g., agency cost and efficiency wage models. If outsiders can infer inside information then it is not inside information. If outsiders can verify inside information ex post then state contingent contracts are feasible.

the inefficiency, or some corporate control problem prevents them from firing the rascals. We assume stock holders can fire the rascals, they just can't tell if they are rascals.

"Undervaluation" of the firm's potential earnings by outsiders provides an opportunity for a profitable takeover by the raider who is an insider. The raider knows there are alternative operating strategies, $x' \in X$, so that the discounted certainty equivalent of the payoff, $RF^{-1}EP(x') > MV_0 = RF^{-1}EP(x_0)$, exceeds the current market value of the firm.

1.4 The Raider's Problem

The raider's objective is to maximize the value of the payoff from his inside information. He can't sell the information to the existing owners since the operating strategy is unobservable and nonverifiable. To capitalize the rent on his inside information he must take over the firm. Assume he makes an offer, MV^0 , that exceeds the current market value of the firm and the owners accept.⁵ Also suppose the raider has limited personal resources, say $C < MV^0$, to purchase the firm. The raider's problem is to select an operating strategy and a financing package that maximize the certainty equivalent value of his payoff.

⁵ Of course the tender offer conveys information. We ignore the complicated problems associated with making, or accepting, an offer, e.g. see Milgrom and Stokey (1987).

Section 2: The Operating Strategy

In this section we assume the raider relies on all debt financing, $D = MV^0 - C$, and only consider the endogenous operating strategy. Risky strategies devalue bonds and, other things equal, the devaluation accrues to the equity holders. Since the raider (borrower) can influence the distribution of payoffs with his choice of an operating strategy a moral hazard exists which induces a game between the borrower and the lenders. A Nash equilibrium of the game has a second-best solution. The raider always chooses an operating strategy that is riskier than the strategy that maximizes the market value of the firm. A rational lender charges a risk premium for the riskier strategy so the raider has an incentive to precommit to a less risky strategy.

2.1 The Conflict of Interest

The raider (borrower) only values payoffs drawn from the upper tail of the distribution, $V(x)$, and the lender only values payoffs drawn from the lower tail,

$$2.1 \quad RF^{-1}EP(x) = RF^{-1} \int_0^R [1 - F(P,x)]dP + RF^{-1} \int_R^b [1 - F(P,x)]dP,$$

$$MV(P(x)) = B(x) + V(x).$$

If the raider can choose a policy x , (a distribution) that shifts value from the lower tail (states where the firm defaults) to the upper tail, then he increases the "equity" value of the firm by transferring some of debt holders' wealth to the equity holders.

We define a policy $x' > x$ as riskier than the policy x if,

$$2.1.2 \quad \int_0^R F(P,x')dP > \int_0^R F(P,x)dP; \quad 0 < R < b,$$

it would reduce the market value of outstanding debt.¹ The policy x' devalues bonds by increasing the probability of default, $F(R,x') > F(R,x)$, and/or reducing the expected value

of the firm if it defaults, $\int_0^R Pf(P,x')dP < \int_0^R Pf(P,x)dP$.

We assume that there are positive but diminishing returns to risk taking and that the firm has a unique maximum value,

$$2.1.3 \quad RF^{-1}EP(x^*) = \max\{RF^{-1}EP(x)\}; x \in X,$$

at the policy x^* . Excessively risky policies $x > x^*$ or excessively conservative policies $x < x^*$ keep the value of the firm below its potential maximum. A unique maximum in the value function implies that policies, say \tilde{x} , which induce very fat tailed or very concentrated induced probability distributions, $F(P,\tilde{x})$, have a lower certainty equivalent value than more moderate policies.

Concavity in the value function comes from either technology and/or tastes. Most models of the loan market assume risk neutral agents² so the certainty equivalent value of the payoff only depends on the technology, $EP(x) = EP(x) = \int_0^b Pg(P,x)dP$. Diminishing returns to risk taking for technologies has the reasonable implication that very safe production plans such as a policy that produces a constant payoff in every state, or extremely risky production plans such as a policy that produces few very high but very unlikely payoffs, have lower expected payoffs than more moderate production plans.

¹ This is similar to the definition of risk proposed by Rothschild and Stiglitz (1970, 1971). They use equation 2.1.2 with a weak inequality and the restriction that the mean of the two random variables, $P(x')$, $P(x)$, are equal to define a mean-preserving spread.

² For example see, Stiglitz and Weiss (1981), Milde and Riley (1988), and Chan and Thankor (1987).

Concavity in the value function can also come from the utility function. The value of an asset's payoffs to an individual depends on the agent's risk preferences and mix of available assets. If the product of the marginal utility of consumption with the payoff (the shadow price times the payoff) is a concave function of the random payoff, then a mean-preserving spread in the payoff distribution, $g(P,x)$, decreases the value of the payoff.³

We do not specify a particular class of utility functions or technologies, but we assume the value function is concave. Propositions 1 and 2 hold if we restrict the analysis of risk to mean-preserving spreads, i.e., $EP = EP(x)$, $x \in X$, but the policy has no effect on the equilibrium value of the firm or on the equilibrium value of debt or equity, see the appendix.

2.2 A Nash Equilibrium

In a Nash game the players maximize their objective function conditional on their conjecture about their advisaries' action. In equilibrium the players' conjectures are correct.

In this model (and almost any realistic representations of a loan) the raider (borrower) observes the lenders' play -- the bond price, (or the loan rate), and **then** he chooses his policy, x . The sequential decision pattern makes the first best solution time inconsistent.

The raider (borrower) chooses the policy, x , to maximize the discounted expected value of the truncated payoff distribution, given the debt service charge, R . At an interior maximum the optimal policy satisfies the first-order condition,

³ See equation 1.1.1. Rothschild and Stiglitz (1971) show that some popular utility functions do not satisfy this restriction.

$$2.2.1 \quad V_x(x) = RF^{-1}EP_x(x) - B_x(x) = 0; \quad R.$$

In a rational expectations equilibrium a competitive securities market sets the risk premium (or the loan rate) on new debt issues so that,

$$2.2.2 \quad B(x) = RF^{-1} \int_0^{R(x)} [1 - F(P,x)]dP = D,$$

the market value of bonds, $B(x)$, equals the amount borrowed, D . A riskier policy $x' > x$ requires a higher risk premium, $r(x') \equiv \{R(x')/D\} - RF$ since in equilibrium,

$$2.2.3 \quad RF^{-1} \int_0^{R(x')} [1 - F(P,x')]dP = RF^{-1} \int_0^{R(x)} [1 - F(P,x)]dP = D,$$

implies that $R(x') > R(x)$. The per dollar carrying cost of the debt increases with the riskiness of the debt.

A Nash equilibrium satisfies equations 2.2.1 and 2.2.2.

Proposition 1: In equilibrium the raider chooses a riskier policy, x^N , than the policy that maximizes the value of the firm, x^* .

Proof: A riskier policy devalues bonds,

$$2.3.4 \quad B_x(x) = -RF^{-1} \int_0^R F_x(P,x)dP < 0,$$

by definition. Evaluating the raider's first order condition, equation 2.2.1, at the policy which maximizes the value of the firm shows that the devaluation accrues to the equity holder,

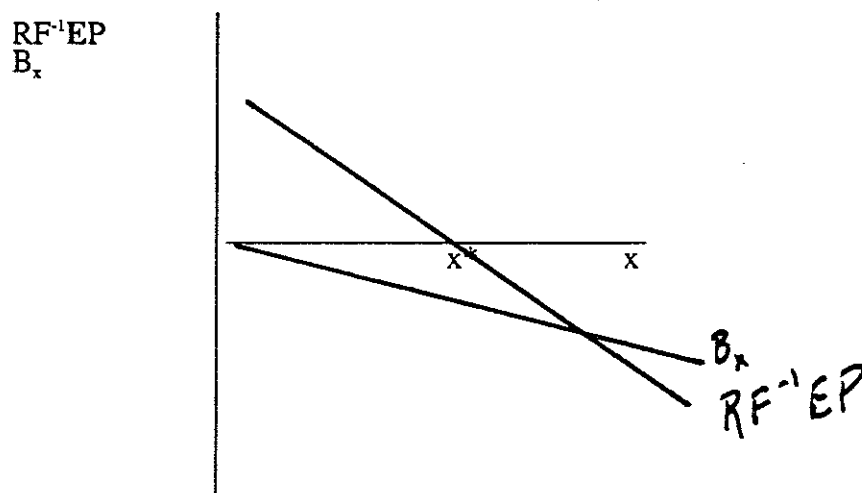
$$2.3.5 \quad V_x(x^*) = RF^{-1}EP_x(x^*) - B_x(x^*) > 0,$$

since $P_x(x^*) = 0$. Thus the borrower chooses a riskier policy, $x^N > x^*$. QED.

Comment: Black and Scholes labeled this proposition the limited liability option. Stiglitz and Weiss in theorems 1 and 3 show that a mean-preserving spread in the payoff distribution increases the borrower's expected payoff, $\int_0^b [1-G(P,x)]dP$, and decreases the lender's expected payoff.

Figure 1 illustrates the equilibrium. By assumption the certainty equivalent value of the payoff has a unique maximum. The line labeled $RF^{-1}EP_x$ illustrates the marginal change in the value of the firm with respect to the policy x . At the value maximizing policy the derivative, $EP_x(x^*)$, equals zero. The line labeled B_x shows the marginal change in the value of debt, riskier policies devalue debt. The policy that maximizes the equity value $V_x(x) = RF^{-1}EP_x(x) - B_x(x) = 0$, lies to the right of x^* .

The Maximizing Policy



Corollary: At a Nash equilibrium the raider always has an incentive to precommit to a less risky policy, $x^* \leq x \leq x_N$.

Proof: At the Nash equilibrium bond buyers (the lenders) correctly anticipate the raider's action and charge the appropriate risk premium, equation 2.2.2. So in equilibrium,

$$2.3.4 \quad B(x^N) = \int_0^{R(x^N)} [1 - F(P, x^N)] = D.$$

And in equilibrium,

$$2.3.5 \quad RF^{-1}EP(x) - D = V(x) > RF^{-1}EP(x^N) - D = V(x^N); \quad x^* \leq x \leq x^N.$$

the raider has an incentive to precommit to a less risky policy. QED.

Comment 1: This is the second best solution to the time-inconsistent problem illustrated by Kydland and Prescott and Calvo. The lender knows the borrower has an incentive to choose a riskier policy as long as the devaluation in bonds exceeds the decrease in the market value of the firm. So the lender charges the appropriate risk premium. The borrower bears the cost of the risky policy and has an incentive to precommit to a less risky policy.

In fact these perverse incentives exist in any debt contract, and many contracts contain forms of precommitment. Bond covenants are an explicit form of precommitment. Implicit precommitment contracts include reputation, long-term relationships between borrowers and lenders, and direct access to inside information (e.g., lender membership on the corporate board of directors). These forms of precommitment seem incredible in hostile takeovers. Takeovers are one-shot games. Bond covenants restrict the raider's actions and they are

costly to monitor and difficult to enforce. Banks seem to shy away from hostile takeover financing (either by preference or from regulatory pressure) but they do participate in financing leveraged buyouts when they have a relationship with the existing management.

Section 3: Financing

The raider loses some of the potential rent on his inside information when he relies on debt financing. Rational lenders expect him to exercise the "limited liability" option and charge the appropriate risk premium, $r(x^N)$. The raider could increase the value of his payoff if he could precommit to a less risky strategy and reduce the risk premium, but no credible precommitment contract exists since the operating strategy is unobservable and nonverifiable. The raider can send a credible signal to lenders by increasing the equity share in the takeover. An increased equity share signals lenders that it is in the borrowers interest to follow a less risky strategy. The raider has limited personal collateral but he can raise equity capital by cutting in partners. The increased capital signals lenders and reduces the risk premium, but the raider must share his rent with his partners. The raider's financing choice depends on the tradeoff between lower risk premiums and a loss in rent from sharing with partners.

3.1 Signalling

A reliable signal requires a known relationship between the level of debt observed by outsiders the unobservable operating policy chosen by the raider. A monotonic relation between the level of debt and the operating policy requires an additional assumption.

Proposition 2: For the class of distributions that satisfy the "single-crossing" property,

$$F(P,x') > (<) F(P,x) ; P < (>) \theta,$$

greater debt, $D' > D$, implies that a riskier policy, $x' > x$, maximizes the equity value of the firm.

Proof: The Nash policy maximizes the equity value of the firm given the debt service charge R ,

$$3.1.1 \quad V(x^N, R) = RF^{-1} \int_R^b [1 - F(P, x^N)] dP > V(x, R).$$

Now consider an increase in the level of debt, $D' > D$, and the associated debt service charge, $R' > R$.¹ If a less risky policy, x' , is optimal with greater debt, then,

$$3.1.2 \quad V(x', R') = RF'^{-1} \int_{R'}^b [1 - F(P, x')] dP > V(x^N, R'),$$

which implies,

$$(i) \quad \int_{R'}^b [F(P, x^N) - F(P, x')] dP > 0, \text{ and since } V(x^N, R) > V(x', R),$$

$$(ii) \quad \int_R^{R'} [F(P, x^N) - F(P, x')] dP < 0.$$

Combining implications (i) and (ii) with the definition of a risky policy,

$$3.1.3 \quad \int_0^R [F(P, x^N) - F(P, x')] dP > 0,$$

shows that any less risky policy, x' , that increases the equity value given greater debt violates the "single-crossing" property. QED.

The raider can send a credible signal about the riskiness of the operating policy to bond buyers with the amount of debt financing.

¹ Recall that R is the total debt service payment, $R(x) \equiv \{1+r(x)\}D$. An increase in the level of debt increases the debt service payment for any interest rate, $r(x)$, less than one. We assume $r(x) \leq 1$ for all x .

3.2 The Raider's Financing Decision

To finance the purchase the raider must borrow, D , and/or cut in equity partners, EP ,

$$3.1.1 \quad MV^0 \equiv C + EP + D \equiv E + D.$$

Equity, $E = C + EP$, and debt are perfect substitutes in the financing constraint; any additional contribution by equity partners reduces borrowing by the amount of the contribution and sends a signal to bond buyers that reduces the risk premium.

To induce equity contributions the raider must assure the contributors that the value of their contribution exceeds its cost. We assume the raider shares his information and control with the equity partners. Equity partners become insiders. The coalition of insiders chooses the operating strategy to maximize the value of the payoff to insiders, i.e., the policy that satisfies the maximization condition 2.2.1. The equity partners earn rent on the inside information so $V(x^N) > E$. The insiders share the payoffs in proportion to their contribution. The raider receives SV , where $S = C/E$ is the raider's share of the equity stake in the takeover.

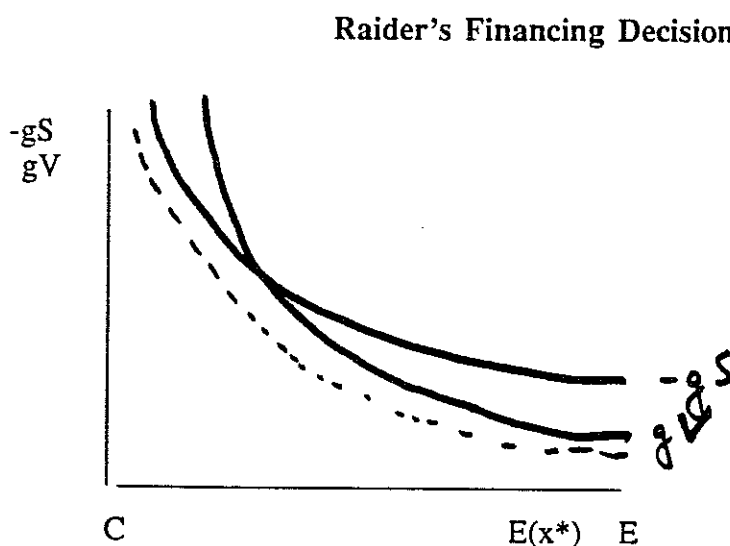
As the raider adds equity partners the present value of the payoff to insiders increases, $dV/dE \geq 1$; but the raider's share of the payoff decreases, $dS/dE = -C/E$. At an interior maximum,

$$3.2.2 \quad d(SV)/dE = (dS/dE)V + (dV/dE)S = 0, \text{ or,}$$

$$gV \equiv (dV/dE)/V = -(dS/dE)/S \equiv -gS,$$

the growth rate in the present value of the payoff, gV , to insiders equals the rate of decline, $-gS$, in the raider's share.

Equation 3.2.2 has a simple and intuitive economic interpretation. The equity sharing rule means the raider dilutes his share of the gains as he adds equity partners. The rate of decline in the raider's share is the hyperbola, $1/E \equiv -gS$, shown in Figure 1.



If the present value of the payoff to insiders increases at a rate faster than the rate of decline in the raider's share, he gains by adding partners. The present value of the payoff to insiders always increases as equity is substituted for debt. A larger equity contribution reduces the required borrowing and the default risk. These effects take place when all agents have complete knowledge of the activities of the firm and imply $dV/dE = -dV/dD = 1$, ie, debt and equity are perfect substitutes as in the Modigliani-Miller theorem. When information is asymmetrically distributed there is an additional signalling effect. As the equity stake

increases bond buyers infer that it is in the insiders' interest to follow a more conservative operating strategy which also lowers the risk premium, so $dV/dE \geq 1$.

At an interior maximum the growth rate in value of the payoff to insiders, gV , crosses the decline in the raider's share from above, as shown by the other solid line in figure one. This occurs when the addition of equity partners signals lenders that insiders will follow a significantly more conservative operating strategy. The strong signal substantially lowers the risk premium increasing the value of the insiders payoff. After some point the marginal equity contribution no longer signals a large change in the operating policy so $dV/dE > 1$ but the growth rate of the increase is less than the rate of decline in the raider's share.

The dashed line illustrates a corner solution with all bond financing. In this case the signal is always too weak to cause a substantial decline in the risk premium.

In either case there is some bond financing and the operating strategy is riskier than the operating strategy that maximizes the present value of the payoff distribution (indicated by $E(x^*)$ in Figure 1).

Conclusions

Asymmetric information and moral hazard, perhaps not surprisingly, usually lead to a deadweight loss. This paper examines the effect of a disciplinary takeover on risk in a model with asymmetric information and moral hazard. The takeover reduces, but does not eliminate, the loss.

Asymmetric information and moral hazard allow management to follow policies that do not maximize share holders' (outsiders') wealth. A profitable takeover leads to a more efficient solution. The raider, his partners, and the original firm owners split the gains. Only the original management loses.

The takeover, however, cannot eliminate the deadweight loss. In the short run the raider and his partners choose a payoff distribution that is riskier than the first best solution. Only in the long run can the raider and his partners establish an implicit precommitment agreement through reputation or long term relationships that overcomes the deadweight loss from asymmetric information and moral hazard.

Public policies that discourage junk bond financing and/or takeovers reduce the riskiness of bonds and possibly the riskiness of the payoff distribution, but they encourage greater inefficiencies by increasing the cost of disciplinary takeovers.

Appendix: Mean-preserving Spreads

A mean-preserving spread satisfies the two conditions,

$$(i) \quad EP(x') = EP(x) = EP,$$

$$(ii) \quad \int_0^y F(P,x')dx \geq \int_0^y F(P,x)dx; \quad 0 \leq y \leq b.$$

Although mean-preserving spreads provide a general and powerful definition of the riskiness of a random variable, in this model it implies that risk has no real effects in equilibrium.

If the expected value of the payoff is independent of the index of risk, x , then the market value of the firm is independent of risk. And in equilibrium where debt is fairly priced,

$$A1 \quad MV(x) = RF^{-1}EP = B(x) + V(x) = D + V,$$

the value of equity only depends on the level of debt. Restricting the analysis to mean-preserving spreads implies that agents only care about the expected value of their opportunity set, and the expected value,

$$A2 \quad EP = \int_0^b [1 - G(P,x)]dP, \text{ for all } x,$$

does not depend on the policy.

Propositions 1 and 2 still hold but the analysis of risk is not very interesting when agents don't care about risk. Insiders will always choose the policy that maximizes the devaluation of the debt since $V_x = -B_x$. But the policy only transfers bond holders' wealth to equity holders if it is unanticipated. The corollary does not hold since there is no loss from choosing a risky policy. Furthermore there is no opportunity for insiders to earn rent by taking over the firm and changing the policy.

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