Agency Contracting
and Inside Debt

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I. Introduction

The primary roles of financial contracting are the provision of liquidity and the pricing of risk. With the development of the economic theory of agency, it has been recognized that two types of risk exist in financial contracts, the "native" risk of loss associated with the endeavor(s) financed and the "incentive" risk associated with the nature of the financial contract itself. The former, "native", risk is nothing more than the systematic risk associated with the purchase of any stock or bond and the making of a bank loan. The latter, "incentive", risk is the risk associated with the incentive that the parties to a financial agreement behave in accordance with the agreement.

The focus of the agency theory literature has been on three separate, but related, incentive-risk problems: The stockholder – manager conflict (SM), the stockholder – debtholder conflict (SD) and the manager – debtholder conflict (MD). (For surveys see Barneal/Haugen/Senbet, 1985; Jensen/Smith, 1985; Baltensperger/Devinney, 1985; Clemenz, 1986.)

The SM conflict literature deals primarily with the incentives that cause managers to reduce their managerial effort when their firms are financed with equity and stockholders can only imperfectly monitor their work habits. The SD conflict literature deals with the conflicting incentives between stockholders and bondholders. Bondholders want managers to reduce the risk of a firm's operations, since doing so decreases the likelihood of a default on the bonds, and hence raises their price. Stockholders, on the other hand, would like the firm to increase the risk of the firm, because their return rises as the price of the stock reflects the increased risk.
Traditionally, agency models solve the firm’s capital structure (debt-equity) problem by simultaneously considering the SM and SD conflicts.

The solution to the SM/SD conflict contains two parts. There is, first, the incentive contract. To provide the manager with the incentive to work in the best interests of the stockholders, the manager must be given a contract which is reflective of the performance of the firm, if only imperfectly. Such a compensation contract contains two components, a fixed salary plus an incentive bonus based on the firm’s performance. The second element of the solution to the SM/SD conflict is the determination of the firm’s capital structure, i.e., its debt/equity mix. It is clear that a firm financed only with equity and straight debt contains too many conflicting incentives. A more appropriate mix is for the firm to be financed through equity and internal funds – this reduces the likelihood that the managers will act against the stockholders – and convertible debt – this assures the bondholders that the equityholders will not attempt to radically increase the risk of the firm’s operations. Overall, the solution is second-best for both the stockholders and bondholders.

The MD literature has two sub-literatures. First, there is the issue of the manager-bondholder conflict. Numerous theoretical discussions exist as to the role of bond covenants in the controlling of the manager’s incentive to increase the risk of the firm. This literature has treated debt mostly as a homogeneous instrument with incentives in direct conflict with those associated with equity financing. Second, there is the borrower-lender literature which has developed from the simple examination of the incentive of the borrower to default on bank loans, to the role of the bank as a delegated monitor of a portfolio of borrowers, i.e., a monitoring agent for bank depositors (see Diamond, 1984). These latter models have served to strengthen the argument that there is a unique information and monitoring role for bank loans and that the phenomenon of credit rationing is due solely to the nature of information asymmetry in these markets (see Devinney, 1985).

In spite of this rather large literature on the incentives associated with a firm’s financing of its operations, there is no examination of the role of equity and bank debt. This paper presents a model of three interacting decision makers, stockholders, managers, and bankers. Stockholders and bankers do not interact directly with each other but take actions (set contractual arrangements) which can affect each other’s wealth through management’s reaction to these actions. Managers obtain funds for investment projects through a combination of stock issued to outside shareholders and bank borrowing. Outside stockholders determine the structure of the managerial compensation package, the fixed salary plus the amount of risk-sharing, while the banks determine the loan contract terms, interest rate and loan size, plus the level of explicit monitoring to engage in. Monitoring aides in determining the risk of the investment project undertaken by the managers. Managers, given the financing structure, determine their level of effort and perquisite consumption.
The model developed here is simultaneously richer than models of the stockholder–bondholder and the borrower–lender variety. (See Stiglitz/Weiss, 1981, 1983; Williamson, 1986, 1987; Besanko/Thakor, 1987a, 1987b, for some examples of the borrower–lender literature, and Fama/Jensen, 1983a, 1983b; Kalay, 1982, and Smith/Warner, 1979, for some examples of the stockholder–bondholder literature.) By explicitly incorporating the role of “inside debt”, our model provides a fuller explanation of the joint stock issuance and bank financing decisions seen in reality, particularly among small to medium-sized firms. Inside debt, as defined by Fama (1985), is debt which explicitly incorporates monitoring by giving the debtholder access to otherwise proprietary information. As noted by Fama or James (1987), it is the inside character of bank debt which makes it unique. Without the direct monitoring activity associated with such debt, banks would be little more than traditional bondholders and the value of bank financial intermediation would cease to exist. The model goes beyond the borrower-lender literature by examining how such inside debt can take on value to outside shareholders. As will be shown, outside stockholders want their firm to have some inside debt because of the associated reduction in agency costs.

The modelling framework used here is that of an asymmetric information game. Generally speaking, two approaches can be used to model a problem of this type. One approach is to model it as a simultaneous game with all players in the game making their moves at the same time, each possessing rational expectations on the anticipated moves of the other players. The second approach (see Holmstrom, 1979), uses the idea of a Stackelberg game (see Stackelberg, 1951). In a Stackelberg game, the leader moves first, anticipating the follower’s reaction. We are employing the Stackelberg formulation in this paper; the outside shareholders and the banks move first, while explicitly taking into account the manager’s reaction function.

The remainder of the paper is organized as follows: Section II formally presents the model to be examined. The assumptions made are outlined in detail is subsection II.1, with the stockholders’, managers’, and bank’s objective functions formalized in subsection II.2. The equilibrium compensation and loan contract terms are discussed in Section III with three subsection formally presenting the solution to each decision maker’s maximization. The model’s equilibrium is shown to be consistent with that found in the more limited financial intermediation literature. Finally, Section IV provides some further discussion on the allocation of total debt to inside debt and outside debt.
II. Model Formulation

1. Assumptions

The economy lasts two periods, indexed by $t = 0, 1$. The financing and investment decisions occur at date 0 and the payoff from the project occurs at date 1. The payoff is directly affected by the effort put forth by the management and the level of monitoring activity of the bank, and is contingent on the random state of nature realized in period 1. Greater managerial effort increases the output from any given project chosen and increases in monitoring expenditures reduce the riskiness of the project eventually accepted. Managers are viewed as choosing amongst alternative investment projects which require the same initial outlay but differ in terms of risk. Greater bank monitoring affects the project chosen by management while the bank’s choice of loan contract terms affects management effort. Outside stockholders choose the managerial incentive contract and, hence, the level of risk sharing between managers and stockholders.

The major assumptions of the model are as follows:

(A1) The initial outlay of the alternative investment projects is identical, $J_0^i = J_0^j$.

(A2) Alternative projects have specific levels of risk and can be ranked ex ante according to their standard deviation, $\sigma^2$.

(A3) The stochastic payoff of the project, $\bar{x}$, is normally distributed with the density $g(x; \mu, \sigma)$ and the distribution $G(x)$.

(A4) The expected payoff, $\mu$, is a function of the level of managerial effort, $e$, with the properties $\mu_e > 0$ and $\mu_{ee} < 0$.

(A5) The standard deviation, $\sigma^2$, is a function of the bank’s level of monitoring activity, $m$, with the properties $\sigma_m < 0$ and $\sigma_{mm} > 0$.

(A6) Both debt, $L$, and equity, $S$, are used to finance the project; $J_0 = S + L$.

(A7) All debt is inside debt (bank loans) as defined by Fama (1985).

(A8) The equity position consists of both “inside” equity and “outside” equity. Inside equity is owned by the management and is a fraction $\alpha$ of the total equity outstanding. The remaining fraction $(1 - \alpha)$ is the equity position held by outside owners.

(A9) Outside shareholders determine the fraction of equity given to managers, $\alpha$, and the managers’ fixed income component $H$. Managers are prohibited to trade the equity of its corporation in the stock market.

(A10) Banks determine the level of monitoring activities $m$, the loan size $L$, and the (gross) loan rate $R = (1 + r)$.

(A11) Managers choose the project, $i$, and hence its riskiness, $\sigma^j$, and their level of effort, $e$. 
(A12) Banks can monitor the managers' choice of project and, hence, risk but monitoring is costly. Total monitoring costs are \( M = vm \), where \( v \) is the per unit monitoring cost.

(A13) Neither outside stockholders nor banks can monitor the level of managerial effort.

(A14) Stockholder and bank expectations are rational in the sense that they can calculate the management's response to changes in their decision variables.

(A15) All decision-makers are risk neutral.

2. Decision Maker’s Objective Functions

Given the above assumptions, we can now formally structure the objective functions of the three groups of decision makers in the economy.

The stochastic end-of-period wealth of equityholders (managers and outside-shareholders) is given by

\[
V^E = \begin{cases} 
  x - RL & \text{if } x \geq RL, \\
  0 & \text{if } x < RL.
\end{cases}
\]  

(1)

The end-of-period wealth of debtholders (banks) is

\[
V^B = \begin{cases} 
  RL & \text{if } x \geq RL, \\
  x & \text{if } x < RL,
\end{cases}
\]  

(2)

where the bank loan "default" state is characterized by \( x < RL \) and the "non-default" state by \( x \geq RL \). The payoffs equityholders and debtholders receive are therefore conditional on the bank debt state occurring. The associated expected values of equations (1) and (2) are given by

\[
E(V^E) = \int_{RL}^{\infty} (x - RL)g(x) \, dx,
\]  

(3)

and

\[
E(V^B) = \mu - \int_{RL}^{\infty} (x - RL)g(x) \, dx,
\]  

(4)

with \( E(V^E) + E(V^B) = \mu \) by assumption; there is no deadweight loss associated with the default state.

In order to have the expected end-of-period wealth given in equations (3) and (4) as a function of project risk, \( \sigma \), the random variable \( x \) is standardized as \( \tilde{y} = (\tilde{x} - \mu)/\sigma \) with the density \( f(y; 0, 1) \) and the distribution \( F(y) \). The new
critical payoff separating the non-default state from the default state is given by \( \hat{y} = (RL - \mu)/\sigma \).

We can now rewrite equations (3) and (4) as follows:

\[
E(V^E) = \sigma \int_{\hat{y}}^{\infty} (y - \hat{y}) f(y) \, dy, \tag{5}
\]

and

\[
E(V^B) = \mu - \sigma \int_{\hat{y}}^{\infty} (y - \hat{y}) f(y) \, dy. \tag{6}
\]

Holding a percent \( \alpha \) of the company's equity the managers' expected claims on the end-of-period equity are given by

\[
E(V^M) = \alpha \sigma \int_{\hat{y}}^{\infty} (y - \hat{y}) f(y) \, dy; \tag{7}
\]

the outside shareholders' expected residual claims are

\[
E(V^0) = (1 - \alpha) \sigma \int_{\hat{y}}^{\infty} (y - \hat{y}) f(y) \, dy \tag{8}
\]

By assumption, \( E(V^M) + E(V^0) = E(V^E) \) (see equation (5)).

To derive the expected profit functions of the managers, \( P^M(\cdot) \), the outside shareholders, \( P^0(\cdot) \), and the banks, \( P^B(\cdot) \), we must take two more factors into account: opportunity costs of investment and managerial effort, and the level of the fixed component of the managerial compensation package.

Managers, outside stockholders, and banks are assumed to be able to invest their share of the project financing in an alternative project which pays the gross risk-free rate of interest \( I = 1 + i \). This rate is assumed to be fixed and known in period 0. If the manager was not working for this company, it is assumed that he could earn the alternative wage rate \( w \). The opportunity cost of managerial effort is denoted by \( we \). In addition to their share of output, the management's expected profit is a function of the fixed compensation, \( H \), which is exogenously given by assumption.

\[
P^M = H + \alpha \left[ \left( \sigma \int_{\hat{y}}^{\infty} (y - \hat{y}) f(y) \, dy - I(J_0 - L) \right) \right] - we. \tag{9}
\]
The outside shareholders expected profit consists of the share of output less the opportunity costs of alternative investments and the income $H$ paid to the managers:

$$P^O = (1 - \alpha) \left[ \sigma \int_{\hat{y}}^{\infty} (y - \hat{y}) f(y) \, dy - I(J_0 - L) \right] - H. \quad (10)$$

The bank's expected profit function consists of the return to the basic loan less the opportunity costs of the bank loan and the expenditures on monitoring activities, $mv$:

$$P^B = \mu - \sigma \int_{\hat{y}}^{\infty} (y - \hat{y}) f(y) \, dy - IL - mv. \quad (11)$$

In order to explain the optimal decisions of the three groups of interested parties it is useful to analyze the critical payoff $\hat{y}$ more closely. $\hat{y}$ is not an exogenously determined variable but is rather a function of the decisions of both the managers and the bank (see assumptions (A10), (A11), (A3) and (A5)).

The bank's participation (or monitoring activity) in the management's decision making process guarantees that only positive NPV projects are accepted: $J_0 < (E(V^E) + E(V^B))/R$. This condition implies $L < \mu \frac{R}{L}$ or $RL < \mu$, because $J_0 = L + S$ according to (A6) and $\mu = E(V^E) + E(V^B)$ according to (3) and (4). Given the above structure the following conditions for $\hat{y}$ will follow:

$$\hat{y} = \frac{RL - \mu(e)}{\sigma(m)} < 0, \quad (12)$$

with

$$\hat{y}_e = -\frac{\mu_e}{\sigma} < 0, \quad (13)$$

$$\hat{y}_R = \frac{L}{\sigma} > 0, \quad (13b)$$

$$\hat{y}_L = \frac{R}{\sigma} > 0, \quad (13c)$$

$$\hat{y}_m = -\frac{\sigma_m \hat{y}}{\sigma} < 0. \quad (13d)$$
III. The Determination of the Bank-Stockholder Management Equilibrium

1. The Managers' Decision Problem

The managers' responsibility is to accept or reject the projects and choose their effort level. By assumption only one project of size $J_0$ can be undertaken. The chosen project is characterized by specific $(\mu, \sigma)$ combinations. Because the choice of $\sigma$ is observable to the bank but not outside stockholders by assumption (A5), managers cannot do anything but to follow the banks instructions regarding $\sigma$. As will be shown, the banks implicitly set $\sigma$ as a component of the loan contract. In contrast, managerial effort and the expected payoff is not observable to the bank or outside stockholders. As a consequence, there is no way to enforce any predetermined choice of $e$ (and $\mu$), implying that effort or expected output can not be components of a written contract.

Managers choose $e$ (and $\mu$) according to their individual objective function, equation (9). This function is characterized by the following properties:

$$P_e^M = \alpha \mu_e (1 - F(\hat{y})) - w \leq 0,$$

$$P_{ee}^M = \alpha \mu_{ee} (1 - F(\hat{y})) + \frac{\alpha \mu^2_e f(\hat{y})}{\sigma} \leq 0,$$  \hspace{1cm} (15a)

$$P_{e\alpha}^M = \mu_e (1 - F(\hat{y})) > 0,$$ \hspace{1cm} (15b)

$$P_{eR}^M = -\frac{\alpha \mu e f(\hat{y})L}{\sigma} < 0,$$ \hspace{1cm} (15c)

$$P_{eL}^M = -\frac{\alpha \mu e f(\hat{y})R}{\sigma} < 0,$$ \hspace{1cm} (15d)

$$P_{em}^M = \frac{\alpha \mu e f(\hat{y})\sigma_m \hat{y}}{\sigma} > 0.$$ \hspace{1cm} (15e)

The First-order and Second-order conditions for a maximum (FOC and SOC, respectively hereafter) are satisfied if

$$P_e^M = 0 \quad \text{and} \quad P_{ee}^M < 0$$

hold. According to the FOC, the effort level choice $e = e^*$ is optimal if the marginal expected payoff to the manager is equal to his/her marginal opportunity cost. The SOC imposes some constraints on the function $\mu(e)$ as well as on the density $f(y)$.

Note that according to the FOC, $e^*$ is a function of all parameters that are data to the managers' decision making process. Those data are $w$ and $\alpha$, and, through $\hat{y}$, $R$, $L$ and $m$. For the purpose of this paper, we assume that $w$ is determined by the managerial labor market. We are not analyzing the comparative statics of changes in
the wage rate. Here we are critically interested in the relationship between $e^\star$ and the decision variables determined by outside shareholders and banks. As a result, we can characterize the existence of an effort response function, $e^\star = e^\star(\alpha, L, R, m)$ possessing properties derived from the simple comparative-statics:

$$e^\star_\alpha = -\frac{pM}{pM_{ee}} > 0 \quad (16)$$

$$e^\star_R = -\frac{pM}{pM_{ee}} < 0 \quad (17)$$

$$e^\star_L = -\frac{pM}{pM_{ee}} < 0 \quad (18)$$

$$e^\star_m = -\frac{pM_{em}}{pM_{ee}} > 0 \quad (19)$$

The logic behind the effort response coefficients are straightforward. An increase in the fraction of inside equity will increase the managers' effort (equation 16). By equation (19), monitoring leads to higher effort levels by management. Increasing the loan size and/or the loan rate, will decrease the effort (equation 17 and 18). These results of the managers' optimization behavior are taken into account by banks and outside shareholders when it comes to setting their optimal levels of the decision variables.

2. The Outsider Stockholders' Decision Problem

Outside stockholders determine the optimal fraction of the firm to give to management, $\alpha^\star$. The amount of managers' fixed income, $H$, is exogenously given. The outside shareholders' objective function (equation 10) is characterized by the following properties:

$$P_\alpha^O = -\sigma \int_{\hat{y}}^{\infty} (y - \hat{y})f(y) \, dy + I(J_0 - L) + (1 - \alpha)\mu_e e^\star_\alpha (1 - F(\hat{y})) \geq 0 \quad (20)$$

$$P_{\alpha\alpha}^O = ((1 - \alpha)\mu_e e^\star_\alpha - \mu_e e^\star_\alpha (1 - F(\hat{y})) \geq 0 \quad (21)$$

where $e_\alpha$ and $e_{\alpha\alpha}$ are determined via equation (16).

The FOC and SOC are satisfied if $P_\alpha^O = 0$ and $P_{\alpha\alpha}^P < 0$ hold. We can rewrite the FOC as

$$\sigma \int_{\hat{y}}^{\infty} (y - \hat{y})f(y) \, dy - I(J_0 - L) = (1 - \alpha)\mu_e e^\star_\alpha (1 - F(\hat{y})) > 0. \quad (22)$$
The LHS of (22) is a positive number and not a function of $\alpha$. The RHS, however, is a decreasing function of $\alpha$ (taking the SOC into account) which reflects the incentive effect of equation (16). If information is public (and effort is observed by all interested parties) it would follow that $e^*_o = 0$ and $P^O_\alpha < 0$. As a result, there is no possibility to endogenously determine $\alpha$ in the public information case. The first best solution would set $\alpha^* = 0$.

In the private information case this is clearly not an optimal solution. Managers’ profit would be $P^M = H - we$, and, without any incentives, they would maximize $P^M$ by setting $e^* = 0$. In order to avoid this “worst” case outcome, the outside shareholders increase $\alpha^*$ thus stimulating a positive managerial effort. Therefore, there is clearly a gain from changing $\alpha^*$, yet, on the other hand, the fraction of the outside stockholders end-of-period payoff (net of opportunity cost) is decreasing with $\alpha^*$. According to equation (22) the choice for $\alpha^*$ is optimal if the two counter effects balance each other at the margin.

3. The Bank’s Decision Problem

The bank determines its level of monitoring activities, $m$, and the terms of the loan contract, $R$ and $L$. The bank’s objective function was given in equation (11) and its properties are:

$$P^B_m = \mu e^*_m F(\hat{y}) - \sigma_m \int y f(y) \, dy - \nu \leq 0,$$

$$P^B_R = \mu e^*_R F(\hat{y}) + L(1 - F(\hat{y})) \geq 0,$$

$$P^B_L = \mu e^*_L F(\hat{y}) + R(1 - F(\hat{y})) - I \geq 0.$$  

The three FOC are satisfied when $P^B_m = 0$, and $P^B_L = 0$. Imposing some functional constraints on $\sigma(m)$, $\mu(e)$, and on the density $f(y)$ we can show (although not demonstrated in the paper) that the SOC for a maximum are satisfied as well.

According to equation (23), the optimal level of bank monitoring activity $m^*$ is determined by

$$\mu e^*_m F(\hat{y}) - \sigma_m \int y f(y) \, dy = \nu.$$  

The term $\nu$ on the RHS measures the constant marginal monitoring expenses with the LHS representing the marginal expected returns from monitoring. The returns from monitoring arise from two sources. The first effect is associated with the riskiness $\sigma$ of the project chosen. From equations (9) and (10), we find that both managers and outside shareholders have clear incentives to prefer (and choose if possible) projects
with higher risk. In choosing high risk projects the managers would act in both their own and the outside stockholder's best interest.

\[
P^M = \alpha \int_{\hat{y}}^{\infty} yf(y)\,dy > 0, \quad (27)
\]

\[
P^O = (1 - \alpha) \int_{\hat{y}}^{\infty} yf(y)\,dy > 0. \quad (28)
\]

Alternatively, the basic risk incentive problem implies that the bank clearly loses from undertaking high risk projects:

\[
P^B = -\int_{\hat{y}}^{\infty} yf(y)\,dy < 0. \quad (29)
\]

By assumption (A5), banks can monitor the managers' choice of \(\sigma\) and/or participate in the decision making process of the corporation. By increasing monitoring and/or participation the banks can enforce its interests more and more, thus eliminating the tendency of management to undertake higher risk projects. The bank's gains from this process are measured by the second term on the LHS of equation (26).

In addition to the risk-choice incentives, there is an incentive effect associated with the expected payoff. The managers' choice of effort, and consequently of \(p\), can not be monitored by banks or outside shareholders. According to equation (19) we know that managers respond to more bank monitoring of their project choice by providing a higher effort level and consequently higher expected output, \(\mu\). The logic of the result in equation (19) should now be obvious. Because an increase in \(m\) will decrease \(\sigma\), and consequently \(P^M\), the managers partly make up for the expected losses by increasing their effort. This extra effort is also in the interest of the bank as revealed by the first term on LHS of equation (26).

The bank's choice of the optimal loan rate \(R\) is derived from equation (24) as:

\[
L(1 - F(\hat{y})) = -\mu e^*_R F(\hat{y}) \quad \text{or} \quad L^* = \frac{-\mu e^*_R F(\hat{y})}{1 - F(\hat{y})}. \quad (30)
\]

The term, \(L(1 - F(\hat{y}))\) measures the expected marginal bank profit of an increase in the loan rate if information is public, i.e., symmetric. In the public information case, we have \(e^*_R = 0\) and \(P^B > 0\). Therefore, the bank would charge the borrower the maximum possible rate \(R_{\text{max}} = \frac{\mu}{F(0)}\). A higher rate is impossible because \(R > \frac{\mu}{F(0)}\) would induce the borrower to drop the project.

In the private information case, there exist adverse incentive effects measured by the term \(\mu e^*_R F(\hat{y}) < 0\). Any increase in \(R\) will subsequently reduce managerial
effort, thereby reducing $\mu$. In order to keep the adverse incentive effect at a reasonable level, banks will not increase the rate up to $R_{\text{max}}$. Instead, they will choose a “bank optimal” rate which balances gains and costs at the margin. Basically, the optimal loan rate determined in equation (30) is identical to the “bank optimal” rate derived by Stiglitz/Weiss (1981).

The determination of the optimal loan size $L$ follows from equation (25):

$$R(1 - F(\hat{y})) - I = -\mu e_L^* F(\hat{y})$$

or

$$R = \frac{I - \mu e_L^* F(\hat{y})}{1 - F(\hat{y})},$$  \hspace{1cm} (31)

where $R(1 - F(\hat{y})) - I$ measures the expected marginal bank profit if information is symmetrically distributed. In this case, we have $e_L^* = 0$ and $(1 - F(\hat{y})) = \frac{I}{R}$ or $F(\hat{y}) = \frac{R - I}{R}$. In the private information case, $e_L^* < 0$ (see equation (17)), we find that $F(\hat{y}) = \frac{R - I}{R - \mu e_L^*} < \frac{R - I}{R}$ As a consequence, the private information $\hat{y}$ is smaller than the public information. Because $\hat{y}_L > 0$, a smaller $\hat{y}$ implies a smaller loan size $L$. As in other bank agency models, we find that costly monitoring leads to credit rationing.

The logic of this result should be intuitively clear. According to equation (18) an increase in the loan size has an adverse incentive effect on optimal managerial effort and hence expected output. In order to reduce the impact of the adverse effect, the loan contract is restricted to a volume which would not be optimal in the public information case.

To summarize: The bank’s decision making process in our model leads to three components characterizing a loan contract-interest rate $R^*$, and loan volume $L^*$, and risk $\sigma^*$. The risk, $\sigma^*$, however, is implicitly determined by bank monitoring $m^*$. This contract specifies the second best solution and is consistent with the managers’ effort response function.

**IV. Final Remarks**

The distinction between inside and outside debt is similar to the distinction between inside and outside equity. In this final section we provide some intuition to explain the introduction of outside debt. The argument is based on a traditional signalling approach in the spirit of Ross (1977).

In his signalling model, Ross argues that the level of total corporate debt serves as a signal of the true value of the project or company. Managers with “good” projects systematically choose different debt levels than managers with “bad” projects. The simple reason is that the managers’ compensation scheme is designed such that it is personally costly for managers with bad projects to mimic the debt level of the good projects. In a separating equilibrium all managers have incentives to
tell the truth. If we include the signalling approach in the formal agency model developed above, we have the following assignment of decision variables to the three interested parties: Managers determine the total debt, banks determine the inside-outside debt ratio, and outside stockholders determine the inside-outside equity ratio. With three decision variables (each determined by a different decision-maker) the capital-ownership structure is fully explained.

Alternatively, the signalling model can be told in terms of the characteristics of the managers rather than those of the projects. Managers are assumed to be of heterogeneous quality. Just as the job applicants in the Spence (1974) model, now managers are characterized by an exogenously given number \( \theta \), where \( \theta \) is called “ability”. Each manager has perfect knowledge of his \( \theta \); the outsiders and the banks cannot observe the true value of \( \theta \) by assumption. With this basic informational asymmetry the \( \mu \)-function (see (A4)) would change to \( \mu = \mu(\theta, e) \). In order to overcome this asymmetry managers may signal their true value of \( \theta \) by choosing a specific level of total debt (just as the level of education signals the ability of job applicants in the Spence model).

A second interpretation regarding the managers’ characteristics refers to the “attitude towards effort” rather than to the “ability”. The managers’ attitude (or motivation towards effort) is clearly not observable because their preferences are private information. However, highly motivated managers prefer to be separated from poorly motivated managers. As a consequence, they signal their superior motivation by increasing the total debt beyond the level of bank loans, thus issuing outside debt. By doing so, the good managers precommit themselves to a minimal level of effort. In modern terminology this is called “prepositioning behavior”.

The basic idea is as follows. If managers bear penalty costs in the event of default (which was ignored in the model above) the default probability and the expected penalty costs are a function of a total debt volume. So far the total debt was assumed to be identical to the loan size. Increasing the debt volume (either by increasing the loan volume or by issuing outside debt) would increase the managers’ expected penalty costs. As a consequence, it would seem that it is never in the interest of the managers to increase the debt volume. However, given specific compensation schemes it is indeed profitable for some types of managers to issue additional debt, thus having a positive amount of outside debt outstanding. Of course, additional debt means higher expected penalty costs of managers and the only possible strategy to reduce the expected penalty costs from the managers’ perspective is to increase effort.

As a result, if managers issue additional outside debt, then outsiders know that it is personally more costly to the managers not to increase effort. This precommitment will signal that expected payoffs will be higher and the corporation will have a higher end-of-period value. Poorly motivated managers will not issue additional debt. Given their motivation (or their preferences toward effort) it is not profitable to mimic the positive outside debt level. Thus, in a separating equilibrium the signal is unambiguous and all information is revealed.
References


Summary

Agency contracting and inside debt

This paper examines the interrelated behavior of outside shareholders, managers, and inside debtholders in an agency setting. Inside debt is, for the most part, bank lending. Unlike prior agency models, the role that bank monitoring plays in increasing managerial effort and reducing investment risk, while simultaneously providing special risk/return benefits to outside shareholders, is explicitly examined. A rationale is provided for why outside shareholders would prefer to hold shares in firms with bank loans versus similarly structured firms without bank loans. Firms which possess bank debt are shown to be effectively signalling both their risk level and the level of managerial effort.