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Capital Structure and the Market for Corporate Control: The Defensive Role of Debt Financing

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ABSTRACT

A capital structure theory based on corporate control considerations is presented. The optimal debt level balances a decrease in the probability of acquisition against a higher share of the synergy for the target's shareholders. This leads to the following implications: (i) the probability of firms becoming acquisition targets decreases with their leverage, (ii) acquirers' share of the total equity gain increases with targets' leverage, (iii) when acquisitions are initiated, targets' stock price, targets' debt value, and acquirers' firm value increase, and (iv) during the acquisition, target firms' stock price changes further; the expected change is zero and the variance decreases with targets' debt level.

IN RECENT YEARS MANY U.S. Corporations have dramatically increased their financial leverage. At the same time the size and number of transactions in the market for corporate control have peaked.[1] In this paper, I present a theory that connects these two seemingly unrelated issues. I argue that nonvoting risky securities (e.g., risky debt) are issued to maximize expected target firm value when there is a potential acquirer.

I consider the following simplified scenario. An incumbent management, whose objective is to maximize the value to its shareholders, chooses its capital structure anticipating the possibility that the firm will become an acquisition target. The ability of the potential acquirer to operate the firm's assets is unknown when the capital structure is chosen. After the capital structure is selected, the identity of the potential acquirer becomes known. An acquirer with a sufficiently high ability pays acquisition costs and mounts a contest for control. The outcome of this contest is a division of the appreciation in equity value between the acquiring and the target firms.

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[1] For the evidence regarding capital structure trends see Taggart (1986) and Harris and Raviv (1991). For the evidence regarding the market for corporate control see Jarrell, Brickley, and Netter (1988).

The choice of capital structure is based on its effects on both the probability that value-increasing acquisitions will materialize and the division of the synergy gain between the various parties. When a better management team assumes control, the value of the target firm's assets increases. The level of risky debt affects the division of this value increase among the beneficial parties: the acquirer, the debtholders, and the shareholders of the target firm.[2] Higher levels of risky debt result in a larger appreciation in debt value and, therefore, in a larger portion of the synergy gain accruing to the target's debtholders. Thus, the portion of the synergy gain left for both the target's shareholders and the acquirer is smaller. This leads to lower profits for the acquirer. Since debt is sold at a fair price, the entire ex ante expected synergy is shared between the acquirer and the target's shareholders. Thus, the ex ante expected profits lost to the acquirer must be transferred to the target's shareholders. This is the value-increasing effect of debt for the shareholders of the target firm.

The decrease in the acquirer's payoff may turn a synergistic acquisition into a losing proposition for the acquirer. Thus, higher levels of debt increase the minimal ability required for the acquirer to find an acquisition profitable. As a result, the probability that synergistic acquisition will materialize is lower.[3] This is the value-decreasing effect of debt for the shareholders of the target firm.

This paper considers value-increasing control changes resulting in higher debt value. Qualitatively similar results are obtained under the alternative assumption that value-increasing control changes lead to lower debt value. Thus, this theory requires that control changes will result in economically significant increases or decreases in debt value.[4] Note that this sensitivity is only required for individual firms. A mix of economically significant increases and decreases in the value of debt may sum, on average, to economically insignificant changes in debt value. Therefore, on average, debt value does not have to change dramatically upon control changes. Thus, it is impossible to evaluate this theory based on empirical evidence regarding the average change in debt value.

The model generates other empirical implications enabling us to test the validity of the theory presented. These implications include: i) the probability of firms becoming acquisition targets decreases with leverage, ii) when contests for control are initiated, target firms' stock price, target firms' debt

[2] In this model, risky debt represents a whole family of risky nonvoting securities. Therefore, in this framework, capital structure distinguishes voting equity from nonvoting securities such as debt, preferred stocks, and nonvoting common stocks. Thus, when testing the predictions of this model, the proxy for debt should be modified to include all nonvoting securities.

[3] A similar view was expressed by Roe (1987). He argues that the increase in value for existing debtholders might be one reason why highly leveraged firms such as Chrysler, Dome Petroleum, and International Harvester had difficulties finding a merger partner and why they were not taken over.

[4] For acquisitions to yield economically significant changes in debt value, firms must issue high enough levels of debt resulting in a nontrivial probability of bankruptcy.

value, and acquirers' firm value, increase, iii) when target firms differ in their bargaining power, acquirers' share of the total equity gain (defined as the increase in the combined equity values of the acquired and the acquiring firms) increases with target firms' leverage, and iv) during the contest for control, when the ability of the acquirer is revealed, there is an additional change in targets' stock price: its expected change is zero, and its variance decreases with targets' debt level.

Capital structure theories that are based on market for corporate control considerations have been proposed by Harris and Raviv (1988a), Israel (1988), and Stulz (1988).[5] According to Harris and Raviv (1988a), debt is used to repurchase equity from outsiders and thereby increase the voting power of the incumbent management. This increase in voting power is traded off against the increase in the likelihood that the firm will go bankrupt and the incumbent management will lose the benefits it derives from control. Israel (1988) discusses two roles for debt. First, debt alters the ownership structure of equity. Second, it is used to extract the benefits of control from the raider. This is done by reducing the opportunity cost from blocking a better raider. Stulz (1988) theorizes that debt is used to repurchase equity from outsiders with a relatively low reservation value. As a result, the cost faced by a potential raider, who must now acquire shares from investors with higher reservation value, increases. Optimal capital structure is obtained by trading off the higher price the raider has to pay, against the lower probability of value-increasing acquisitions.

The insight offered by Harris and Raviv (1988a) and Stulz (1988) is that capital structure affects the outcome of takeover contests through its effect on the distribution of votes between management and outside investors. My insight is that capital structure affects the outcome of takeover contests through its effect on the distribution of cash flows between voting and nonvoting securities. In addition to the differences in the basic insight and the resulting empirical implications, there are important methodological differences between my model and the models cited above. First, in both Harris and Raviv (1988a) and Stulz (1988) corporate debt is relevant to firm value because personal borrowing is more expensive or infeasible. In this paper, I develop a control-driven capital structure theory under the assumption that individuals can use homemade leverage. Second, unlike the three theories mentioned above, equity ownership structure plays no role in this model. Finally, my model does not depend upon agency problems between shareholders of target firms and their incumbent management.

The paper is organized as follows. The model is presented in Section I. Section II discusses the contest for control. Optimal capital structure is analyzed in Section III. Section IV provides the empirical implications of the model. Section V summarizes and concludes.

[5] The theory presented here abstracts from the constraints debt imposes on managerial discretion in choosing investment projects. See Grossman and Hart (1982), Jensen (1986), and Stulz (1990) for analyses focusing on the effects of debt on investment policy.

I. The Model

Consider a firm that operates for one period in a risk-neutral world in which the interest rate is zero. The firm produces a nonnegative random cash flow $\tilde{y}$ at the end of the period, and then it liquidates. The probability distribution of $\tilde{y}$ depends on the ability of the management m and is given by $H(y \mid m)$. I assume that $H(y \mid m)$ is continuously differentiable with respect to y and m. Management's ability m can take any value on the interval [0, 1]. Larger values of m indicate better management: the conditional distributions $H(y \mid m)$ are ordered by first-order stochastic dominance. The improvement in the distribution of the cash flow diminishes with m, i.e., the decrease in $H(y \mid m)$ decreases with m. These assumptions are summarized below

Assumption 1: (*1A*). $\partial H(y \mid m)/\partial m < 0 \ \forall y$;
(*1B*). $\partial^2 H(y \mid m)/\partial m^2 \geq 0 \ \forall y$.

At first, the incumbent management, whose objective is to maximize the value to its shareholders, controls the firm. The incumbent's ability is normalized to $m = 0$. The firm's expected cash flow under the incumbent, $Y(0)$, is common knowledge.

It is common knowledge that a rival management, with an unknown ability $m = r \in [0,1]$, will consider acquiring the firm. The prior distribution of r is uniform over the interval [0, 1], the expected cash flow under a rival management with a given ability r is $Y(r)$, and both are common knowledge.

The sequence of events is as follows. At $t = 0$, anticipating an acquisition by a rival whose identity is unknown, the incumbent management chooses the capital structure. At $t = 1$, a contest for control evolves. This contest has two stages: the *initiation* stage and the *acquisition* stage. In the initiation stage the acquirer privately learns whether its ability is good enough to pursue a profitable acquisition. If not, the incumbent management continues to run the firm, the cash flow is realized and distributed to the various claimholders, and the firm liquidates. If the acquirer's ability is good enough, the market first learns that an acquisition will take place. However, the acquirer's ability to operate the assets of the target firm and hence the price it will pay to the target's shareholders are still unknown at this stage. In the acquisition stage all agents learn the ability of the acquirer.[6] The acquirer then buys the equity of the target firm, assumes control, runs the firm, pays the debtholders, keeps the residual, and liquidates the firm.[7]

At $t = 0$, the incumbent management issues debt with face value F, collects its market value, denoted by $D_0(F)$, and distributes it to the share-

[6] This sequence of events overlooks the possibility of bargaining under asymmetric information. It represents a situation in which, when the market learns about possible acquisition of a firm by a raider, it or analysts study the future prospects of the target under the control of the raider.

[7] I assume that the acquirer obtains 100% of the equity. This is without loss of generality, and I obtain the same results if only 50% is required for a change in control.

holders. The value of debt, conditional on the identity of the management, is denoted by $D(F, m)$. The *expected cash to equityholders* under management m is denoted by

$$C(F, m) = Y(m) - D(F, m). \tag{1}$$

Note that this is not the market value of equity because it ignores the premium the acquirer has to pay.

II. The Contest for Control

At $t = 1$, the acquirer first learns its ability r and then considers acquiring the firm. In general, the equilibrium price the acquirer pays depends on the type of the contest for control (e.g., the structure of the bidding process, the number of potential raiders, the target's equity ownership structure, etc.). Thus, the division of the synergy between the target and the acquiring firm is sensitive to the assumptions made and to the specifics of the model. In one extreme, there are models in which acquirers pay the minimum acceptable bid and capture the entire synergy.[8] In the other extreme, there are models in which acquirers are forced to pay the post-takeover value of securities, and therefore target firms capture the entire appreciation in their assets value.[9] Between these two extremes are models in which the synergy is divided between the acquiring and the target firms.[10]

Because of this sensitivity, I do not explicitly model the bidding process. Instead, I assume that the price the acquirer must pay to the target's shareholders is a weighted average of the expected cash to equityholders under the incumbent management and the expected cash to equityholders (net of acquisition costs) under the acquirer. This price is given by

$$P(F, r) = \gamma C(F, 0) + (1 - \gamma)(C(F, r) - T), \qquad 0 < \gamma \leq 1 \tag{2}$$

where T represents acquisition costs the acquirer must pay. This price represents the outcome of a wide variety of types of control contests. The weights γ and $(1 - \gamma)$ represent the relative strengths of the acquirer and the target firm, respectively.[11] Thus, in the remainder of the paper I refer to γ and $(1 - \gamma)$ as the acquirer's and target's *bargaining power,* respectively.

[8] See the Appendix in Bradley, Desai, and Kim (1988).

[9] Examples are given by Grossman and Hart (1980, 1988), Shleifer and Vishny (1986), Harris and Raviv (1988b, 1989), and Stulz (1988).

[10] Examples are provided by Fishman (1988), Berkovitch and Narayanan (1990a), and Berkovitch and Khanna (1991).

[11] Note that γ is not a function of either the ability of the acquirer r or the target's capital structure. If, for example, better acquirers have more bargaining power, any subsequent result concerning γ can be directly projected into a similar result concerning the ability of the acquirer. Moreover, the main results of the paper are not changed. In Israel (1988) γ is a function of debt level. While the analysis becomes somewhat more complicated, the intuition behind the results is robust to this assumption. Thus, it is plausible that the results derived here are applicable for the case in which γ is a function of the target's debt level.

The bargaining power γ may depend upon the degree of competition in the market for corporate control, the diffusion of target firms' equity ownership, the institutional rules governing the market for corporate control, and other market variables.

The acquirer pays the price $P(F, r)$ and obtains an expected cash flow of $C(F, r) - T$. Hence, using equation (2), its gain, $C(F, r) - T - P(F, r)$, is nonnegative if, and only if,

$$C(F, r) - T \geq C(F, 0). \tag{3}$$

The acquirer initiates a contest for control only if inequality (3) holds. The left-hand side of inequality (3) increases with r. Let $r_c = r_c(F)$ be the minimal ability of the acquirer above which an acquisition becomes profitable.[12] r_c is implicitly defined by

$$C(F, r_c) - T \equiv C(F, 0). \tag{4}$$

Using the assumption that the ability of the acquirer is uniformly distributed over [0, 1], the probability of acquisition, as a function of debt level F is

$$q(F) = Pr(r \geq r_c) = 1 - r_c. \tag{5}$$

Capital structure decisions affect the price the acquirer pays, $P(F, r)$, and the probability that acquisition will materialize, $q(F)$. Anticipating these consequences, the incumbent management chooses the capital structure.

III. Optimal Capital Structure

The incumbent's objective is to maximize the value to its shareholders at $t = 0$. Equity value depends on the ability of the incumbent management and on expectations regarding future control contests. If the realized ability of the acquirer is less than r_c, then the incumbent management retains control and equity value is $C(F, 0)$. If the acquirer's ability is at least r_c, it will acquire the equity for the price $P(F, r)$ given by equation (2). Thus, the ex ante equity value is

$$S_0(F) = [1 - q(F)]C(F, 0) + q(F)E_r[P(F, r) \mid r \geq r_c] \tag{6}$$

where E_r is the expectation with respect to the distribution of r. The first term on the right-hand side is equity value under the incumbent management multiplied by the probability that it remains in control. The second term on the right-hand side is the conditional expected price the acquirer pays times the probability that acquisition will take place. Similarly, the market value of debt is

$$D_0(F) = [1 - q(F)]D(F, 0) + q(F)E_r[D(F, r) \mid r \geq r_c]. \tag{7}$$

[12] If $C(F, 1) - T < C(F, 0)$, then $r_c = 1$. We overlook this case by assuming that $Y(1) - T > Y(0)$.

Debt is issued in competitive markets at the present value of its expected payoff, yielding zero net present value (NPV) to debtholders. As a result, the debt level that maximizes ex ante firm value also maximizes ex ante equity value. Thus, the incumbent management, acting on behalf of its shareholders, selects the optimal capital structure to maximize the ex ante total firm value, equity plus debt. Formally, the incumbent chooses the level of debt F that maximizes

$$V_0(F) = S_0(F) + D_0(F). \tag{8}$$

Using equations (1), (2), (5), (6), and (7), $V_0(F)$ can be rewritten as

$$V_0(F) = Y(0) + (1 - \gamma) \int_{r_c}^{1} (\Delta C(F, r) - T)\, dr + \int_{r_c}^{1} \Delta D(F, r)\, dr \tag{9}$$

where $\Delta D(F, r) \equiv D(F, r) - D(F, 0)$ and $\Delta C(F, r) \equiv C(F, r) - C(F, 0)$.

The firm value consists of the expected cash flow under the incumbent management, $Y(0)$, and a premium due to a possible value-increasing acquisition. The premium incorporates two expressions. The first expression is the portion $1 - \gamma$ of the expected (net) appreciation in expected cash to equityholders accruing to the target's shareholders. The second expression is the total expected appreciation in debt value. The reason for this asymmetry is that while a portion γ of the expected appreciation in expected cash to equityholders accrues to the acquirer, the target captures the entire ex ante expected appreciation in debt value when debt is first sold at a price yielding zero NPV to debtholders.

Risky debt has two effects on the premium and, hence, on firm value. The riskiness of debt, the fact that the acquirer has better ability than the incumbent management, and Assumption 1(A), imply that $\Delta D(F, r)$ increases with the level of debt F.[13] Since the synergy, $\Delta Y \equiv Y(r) - Y(0)$, is fixed, the appreciation in expected cash to equityholders, $\Delta C(F, r) = \Delta Y - \Delta D(F, r)$, is lower the higher is the face value of debt. Consequently, the gain for an acquirer with a given ability r, $\gamma(\Delta C(F, r) - T)$, is lower. As a result, the minimal ability needed for a profitable acquisition is higher, the likelihood that the acquirer has this minimal ability is smaller, and, hence, the probability of acquisition is lower. This is the value-decreasing effect of debt on the premium in equation (9). Lemma 1 summarizes this result and is proved, along with the proofs of all subsequent results, in the Appendix.

Lemma 1: *All else being equal, the probability of acquisition* $q(F) = 1 - r_c$, *decreases with the level of debt* F.

Since the gross synergy, $\Delta Y = \Delta D(F, r) + \Delta C(F, r)$, is fixed, a change in the level of debt that results in a \$1 increase in $\Delta D(F, r)$ must also lead to a \$1 decrease in $\Delta C(F, r)$. Since the target's shareholders realize the entire ex

[13] Using equation (A-1) in the Appendix, the derivative of $\Delta D(F, r)$ with respect to F is equal to $[H(F \mid 0) - H(F \mid r)]$. By Assumption 1(A) it is positive.

ante expected \$1 increase in $\Delta D(F, r)$ but lose only $(1 - \gamma)$ of the ex ante expected \$1 decrease in $\Delta C(F, r)$, their ex ante expected payoff increases with the level of debt (for a given probability of acquisition). This is the value-increasing effect of debt on the premium in equation (9).

The incumbent management selects the optimal debt level by balancing the value-increasing against the value-decreasing effects of debt just discussed. The optimal debt level F^* satisfies the first order condition

$$\left.\frac{\partial V_0}{\partial F}\right|_{F=F^*} = \gamma \int_{r_c}^{1} \left[H(F \mid 0) - H(F \mid r)\right] dr - (\partial r_c / \partial F)\left[\Delta Y(r_c)\right] = 0 \quad (10)$$

which can be rewritten as

$$\gamma(1 - r_c) E_r\left[\partial \Delta D(F, r)/\partial F \mid r \geq r_c\right] = (\partial r_c / \partial F)\left[\Delta Y(r_c)\right]. \quad (11)$$

The left-hand side of (11) is the marginal benefit of debt. It is the increment in the value transferred from the acquirer's expected payoff to the debtholders.[14] The value transferred consists of the acquirer's bargaining power multiplied by the unconditional expected change in the appreciation in debt value. The debtholders, in turn, pay the target's shareholders this full value when debt is first issued. The right-hand side of equation (11) is the marginal cost of debt. It consists of the probability that additional debt will deter the just indifferent acquirer (i.e., the one with ability r_c) from acquiring the target firm multiplied by the foregone synergy as a result of this deterrence. Based on this tradeoff, Proposition 1 establishes the existence of an interior optimal debt level.

Proposition 1: *The target firm has an interior optimal debt level* $F^* > 0$ *such that* $V_0(F^*) \geq V_0(F)$ *for every* $F \geq 0$.

IV. Empirical Implications

This section predicts how firms' debt levels relate to their probability of becoming acquisition targets and to their and their acquirers' securities price changes around the time of acquisitions. Since debt is an endogenous variable, the cross-sectional comparison across firms with different debt levels is based on variation in exogenous variables such as acquisition costs T and acquirers' bargaining power γ.

In the previous section it was shown that the choice of capital structure balances a lower probability of acquisition against a higher expected payoff to the shareholders of the target firm if acquisition is materialized. Thus, all else being equal, firms with a lower probability of becoming acquisition

[14] Similarly, wealth of $(1 - \gamma)(1 - r_c) E_r[\partial \Delta D(F, r)/\partial F \mid r \geq r_c]$ is being transferred from the shareholders to the bondholders of the target firm as F increases. The debtholders, however, pay this amount up front to the shareholders when debt is issued.

targets are likely to issue less debt. A firm whose acquisition is more expensive for the acquirer, other things being equal, is less likely to be acquired, and, therefore, it issues less debt. Higher bargaining power for the acquirer increases the incentive for the incumbent management to transfer more wealth from the acquirer to the debtholders (who in turn transfer this value to shareholders when debt is first issued). Thus, an incumbent management facing an acquirer with higher bargaining power issues more debt. Lemma 2 summarizes these results.

Lemma 2: *The optimal debt level F^* decreases with acquisition costs T and increases with acquirers' bargaining power γ.*

A. Empirical Implications Regarding the Probability of Acquisition

The first comparative static result addresses the relations between the probability of firms becoming acquisition targets and their capital structure, as a function of acquisition costs. Higher acquisition costs decrease the probability of a firm becoming an acquisition target since the minimal ability the acquirer must have in order to find an acquisition profitable will be higher. However, higher acquisition costs also result in a lower debt level and, consequently, in higher probability of a firm becoming an acquisition target. Which effect dominates depends on the specifics of the conditional probability distribution functions of cash flows. When the distributions of cash flows are such that debt is relatively insensitive to a change in acquisition costs (i.e., $1/[H(F^*|0) - H(F^*|r_c)] > |\partial F^*/\partial T|$), the likelihood of a firm becoming an acquisition target increases with leverage. Similarly, when the distributions of cash flow are such that debt is relatively sensitive to a change in acquisition costs, the likelihood of a firm becoming an acquisition target decreases with leverage. Proposition 2 summarizes these results.

Proposition 2: *In a sample of firms that differ only in their acquisition costs T, the probability of a firm becoming an acquisition target $q(F^*)$ either a) increases with the debt level F^* if $1/[H(F^*|0) - H(F^*|r_c)] > |\partial F^*/\partial T|$ or b) decreases with the debt level F^* if $1/[H(F^*|0) - H(F^*|r_c)] < |\partial F^*/\partial T|$.*

Note, however, that testing Proposition 2 requires estimation of the conditional probability distribution functions of cash flows. Estimating these distribution functions may be very complicated. Thus, it may be difficult to test Proposition 2 empirically.

The second comparative static result addresses the relations between the probability of firms becoming acquisition targets and their capital structure, as a function of acquirers' bargaining power. As was established in Lemma 2, an incumbent management that faces a potential acquirer with higher bargaining power issues more debt. The higher debt level reduces the probability of a firm becoming an acquisition target. Since the acquirer's bargaining power γ does not affect directly the probability of acquisition, Proposition 3 establishes that the probability of a firm becoming an acquisition target decreases with the level of debt.

Proposition 3: *In a sample of firms that differ only in the relative bargaining power* γ, *the probability of a firm becoming an acquisition target,* $q(F^*)$, *decreases with the level of debt* F^*.

The evidence regarding the relations between firms' degree of leverage and their probability of becoming acquisition targets is mixed. Palepu (1986) finds that targets in his sample are characterized, among other things, by low leverage. Morck, Shleifer, and Vishny (1988) document that while the mean of the ratio of market value of debt to firm value for a sample of 454 (Fortune 500) firms was 0.248, the means for the subset of firms that became targets of friendly and hostile takeovers were 0.285 and 0.330, respectively. While Palepu's result may indicate that the probability of a firm becoming an acquisition target decreases with the degree of leverage, Morck, Shleifer, and Vishny's findings may, on the contrary, support positive relations between leverage and probability of acquisition. Note, however, that neither Palepu nor Morck, Shleifer, and Vishny control for the attributes relevant to this model.

B. Empirical Implications Regarding Price Effects

In analyzing price changes, I distinguish between two stages. First, in the *initiation stage* the market learns that the acquirer initiates the acquisition. While the ability of the acquirer is as yet unknown, the market infers that the acquirer possesses at least the minimal ability required for a profitable change in control r_c. Second, in the *acquisition stage* the ability of the acquirer to operate the target's assets is revealed to the market, and the acquisition is consummated.

B. 1. Price Effects – The Initiation Stage

In the initiation stage, the target's equity value is given by the conditional expected price the acquirer, whose ability is unknown, has to pay:

$$\begin{aligned} S_1(F^*) &= E_r\left[\, P(F^*, r) \mid r \geq r_c \right] \\ &= C(F^*, 0) + (1 - \gamma) E_r\left[\Delta C(F^*, r) - T \mid r \geq r_c\right]. \end{aligned} \tag{12}$$

When the market learns that the acquirer is good enough to pursue a profitable change in control but the extent of its ability is as yet unknown, the target's stock price and the acquirer's firm value increase because the acquisition is now a sure event. As a result, the target's shareholders and the acquirer jointly absorb the unexpected part of the appreciation in the value of expected cash to equityholders, $(1 - q(F^*))(E_r[\Delta C(F^*, r) - T \mid r \geq r_c])$. Using equations (2), (6), and (12), the change in the target's equity value is

$$\begin{aligned} \Delta S_1(F^*) &\equiv S_1(F^*) - S_0(F^*) \\ &= (1 - \gamma)(1 - q(F^*))\left(E_r\left[\Delta C(F^*, r) - T \mid r \geq r_c\right]\right) \end{aligned} \tag{13}$$

i.e., the target's shareholders capture $1 - \gamma$ of the appreciation in the value of expected cash to equityholders. The change in the acquirer's firm value is proportional to the change in the target's equity value. Hence, the acquirer's firm value also increases. This is summarized in Proposition 4.

Proposition 4: *In the initiation stage of the acquisition, the stock price of the target firm and the acquirer's firm value increase.*

Proposition 4 is not specific to this model. In fact, most models in which synergy motivates the change in control yield a similar prediction. While the empirical evidence (e.g., Jensen and Ruback (1983), Bradley, Desai, and Kim (1988), and Jarrell, Brickley, and Netter (1988)) supports the prediction that target firms' stock price increases upon announcement of an acquisition attempt, the evidence regarding acquirers' stock price changes upon announcement of acquisitions is mixed.

The last result concerning stock price changes in the initiation stage states that when target firms differ only in their bargaining power, acquirers' share of the total equity gain (defined as the increase in the combined equity values of the acquired and the acquiring firms) increases with target firms' leverage. For any debt level the division of the total gain between the shareholders of the acquiring and the target firms is given by the bargaining powers γ and $1 - \gamma$, respectively. Also, in a sample of firms that differ only in their bargaining power, leverage increases with γ. Thus, acquirers' share γ increases with leverage. This is summarized in Proposition 5.

Proposition 5: *When target firms differ only in their bargaining power, acquirers' share of the gain in total equity values increases with target firms' leverage.*

Berkovitch and Narayanan (1990b), and Stulz, Walkling, and Song (1990) document cross-sectional variation in the shares of the total equity gain that are captured by target and acquiring firms. However, in both papers the relation between the division of the total synergy and target firms' capital structure was not investigated.

Before I turn to investigate price effects in the acquisition stage, I analyze how prices of nonvoting securities change in the initiation stage.[15] Upon announcement of acquisition attempt, the capital market learns that the ability of the acquirer is at least r_c. Adjusting the value of debt in equation (7) to this new information yields

$$D_1(F) = E_r\left[D(F, r) \mid r \geq r_c \right]. \tag{14}$$

Using equations (7) and (14), the change in debt value is

$$\begin{aligned} \Delta D_1(F^*) &= D_1(F^*) - D_0(F^*) \\ &= \left[1 - q(F^*)\right]\left[E_r\left[D(F^*, r) \mid r \geq r_c \right] - D(F^*, 0)\right]. \end{aligned} \tag{15}$$

[15] Although the analysis is stated in debt-equity terms, its implications, as I argued in footnote 2, concern voting equity and any nonvoting security. Thus, I generalize Proposition 6 to include all nonvoting securities.

Since $r_c > 0$, and since $D(F^*, r)$ increases with r, it follows that target firms' debt value increases in the initiation stage. This is summarized in Proposition 6.

Proposition 6: *In the initiation stage of the acquisition, the prices of nonvoting securities of target firms increase.*

The empirical evidence support this prediction. Asquith and Kim (1982) and Dennis and McConnell (1986) find that nonconvertible debtholders of acquired firms neither gain nor lose by a statistically significant amount in mergers. On the other hand, Dennis and McConnell (1986) find that, on average, acquired companies' holders of other nonvoting securities such as convertible and nonconvertible preferred stockholders, as well as convertible bondholders, receive statistically significant gains in mergers. Since the voting status of the convertible securities varies across cases in which the conversion option is in- or out-of-the-money, and since Dennis and McConnell (1986) do not separate these situations, a conservative evaluation of their results must be based only on the results regarding returns to nonconvertible debtholders and preferred stockholders. Focusing on the returns to the holders of these two nonconvertible, nonvoting securities, I conclude that, on average, holders of nonvoting securities gain value upon announcement of merger. Note that if the convertible securities are regarded as nonvoting securities, the result is even stronger. Proposition 6 follows directly from the assumption that debt value increases when a better management assumes control. Thus, this empirical evidence supports the assumptions made rather than the validity of the theory.

B. 2. Price Effects – The Acquisition Stage

In the acquisition stage, when the ability of the acquirer r is revealed, the target's equity value $S_2(F^*)$ is equal to the price $P(F^*, r)$ the acquirer pays for it. Rearranging equation (2) yields

$$S_2(F^*) = P(F^*, r) = C(F^*, 0) + (1 - \gamma)(\Delta C(F^*, r) - T). \tag{16}$$

The change in equity value, in the acquisition stage, is

$$\Delta S_2(F^*) = S_2(F^*) - S_1(F^*) \tag{17}$$

where $S_1(F^*)$ is given by equation (12). Define the expected ability $\bar{r}$ by

$$S_1(F^*) \equiv C(F^*, 0) + (1 - \gamma)(\Delta C(F^*, \bar{r}) - T). \tag{18}$$

Substitute (16) and (18) into (17) to obtain

$$\Delta S_2(F^*) = (1 - \gamma)[\Delta C(F^*, r) - \Delta C(F^*, \bar{r})]. \tag{19}$$

If the acquirer's ability is higher than expected, there is an additional price increase, and if its ability is lower than expected, there is a price drop. Because $S_1(F^*)$ is the expected value (with respect to r) of $S_2(F^*)$, the expected change in the target's stock price, during the acquisition stage, is zero. Holding constant the realized ability of the acquirer, the magnitude of the change in the target's stock price decreases with leverage. The reason is that part of the unanticipated portion of the change in expected cash to equityholders accrues to the debtholders. The zero expected change in the target firm's stock price implies that the variance of the price changes is equal to the expected value of their squares, and, therefore, it decreases with leverage. All this is summarized in Proposition 7.

Proposition 7: *In the acquisition stage there is an additional change in target firms' equity value: it can further increase or drop, the expected price change is zero, and its variance decreases with debt levels.*

I am not aware of empirical studies focusing on the changes in target firms' stock price in the period starting after the initiation of acquisitions.[16] Bradley, Desai, and Kim (1988) find, however, that, on average, target and acquiring firms earn a normal rate of return for each day, starting at the second day following the announcement of the offer up to 80 days after the announcement. In addition, Bradley, Desai, and Kim (1988) find that between forty and fifty percent of both target and acquiring firms in their sample realized on each of these days a positive abnormal rate of return.[17] These findings are consistent with the prediction of Proposition 7 that during the acquisition there are significant stock price changes with an average of zero.

V. Summary and Conclusions

This paper presents a capital structure theory that is based on market for corporate control considerations. The fundamental insight is that capital structure affects the outcome of control contests through its effect on the distribution of cash flows between voting equity and nonvoting debt. In particular, higher debt levels result in a lower profitability for the acquirer and, therefore, in a lower probability of acquisition. Thus, the choice of the optimal debt level is based on trading off a decrease in the probability of acquisition against an increase in the share of the expected synergy gain for the target's shareholders.

[16] An exception is a study by Dann and DeAngelo (1988) who focus on a sample of firms that adopted defensive adjustments in assets and ownership structure in response to outstanding bids. Their results regarding price changes during the contest for control are not applicable for testing the results of the theory presented here since they measure reactions to announcements of defensive adjustments that are not allowed in this model.

[17] It should be noted that while the sample analyzed by Bradley, Desai, and Kim (1988) includes not only firms that were acquired but also firms that were not, the predictions of this model are restricted to firms that were finally acquired.

The theory has the following empirical implications: (i) the probability of firms becoming acquisition targets decreases with leverage, (ii) when acquisition is initiated, target firms' stock price, target firms' debt value, and acquirers' firm value increase, (iii) acquirers' share of the total gain increases with target firms' degree of leverage, and (iv) during the acquisition, there are additional price changes in which the expected change is zero and the variance decreases with target firms' leverage.

In this paper, it was assumed that acquirers have only equity outstanding. Moreover, acquisitions were assumed to be financed with cash only. Relaxing either of these assumptions, or allowing acquirers to take other actions to increase the riskiness of existing debt and thereby reduce the ex post value to target firms' debtholders, would mitigate the effectiveness of debt in increasing target firms' value. Analysis along these lines, while beyond the scope of this paper, has potential in explaining: (i) how the use of leveraged buyouts (LBOs) varies with targets' leverage, (ii) the relationship between the choice of medium of payment in acquisitions and target firms' leverage, and (iii) how target firms' capital structure affects post acquisition changes in their financial and investment policies.

Other direct antitakeover devices such as poison pills also reduce the attractiveness of potential targets to potential acquirers. Such antitakeover measures are equivalent, in this model, to a lower γ. This provides an additional set of empirical implications relating firms' use of direct antitakeover devices, on the one hand, to their capital structure, probability of becoming acquisition targets, and price reactions around the time of their acquisition, on the other hand. For example, more poison pills are equivalent to a lower bargaining power for acquirers. Consequently, the predictions are that firms with more poison pills will have less debt, and as a result will be more likely to become acquisition targets. This suggests that while the direct effect of poison pills is to reduce the probability of acquisition, there is an indirect effect that increases this probability. Thus, a more careful study that accounts for both the direct and the indirect effects of antitakeover devices is necessary in exploring the impact of antitakeover devices on the market for corporate control.

Appendix

The following assumption and two expressions are needed:

Assumption $A - 0$: $y \in [0, \hat{Y}]$

Expected cash flow and debt value under management m are:

$$Y(m) = E_m(y) = \int_0^{\hat{Y}} y \, dH(y \mid m), \; m = 0, r \tag{A-0}$$

$$D(F, m) = \int_0^{F} y \, dH(y \mid m) + \int_F^{\hat{Y}} F \, dH(y \mid m), \; m = 0, r \tag{A-1}$$

Proof of Lemma 1: Let $Z(r, F, T) \equiv \Delta C(F, r) - T$. Identity (4) implies that $Z(r_c, F, T) = 0$. Using the implicit function theorem and Leibnitz's rule,

$$\partial r_c/\partial F = \left[H(F \mid r_c) - H(F \mid 0)\right] \Big/ \left[\int_F^{\hat{Y}} \left(\partial H(y \mid r)/\partial r\right) \mathrm{d}y \mid r = r_c\right]. \quad \text{(A-2)}$$

By Assumption 1(A):

$$\left[H(F \mid r_c) - H(F \mid 0)\right] < 0, \textit{ and} \quad \text{(A-3)}$$

Assumption 1(A) implies that the denominator is negative. Thus, $\partial r_c/\partial F > 0$. Therefore, the probability of acquisition, $q(F) = 1 - r_c$, decreases with F.
Q.E.D.

Proof of Proposition 1: Let F_1 be the solution to $\Delta C(F_1, 1) - T = 0$. It follows that

$$Y(0) + (1 - \gamma) \int_{r_c}^{1} \left(\Delta Y(r) - T\right) \mathrm{d}r = V_0(0) > V_0(F_1) = Y(0). \quad \text{(A-4)}$$

Since $V_0(F)$ is continuously differentiable in F, it is enough to show that $V_0(F)$ increases with F in the neighborhood of $F = 0$:

$$\begin{aligned}
\partial V_0(F)/\partial F &= \gamma \int_{r_c}^{1} \left[H(F \mid 0) - H(F \mid r)\right] \mathrm{d}r - \left(\partial r_c/\partial F\right)\left[\Delta D(F, r_c)\right] \\
&\geq \gamma(1 - r_c)\left[H(F \mid 0) - H(F \mid r_c)\right] \\
&\quad - \left[\left[H(F \mid r_c) - H(F \mid 0)\right]\right. \\
&\quad \left.\left[\int_F^{\hat{Y}} \left(\partial H(y \mid r)/\partial r\right) \mathrm{d}y \mid r = r_c\right]\right]\left[\Delta D(F, r_c)\right] \\
&= \left\{H(F \mid 0) - H(F \mid r_c)\right\} \\
&\quad \cdot \left\{\gamma(1 - r_c) - \left[\Delta D(F, r_c)\right]\right. \\
&\quad \left.\left[-\int_F^{\hat{Y}} \left(\partial H(y \mid r)/\partial r\right) \mathrm{d}y \mid r = r_c\right]\right\}. \qquad \text{(A-5)}
\end{aligned}$$

Using inequality (A-3), it is enough to show that the second expression is positive in the neighborhood of $F = 0$. At $F = 0$ the second expression equals $\gamma(1 - r_c) > 0$.

By continuity of $\Delta D(F, r)$ in F, there exists $F' > 0$ such that the second expression is positive $\forall F \in (0, F')$. Consequently $V_0(F) > V_0(0)\, \forall F \in (0, F')$. By the intermediate value theorem, there exists $F^* \in (0, F_1)$ such that $V_0(F^*) \geq V_0(F)\, \forall F \geq 0$. Q.E.D.

Proof of Lemma 2: Substitute $\Delta C(F, r_c) = 0$ in the first order condition equation (10), and define the function $\Phi(F^*, T, r_c, \gamma, H)$ (for short $\Phi(\bullet)$):

$$\Phi(\bullet) = \left\{ \gamma \int_{r_c}^{1} \left[H(F|0) - H(F||r) \right] dr - (\partial r_c/\partial F)\left[\Delta D(r_c)\right] \right\}\Bigg|_{F=F^*}. \quad \text{(A-6)}$$

First, I prove the result regarding acquisition costs T. Differentiate (A-6) with respect to T:

$$\partial\Phi(\bullet)/\partial T = \{-\gamma(\partial r_c/\partial T)\left[H(F|0) - H(F|r_c)\right] - (\partial^2 r_c/\partial F \partial T)\Delta D(F, r_c) + (\partial r_c/\partial F)\int_0^F \left[(\partial H(y|r)/\partial r)(\partial r_c/\partial T)\right] dy\Big\}\Big|_{F=F^*,\, r=r_c}. \quad \text{(A-7)}$$

To determine the sign of this expression, sign $\partial r_c/\partial T$ and $(\partial^2 r_c/\partial F \partial T)$. Apply the implicit function theorem to $Z(r, F, T)$:

$$\partial r_c/\partial T = \left\{ -1/\left[\int_F^{\hat{Y}} (\partial H(y|r)/\partial r)\, dy \right] \right\}\Bigg|_{r=r_c} > 0. \quad \text{(A-8)}$$

Differentiate equation (A-2) with respect to T and use (A-2) and (A-8) to obtain:

$$\partial^2 r_c/\partial F \partial T = \left\{ \left[-\partial H(F|r)/\partial r + \int_F^{\hat{Y}} \left[(\partial^2 H(F, r)/\partial r^2)(\partial r_c/\partial F)\right] dy \right] \cdot \left[(\partial r_c/\partial T)^2\right] \right\}\Bigg|_{r=r_c} > 0. \quad \text{(A-9)}$$

Thus, $\partial\Phi(\bullet)/\partial T < 0$.

From the second order condition it follows that $\partial\Phi(\bullet)/\partial F^* < 0$. Apply the implicit function theorem to $\Phi(\bullet)$ to obtain

$$\partial F^*/\partial T = -\left(\partial\Phi(\bullet)/\partial T\right)/\left(\partial\Phi(\bullet)/\partial F^*\right) < 0.$$

Next, I prove the result regarding acquirer's bargaining power γ. It is enough to show that $\partial\Phi(\bullet)/\partial\gamma$ is positive:

$$\partial\Phi(\bullet)/\partial\gamma = \int_{r_c}^{1} \left[H(F|0) - H(F|r) \right] dr \,|_{F=F^*} > 0. \quad \text{(A-10)}$$

Q.E.D.

Proof of Proposition 2: a) differentiate $q(F^*)$ with respect to T and use equations (A-2) and (A-8) to obtain:

$$dq(F^*, T)/dT = -(\partial r_c/\partial T)\{1 + \left[H(F^*|0) - H(F^*|r_c)\right](\partial F^*/\partial T)\} \quad \text{(A-11)}$$

$|\partial F^*/\partial T| < 1/[H(F^*|0) - H(F^*|r_c)]$ implies that the expression in the brackets is positive. Since $-\partial r_c/\partial T < 0$, $dq(F^*, T)/dT < 0$. Since $\partial F^*/\partial T$

< 0, $q(F^*)$ increases with F^*; b) the proof for the case in which $|\partial F^*/\partial T|$ is relatively large is identical. Q.E.D.

Proof of Proposition 3: Differentiate $q(F^*, \gamma)$ with respect to γ:

$$dq(F^*, \gamma)/d\gamma = -(\partial r_c/\partial F^*)(\partial F^*/\partial \gamma) < 0, \tag{A-12}$$

since $dF^*/d\gamma > 0$, $q(F^*)$ decreases with F^*. Q.E.D.

Proof of Proposition 4: From equation (13) it follows that the appreciation in the target firm equity value is

$$\Delta S_1(F^*) = r_c(1 - \gamma)E_r[\Delta C(F^*, r) - T \mid r \geq r_c] > 0. \tag{A-13}$$

Similarly, the appreciation in the acquirer's firm value is

$$r_c\gamma E_r[\Delta C(F^*, r) - T \mid r \geq r_c] > 0. \tag{A-14}$$

Q.E.D.

Proof of Proposition 5: Follows directly from the definition of γ and Lemma 2. Q.E.D.

Proof of Proposition 6: Follows directly from equation (15). Q.E.D.

Proof of Proposition 7: $\Delta S_2(F) = (1 - \gamma)(\Delta C(F, r) - \Delta C(F, \bar{r}))$ (from equation (19)). (A-15)

Since $\Delta C(F, r)$ increases with r, $\Delta S_2(F)$ is positive iff $r > \bar{r}$.

The expected change in price during the acquisition is:

$$\begin{aligned} E_r[\Delta S_2 \mid r \geq r_c) &= E_r[[S_2(F^*) - S_1(F^*)] \mid r \geq r_c] \\ &= (1 - \gamma)(E_r[[(\Delta C(F^*, r) - T) \\ &\quad - (E_r[\Delta C(F^*, r) - T \mid r \geq r_c])] \mid r \geq r_c]) \\ &= (1 - \gamma)(E_r[(\Delta C(F^*, r) - T) \mid r \geq r_c] \\ &\quad E_r[(\Delta C(F^*, r) - T) \mid r \geq r_c]) \\ &= 0. \end{aligned} \tag{A-16}$$

The variance of the change in the target firm's stock price is calculated using equations (12), (16), (17), and (A-16):

$$\text{var} = (1 - \gamma)^2 \int_{r_c}^{1} \left([\Delta S_2(F) - 0]^2[1/(1 - r_c)]\right) dr. \tag{A-17}$$

Equation (A-17) is a weighted average of a monotone increasing transformation of $\Delta S_2(F)$. Thus, in order to determine the relations between the variance and the debt level, it is enough to determine how $\Delta S_2(F)$ relates to

F. There are two cases to consider. First, consider how $\Delta S_2(F)$ varies with T:

$$d\Delta S_2(F)/dT = \left[H(F/r) - H(F \mid \bar{r})\right](\partial F^*/\partial T). \tag{A-18}$$

Recall that $\partial F^*/\partial T < 0$ and that inequality (A-3) implies: $[H(F \mid r) - H(F \mid \bar{r})] > 0$ if $\bar{r} > r$.

$$r > \bar{r} \rightarrow d\Delta S_2(F)/dT > 0, \text{ and}$$
$$r < \bar{r} \rightarrow d\Delta S_2(F)/dT < 0,$$

since (when $r < \bar{r}$) $\Delta S_2(\mathrm{F}) < 0$, the magnitude of the decline in equity value is larger. Thus, the magnitude of the change in equity value increases with T. This, combined with $\partial F^*/\partial T < 0$, implies that the magnitude of the change in equity value decreases with F^*.

Consider now how $\Delta S_2(F)$ varies with γ:

$$d\Delta S_2(F)/d\gamma = \left[H(F \mid r) - H(F \mid \bar{r})\right](\partial F^*/\partial \gamma) - \left(\Delta C(F, r) - \Delta C(F, \bar{r})\right). \tag{A-19}$$

Recall that $\partial F^*/\partial \gamma > 0$. Thus:

$$r > \bar{r} \rightarrow \left[H(F \mid r) - H(F \mid \bar{r})\right] < 0, \left[\Delta C(F, r) - \Delta C(F, \bar{r})\right] > 0 \rightarrow$$
$$d\Delta S_2(F)/d\gamma < 0, \text{ and}$$
$$r < \bar{r} \rightarrow \left[H(F \mid r) - H(F \mid \bar{r})\right] > 0, \left[\Delta C(F, r) - \Delta C(F, \bar{r})\right] < 0 \rightarrow$$
$$d\Delta S_2(F)/d\gamma > 0,$$

since (when $r < \bar{r}$)$\Delta S_2(R) < 0$, the magnitude of the decline in equity value is smaller. Thus, the magnitude of the change in equity value decreases with γ. This, combined with $\partial F^*/\partial \gamma > 0$, implies that the magnitude of the change in target firms' equity value decreases with F^*.

Thus, I established that $\Delta S_2(F)$ decreases with F^*. Hence, the variance of change in equity value decreases with F^*. Q.E.D.

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