Mergers and Acquisitions: Control Incentives, Capital Structure and Means of Payment

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Abstract

This paper considers a two period model of an acquisition. The main focus of the work is the impact of the corporate governance and capital structure on the choice of the payment method. The model takes into account the benefits of the large share from keeping control of their companies. The model considers the incentive of the large shareholder to sidestep the risk of becoming a minority shareholder after the M&A. The problem is solved numerically and its results are in accordance with the empirical evidences.

1 *Introduction*

Mergers and Acquisitions have grown dramatically over the last ten years. Although, Merger and Acquisition activities have long been an interesting subject of corporate finance research, there is still much about MA process that we do not fully understand, including the choice of payment method. The study of payment method in corporate finance is intriguing because previous research showed that financing decisions can have a significant impact on acquier's financial structure and subsequent financial decisions.

The aim of this paper is to study the impact of the corporate control and corporate financial structure on the choice of payment method.

In this work the buyer faces a choice between cash and stock financing which involves a trade off between corporate control concerns of using equity and rising financial distress costs of issuing debt. Thus acquirer's M&A currency decision can be strongly influenced by its debt capacity, existing leverage and ownership structure.

The main focus is the impact of capital structure and control incentives on the choice of payment method in mergers and acquisitions. I consider a two period model in which both financial and operational synergies are possible. The basic model assumes that an acquisition occurs after some shock and it is not anticipated by the bidder and the target. Later this assumption is relaxed and the case where both firms believe ex-ante that in the interim date there would be a possibility for an acquisition is considered. In the model the manager of the bidding firm chooses the exchange method such that to maximize the total utility of buyer's shareholders. In order the offer made by the bidder to be accepted it should satisfy the incentive constraint of the target, and the bidding shareholders.

This work shows that the governance structure of both firms participating in the M&A process as well their control motives affect the choice of exchange currency. In particular, the analysis shows that in M&A of identical firms, with dispersed shareholders for which an acquisition happens after a shock the optimal exchange currency is mixed cash and equity. However, if there is a large shareholder in the target the optimal payment method is pure debt. The size affects the payment method only for the case when both firms are diffusively owned. Once the expectations of both firms about a future acquisition are taken into account I find that pure cash is optimal. This result is also due to the fact that the model ignores the tax benefits of stock payments.

2 Related Literature

A number of earlier studies have analyzed M&A financing decisions. Hansen (1987), Stulz (1988) and Fishman(1989) develop theories of acquisition payment choice based on asymmetric information. Of these studies only Stulz's focuses primarily on corporate control concerns. He points that M&A financing decisions are affected by management's desire to maintain corporate control and generate continued personal benefits.

Eckbo, Giammarino and Heinkel (1990) develop an asymmetric information model that predicts that the revealed bidder value is monotonically increasing and convex in the fraction of the total offer that consists of cash. In their model a mix of debt and cash is chosen to convey information about the bidder's true value.

Hansen (1987) finds that bidders have greater incentives to finance with stock when the asymmetric information about the target asset is high.

The work is also related to the wide and growing empirical literature considering MA processes and the impact of capital and ownership structure on the method of payments.

Faccio and Masulis(2005) study the payment choices of the M A in Europe for the period 1997-2000. Their primary focus is the tardeoff between bidder corporate control threats which discourage stock financing and bidder financing constraints. They find that corporate control incentives to choose cash are particularly strong when a bidder's controlling shareholder has an intermediate level of voting power. Bidders prefer cash financing when the voting control of their dominant shareholder is threatened. They find that European bidders choose stock financing with greater frequency as measures of their financial condition weaken

Andrade, Mitchell and Stafford (2001) claim that the theory has limited success of explaining why mergers might occur. While Faccio and Masulis find that most European bids are entirely cash financed [1] Andrade et al.

[1]Faccio and Masuilis (2005) report that 80% of the European MAs are pure cash deals, 8.4% are mix of cash and stock and 11.3% are pure stock deals

report that 70% of MA transactions by US firms involve stock financing with 58% percents entirely stock financed.

Martin (1996) and Ghosh and Ruland (1998) empirically study the determinants of M&A payment method and investigate the importance of buyer and management stock holdings on U.S. acquisitions over 1978-1988 period. All three studies conclude that buyer management shareholdings have a negative effect on stock financing, consistent with a corporate control motive.

The framework of the model presented in this work is closely related to the work of Leland (2007). He considers multiple activities with imperfectly correlated cash flows and zero operational synergies. These activities may be separated financially, allowing each to optimize its financial structure. Characteristics of activities that gain control from combination or separation are identified and the magnitudes of the gains are examined assuming normally distributed cash flows and a simple model of capital structure. Like Leland I consider normally distributed cash flows.

The paper is organized as follows: Section 3 considers simple two period valuation model, the maximization problem of the merged firm is presented in section 4. Section 5 presents some comparative statics , Section 6 extends the model by allowing both firms to have an ex-ante expectations about the acquisition and section 7 concludes. A table with all the parameters used in the model is presented in the appendix:

3 *Firm's Capital Structure*

3.1 *Basic Structure*

This section follows Leland(2007). It develops a two-period model to value debt and equity. In this model there are two periods, $t = \{0, T\}$. In the first period the firm chooses its optimal debt level and undertakes activity which generates a random cash flow at t=T. The future cash flows may be negative. At ,$t = 0$, the firm can issue a zero coupon bond with principal value ,P, due at T. In this model only interest expenses are tax deductible.

This creates endogeneity problem. At $t = T$, cash flows are realized taxes and debtors are paid and the rest is received by equityholders. In case of default the firm is liquidated and the debt holders receive ,$(1 - \alpha)$, of the pre-tax operational cash flow, $X \geq 0$. Where ,α, is the fraction lost due to default cost. In this model I assume that the government has priority for tax payments before bondholders. In case of default interest first repayment regime is considered[2]. This choice of repayment regime can influence the optimal leverage.[3]

The model assumes risk-neutral environment. The risk-free interest rate over time period T is r_T.

3.2 *Debt and Equity Valuation*

The present value of the future cash flows is:

$$X_0 = \frac{1}{1 + r_T} \int_{-\infty}^{\infty} X dF(x), \tag{3.2.1}$$

where $F(x)$ is the cumulative distribution function of X at $t = T$.

The pre-tax value of activity with limited liability at $t = 0$ is:

$$H_0 = \frac{1}{1 + r_T} \int_{0}^{\infty} X dF(x), \tag{3.2.2}$$

The after tax value of unlevered firm is:

$$V_0 = \frac{1}{1 + r_T} \int_{0}^{\infty} (1 - \tau) X dF(x), \tag{3.2.3}$$

where τ is the effective tax rate. The tax deductible interest payment is equal to the principal value of the debt minus the market value of the debt:

[2]For discussion of this regime see Talmor, Haugen and Barnea (1985)

[3] The setting of the model allows the model to be interpreted as a model in which the presence of a large shareholder in the bidder and the target leads to better monitoring and higher firm values.

(3.2.4) $$I(P) = P - D_0(P)$$

The point where the cash flow is just enough to cover the interest expenses,X^z, is given by:

(3.2.5) $$X^z = I = P - D_0$$

Determining this point is important because below it, $X < X^z$, there are no tax payments and above it taxes are due.

(3.2.6) $$T_0 = \frac{\tau}{1+r_T}\int_0^{\infty}(X - X^z)dF(x)$$

The future random equity cash flow is operational cash flow less taxes and repayment of principal:

(3.2.7) $$E = X - \tau max[X - X^z, 0] - P$$

The firm defaults when the equity value becomes negative ($X < X^d$). In the appendix it is shown that $X^d > X^z$. Therefore X^d is equal to:

(3.2.8) $$X^d = P + \frac{\tau}{1-\tau}D_0$$

The value of the debt:

(3.2.9) $$D_0 = \frac{P\int_{X^d}^{\infty} dF(x) + (1-\alpha)\int_0^{X^d} XdF(x) - \tau\int_{X^z}^{X^d}(X - X^z)dF(x)}{1+r_T}$$

The equity cash flows are give by:

(3.2.10) $$E_0(P) = \frac{\int_{X^d}^{\infty}(X-P)dF(x) - \tau\int_{X^d}^{\infty}(X - X^z)dF(x)}{1+r_T}$$

The recovery rate of the debt is:

(3.2.11) $$R = \frac{(1-\alpha)\int_0^{X^d} XdF(x) - \tau\int_{X^z}^{X^d}(X - X^z)dF(x)}{\int_{-\infty}^{X^d} PdF(x)}$$

Parameter	Value
riskless rate of interest r	5%
debt maturity (years) T	5
default costs α	0.19
effective tax rate τ	0.1
cash flow volatility at T std	49.19
Annualized cash volatility σ	22
expected future cash flow mu	127.63

Table 1: Base case parameters

3.3 *Optimal Capital Structure*

The value of the levered firm is equal to the value of equity plus the value of the debt $\nu_0 = D_0 + E_0$. Equation 3.2.9 represents the value of the debt as a function of ,X^z, and ,X^d, but equations 3.2.5 and 3.2.8 show that X^z and X^d depend on the initial value of the debt. The optimal value of the firm is derived numerically. The numerical problem assumes normally distributed cash flows. I optimize the value of the firm with respect to ,D_0, and ,P, subject to equation 3.2.5 which establishes the relationship between ,D_0, and ,P, and the equations for, X^z, and, X^d. The closed forms of ,D_0, and ,E_0, are derived in the appendix.

The parameter values for the valuation are summarized in, table 1. The value of α is in accordance with Andrade and Kaplan (1998) who estimate a range for α from 10% to 23%. Effective tax rate equals the estmated tax rate from Graham (2003). The cash flow volatility at T is choosen such as the annualized cash volatility to be 22% . This annualized volatility equals the asset volatility for firms with investment grade bonds over the period (1996-2002), estimated by Strebulaev and Schaefer(2004). The expected value of the future operational cash flow is selected such that its present value X_0 is equal to 100.

The optimal capital structure estimated with the base case parameters given in table 1 is summarized in table 2. The results of the model are

Parameter	Value
optimal debt D_0	37.43
optimal principal P	49.41
optimal value of the firm ν	90.66
optimal equity E	53.23
optimal leverage ratio	41.29%
recovery rate	49.8%
yield spread	0.71%
X^z	11.98
X^d	53.57

Table 2: Optimal capital structure

compared with the empirical results for the BBB rated firms. The recovery rate estimated by the model (49.8) is very close to the estimated average recovery rate on senior debt of 49.4 by Acharya et al. (2004). The model generates a optimal debt leverage close to the empirical estimated one (38%) by Schaefer and Strebulaev for the BBB rated firms over the period 1996-2002. The yield spread is below the one estimated by Elton et.al (120 bps) for the BBB rated firms over the period 1987-1996. The results of the model are plausible and will be used in the next section.

4 *Merged Firm*

This section considers an M&A activity in which both firms determine their optimal capital structure and do not have any expectations about a possibility of a future acquisition. In the interim date a merger happens after a shock. The bidder makes a cash and stock offer to the target. In this model a cash offer requires debt financing. The bidder faces a choice of debt and equity financing which requires a tradeoff between corporate control concerns of issuing equity and raising financial distress cost of issuing debt. Thus, the bidder's M&A currency decision can be influenced by management's desire to maintain the existing corporate governance structure. The initial capital structure of the bidder and the target is derived via the model developed in the previous section.

4.1 Model Set Up

Typically, acquisitions generate gains that might be related to a better utilization of production facilities, a greater market power, or economies of scale [see e.g. Mitchell and Mulherin (1996), Andrade and Stafford(2004) for empirical evidence]. It is then natural to assume that the cashflows of the merged firm. X_M is:

$$X_M = (1+\lambda)(X_B + X_T), \tag{4.1.12}$$

where, X_B, and, X_T, are the cash flows generated by the bidder and by the target respectively, $\lambda \in (0,1)$ reflects the operational leverage. In this section I assume that, X_B, and, X_T, are jointly normally distributed and, X_M, is normally distributed. The correlation of the cash flows of the bidder and the target is, ρ. The expected future cash flows, μ_M, the standard deviation, std_M, and the annualized standard deviation, σ_M, of the merged firm are respectively:

$$\mu_M = (1+\lambda)(\mu_B + \mu_T) \tag{4.1.13}$$

$$std_M = (1+\lambda)(std_B^2 + std_T^2 + 2\rho std_B std_T)^{0.5} \tag{4.1.14}$$

$$\sigma_M = (1+\lambda)(\sigma_B^2 + \sigma_T^2 + 2\rho\sigma_B\sigma_T)^{0.5}, \tag{4.1.15}$$

where, μ_B, and, μ_T, are respectively the the expected future cash flows of the bidder and the target. Whenever, $\rho < 1$, the merger creates risk reduction.

The merger at t=0 is financed through stocks and debt. The debt raised to finance this activity is assumed to be junior to the debt of the bidder and the target. The debt and equity values of the bidder and the target are estimated by the model developed in section 3. In order to evaluate the junior debt and the equity it is necessary to find the break-even and the default points and the point above which taxes are due.

The point above which the merged firm has to pay taxes, X_M^z is equal to the sum of the interest payments to the senior and the junior debt:

$$X_M^z = I_s + I_j = P_s + P_j - D_s - D_j, \tag{4.1.16}$$

where I_s, D_s and I_j, D_s are respectively the interest payments and debt levels of junior and senior debts. The senior debt, D_s is equal to the sum of the debt of the bidder and the debt of the target, the junior debt ,D_j, is endogenously chosen. The default level of the merged cash flows is determined in the following way:

$$X_M^d = \tau max[X_M^d - X_M^z, 0] + P_s + P_j \tag{4.1.17}$$

As for the single firm we have that $X_M^d > X_M^z$. Therefore, the default point is given by:

$$X_M^d = (P_s + P_j) + \frac{\tau}{1-\tau}(D_s + D_j). \tag{4.1.18}$$

The equity holders receive what is left after the taxes and the debt has been paid:

$$E_M = \frac{\int_{X^d}^{\infty}[X - P_s - P_j - \tau(X - X^z)]dF(x)}{1 + r_T} \tag{4.1.19}$$

In order to determine the value of the junior debt at t=0, first, it is necessary to determine the point at which the firm is just able to repay its senior debt X_s^d. This point depends on the point X^z and is given by:

$$X_s^d = \begin{cases} \frac{P_s}{1-\alpha} & \text{for } \frac{P_s}{1-\alpha} < X^z \\ \frac{P_s - \tau X^z}{1-\alpha-\tau} & \text{for } \frac{P_s}{1-\alpha} > X^z \end{cases} \tag{4.1.20}$$

The value of the junior debt depends on X^z in the following way:

(4.1.21)

$$D_j = \begin{cases} \frac{\int_{X_s^d}^{X^d} [(1-\alpha)X - P_s - \tau(X - X^z)] dF(x) + \int_{X^d}^{\infty} [P_j] dF(x)}{1+r_T} & \text{for } \frac{P_s}{1-\alpha} > X^z \\ \frac{\int_{X_s^d}^{X^z} [X - P_s] dF(x) + \int_{X^z}^{X^d} [(1-\alpha)X - P_s - \tau(X - X^z)] dF(x) + \int_{X^d}^{\infty} [P_j] dF(x)}{1+r_T} & \text{for } \frac{P_s}{1-\alpha} < X^z \end{cases}$$

The above equation is implicit equation, since, X^z, X_M^s, and, X^d, are themselves functions of, P_j, and, D_j. The closed form solution of the junior debt and the equity using normal distribution are presented in the appendix. Once, the valuation formulas for debt and equity have been derived I can look for the optimal cash and equity used as a payment method. The next section presents the model which allows the optimal mix of debt and cash to be evaluated numerically.

4.2 The Maximization Problem

I assume that in case of an acquisition, the aim of the manager of the bidder is to maximize the utility of the old shareholders. He does so by choosing the optimal level of the shares and cash paid to the target. It is also assumed that the interests of the managers and the shareholders are aligned. Due to the assumption of risk-neutrality the utility that the old shareholders will receive from the acquisition is equal to the present value of the equity payment that they will receive at $t = T$, plus the utility of the large shareholder from keeping control. In this model I assume one share one vote principal. The maximization problem is given by:

$$max_{\beta, D_j, P_j} E_M + Um \tag{4.2.22}$$

subject to

$$E_b + U(m) \leq (1-\beta)E_M + U^M((1-\beta)m) \tag{4.2.23}$$

$$E_t + U(n) \leq \beta E_M + U^M(\beta n) + D_j + D_j U^D(1-\beta n) \tag{4.2.24}$$

$$0 \leq \beta \leq 1 \tag{4.2.25}$$

$$(4.1.16), (4.1.18), (4.1.20), (4.1.21) \tag{4.2.26}$$

Where the utility of the large shareholder is given by:

$$U(j) = \nu_i \frac{k}{\sqrt{2\pi}} \int_0^1 e^{-\frac{j^*}{2}} dj,$$

where j is the number of shares hold by the largest shareholder, $i \in \{b, t, M\}$, j^*, is given by:

$$j^* = \frac{j-s}{l},$$

s is the minimum fractions of shares which a shareholder needs to have in order to be considered as a large shareholder and l is a constant, $l < 0.1$. The above utility functions tells that if the company has only dispersed shareholders this utility will be equal to zero. However, if the company has a large shareholder his private benefits of control will be proportional to the value of the company,if there is no merger $\nu_i k$ and $\nu_i k_M$, in case of a merger. I assume that $k_M \geq k$.U^D is given by:

$$U^D = \frac{U(n)U^M(1-\beta n)}{k * \nu_t}$$

The large shareholder of the target prefers cash payment rather than becoming a minor shareholder. This preference is expressed by U^D in the model. The utility of the large shareholder from cash payment is equal to zero if he remains a large shareholder after the acquisition. If the large shareholder looses control than he prefers cash payment and leaves the firm. The utility from cash in this case is equal to $\mathrm{k}_M D_j$.

Inequality 4.2.23 is the incentive constraint of the target shareholders. The target shareholders will accept the offer if and only if the utility of the target shareholders from operating the target firm on their own is smaller or equal to the utility that they will receive from the merger. If they operate the target on their own they will receive the total amount of the equity plus the utility that the large shareholder gets from keeping control of the company. In case, that there is a large shareholder it is assumed that the utility that he derives from keeping the control of the company is proportional to the value of the firm $k\nu_t$, ν_t is the optimal value of the target company and, k, is a positive constant. It is assumed that preserving control is important to the large shareholder of the target company. This drives him to prefer cash consideration to sidestep the risk of becoming a minority shareholder after the MA. The utility of the target shareholders from the acquisition is the payment that the target shareholders receive in case of a merger plus the utility of the large shareholder if he still remains a large shareholder after the acquisition plus the utility that he gets from the cash payment if he becomes a minor shareholder. The payment is equal to the share of that the target shareholder receives after the merger plus the cash payment which is equal to D^j. In a similar way, in order the shareholders of the acquiring firm to agree with the acquisition they have to receive at least the same utility from the acquisition as they will receive if they operate their firm separately. The above maximization problem is solved numerically and the solution is presented in the next section.

4.3 Numerical Solution of the Maximization Problem

As discussed in the introduction, the objective of this work is to develop a model which can allow me to study the impact of the control incentives of the large shareholders of the bidding and the target firms on the choice of

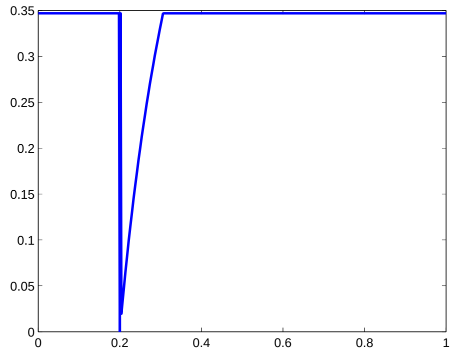

Figure 1: Optimal β, when the target's shareholders are dispersed.

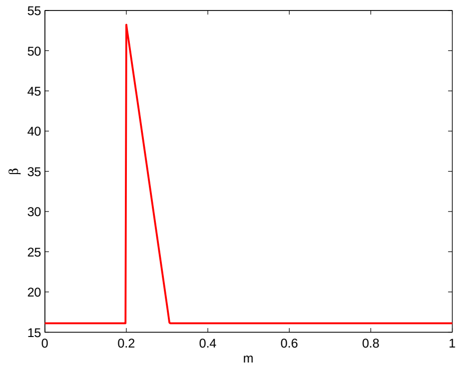

Figure 2: Optimal junior debt, when the target's shareholders are dispersed

the payment method. As well as the effect of the correlation of the cash flows of the bidder and the target firm, the size and the capital structure of the target. The model is simple enough and is solved numerically.

In the base case I consider a bidder and a target which generate identical cash flows, and have the parameters listed in table 1. The optimal capital structure of these firms is the one summarized in $table2$. I take the benchmark parameter set to be, $\rho = 0.2$, $\lambda = 0.1$, $k = 0.1$, and $k_M = 0.15$, $\mathrm{k}_M \geq k$ reflects that both shareholders receive higher benefits if they are large shareholders in the merged company than the private benefits form control before the merger. In the numerical solution I assume that a large shareholder is the one who has more than 20% of the shares. It is also assumed that there can be only one large shareholder in the bidder and in the target.

This section considers the effect of the operational benefits from the merger on means of payment.

Table 3 and figure 2 show that when the shareholders of the bidder and the target are dispersed, then it is optimal to use a mix of debt and equity as a payment method. This is due to the fact that the control motives are not affected in this case. However if the target shareholder has a concentrated ownership structure, $n \geq 0.2$, (see figure 3) than it is optimal to use only

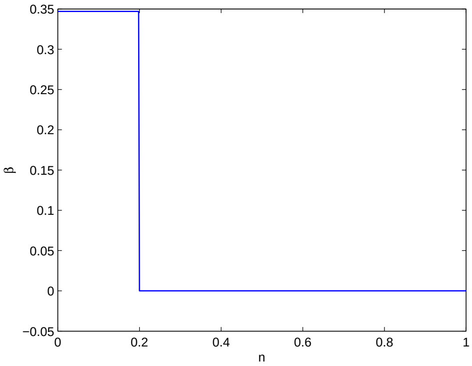

Figure 3: Optimal β,as a function of n.

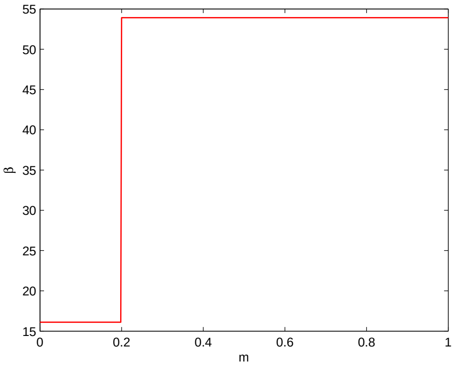

Figure 4: Optimal Junior debt as a function of n.

cash as exchange currency. Whenever the target has dispersed shareholders, then for, $m \in [0.2, 0.338]$, the optimal payment is mixed cash and stock. The shares offered increase with, m, while the debt decreases, $\beta = 1 - \frac{1}{5m}$. The corporate control incentives to choose cash and stock are strongest when the target's share ownership is dispersed and the bidder's largest shareholder has an intermediate level of voting power. The incentives to use stock increases when the bidder is either diffusely owned or when a shareholder from the bidder has a supermajority voting rights, since the bidder's controlling block is not threatened. This result, however depends on the size of the bidder and the target. When both firms have the same size and are diffusively owned the manager will choose mixed payment. Figures 1 and 2 represent, β, and the value of the junior debt as a function of m when the target is diffusively owned. Figure 3 and four represent the level of the stocks and the cash paid as a function of n. When the bidder has a concentrated ownership structure the optimal payment method is pure debt. This result is driven by two factors. First, cash payments does not threaten the control of the bidder's largest shareholder. Second, the largest shareholder of the target prefers cash payment rather than staying as a minor shareholder.

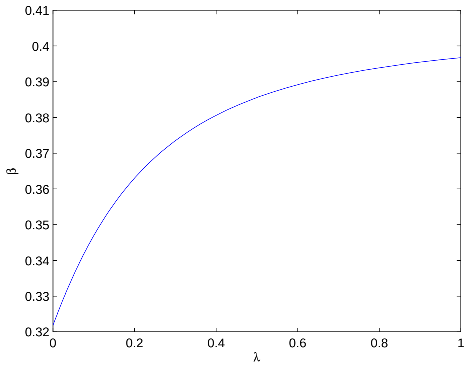

Figure 5: The figure shows how λ affects β when shareholders are dispersed

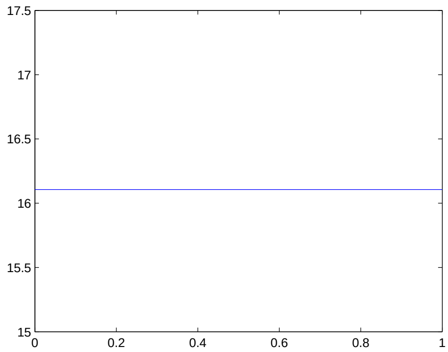

Figure 6: The figure shows how λ affects D_j when shareholders are dispersed

5 Some Comparative Statics

In this section I explore the sensitivity of the model to some of the parameters.

5.1 Comparative statics:λ

This section considers the effect of the operational benefits from the merger on means of payment.

When both firms have dispersed ownership structure an increase in the operational leverage will not affect the cash payment. The increase in, λ, will result in an increase in stock payment. (figure 5 and 6).

With concentrated ownership structure of the target for sufficiently low, λ, the debt level increases and the cash payment decreases. When λ is sufficiently large the optimal payment is pure debt and the debt level is constant and does not depend on lambda.

5.2 Comparative statics: μ

Does the size of the target affect the payment method? When both firms are difuslively owned and the target is sufficiently smaller than the optimal

m,n	β	D^j	P^j
$m \in [0, 0.2]$, $n \in [0, 0.2]$	40.8%	0	0
$m = 0.21$, $n \in [0, 0.2]$	4.8%	49.39	68
$m = 0.23$, $n \in [0, 0.2]$	13.04%	41.66	56.54
$m = 0.25$, $n \in [0, 0.2]$	20%	33.88	45.42
$m = 0.27$, $n \in [0, 0.2]$	25.93%	26.17	34.74
$m = 0.29$, $n \in [0, 0.2]$	31.03%	18.44	24.26
$m = 0.33$,n$\in [0, 0.2]$	39.39%	3.08	3.9
$m \in [0.3378]$, $n \in [0, 0.2]$	40.8%	0	0
$n \in (0.2, 1]$	0%	48.42.88	66.54

Table 3: Numerical Solution

payment method is pure stock. With dispersed shareholders the problem of control disappears and stock financing is cheaper than cash payment (through risky debt)(figures 9 and 10). However, if the size of the target is sufficiently high then mixed payments are optimal. When either the bidder or the target has a large shareholder, the size of the target does not affect the method of payment.

6 A model with an exogenous probability of an acquisition

The previous section assumes that the bidder and the target do not have any expectations about the future possibility of a merger. This section considers how this expectations would influence the decisions of both firms. In particular, I assume that both the bidder and the target at date zero expect with an exogenous given probability, p, that there would be a possibility of a merger at an interim date t=1. This expectations would influence the capital structure choice of the bidder and the target at date 0. I solve this problem backwards starting from date 1. At date 1 the bidder makes an offer to the target. He chooses how much cash and how much shares to offer taking as

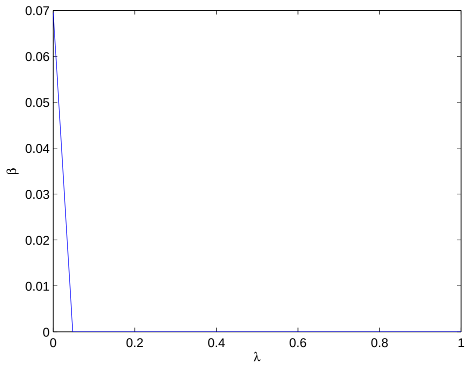

Figure 7: The figure shows how λ affects β when the target has a concentrated ownership structure.

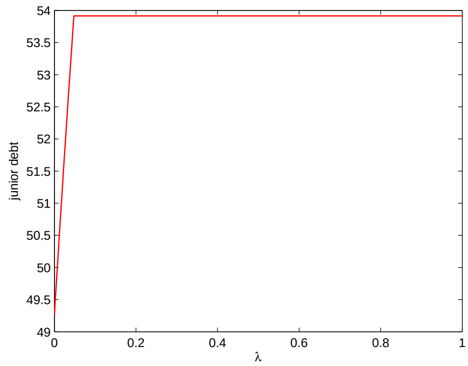

Figure 8: The figure shows how λ affects D_j when the target has a concentrated ownership structure

given the debt and equity levels selected by the firms at date 0. The optimal offer is determined as a function of date 0 debt levels. Finally I have to solve the date zero problem the bidder and the target solve their date 0 problem. At the initial date the bidder and the target choose their optimal capital structure taking into account the future proceeds from the acquisition. The former model is presented below:

$$max_{D_b,P_b} p\nu_i + (1-p)\beta\nu_M(\nu(D_i, D_j, D_{-i})) \tag{6.0.27}$$

subject to

$$[D_j, P_j, \beta] = arg\ max\,\{(1-\beta)\nu_M(\nu(D_i, D_j, D_{-i}))\}$$

subject to

$$E_b + U(m) \leq (1-\beta)E_M + U_M((1-\beta)m) \tag{6.0.29}$$

$$E_t + U(n) \leq \beta E_M + U_M(\beta n) + D^j + D^j U^D(1-\beta n) \tag{6.0.30}$$

$$0 \leq \beta \leq 1 \tag{6.0.31}$$

$$(4.1.16), (4.1.18), (4.1.20), (4.1.21) \tag{6.0.32}$$

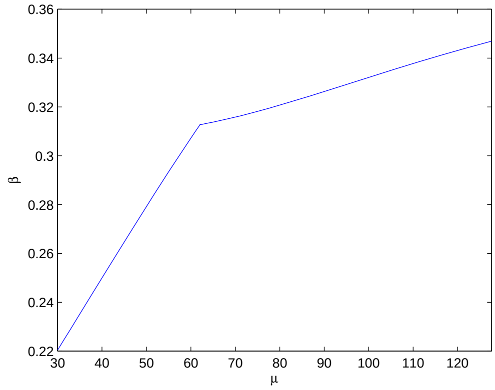

Figure 9: The figure shows how β depends on,μ when both firms are diffusively owned.

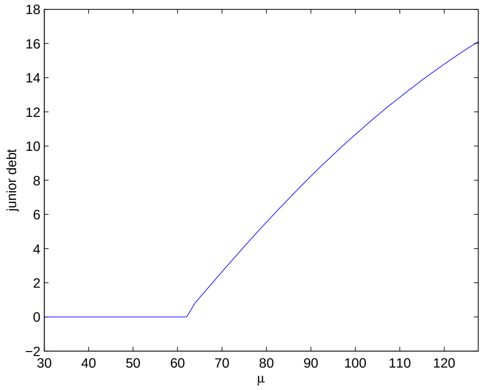

Figure 10: The figure shows how D_j depends on μ when both firms are diffusively owned

$$[D_{-i}, P_{-i}] = arg\,max\,\{p\nu_{-i} + (1-p)\beta\nu_M(\nu(D_i, D_{-i}))\} \tag{6.0.33}$$

Expression (6.0.27) is the maximization problem of the bidder (target) at date zero, where ,i, stays for the bidder(target) and ,$-i$, stays for the target(bidder). This maximization problem is subject to the optimal level of, D_j and, β, chosen in the interim date when there is an acquisition. This is the best response to any debt levels chosen from the bidder and the target at date 0 by both firms. The bidder (target) solving his optimization problem takes into account the best response of the target (bidder) at date 0, given by expression (6.0.33).

p	D_t	P_t	D_b	P_b	D_j	P_j	β
0.99	40.16	53.29	38.09	50.34	83.78	112.67	0
0.98	42.48	56.66	38.75	51.27	83.62	112.65	0
0.97	44.52	59.66	39.40	52.20	83.49	112.66	0
0.96	46.33	62.39	40.05	53.13	83.36	112.69	0

Table 4: Solutions for the case where the target has a concentrated ownership structure

I have solved the model numerically with the parameters described in table 1, and section 4.3.

The solution of the model for the case when both firms are diffusively owned is presented in table 5. Table 4 presents the solutions of the case when the target has a concentrated ownership structures.

Both tables show that an increase in the probability of an acquisition at the interim date 1 leads to an increase in the debt levels of both firms at date zero. These debt levels increase with the probability of a takeover. This is due to the fact that if there is an acquisition the initial debt of the bidder and the target becomes less risky and respectively less expensive. The expectation of an acquisition results in an asymmetric capital structures at date 0. In equilibrium the target will be more levered at the initial date than the bidder.

When the bidder is diffusively owned independently of the ownership structure of the target the optimal payment will be pure debt. This result is also due to the fact that this model does not consider the tax benefits of the stock payments. As the probability of a takeover increases the debt that has to be raised in the interim period decreases. When both firms are diffusively owned the target will raise more debt and the bidder will raise less debt than in the case when the target has a large shareholder.

p	D_t	P_t	D_b	P_b	D_j	P_j	β
0.99	40.59	53.91	38.09	50.34	86.45	116.80	0
0.98	43.21	57.72	38.73	51.25	86.27	116.79	0
0.97	45.46	61.07	39.35	52.13	86.11	116.80	0
0.96	47.44	64.09	39.95	52.99	85.98	116.83	0

Table 5: Solutions for the case where both firms are diffusively owned

7 Conclusion

This paper presents a two period model of M&A. The aim of the model was to study how control incentives determine the method of payment in M.

The primary focus is the tradeoff between corporate control threats and the increase in distressed costs by raising more debt. Considering a symmetric bidder and target and assuming that an acquisition happens after a shock I find that mixed payment is optimal for diffusively owned firms. When the target has a concentrated ownership structure the optimal payment will be pure cash. For the case where the bider has a large shareholder I find that when his control is threatened the bidder will offer shares such as to preserve the control of the large shareholder. The size of the target influences the payment method only when both firms have dispersed shareholders. In this work I also consider the case where both firms have the same expectations about a future acquisition. In this case I find it is optimal for both firms to have higher debt levels at the initial date. These debt levels increase with the probability of an acquisition.

The model which I consider has several limitations. In the model I do not allow the large shareholders to trade after an announcement of an acquisition. Such a trade would have influenced the value of both firms. A possible further development of the model has to include the possibility for at least one round of trade. A complete solution of the multi-period problem is difficult in the normally distributed cash flows. The next step of extending this framework is to consider a constant cash flows and an industry shock which affects them. This will allow me to study the problem in a dynamic framework.

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8 Appendix

To derive the formulas of the debt and equity for the normally distributed cash flows I will use the following formula. For the normally distributed variable x:

$$G(x,y) = \int_a^b xdF(x) = Mu(N(d(b)) - N(d(a))) - std(n(d(y)) - nd(x)),$$

where $N(.)$ and $n(.)$ are respectively the cumulative and the probability distribution functions of the normal distribution, d(a)- is normalization of the normally distributed variable a.

The closed form formula for the equity value of a single firm is given by:

$$E_0 = G(X^d, inf) - (P - \tau X^z)(1 - N(d(X^d)) \tag{8.0.34}$$

The closed form formula of the debt value of the single firm is given by:

$$D_0 = P\left[1 - N(d(X^d))\right] + (1-\alpha)G(0, X^d) - \tau G(X^z, X^d) + \tau(N(dX^d) - N(d(X^z))) \tag{8.0.35}$$

for $P_s/(1-\alpha) < X^z$

$$\begin{aligned} D^j = & \frac{1}{1+r_T}[(1-\alpha)G(X_s^d, X^z) - P_s(N(dX^z) - N(dX_s^d))+ && (8.0.36)\\ & + (1-\alpha)G(X^z, X^d) - (P_s + \tau)(N(dX^d) - N(dX^z))- && (8.0.37)\\ & - \tau G(X^z, X^d) + P_j(1 - N(dX^d))] && (8.0.38) \end{aligned}$$

for $P_s/(1-\alpha) > X^z$

$$\begin{aligned} D^j = & \frac{1}{1+r_T}[(1-\alpha)G(X_s^d, X^d) - P_s(n(dX^d) - n(dX_s^d)) - (X_s^d, X^d)+ && (8.0.39)\\ & + \tau X^z(N(dX^d) - N(dX_s^d)) + P_j(1 - N(dX^d))] && (8.0.40) \end{aligned}$$

The closed form formula of the equity value of the merged firm is given by:

$$E_M = \frac{1}{1+r_T}\left[(1-\tau)G(X^d, inf)) - (P_s + P_j -^z)[1 - N(d(X^d))]\right]$$

(8.0.41)

The notations used in this paper are summarized in the table below:

X	cash flow
μ	expected cash flow
D_0	debt level at t=0 of a single firm, endogenous
P	face value of the debt
E	equity value of a single firm
X^z	the point at which the firm is just able to pay its interest obligations
X^d	default point
ν	firm's value
D_b	debt level of the bidder at t=0
D_t	debt level of the target at t=0
D_j	junior debt
ν_b	value of the bidder
ν_t	value of the target
ν_M	value of the merged firm
β	fraction of the value of the merged firm given to the target

Table 6: Table with notations