

Conflicts between Managers and Investors over the Optimal Financial Contract

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Abstract

We develop a principal-agent model of financial contracting in which investors face moral hazard problems relating to managerial effort. The level of debt potentially mitigates these problems in two ways. For high debt levels, the manager owns more of the equity, and also the threat of financial distress increases. In the absence of financial distress costs, we derive a novel irrelevance result; the financial contract does not affect managerial effort or firm value. Therefore, the manager and the investors are indifferent between a high debt and low debt contract. In the presence of financial distress costs, the manager has an incentive to increase his effort level in order to reduce the threat of distress. Now investors unambiguously prefer the (value-maximising) high debt contract. When effort costs and financial distress costs are low, the manager also prefers the high debt contract. When effort costs and financial distress costs are high, the manager prefers the (value-minimising) low debt contract.

Key words: financial contracting; moral hazard; equity ownership; financial distress

JEL classification: G32

1. Introduction

In the field of corporate finance, it has long been recognised that the way in which a firm finances its activities can have a substantial effect on its performance and valuation in the market. Modigliani and Miller's (1958; henceforth abbreviated MM) seminal irrelevance theorem stated that, under certain conditions, the value of the firm is independent of its capital structure (for example, MM assumed that the manager always acts in the shareholders' best interests). Subsequent research has sought to examine the conditions under which a firm's capital structure can affect its value.

In this paper, we develop a principal-agent model of financial contracting in which investors (the principals) provide finance, and then the manager (the agent) exerts effort in creating firm value. Since investors provide money up-front, and

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then the manager makes value-affecting decisions, we can study the relationship with a focus on moral hazard (hidden action) problems. The investors are only interested in value-maximising policies, while the manager may pursue other (value-reducing) objectives, such as extracting money from the firm for private benefits, or not exert the high effort levels required for firm value maximisation.

Jensen and Meckling's (1976; henceforth JM) pioneering agency cost model demonstrated how the capital structure may affect firm value in a principal-agent setting. They considered an owner-manager who seeks finance for a new project. If he issues a large amount of outside equity, he dilutes his own equity stake. This increases his incentives to spend company funds on private benefits, hence reducing firm value. If he increases the debt level and reduces the level of outside equity, he increases his own equity stake. Hence, a high debt level reduces his incentives to spend company funds on his private benefits, and this increases firm value.

JM only considered the income rights relating to debt and equity (debt holders obtain the first, fixed claim on the company's income, while the equity holders are residual claimants). Recent financial contracting research (e.g., Grossman and Hart, 1982; Aghion and Bolton, 1992; Dewatripont and Tirole, 1994; Zwiebel, 1996; and Jong and Veld, 2000) has recognised that securities allocate both income and control rights. Debt holders have the right to liquidate the firm if they are not paid, while equity holders have much weaker control rights.

The financial contracting research views debt as a disciplining device. For example, in Grossman and Hart's (1982) model, the bankruptcy threat of debt can mitigate the manager's incentives to extract company funds for his own consumption. In Aghion and Bolton's (1992) model, the financial contract is designed to force the firm to make an efficient liquidation/continuation decision. When the firm is performing effectively, equity holders make the value-maximising decision to allow the firm to continue. When the firm is performing badly, debt holders make the value-maximising liquidation decision. In Dewatripont and Tirole's (1994; henceforth DT) model, the liquidation threat from debt holders affects the manager's effort level.

It is generally assumed that the manager chooses the financial contract. Furthermore, under the assumption that financial markets are competitive, price-taking investors pay a fair price for securities. The implication is that the manager gains all of the value-added from the financial contract. Hence, in JM's model, it is in the manager's interests to align himself with investors by adopting the value-maximising capital structure.

However, Garvey and Hanka (1997) argue that, when the manager has no equity stake and is only concerned with keeping his job, he may not be aligned with investors in choosing the value-maximising capital structure. He may avoid debt, in order to avoid financial distress costs.

As far as we are aware, no model exists that satisfactorily combines the two incentive-aligning roles of debt; that is, the effect of debt on the manager's equity stake and the effect of the financial distress threat of debt. Our principal-agent model addresses this. Our specific goal in this paper is to analyse when managers and in-

vestors may be aligned in their capital structure preferences and when they may be in conflict. We demonstrate that this depends crucially on the manager's marginal cost of effort and on the level of financial distress costs. Our main results are as follows.

(a) When we only consider the effect of debt on the manager's equity stake, we derive a novel "irrelevance" result. Increasing the level of debt increases the manager's equity stake, but this is neutralised by the increase in the required debt repayments (that is, the increase in the face value of debt) due to the increased risk faced by debt holders. Therefore, increasing debt does not increase managerial effort or firm value. Hence, both the manager and the investors are indifferent between a high debt and low debt contract.

(b) When we introduce financial distress costs, increasing the level of debt increases the manager's effort levels as he seeks to avoid financial distress. When financial distress and effort costs are low, the manager and the investors' interests are aligned in preferring the high debt contract. When financial distress and effort costs are high, there is a conflict of interests, with the manager choosing the low debt contract.

The paper is organised as follows. In the next section, we describe and develop the model. In Section 3, we compare the pure debt and the debt-equity contracts in order to analyse when the manager's and investors' capital structure preferences are aligned or in conflict. The equilibrium financial contract is derived in Section 4. In Section 5, we focus on the case where the pure debt contract forces a higher effort level. We present a numerical example in Section 6. Section 7 provides the conclusion and directions for future theoretical and empirical research.

2. The Model

We consider a firm operating in an economy consisting of risk-neutral agents. Since agents are risk-neutral, they are only concerned with their expected cashflows, and not with the variability of these cashflows. Furthermore, since they are risk-neutral, they discount future cashflows at the risk-free rate (that is, they do not require a risk premium). For simplicity, we assume that the risk-free rate is zero. Therefore, we do not need to discount future cashflows when considering an agent's wealth.

We consider the following sequence of events.

Date 0: A project becomes available to the firm. The manager issues securities, and, if he raises sufficient funds, he invests in the project.

Date 1: The manager exerts an effort level which affects the outcome of the project.

Date 2: The outcome of the project is realised, payoffs occur, and the world ends.

The details of the model are as follows. A firm, with no assets in place and no current projects, has an opportunity to invest in a new project. The project requires investment funds I at date 0. Two possible states can occur at date 2. The good state occurs with probability p , in which case the project provides income R_H (H for “high income”). The bad state occurs with probability $1-p$, in which case the project provides income of R_L (L for “low income”), with $R_H > I > R_L$. Therefore, if the firm takes this project, the date 0 value of the firm is $V = pR_H + (1-p)R_L$.

At date 1, the manager exerts effort e_i , where $i \in \{L, H\}$. That is, he can exert a high effort level, e_H , or he can exert a low effort level, e_L , with $e_H > e_L$. The manager faces a cost of effort $C(e_i)$, with $C(e_H) > C(e_L)$.

Managerial effort positively affects the probability of the good state, such that $\gamma e = p \in [0, 1]$. Therefore, date 0 firm value can be written as $V = \gamma e_i R_H + (1 - \gamma e_i) R_L$. We assume that $\gamma e_H R_H + (1 - \gamma e_H) R_L > \gamma e_L R_H + (1 - \gamma e_L) R_L \geq I$; that is, the value of the firm exceeds the required investment funds, whether the manager exerts the high or low effort level. Hence, the manager can always obtain funding. Note that γ represents managerial ability; the higher is γ , the greater the effect of effort level on the good state probability.

Two possible methods of finance are available to the manager at date 0. He can issue a pure debt contract to investors, retaining all of the equity himself, or he can issue a debt/equity contract.

Throughout the model, we assume that the financial market is competitive, such that investors are price-takers. The implication of this is that financial contracts are fairly priced. Hence, the investors provide finance at zero net present value (NPV); that is, they provide investment funds at date 0 equal to the discounted value of expected future cashflows. Recall that we assume risk-neutrality and a zero risk-free rate; this means that the discount rate is zero. Hence, in equilibrium, the financial contract must be priced such that it has a terminal expected value I , in order that competitive investors provide investment funds I at date 0.

For example, the debt contract contains the face value of debt D , which in a competitive market will be set such that the expected value of the debt contract is I . In issuing debt and equity, the expected value of total equity will determine what proportion of equity α the manager will be able to retain and what proportion $(1-\alpha)$ he can issue such that the total debt-equity contract is worth I to the investors. We will analyse this in more detail in the next section.

Since investors provide finance at zero NPV, the manager gains all of the positive NPV. Hence, the manager ultimately suffers from his own moral hazard problem relating to effort level. If investors expect low managerial effort after they have provided finance, α and D adjust in equilibrium such that the financial contract remains valued at I , and it is the manager who suffers in terms of reduced NPV. Hence, it may be in the manager’s interests to use the financial contract as a commitment device; that is, to commit to a high effort level.

The manager must raise sufficient funds I in order to take the project. Recall that $I > R_L$. Therefore, if he raises the investment funds using a pure debt contract,

the debt holders do not receive full payment if the bad state occurs. Furthermore, a feature of a debt contract is that the holders' income is capped at the face value (i.e., the maximum that they can receive in the good state). As we analyse below, this means that the face value of debt must actually exceed the required investment funds, so that the holders are compensated for the shortfall in the bad state. In finance, we term this risky debt (from the debt holders' point of view), where risk relates to volatility of income.

From the manager's viewpoint, if he finances the project with a pure debt contract, he faces financial distress costs F in the case where debt holders are not paid at date 1. The manager can avoid financial distress costs by reducing the debt level so that the debt holders are guaranteed to receive the same fixed payment in either state; that is, debt is risk-free (from the debt holders' point of view). The manager does so by issuing debt with a face value R_L . Since the debt holders are guaranteed payment of R_L in either state at date 2, they will be willing to invest R_L at date 0 (recall that we are assuming a discount rate of zero). Hence, the manager can avoid financial distress costs by reducing the debt level so that debt is risk-free. However, since debt holders are only willing to invest R_L , he must raise the balance of the funds by issuing equity. This dilutes the manager's equity stake.

The main aim of our model is to analyse when the manager and the investors are aligned or in conflict in their choice of financial contract. In the presence of financial distress costs, we will demonstrate that investors aim to maximise firm value and so (weakly) prefer the pure debt contract since the threat of financial distress forces high managerial effort. The manager may or may not prefer the pure debt contract. He may use the pure debt contract to commit to a high effort level since this has a positive effect on his NPV. However, this incentive is crucially affected by his cost of effort and the expected financial distress costs. If either is too high, he will prefer the debt-equity contract.

We solve the game by backward induction. That is, we first take the financial contract, D , and α as given and solve for the manager's optimal effort level. Then we solve for the competitively market-determined D and α . We finally work out the impact on the payoffs and solve for the optimal security structure (both from the viewpoint of the manager and the investors).

3. Comparison of Financial Contracts

We solve the game by backward induction. That is, we first take the financial contract (pure debt or debt-equity) as given. Within these contracts, we initially take the values D and α under the assumption that the manager exerts equilibrium effort level e^* . We then solve for the manager's equilibrium effort level. Next, we recognise that, in equilibrium, the market-determined D and α and the optimal effort level must be consistent with each other. Next, we derive the manager's and the investors' equilibrium payoffs. This will enable us to determine the manager's and investors' optimal contracts. Finally, we derive the equilibrium contract.

First, we consider the pure debt contract. The respective expected payoffs for the manager, the debt holders, and the total firm value at date 0 are:

$$M_D(e_i) = \gamma e_i (R_H - D(e^*)) - (1 - \gamma e_i) F - C(e_i), \quad (1)$$

$$S_D = \gamma e_i D(e^*) + (1 - \gamma e_i) R_L = I, \quad (2)$$

$$V_D = \gamma e_i R_H + (1 - \gamma e_i) R_L. \quad (3)$$

We analyse these payoffs as follows. The first term in (1) represents the manager's payoff if the good state occurs. The good state occurs with probability γe_i . In this state, the debt holders' payoff is capped at the face value $D(e^*)$. The manager receives the remainder $R_H - D(e^*)$. The second term represents his payoff in the bad state. The bad state occurs with probability $(1 - \gamma e_i)$. In this state, the debt holders are not fully paid, and so the manager faces financial distress costs F . The final term in (1) is the manager's cost of effort.

The first term in (2) represents the debt holders' capped payoff, $D(e^*)$, if the good state occurs. If the bad state occurs, the debt holders only receive R_L . As discussed in the previous section, competitive debt holders invest at zero NPV; that is, the debt contract is worth I .

Equation (3) represents total firm value. Since investors are risk-neutral and the risk-free rate is zero, total firm value equals the expected date 2 cashflow, which in the good state is R_H and in the bad state is R_L . Furthermore, we note that $M_D + S_D = V_D - (1 - \gamma e_i) F - C(e_i)$; that is, the manager and the debt holders have a share in firm value, but the manager also faces private financial distress costs and effort costs. This provides a conflict between investors, who wish to maximise firm value, and the manager, who is also concerned with his private costs.

Using backward induction, we first recognise that the manager's equilibrium effort level is affected by the face value of debt. We then note that the face value of debt is determined in (2) by the manager's effort level. Intuitively, if the debt holders expect a low managerial effort level, they will set a high face value of debt (as compensation for the low probability of being fully paid). If they expect a high managerial effort level, they will set a low face value of debt.

In equilibrium, the market-determined face value of debt must be consistent with the manager's equilibrium effort level, and the manager's equilibrium effort level must be consistent with the equilibrium face value of debt.

We solve as follows. First, take as given that the market has set the face value of debt $D(e^*)$. What will the manager's optimal effort level be? Equilibrium will occur when $D(e^*)$ leads to effort level e^* .

Define $\Delta M_D = M_D(e_H) - M_D(e_L)$. This represents the gain in managerial wealth from exerting the high effort level compared with the low effort level for a given D . Therefore, for a given D , the manager exerts the high effort level iff $\Delta M_D \geq 0$. Substituting for $i \in \{H, L\}$ in (1), we find that the manager selects e_H iff

$$\Delta M_D = \gamma (e_H - e_L) (R_H - D(e^*) + F) + C(e_L) - C(e_H) \geq 0. \quad (4)$$

The first term represents the expected marginal benefit from the manager's higher effort. That is, higher effort increases the probability of the good state, represented by $\gamma(e_H - e_L)$. If the good state occurs, the manager receives payoff $R_H - D(e^*)$. Furthermore, the manager avoids financial distress costs in the good state. We later identify that the avoidance of financial distress costs is a key difference between the manager's effort incentives in the pure debt contract and the debt-equity contract. The second and third terms together represent the marginal cost of the higher effort level.

From (2), we obtain the market-determined face value of debt D , given that the manager exerts effort level e^* :

$$D(e^*) = \frac{I - R_L}{\gamma e^*} + R_L. \quad (5)$$

This represents the face value of debt for which the expected value of the debt contract equals I , given that the manager exerts effort level e^* . That is, the debt holders invest at zero NPV.

We wish to examine the conditions under which the manager exerts the high or low effort level in equilibrium. We do this as follows. First, assume that the manager's equilibrium effort level is $e^* = e_H$. Substituting into (5) and then substituting into (4), we obtain condition c1:

$$\gamma(e_H - e_L)(R_H - R_L) - \frac{(e_H - e_L)(I - R_L)}{e_H} + \gamma(e_H - e_L)F + C(e_L) - C(e_H) \geq 0, \quad (c1)$$

If condition c1 is satisfied, the debt holders set $D(e_H)$ in equilibrium, and the manager exerts $e^* = e_H$ in equilibrium. Hence, the manager's effort incentives are consistent with the face value of debt set by the market. If condition c1 is violated, then, if the market sets $D(e_H)$, the manager will exert the low effort level. Hence, the high effort level cannot be an equilibrium. Therefore, the market sets $D(e_L)$, and the equilibrium effort level is $e^* = e_L$.

Next, consider the debt-equity contract. The respective expected payoffs for the manager, the debt and equity holders, and the total firm value at date 0 are:

$$M_{DE}(e_i) = \alpha(e^*)\gamma e_i(R_H - R_L) - C(e_i), \quad (6)$$

$$S_D = R_L, S_E = (1 - \alpha(e^*))\gamma e_i(R_H - R_L), \quad (7)$$

$$S_D + S_E = I, \quad (8)$$

$$V_{DE} = \gamma e_i R_H + (1 - \gamma e_i)R_L. \quad (9)$$

We analyse these payoffs as follows. The debt holders hold a contract with face value of debt, $D = R_L$; that is, debt is risk-free. In other words, the debt holders are guaranteed full payment. The manager and the equity holders share the firm's equity (i.e., the value of the firm in excess of the value of debt R_L). The manager issues a proportion $(1 - \alpha(e^*))$ to outside equity holders and retains a proportion $\alpha(e^*)$.

Define $\Delta M_{DE} = M_{DE}(e_H) - M_{DE}(e_L)$. This represents the gain in managerial wealth from exerting the high effort level compared with the low effort level for a given α . Therefore, the manager selects e_H iff

$$\Delta M_{DE} = \alpha(e^*)\gamma(e_H - e_L)(R_H - R_L) + C(e_L) - C(e_H) \geq 0, \quad (10)$$

From (7) and (8), we obtain the market-determined α^* , given that the manager exerts effort level e^* :

$$\alpha(e^*) = 1 - \frac{I - R_L}{\gamma e^*(R_H - R_L)}, \quad (11)$$

This represents the proportion of the equity that the manager can keep (issuing $1 - \alpha(e^*)$ to outside equity holders), given that the market is expecting an effort level e^* , and values equity accordingly. The combined values of debt and equity then equal I ; that is, the debt holders and equity holders invest at zero NPV.

As before, we wish to examine the conditions under which the manager exerts the high or low effort level in equilibrium. Assume that the manager's equilibrium effort level is $e^* = e_H$. Substituting into (11) and then substituting into (10), we obtain condition c2:

$$\gamma(e_H - e_L)(R_H - R_L) - \frac{(e_H - e_L)(I - R_L)}{e_H} + C(e_L) - C(e_H) \geq 0. \quad (c2)$$

If condition c2 is satisfied, the market sets the share price such that the manager must issue $1 - \alpha(e_H)$ and can only retain $\alpha(e_H)$ for himself. Given this equity allocation, the manager exerts $e^* = e_H$ in equilibrium. Hence, the manager's effort incentives are consistent with the equity allocation set by the market. If condition c2 is violated, then, if the market allocates $1 - \alpha(e_H)$ and $\alpha(e_H)$, the manager will exert the low effort level. Hence, the high effort level cannot be an equilibrium. Therefore, the market allocates $1 - \alpha(e_L)$ and $\alpha(e_L)$, and the equilibrium effort level is $e^* = e_L$.

We note that condition c1 exceeds condition c2 by $\gamma(e_H - e_L)F$. This represents the expected reduction in financial distress costs from exerting the higher effort level in the pure debt contract. Since there are no financial distress costs in the debt-equity contract, this term is absent from c2. Furthermore, if $F = 0$, conditions c1 and c2 are identical. The implication of this is that it is only the expected financial distress costs that force the manager to exert the higher effort level. Since the investors (both the debt holders and equity holders) invest at zero NPV, the manager has identical effort incentives under the pure debt and debt-equity contracts in the absence of financial distress costs.

Lemma 1 compares the manager's effort incentives in the pure debt and debt-equity contracts.

Lemma 1: The manager's incentives to exert high effort in the pure debt and debt-equity contracts are determined by the expected marginal benefits and marginal costs of high effort. Furthermore, in the pure debt contract, an additional incentive to exert high effort is provided by the existence of financial distress costs. This incentive is absent in the debt-equity contract. Therefore, we may state the following.

(a) If $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + \gamma(e_H - e_L)F + C(e_L) - C(e_H) \geq 0$ and $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + C(e_L) - C(e_H) \geq 0$ (that is, conditions c1 and c2 hold), the marginal benefit from the higher effort level exceeds the marginal cost, and therefore the manager exerts the high effort level in both contracts.

(b) If $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + \gamma(e_H - e_L)F + C(e_L) - C(e_H) < 0$ and $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + C(e_L) - C(e_H) < 0$ (conditions c1 and c2 are violated), the marginal cost of exerting the higher effort level exceeds the marginal benefit, and the manager exerts the low effort level in both contracts.

(c) If $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + \gamma(e_H - e_L)F + C(e_L) - C(e_H) \geq 0$ and $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + C(e_L) - C(e_H) < 0$ (condition c1 holds, and c2 is violated), the marginal benefit from the higher effort level exceeds the marginal cost in the pure debt contract, but the marginal cost of exerting the higher effort level exceeds the marginal benefit in the debt-equity contract. Therefore, the manager exerts the high effort level in the pure debt contract and the low effort level in the debt-equity contract. The difference in incentives is not caused by the equity stake (since investors invest at zero NPV) but by the financial distress costs.

In the special case where $F = 0$, conditions c1 and c2 are identical. Therefore, they both either hold or are violated. In other words, when $F = 0$, we derive an irrelevance result, where the manager exerts the same effort level in either contract. The intuition is that, although the manager has a higher equity stake in the pure debt contract, which has a positive effect on effort level, this is completely cancelled by the increase in the face value of debt, due to debt being risky, which has an offsetting negative effect on effort incentives.

4. The Equilibrium Financial Contract

We now solve for the equilibrium financial contract. We compare two cases: (a) the investor selects the contract and (b) the manager selects the contract.

First, consider the case where the investor selects the contract. The investor aims to maximise firm value. By comparing (3) and (9), we note that, in order to maximise firm value, the investor selects the financial contract that maximises the manager's effort level.

Next, consider the case where the manager selects the optimal contract. The manager is not concerned with firm value. He selects the contract that maximises his

expected personal wealth; that is, he compares (1) and (6). In order to make the comparisons, we substitute for $D(e^*)$ in (1) and for $\alpha(e^*)$ in (6). These equations become

$$M_D(e^*) = \gamma e^*(R_H - R_L) + R_L - I - (1 - \gamma e^*)F - C(e^*), \quad (12)$$

$$M_{DE}(e^*) = \gamma e^*(R_H - R_L) + R_L - I - C(e^*). \quad (13)$$

At this point, it is instructive to re-write the firm value equation (3) or (9) as $V = \gamma e^*(R_H - R_L) + R_L$. Hence, we note that, in both contracts, the manager has all of the equity in excess of I . This is because the investors provide finance at zero NPV; that is, in both contracts, the total value of the investors' contract is I . The manager has the positive NPV.

Recall that we are dealing with a moral hazard problem, whereby investors provide finance up front, and the manager then exerts his effort level. Hence, there is a commitment problem. In comparing (12) and (13), the manager recognises that his choice of financial contract affects the market's expectation of his effort level, which ultimately affects the manager's NPV and wealth.

We will be examining the manager's use of the pure debt contract to commit to a higher effort level. We note that, if the manager exerts the same effort level in both contracts (either high or low), then (13) > (12) due to the presence of the financial distress costs in (12). That is, he strictly prefers the debt-equity contract. If the manager exerts the high effort level under the pure debt contract and the low effort level under the debt-equity contract, he is then comparing

$$M_D(e_H) = \gamma e_H(R_H - R_L) + R_L - I - (1 - \gamma e_H)F - C(e_H), \quad (14)$$

$$M_{DE}(e_L) = \gamma e_L(R_H - R_L) + R_L - I - C(e_L). \quad (15)$$

Lemma 2 compares the manager's and the investor's optimal contracts.

Lemma 2: The investor prefers the contract that maximises firm value. The manager prefers the contract that maximises his personal payoff.

If the choice of financial contract does not affect the manager's effort level (and hence does not affect firm value), then investors are indifferent between the contracts. The manager unambiguously prefers the debt-equity contract due to the expected financial distress costs from the pure debt contract.

If the choice of financial contract affects the effort level, then investors unambiguously prefer the pure debt contract, since financial distress costs force higher managerial effort. The manager's choice of contract depends on the marginal effect on his wealth (including the expected financial distress costs in the pure debt contract). Therefore, we conclude the following.

(a) If $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + \gamma(e_H - e_L)F + C(e_L) - C(e_H) \geq 0$ and $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + C(e_L) - C(e_H) \geq 0$ (conditions c1 and c2 both hold), or $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + \gamma(e_H - e_L)F + C(e_L) - C(e_H) < 0$ and $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H +$

$C(e_L) - C(e_H) < 0$ (conditions c1 and c2 are both violated), the choice of financial contract does not affect the manager's effort level (from Lemma 1). Therefore, the investor is indifferent between the debt and debt-equity contracts. The manager prefers the debt-equity contract.

(b) If $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + \gamma(e_H - e_L)F + C(e_L) - C(e_H) \geq 0$ and $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + C(e_L) - C(e_H) < 0$ (c1 holds and c2 is violated), the investor prefers the pure debt contract (since this induces higher managerial effort and higher firm value).

The manager is aligned with the investors in preferring the (value-maximising) pure debt contract if $M_D(e_H) \geq M_{DE}(e_L)$. In contrast, the manager is in conflict with the investors, preferring the (value-minimising) debt-equity contract, if $M_{DE}(e_L) > M_D(e_H)$.

We obtain our irrelevance result in the special case where $F = 0$. In this case, c1 and c2 both hold or are both violated. Therefore, the manager exerts the same effort level in either contract. Hence, the investors are indifferent between the two contracts. Also, since $F = 0$ and the manager's effort level is unaffected, examination of (14) and (15) reveals that the manager is also indifferent between the two contracts.

Note that, for ease of modelling, we have assumed only two discrete managerial effort levels (high or low). Therefore, under certain conditions (as described in Lemma 2a), the financial contract does not affect the manager's effort levels or firm value. Hence, investors are indifferent between the two contracts, and the manager prefers the debt-equity contract (due to the financial distress costs).

In a more complex model, we would assume a continuous distribution of possible effort levels. In such a model, we would expect the financial contract to affect the manager's effort level, with the pure debt contract forcing a high effort level.

Lemma 2b demonstrates the conditions under which we obtain precisely this result in our discrete effort level case. The financial contract does affect the managers' effort level. The manager exerts the low effort level under the debt-equity contract and the high effort level under the pure debt contract. Now, the investors unambiguously prefer the pure debt contract.

The manager may be aligned or in conflict with the investors in the choice of financial contract. The manager will have an incentive to issue the pure debt contract to commit to a higher effort level. However, he will compare this incentive with the marginal cost of effort and the expected financial distress costs from using the pure debt contract.

For the remainder of this paper, we focus on Lemma 2b. That is, we focus on a case where c1 holds and c2 is violated, so that the debt contract has a role to play in forcing the higher effort level.

5. Equilibrium Financial Contracts When the Pure Debt Contract Forces Higher Managerial Effort

The manager is aligned with investors in selecting the pure debt contract iff $M_D(e_H) \geq M_{DE}(e_L)$; that is, iff

$$\gamma(e_H - e_L)(R_H - R_L) - (1 - \gamma e_H)F + C(e_L) - C(e_H) \geq 0. \quad (c3)$$

The first term of condition c3 represents the expected gain in the manager's wealth from higher effort level due to the increased probability of the good state. The second term represents the expected financial distress costs from the pure debt contract. The last two terms represent the marginal cost of the higher effort level under the pure debt contract. Hence, the manager has an incentive to issue the pure debt contract in order to commit to a higher effort level (the first term), but this incentive may be reduced by the expected financial distress costs and the increased cost of effort.

Proposition 1 draws the analysis together to provide our main result.

Proposition 1: When the pure debt contract forces a higher managerial effort level than the debt-equity contract, investors unambiguously prefer the pure debt contract. The manager's choice of contract depends on the marginal effect on his wealth. By choosing the pure debt contract, he commits to a higher effort level, which has a positive effect on his wealth (since investors provide finance at zero NPV and the manager gains all of the positive NPV). However, he also faces the negative effects of expected financial distress costs. Hence, if both $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + \gamma(e_H - e_L)F + C(e_L) - C(e_H) \geq 0$ and $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + C(e_L) - C(e_H) < 0$ (c1 holds and c2 is violated), the manager exerts higher effort under the pure debt contract. This is purely due to the threat of financial distress costs. Therefore, we conclude as follows.

(i) If $\gamma(e_H - e_L)(R_H - R_L) - (1 - \gamma e_H)F + C(e_L) - C(e_H) \geq 0$, the manager is aligned with the investors in preferring the pure debt contract.

(ii) If $\gamma(e_H - e_L)(R_H - R_L) - (1 - \gamma e_H)F + C(e_L) - C(e_H) < 0$, the manager is in conflict with the investors, preferring the debt-equity contract.

Therefore, the investor strictly prefers the pure debt contract, since this will induce the high effort level (due to the financial distress threat). We note that the manager is aligned with the investor in preferring the value-maximising pure debt contract if his wealth gain from committing to the higher effort level exceeds the higher cost of effort and the expected financial distress costs from issuing pure debt.

On the other hand, the manager is in conflict with the investor if the expected financial distress costs from issuing pure debt, plus the higher cost of effort, exceed his wealth gain from committing to the higher effort level.

In the next section, we consider a numerical example to illustrate the possible conflict in choice of financial contract and the effect on firm value.

6. Numerical Example

We assign the following parameter values:

$$R_H = 1600, \quad R_L = 200, \quad I = 400, \quad e_H = 0.7, \quad e_L = 0.2, \quad \gamma = 1, \quad F \in \{300, 500\}, \\ C(e_H) = 600, \quad C(e_L) = 0.$$

Note that we have assigned two possible values for financial distress costs in order to analyse the effect on the manager's choice of financial contract.

First, consider the case where $F = 300$. Substituting the parameters into c1, we obtain $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + \gamma(e_H - e_L)F + C(e_L) - C(e_H) = 108 \geq 0$. Furthermore, substituting the parameters into c2, we obtain $\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + C(e_L) - C(e_H) = -42 < 0$. Therefore, c1 holds and c2 is violated. As described in Proposition 1, the manager exerts the high effort level in the pure debt contract and the low effort level in the debt-equity contract. Hence, the investors prefer the (value-maximising) pure debt contract.

Now, substitute the parameters into c3 in order to determine the manager's optimal contract. We obtain $\gamma(e_H - e_L)(R_H - R_L) - (1 - \gamma e_H)F + C(e_L) - C(e_H) = 10 \geq 0$. Therefore, Proposition 1(i) applies; the manager is aligned with the investors in preferring the pure debt contract. The intuition is that the manager's financial gain from committing to the high effort level exceeds the higher cost of effort and the expected financial distress costs.

Next, consider the case where $F = 500$. Condition c1 becomes

$$\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + \gamma(e_H - e_L)F + C(e_L) - C(e_H) = 208 \geq 0.$$

Condition c2 remains as

$$\gamma(e_H - e_L)(R_H - R_L) - (e_H - e_L)(I - R_L)/e_H + C(e_L) - C(e_H) = -42 < 0.$$

Therefore, c1 still holds, and c2 is still violated. The manager continues to exert the high effort level in the pure debt contract and the low effort level in the debt-equity contract, and the investors continue to prefer the pure debt contract.

Condition c3 becomes

$$\gamma(e_H - e_L)(R_H - R_L) - (1 - \gamma e_H)F + C(e_L) - C(e_H) = -50 < 0.$$

Since condition c3 is now negative, Proposition 1(ii) now applies. In contrast to the investors, the manager prefers the debt-equity contract. The intuition is that, although the pure debt contract commits the manager to a higher effort level, thus increasing the manager's NPV, this gain is less than the financial distress costs and the higher cost of effort from the pure debt contract.

7. Conclusion

We have developed a principal-agent model of financial contracting that considers two effects of debt on a manager's effort incentives. First, following Jensen and Meckling (1976), a high debt level increases the manager's equity stake, whereas a low debt level dilutes the manager's equity stake. Second, the threat of financial distress increases with the high debt level.

In the absence of financial distress costs, we derive a novel irrelevance result; the financial contract does not affect managerial effort or firm value. This is because, for high debt levels, the manager has a greater equity stake, but this is exactly offset by the increase in the face value of risky debt. In the presence of financial distress costs, a high debt level forces an increase in managerial effort, as the manager seeks to avoid these costs. Hence, investors unambiguously prefer the high debt contract. The manager's optimal contract depends on the level of financial distress and effort costs. If these are low, he is aligned with investors in preferring the pure debt contract. If these are high, he prefers the low debt contract.

Our model provides a basis for future research as follows.

(a) For simplicity, we only considered two types of financial contract; first, a pure debt contract (in which debt is risky), and second, a debt-equity contract, where debt is risk-free. Furthermore, we only considered two possible effort levels, high or low. It would be interesting to develop the model to include a continuum of effort levels and debt levels.

(b) Our model provides a basis for empirical testing. A promising approach would be to develop Garvey and Hanka's (1997) takeover model. In their model, a manager uses the capital structure as a defensive mechanism against a hostile takeover threat. The manager holds no equity in the firm and merely is interested in keeping his job. When takeover threats are weak, he sets low debt levels in order to avoid financial distress. When takeover threats are strong, he sets high debt levels in order to increase firm value and therefore reduce the takeover threat. Hence, there are large swings in leverage relating to takeover cycles. Our model suggests that if we include the manager's equity stake in Garvey and Hanka's (1997) model, then these swings in leverage may be mitigated. If financial distress costs are low, the manager always carries high debt levels. If financial distress costs are high, then the swings in leverage will be larger.

(c) In our model, the manager suffers from financial distress costs to a greater extent than the investors (since he has his human capital and reputation tied up in the firm). Therefore, he naturally favors a lower debt level. An extremely interesting area of research examines the behavioral aspects of corporate finance (e.g., Besharov, 2002; Gervais, Heaton, and Odean, 2003; Heaton, 2002; Mattson and Weibull, 2002; Shefrin, 1999; and Stein, 1996). One extensively researched aspect is that of overconfidence. Heaton (2002) argues that agents, such as managers, are more optimistic about outcomes that they believe they can control. Shefrin (1999) argues that "over-

confident executives may underestimate the probability of default, and as a result choose an overly debt-heavy capital structure.” Furthermore, Besharov (2002) develops a framework in which an irrational individual suffers from positive and negative biases. It is then possible that these biases cancel each other, such that the agent makes an optimal decision overall. It would be possible to develop our model to consider a trade-off between the manager’s rational aversion to financial distress (favoring a low debt level) and his irrational overconfidence (favoring a high debt level). Applying the Besharov (2002) framework, we could then examine when these opposing biases result in the optimal (value-maximising) debt level from the investors’ point of view.

(d) Furthermore, we should consider the impact of asymmetric information and signalling in our model (see Ross, 1977; Leland and Pyle, 1977; and Myers and Majluf, 1984, for pioneering signalling models of the capital structure).

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