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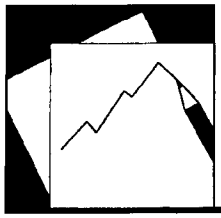

IMF Working Paper

The Impact of Corporate Governance Structures on the Agency Cost of Debt

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Abstract

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

This paper uses a stochastic continuous-time model of the firm to study how different corporate governance structures affect the agency cost of debt. In the absence of asymmetric information, it shows that control of the firm by debtholders with a minority stake delays the exit decision and reduces the underinvestment problem. Such a governance structure may play an important role in diminishing conflicts between shareholders and debtholders.

JEL Classification Numbers: G3

Keywords: Corporate governance, agency cost of debt, exit decision, bankruptcy.

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[1] This paper has benefited from Garry Schinasi's useful comments. Any errors or omissions remain the author's responsibility.

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I. INTRODUCTION

This paper uses a stochastic continuous time model to study the impact of different corporate governance structures on the exit decision, or bankruptcy decision, of an individual firm when there are no informational asymmetries between shareholders and debtholders. The paper, then, deals with the agency cost of debt, first identified by Myers (1977). The agency cost of debt arises from competing interests between shareholders and debtholders on the firm's cash flow. As a result, the shareholders have an incentive to choose investment projects that reduce the total value of the firm, the so called underinvestment problem. In the model setup chosen here, underinvestment amounts to the early liquidation of the debt-equity financed firm compared to an equity financed firm.

The primary contribution of this paper is to demonstrate that the choice of corporate governance structure plays a role in determining the agency cost of debt. In particular, a governance structure in which debtholders have the right to control the firm reduces the agency cost of debt induced compared to one in which shareholders control the firm. This result follows intuitively from the fact that a debtholder-controlled levered firm behaves as a social planner maximizing the weighted value of debt and equity, where the weight of equity relative to debt is given by the fraction of equity owned by the debtholder. As this fraction increases, the similarity of the debtholder-controlled levered firm to the pure equity financed firm increases, and hence, the agency cost of debt decreases. Therefore, the advantages (or disadvantages) of governance systems that impart corporate control to debt holders are not necessarily related to the existence of asymmetric information, an assumption frequently used in earlier theoretical and empirical studies.[2]

Although the academic literature has studied extensively the agency cost of debt, it has always been under the assumption that the firm is under control of the shareholders. This assumption is a good approximation if applied to corporate sectors where there is heavy reliance on financial markets, dispersed ownership, and a wide base of debtholders. Arguably, dispersed ownership does not create a major problem because of the existence of strong markets for corporate control that align the incentives of managers with those of shareholders.

This paper is related to several strands in the academic literature. First, it is related technically to the relatively young but rapidly growing literature on the strategic exercise of real options, based on the theory of complete information stopping problems, which was initiated by McDonald and Siegel (1985) and is superbly explained in the textbook by Dixit and Pindyck (1993). Second, the paper also builds on the literature of strategic analysis of

[2] For example, Hayashi (1997) and references therein.

contingent claims and endogenous default risk, as exemplified by Leland (1994), Leland and Toft (1996), Anderson and Sundaresan (1996) and Mella-Barral and Perraudin (1997) among others. Leland (1994) examines the value of corporate debt and the optimal capital structure under different assumptions about what triggers bankruptcy, allowing for the effects of taxes, payout rates, and bond covenants. Leland and Toft (1996) build on the previous model by allowing the choice of debt maturity, and apply their results to characterize the term structure of credit spreads. Anderson and Sundaresan (1996) examine the effects of take it or leave it offers on debt valuation in a discrete time model. Similarly, Mella-Barral and Perraudin (1997) analyze how the underinvestment problem can be solved through renegotiation. Finally, the paper complements recent work by Mahrt-Smith (2000), that shows in a finite-discrete time model that equity ownership by banks help to alleviate the underinvestment problem when there exist informational asymmetries among competing banks.[3]

The structure of the paper is as follows. The benchmark case of the pure equity financed firm is analyzed in Section II. The case of the debt-equity financed firm controlled by shareholders is analyzed in section III. We then turn our attention in section IV to the case of the debt-equity financed firm controlled by the debtholders, which we assume are represented by a bank. Section V concludes.

II. The Model

The model used in the analysis is a simplified version of the contingent claims asset pricing model introduced by Mella-Barral and Perraudin (1997). In contrast to Mella-Barral and Perraudin (1997), the analysis herein abstains from debt renegotiation but focuses on how different corporate governance structures affect the value of the firm as well as the value of its two components, debt and equity. The model assumes efficient capital markets, and risk-free lending and borrowing at the constant risk-free rate, r. There are two types of risk-neutral agents, shareholders and debtholders. It is assumed that all debtholders are represented by a single representative bank. Informational asymmetries among the different agents are ruled out. Although this assumption may appear somehow overly restrictive, as problems arising from asymmetric information are very important in the corporate finance literature, it permits isolating the agency problems related only from the existence of different claimants to the cash flow of the firm.

[3] The ownership of equity by banks have been explored in the literature of banking regulation by Bhattacharya and Thakor (1993) and Dewatripont and Tirole (1994) among others. However, this literature paid no attention to agency costs.

The Production Technology of the Firm

The firm, if operating, produces one unit of output per unit of time at a constant cost equal to ω. It is assumed that the price of one unit of output, p_t, follows a geometric brownian motion process given by

$$\frac{dp_t}{p_t} = \mu dt + \sigma dB_t,$$

where μ is the instantaneous rate of return, and B is a standard Brownian motion. In case that the firm ceases to operate, it is possible to recover an amount γ, which is the salvage value of the firm. The salvage value of the firm is paid to the debtholders, in case that the firm is financed by debt. Otherwise, it is paid to the shareholders. Once the firm shuts down, it cannot operate again. There are no costs associated to shutting down the firm. The corporate governance structure of the firm states which group of agents, either debtholder or shareholders, takes the decision to keep the firm in operation or to shut it down. Three cases are discussed in detail below: the pure equity firm, the shareholder-controlled firm, and the bank-controlled firm. These cases are discussed in detail below.

The Pure Equity Firm

Clearly, if the firm is financed only with equity and absent informational asymmetries, there are no agency problems at all. Therefore, the pure equity firm is a good benchmark to compare our results with. Let $W(p)$ be the value of the pure equity firm, which clearly depends only on the price of output, p. The value of the pure equity firm must satisfy the following second order differential equation

$$rW(p) = p - \omega + \mu p W'(p) + \frac{1}{2}\sigma^2 p^2 W''. \tag{1}$$

This equation simply states that the return from holding equity in the firm must be equal to the net cash flow after paying off the operating costs plus the expected appreciation of equity. This last component is captured by the last two terms in the equation above, after applying Ito's Lemma to W. There are two boundary conditions associated to the solution of the differential equation above. The first condition simply states that in case of bankruptcy, the shareholders obtain the salvage value of the firm, that is, $W(p_E) = \gamma$, where p_E is the optimal liquidation price. The second condition is that the value of equity, which corresponds to the value of the firm in this case, must be maximized by the choice of the liquidation price, that is, $W'(p_E) = 0$. The solution of the differential equation imposing the two boundary conditions is given by

$$W(p) = \frac{p}{r-\mu} - \frac{\omega}{r} + \left[\gamma - \frac{p_E}{r-\mu} + \frac{\omega}{r}\right]\left(\frac{p}{p_E}\right)^{\lambda}, \tag{2}$$

where λ is the negative solution of the quadratic equation associated to the second order differential equation above,

$$\lambda(\lambda - 1)\sigma^2/2 + \mu\lambda = r \tag{3}$$

and the liquidation price p_E is given by

$$p_E = -\frac{\lambda}{1-\lambda}\left(\frac{\omega}{r} + \gamma\right)(r - \mu). \tag{4}$$

As soon as the price is equal or below the liquidation price, the firm is shut down. These results hold even if the governance structure of the firm specifies that only a fraction of the shareholders control the firm, as the optimization problem faced by each single shareholder is the same in the absence of informational asymmetries.

III. The Shareholder-controlled Levered Firm

Now, consider the case of a firm financed by debt and equity. The debt is held by the bank which does not own equity at all. For simplification, assume that the issued debt pays a constant coupon b per unit of time, that is, its principal value is b/r. To guarantee that the debt is risky, it is assumed that the principal value of the debt is greater than the salvage value of the firm, which is paid to the debt holders in case of bankruptcy, $b/r > \gamma$. We proceed to derive the expressions for the value of equity and debt.

Let $V(p)$ denote the value of equity. As in the case of the pure equity financed firm, the value of equity should satisfy the following no arbitrage condition:

$$rV(p) = p - b - \omega + \mu p V'(p) + \frac{1}{2}\sigma^2 p^2 V''. \tag{5}$$

This equation simply states that the return on holding equity in the firm is equal to the net cash flow after paying off the debt and the operating costs plus the expected capital appreciation of equity. The boundary conditions are similar to those in the pure equity firm: $V(p_S) = 0$, and $V'(p_S) = 0$, where p_S is the optimal liquidation price when the firm is controlled by shareholders. The main difference is that now, the shareholders obtain nothing when the firm is liquidated, since the salvage value goes to the bank. The solution for the value of equity is

$$V(p) = \frac{p}{r-\mu} - \frac{\omega + b}{r} - \left[\frac{p_S}{r-\mu} - \frac{\omega + b}{r}\right]\left(\frac{p}{p_S}\right)^{\lambda}, \tag{6}$$

where λ is the same as in the pure equity firm case, and the liquidation price p_S is given by

$$p_S = -\frac{\lambda}{1-\lambda}\left(\frac{\omega + b}{r}\right)(r - \mu). \tag{7}$$

Let $L(p)$ be the value of debt at any given time when the price of output is $p_t = p$. Similarly to the case of the pure equity financed firm, no arbitrage arguments, risk neutrality, and Ito's Lemma yield a second order differential equation that must be satisfied by $L(p)$:

$$rL(p) = b + \mu p L'(p) + \frac{1}{2}\sigma^2 p^2 L''. \tag{8}$$

The boundary condition associated with this equation states that in case of bankruptcy, when the price of output is p_S, the bank receives the salvage value of the firm, that is, $L(p_S) = \gamma$. Because the liquidation price, p_S, is chosen by the equity holder, the value of debt is not necessarily maximized at p_S since shareholders are only interested in their own welfare, as measured by the value of equity. The value of debt, given p_S, is

$$L(p) = \frac{b}{r} + \left[\gamma - \frac{b}{r}\right]\left(\frac{p}{p_S}\right)^{\lambda}. \tag{9}$$

The value of the firm, given by the sum of the values of debt and equity, is equal to

$$W_D(p) = \frac{p}{r-\mu} - \frac{\omega}{r} + \left[\gamma - \frac{p_S}{r-\mu} + \frac{\omega}{r}\right]\left(\frac{p}{p_S}\right)^{\lambda}. \tag{10}$$

Though the expressions for the value of equity and the endogenous bankruptcy price are similar, the introduction of debt financing reduces the cash flow to the shareholders, and therefore, affects the choice of the optimal bankruptcy price. In particular, shareholders are not interested in keep the firm operating when output prices are very low since most of the cash flow would be used to pay the debt coupon. As a result, a debt-equity financed firm will shut down before pure equity financed firm and the value of the firm will be less than the value of the equity-financed firm, because of the early liquidation.

Proposition 1 *a) The liquidation price in the case of debt-equity financing is greater than when the firm is financed exclusively by equity, that is,* $p_S > p_E$. *b) The value of the pure equity firm is greater than the value of the shareholder controlled levered firm, that is,* $W(p) > W_D(p)$.

Proof: *The proof of a) follows from equations (4) and (7), and the assumption that debt is risky, that is,* $b/r > \gamma$. *The proof of b) follows from direct comparison of the formulas for* $W(p)$ *and* $W_D(p)$.*Q.E.D.*

The results in this section also applies to the case in which debtholders also own a minority stake in shares, and therefore, are precluded from controlling the firm. In fact, if debtholders own a fraction α of the existing shares, $\alpha < 1/2$, and controlling rights are decided on a one-share, one-vote basis, the optimal choice of the liquidation price is still given by equation (7).

IV. The Debtholder-controlled Levered Firm

This section studies the case in which debtholders, which we assume are represented by a single bank, own a fraction α of the existing shares and have the right to control the firm. Even if the bank is a minority shareholder, e.g. $\alpha < 1/2$, there are several mechanisms through which it can gain control of the firm, as described by Bebchuk, Kraakman, and Triantis (1999). In particular, one that has been widely used in East Asia, especially in Japan and South Korea, is the cross-shareholding system. Let $L_B(p)$ denote the value of debt, and let $V_B(p)$ denote the value of equity. The value of the bank's stake in the firm, $B(p)$, will be given by

$$B(p) = L_B(p) + \alpha V_B(p). \tag{11}$$

The two boundary conditions that determine the output price, $p_B > 0$, at which it is optimal to shut down the firm are:

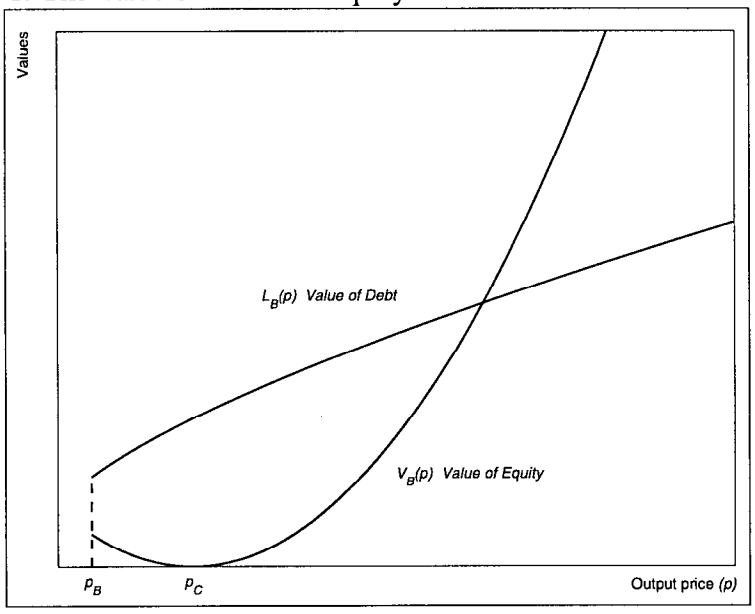
$$B'(p_B) = L'(p_B) + \alpha V'_B(p_B) = 0, \tag{12}$$

$$B(p_B) + (1-\alpha)V_B(p_B) = L_B(p_B) + V_B(p_B) = \gamma. \tag{13}$$

The first boundary condition simply states that when the output price is equal to p_B and the firm is shut down, the decision is optimal for the bank. The second boundary condition states that the salvage value of the firm must be distributed between the bank and the remaining shareholders. Because the bank now owns equity in the firm, the optimal decision to shut down the firm does not necessarily imply that the value of equity should be equal to zero.

In fact, the bank is acting as a "social planner" that maximizes a weighted combination of the interests of both debtholders and shareholders, where the weight of the shareholders relative to the debtholders is α. In consequence, it should be expected that the optimal shut down price when the bank controls the firm, p_B, must lie somewhere in between the optimal bankruptcy point of a pure equity financed firm, p_E, and the optimal bankruptcy point of a debt-equity financed firm controlled by the shareholders, p_S. The intuition behind these result is as follows. On the one hand, from the point of view of the debtholders, the firm is prematurely shut down when the shareholders exercise control. Once the interests of the debtholders are taken into account, the firm would continue to operate below the optimal bankruptcy point preferred by the shareholders. On the other hand, to keep the firm operating when prices are below p_S, shareholders must be "bribed," which explains why the value of equity is strictly positive at p_B. Moreover, the social planner analogy also suggests that the value of the debtholder controlled levered firm should be greater than the value of the shareholder- controlled levered firm. The intuitive analysis above is formalized in the following propositions and illustrated in Figure 1.

Figure 1: The Value of Debt and Equity in the Debtholder-controlled firm.



Proposition 2 *The value of equity in the debtholder-controlled firm at liquidation is strictly positive, that is,* $V_B(p_B) > 0$.

Proof: *Suppose not. Then, for any given* $\delta > 0$, $V_B(p_B + \delta) < 0$, *because* $V_B(p)$ *is continuous. However, equity can never have negative value, which contradicts our supposition. Q.E.D.*

Proposition 3 *a) The liquidation price of the debtholder controlled firm is greater than when the firm is financed only with equity, but lower than when the firm is controlled by the shareholders, that is,* $p_E \leq p_B \leq p_S$. *b) The value of the pure equity firm is greater than the value of the debtholder controlled levered firm, which in turn is greater than the value of the shareholder controlled firm, that is,* $W(p) > W_B(p) > W_D(p)$.

Proof: *a) An informal argument could be used to prove that* $p_E \leq p_B \leq p_S$, *Because the cash flow rights remains unchanged, the value of debt and equity must satisfy second order differential equations similar to those derived in the case of the debt-equity financed firm. Therefore,* $V_B(p)$ *and* $L_B(p)$ *must satisfy*

$$rV_B(p) = p - b - \omega + \mu p V_B'(p) + \frac{1}{2}\sigma^2 p^2 V_B'',$$

$$rL_B(p) = b + \mu p L'_B(p) + \frac{1}{2}\sigma^2 p^2 L''_B.$$

The solutions of these two differential equations are of the form

$$V_B(p) = \frac{p}{r-\mu} - \frac{\omega + b}{r} + A_1 \left(\frac{p}{p_C}\right)^{\lambda}, \tag{14}$$

$$L_B(p) = \frac{b}{r} + A_2 (p)^{\lambda}, \tag{15}$$

where A_1 and $A_2 < 0$ are constants, λ is the negative solution of equation (X), and $p_C > p_B$ is an endogenous point that satisfies the boundary conditions $V'_B(p_C) = 0$, and $V_B(p_C) = 0$. These conditions must be justified. First, note that A_2 must be negative such that $L'_B(p) > 0$, because the value of debt is increasing in the price of output as the firm is able to pay the coupon without problems. Second, if the value of debt is an increasing function of the price, it must be the case that the value of equity must be decreasing function of the price when $p = p_B$ to ensure that $B'(p_B) = 0$, as required for an optimum solution. This requires that $A_1 < 0$. However, as p becomes very large, the value of equity becomes an increasing function of the price. Because V_B is twice differentiable, there must be a price p_C such that $V'_B(p_C) = 0$. Finally, shareholders benefit from a positive equity value when the firm closes at the expense of sacrificing value in better times. Hence, $V_B(p_C) = 0$, because the bank, that acts both as a debtholder and shareholder, could appropriate all the rents for itself with this condition. Therefore, A_1, A_2, p_B, and p_C can be solved from the two order conditions, $V'_B(p_C) = 0$, and $L_B(p_C) = b/r$, together with boundary conditions (11) and (12). Using the implicit function theorem, it can be established that p_B is a continuous function of α, and given that $p_B \to p_E$ when $\alpha \to 1$, and that $p_B \to p_S$ when $\alpha \to 0$, establishes the result.
b) Because the bank and the shareholders are risk neutral, the optimization of the problem is equivalent to that of a social planner maximizing a weighted average utility function, where the utility of the bank and the shareholder corresponds to the value of debt and equity respectively, and the relative weight of the shareholder is the minority equity stake of the bank, α. As $\alpha \to 1$, the social planner problem optimal solution tends to the benchmark case of the pure equity financed firm, and when $\alpha \to 0$, it converges to the shareholder-controlled case. Q.E.D.

V. CONCLUSIONS

Corporate governance plays an important role in determining the agency costs arising from the conflicts of interest between debtholders and shareholders, a role which has not been extensively analyzed previously in the academic literature.[4] This paper finds that in the absence of informational asymmetries, governance structures in which debtholders owning equity stakes in the firm have the right to control it can effectively reduce the agency cost of debt – or underinvestment problem – providing a rationalization to the existence of such governance structures in the real world. Therefore, bank-based systems may play an important role not only in solving the conflicts between managers and shareholders, as analyzed extensively in the academic literature, but also in solving the underinvestment problem.

This conclusion should be taken with caution, as the choice of the optimal governance structure should be determined in a complete model that includes all the relevant factors that affect the financing and production decisions of the firm, such as informational asymmetries among managers, debtholders, and shareholders; debt maturity; and taxes among others.

[4] See Shleifer and Vishny (1997), and chapter 4 in Allen and Gale (2000) for recent surveys of corporate governance.

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