Do Bank Loans Curb Corporate Moral Hazard?

Paul Moon Sub Choi, Ewha Womans University, South Korea
Joung Hwa Choi, Cornell University, USA

ABSTRACT

In this paper, we discuss optimal contract drafting between a lender with deficient monitoring capabilities and an agency-ridden borrower with insufficient budget to finance an investable project. The theoretical implications are as follows: First, the first best solution (FBS) is achievable under no hidden action. However, the borrower's action is hardly observable in practice. Second, with unobservable managerial decisions the borrower exerts sub-optimal effort (moral hazard), and the probability of default increases. Lastly, with a penalizing discretion entitled to the bank on a long-term contract, the financial intermediary will be able to control the firm's managerial action effectively such that the solution is equivalent to the FBS attained under no hidden action. Empirical implications are followed.

Keywords: Bank Loan; Moral Hazard; Optimal Contract; First Best Solution

1. INTRODUCTION

The sources of corporate external financing are either direct or indirect or both. Direct, disintermediated, or market-based financing taps the long-term investors in the capital markets via investment banks by issuing bonds and/or equities; whereas indirect, intermediated, or bank-based funding chanels the diversified depositors in the money market via commercial banks by taking loans (Tirole, 2005). Unobservable managerial decisions incur agency costs, and this paper attempts to address the theoretical and empirical questions of varying moral hazard behavior of firms with respect to the external sources of financing.

In the literature, there have been extensive articles regarding the costs and benefits of relationship banking (Gopalan et al., 2011; Schenone, 2010; Drucker and Puri, 2009; Bharath et al., 2007; Boot, 2000). In our moral hazard-prone theoretical framework, money changes hands from a lender with deficient monitoring capabilities to an agency-ridden borrower with insufficient budget to finance an investable project. The theoretical implications are as follows: First, the first best solution (FBS) is achievable under no hidden action. However, the borrower's action is hardly observable in practice. Second, with unobservable managerial decisions the borrower exerts sub-optimal effort (moral hazard), and the probability of default increases. Lastly, in case of a loan made with a penalizing discretion entitled to the bank on a long-term contract, the financial intermediary will be able to control the firm's managerial action effectively such that the solution is equivalent to the FBS attained under no hidden action. Our contribution to the literature is that we formally model heuristic notions that are prevalent in the banking literature, and propose a feasible empirical model, identify variables, and provide predictions to test the theoretical implications.

The remainder of this paper is organized as follows: In Section 2, a theoretical moral hazard model shows that when the lender-borrower relationship is settled in the long run, the first best solution is achievable. Section 3 proposes statistical inference procedures to validate the theoretical model provided in Section 2. We conclude in Section 4.

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2. MODEL

2.1. First-best solution under no hidden action

We first consider an optimal contract under no unobservable managerial decisions. The assumptions are as follows:

- There exist a lender (bank) and a borrower (manager).
- The project outcome (q) of the borrower will turn out either as a success (u) or a failure (d) whose second-differentiable probability measure of a successful operation (u) depends on the borrower's effort level a: $\mathbb{P}(u) = \mathbb{P}(a)$, where $\mathbb{P}(0) = 0$, $\mathbb{P}(\infty) = 1$, $\mathbb{P}'(a) > 0$, and $\mathbb{P}''(a) < 0$.
- The lender earns $D = \alpha u$, which depends on the financing type. For simplicity, let $\alpha = 1$, thus $D = u$: The lender can extract all rent from the borrower.
- The borrower is paid off by C_i, which depends on the project outcome *and* on the financing type. It may be a managerial compensation, or a benefit/fine from relationship banking, where $C_u = r + k$, $C_d = 0 - k$, $r \equiv u - D$, and k is the benefit from repayment or a loss due to a halt in banking relationship or a higher interest rate etc.
- The respective utility functions of lender and borrower are $V(q - C_i)$ and $U(C_i) - \Phi(a)$, where $\Phi(a)$ is the cost of effort. Furthermore, the reservation utility of the borrower is zero.

Under these assumptions, the optimal contract can be drafted by solving the lender's utility maximization subject to the borrower's participation constraint:

$$\underset{C_i, a}{Max}[\mathbb{P}(a)V(u - C_u) + \{1 - \mathbb{P}(a)\}V(d - C_d)] \tag{1}$$

$$\text{s.t.} \ \ \mathbb{P}(a)U(C_u) + \{1 - \mathbb{P}(a)\}U(C_d) \geq a. \tag{2}$$

By Lagrangian,

$$\underset{C_i, a, \lambda}{Max} \ \mathbb{P}(a)V(u - C_u) + \{1 - \mathbb{P}(a)\}V(d - C_d)$$
$$+\lambda[\mathbb{P}(a)U(C_u) + \{1 - \mathbb{P}(a)\}U(C_d) - a] \tag{3}$$

With respect to the argument variables, the first order conditions (FOCs) are

$$C_u: -\mathbb{P}(a)V'(u - C_u) + \lambda\mathbb{P}(a)U'(C_u) = 0 \tag{4}$$

$$C_d: -\{1 - \mathbb{P}(a)\}V'(d - C_d) + \lambda\{1 - \mathbb{P}(a)\}U'(C_d) = 0 \tag{5}$$

$$a: \mathbb{P}'(a)V(u - C_u) - \mathbb{P}'(a)V(d - C_d) + \lambda[\mathbb{P}'(a)\{U(C_u) - U(C_u)\} - 1] = 0 \tag{6}$$

$$\lambda: \mathbb{P}(a)U(C_u) + \{1 - \mathbb{P}(a)\}U(C_d) \geq a \tag{7}$$

$$\lambda[\mathbb{P}(a)U(C_u) + \{1 - \mathbb{P}(a)\}U(C_d) - a] = 0 \tag{8}$$

$$\lambda \geq 0. \tag{9}$$

From these FOCs, we know that $\lambda = \frac{V'(u - C_u)}{U'(C_u)} = \frac{V'(u - C_d)}{U'(C_d)} \neq 0$ per Borch rule. Thus, Equation (8) is binding as follows:

$$\mathbb{P}(a)U(C_u) + \{1 - \mathbb{P}(a)\}U(C_d) = a. \tag{10}$$

Now, let us assume that both lender and borrower are risk-neutral: $V(x) = U(x) = x$. The upper conditions boil down to

$$-\mathbb{P}(a) + \lambda\mathbb{P}(a) = 0 \tag{11}$$

$$-\{1 - \mathbb{P}(a)\} + \lambda\{1 - \mathbb{P}(a)\} = 0 \tag{12}$$

$$\mathbb{P}'(a)[(u - C_u) - (d - C_d)] + \lambda[\mathbb{P}'(a)(C_u - C_d) - 1] = 0 \tag{13}$$

$$\mathbb{P}(a)C_u + \{1 - \mathbb{P}(a)\}C_d = a. \tag{14}$$

From Equations (11) and (12) it follows $\lambda = 1$, thus

$$\mathbb{P}'(a)(u - d) = 1 \text{ and } \mathbb{P}(a) = \frac{a - C_d}{C_u - C_d}. \tag{15}$$

Hence, the optimal levels of effort (a^*), upside (C_u) and downside (C_d) managerial compensations are determined by $\mathbb{P}'(a^*) = \frac{1}{u-d}$ and $\mathbb{P}(a^*) = \frac{a^* - C_d}{C_u - C_d}$. Therefore, the FBS is attained under no hidden action as follows:

$$FBS = \left\{ (a^*, C_u^*, C_d^*) \middle| \mathbb{P}'(a^*) = \frac{1}{u-d} \wedge \mathbb{P}(a^*) = \frac{a^* - C_d}{C_u - C_d} \right\}. \tag{16}$$

However, observing the effort level (a) in practice is infeasible or monitoring is very costly, thus agency problems arise. This nuisance may persist if (1) lender-borrower relationship is not set on a long-term basis, and/or (2) the fine (punishment) for a bad outcome is non-negative $(C_d \geq 0)$. Let us now turn to when the action (a) is unobservable to see how the managerial effort level diminishes.

2.2. Second-Best Solution Under Hidden Action

In addition to the assumptions previously given in Section 2.1 the borrower's effort level is now assumed to be unobservable to the lender. The borrower maximizes her expected utility less effort level a such that

$$\underset{a}{Max}[\mathbb{P}(a)U(C_u) + \{1 - \mathbb{P}(a)\}U(C_d) - a], \tag{17}$$

whose FOC is

$$\mathbb{P}'(a)U(C_u) - \mathbb{P}'(a)U(C_d) = 1, \tag{18}$$

and this serves as her binding incentive criterion (IC) to be reflected in the lender's decision making procedure. With conjectured effort level of the borrower, the lender faces his optimization problem as follows:

$$\underset{C_i,a}{Max}[\mathbb{P}(a)V(u - C_u) + \{1 - \mathbb{P}(a)\}V(d - C_d)] \tag{19}$$

$$\text{s.t. } \mathbb{P}(a)U(C_u) + \{1 - \mathbb{P}(a)\}U(C_d) \geq a \tag{20}$$

$$\mathbb{P}'(a)U(C_u) - \mathbb{P}'(a)U(C_d) = 1 \tag{21}$$

$$C_d \geq 0. \tag{22}$$

Assuming that both parties are risk-neutral, the objective Lagrangian function is

$$\underset{C_i,a,\lambda,\mu,\gamma}{Max} \mathbb{P}(a)(u - C_u) + \{1 - \mathbb{P}(a)\}(d - C_d)$$
$$+ \lambda[\mathbb{P}(a)C_u + \{1 - \mathbb{P}(a)\}C_d - a] + \mu[\mathbb{P}'(a)C_u - \mathbb{P}'(a)C_d - 1] + \gamma C_d, \tag{23}$$

whose FOCs are

$$C_u: -\mathbb{P}(a) + \lambda\mathbb{P}(a) + \mu\mathbb{P}'(a) = 0 \tag{24}$$

$$C_d: -\{1 - \mathbb{P}(a)\} + \lambda\{1 - \mathbb{P}(a)\} - \mu p'(a) + \gamma = 0 \tag{25}$$

$$a: \mathbb{P}'(a)(u - C_u) - \mathbb{P}'(a)(d - C_d) + \lambda[\mathbb{P}'(a)(C_u - C_d) - 1] + \mu\mathbb{P}''(a)(C_u - C_d) = 0 \tag{26}$$

$$\lambda: \mathbb{P}(a)C_u + \{1 - \mathbb{P}(a)\}C_d - a \geq 0,\ \lambda \geq 0,\ \lambda[\mathbb{P}(a)C_u + \{1 - \mathbb{P}(a)\}C_d - a] = 0 \tag{27}$$

$$\mu: \mathbb{P}'(a)(C_u - C_d) - 1 = 0 \tag{28}$$

$$\gamma: C_d \geq 0, \gamma \geq 0,\ \text{and}\ \gamma C_d = 0. \tag{29}$$

First, consider Equation (28): Assuming $C_d > 0$ implies $\gamma = 0$, then $\lambda = 1 - \mu\frac{\mathbb{P}(a)}{\mathbb{P}'(a)} = 1 + \mu\frac{\mathbb{P}(a)}{1-\mathbb{P}'(a)}$. This means $\mathbb{P}'(a) = \mathbb{P}'(a) - 1$ which is a contradiction. Thus, $C_d = 0$. From Equation (26) we get $C_d = 0$. If $\lambda = 0$,

$\mu = \frac{\mathbb{P}(a)}{\mathbb{P}'(a)}$, thus

$$\mathbb{P}'(a)C_u = 1 \implies C_u = \frac{1}{\mathbb{P}'(a)}, \tag{30}$$
hence
$$\mathbb{P}'(a^{**}) = \left(\frac{1}{u-d}\right)\left\{1 - \frac{\mathbb{P}''(a)\mathbb{P}(a)}{\mathbb{P}'(a)^2}\right\}. \tag{31}$$

Because $-\frac{\mathbb{P}''(a)\mathbb{P}(a)}{\mathbb{P}'(a)^2}$ is strictly positive and $\mathbb{P}(\cdot)$ is strictly concave, $a^{**} < a^*$. State-contingent compensations (C_u and C_d) can be derived as follows:

$$\mathbb{P}(a^{**})C_u \geq a^{**} \implies C_u \geq \frac{a^{**}}{\mathbb{P}(a^{**})} \text{ and } C_d = 0. \tag{32}$$

If $\lambda > 0$, then

$$\mathbb{P}(a)C_u = a \implies \frac{1}{C_u} = \frac{\mathbb{P}(a)}{a}, \tag{33}$$

and

$$\mathbb{P}'(a)C_u = 1 \implies \mathbb{P}'(a) = \frac{1}{C_u} = \frac{\mathbb{P}(a)}{a}. \tag{34}$$

That is, the only effort level satisfying $a\mathbb{P}'(a) = \mathbb{P}(a)$ is zero ($a^{**} = 0$) which is less than the optimal level (a^*) under observable action. To this end, we find when the borrower's managerial decision is unobservable she exerts less effort and the probability of default increases: corporate moral hazard. Therefore, the resulting second-best solution (SBS) is

$$SBS = \{(a^{**}, C_u^{**}, C_d^{**}) | a^{**} = C_d^{**} = 0 \wedge C_u^{**} = [\mathbb{P}'(0)]^{-1}\}. \tag{35}$$

2.3. First-Best Solution When the Lender Can Penalize The Borrower's Losses

In case where the lender-borrower relationship is a repeated game, i.e. a long-term series of loan contracts between the bank and the firm, the lender can penalize the borrower's moral hazard behavior. The bank can raise the interest rate when the operating performance of the corporate project is poor thereby increasing the likelihood of a borrower's default on the bank loan, or the bank can reject a subsequent debt rollover or re-financing. This is due to the nature of

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indirect financing the firm sought in the first place. Had the firm raised capital through direct financing, the shareholder may unload her stakes in times of bad operating results, or the bond investor may liquidate the firm: no re-negotiation.

Thus, a feature of indirect financing that the bank can punish or compensate for the corporate earnings performance means that the downside compensation C_d can either be positive or negative. This makes the FBS feasible for the lender which was only achievable under unobservable borrower's managerial decisions. The optimal contract can be drafted by maximizing the bank's profit (Equation (36)) subject to the individual rationality (Equation (37)) and incentive criterion (Equation (38)) constraints as follows:

$$\underset{C_{i,}a}{Max}[\mathbb{P}(a)V(u - C_u) + \{1 - \mathbb{P}(a)\}V(d - C_d)] \tag{36}$$

$$\text{s.t.} \ \ \mathbb{P}(a)U(C_u) + \{1 - \mathbb{P}(a)\}U(C_d) \geq a \tag{37}$$

$$\mathbb{P}'(a)U(C_u) - \mathbb{P}'(a)U(C_d) = 1. \tag{38}$$

Assuming that both parties are risk-neutral, by Lagrangian

$$\underset{C_i,a,\lambda,\mu}{Max} \ \mathbb{P}(a)(u - C_u) + \{1 - \mathbb{P}(a)\}(d - C_d)$$
$$+\lambda[\mathbb{P}(a)C_u + \{1 - \mathbb{P}(a)\}C_d - a] + \mu[\mathbb{P}'(a)(C_u - C_d) - 1]. \tag{39}$$

The FOCs are

$$C_u: -\mathbb{P}(a) + \lambda\mathbb{P}(a) + \mu\mathbb{P}'(a) = 0 \tag{40}$$

$$C_d: -\left(1 - \mathbb{P}(a)\right) + \lambda\left(1 - \mathbb{P}(a)\right) - \mu\mathbb{P}'(a) = 0 \tag{41}$$

$$a: \mathbb{P}'(a)(u - C_u) - \mathbb{P}'(a)(d - C_d) + \lambda[\mathbb{P}'(a)(C_u - C_d) - 1] + \mu\mathbb{P}''(a)(C_u - C_d) = 0 \tag{42}$$

$$\lambda: \mathbb{P}(a)C_u + \{1 - \mathbb{P}(a)\}C_d - a \geq 0, \lambda \geq 0, \lambda[\mathbb{P}(a)C_u + \{1 - \mathbb{P}(a)\}C_d - a] = 0 \tag{43}$$

$$\mu: \mathbb{P}'(a)(C_u - C_d) - 1 = 0. \tag{44}$$

From Equation (43), if $\lambda=0$, then $\mu = \frac{\mathbb{P}(a)}{\mathbb{P}'(a)} = \frac{\mathbb{P}(a)-1}{\mathbb{P}'(a)}$ which is a contradiction, thus $\lambda > 0$ and this gives a binding condition such that

$$\mathbb{P}(a)C_u + \{1 - \mathbb{P}(a)\}C_d = a \implies \mathbb{P}(a) = \frac{a - C_d}{C_u - C_d}. \tag{45}$$

Equations (40) and (41) yield

$$\mu = \frac{\mathbb{P}(a)(1-\lambda)}{\mathbb{P}'(a)} = \frac{\{\mathbb{P}(a)-1\}(1-\lambda)}{\mathbb{P}'(a)} \implies \lambda = 1 \text{ and } \mu = 0. \tag{46}$$

Equation (44) prescribes

$$\mathbb{P}'(a)(C_u - C_d) = 1 \implies (C_u - C_d) = \frac{1}{\mathbb{P}'(a)} \tag{47}$$

which further implies

$$\mathbb{P}'(a)\left\{u - d - \frac{1}{\mathbb{P}'(a)}\right\} = 0 \implies \mathbb{P}'(a) = \frac{1}{u-d}. \tag{48}$$

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Thus, with presence of a downside penalizing option entitled to the bank, the optimal contract is equivalent to the FBS under no hidden action. In other words, a bank loan plays an effective monitoring role in curbing moral hazard incentive. Therefore, the optimal contract is

$$FBS = \left\{ (a^{***}, C_u^{***}, C_d^{***}) \middle| \mathbb{P}'(a^{***}) = \frac{1}{u-d} \land \mathbb{P}(a^{***}) = \frac{a^{***}-c_d}{c_u-c_d} \right\}. \tag{49}$$

3. EXPERIMENT DESIGN

Other than the monitoring role of a bank loan modeled in Section 2, equity and debt financing instruments also are known for their effective functions in preventing managerial moral hazard by facilatating independent board members, institutional monitoring creditors etc. Does corporate moral hazard behavior vary in the cross-section of various financing methods? How can we account for the influence of securitization (Wang and Xia, 2014; Nadauld and Weisbach, 2012)? What happens after covenant violations (Saunders et al., 2012; Nini et al., 2012; Roberts and Sufi, 2009; Chava and Roberts, 2008)? In order to answer these questions, we now turn to identifying the objective, explanatory and control variables to be collectively framed in regression models.

3.1. Variables and Regression Model

Following the literature (Beatty and Ritter, 1986; Carter and Manaster, 1990; Yung and Zender, 2010), a likely proxy for moral hazard is the variance (*AbVariance*) of abnormal stock return bench-marked with the associated industry index return. So is free cash flow (*FreeCashFlow*) a proxy for moral hazard (Jensen, 1986). The key explanatory variables to gauge the degree of moral hazard of corporate managerial decisions are the financing means which are the proportions of bank loan (*Loan*), bond (*Bond*), and equity (*Equity*) over the total value of external financing and the squared terms of respective instruments to control for the effect of over-financed excess capital. The auxiliary variables to see additional effect as interaction terms are categorized into three groups of respective financing vehicle. For the bank loan, these are the period of relationship with the main bank (*Period*), the number of loaning banks (*NumBank*). The ones associated with debt capital are the share of main creditor (*MainCreditor*), government share in percentage or as a dummy variable (*Government*). The last group of interacts with equity financing are the number of independent board members (*Independent*), largest ownership (*Largest*), and institutional holdings (*Institution*). The controls for firm characteristics are the age of incorporation (*Age*), firm size (*Size*), industry indicators (*Industry*), and developed market dummy (*Developed*). Overall, our empirical questions are raised as follows:

$$\begin{aligned}
MoralHazard_i &= a + b_0 \cdot Loan + b_1 \cdot Loan{\times}Period + b_1 \cdot Loan{\times}NumBank \\
&+ c_0 \cdot Bond + c_1 \cdot Bond{\times}MainCreditor + c_2 \cdot Bond{\times}Government \\
&+ d_1 \cdot Equity{\times}IndepBoard + d_2 \cdot Equity{\times}LargestOwner + d_3 \cdot Equity{\times}Institution \\
&+ e \cdot Age + f \cdot Size + g_i \cdot Industry + h_i \cdot Developed + \epsilon_i.
\end{aligned} \tag{50}$$

Readers should carefully treat potential endogeneity issues. For example, the model predicts that moral hazard is lower the longer is the relationship with the main bank. However, the length of the banking relationship may also depend on the probability and severity of moral hazard behavior where banks are more likely to extend lending if the manager is expected to show less of moral hazard behavior. Similar concerns apply to most other independent variables, questioning the validity of the empirical model.

3.2. Predictions

Based on the aforementioned regression model (Equation 50), we can postulate testable hypotheses as follows:

- Moral hazard is expected to be less the higher the weight of bank loan over total external financing, the longer the relationship with the main bank, or the more the number of loaning banks.
- The degree of moral hazard will alleviate the larger the bond share, or the higher the share of main creditor and/or government.
- The degree of moral hazard will aggravate the less the number of independent board members, the larger the share of the largest ownership (not related to the CEO), or the lower the institutional holdings.

- These predictions may vary across the borders in terms of magnitude depending on the degree of economic development, and also between common and civil law systems.

These predictions are not restricted to specific markets or economies. Our readers may develop testing procedures based on any geographically concentrated data that are accessible to them.

4. CONCLUSION AND FURTHER AGENDA

In this paper, we discussed optimal contract drafting between a lender with deficient monitoring capabilities and an agency-ridden borrower with insufficient budget to finance an investable project. The theoretical implications are as follows: First, the first best solution (FBS) is achievable under no hidden action. However, the borrower's action is hardly observable in practice. Second, with unobservable managerial decisions the borrower exerts sub-optimal effort (moral hazard), and the probability of default increases. Lastly, with a penalizing discretion entitled to the bank on a long-term contract, the financial intermediary will be able to control the firm's managerial action effectively such that the solution is equivalent to the FBS attained under no hidden action. Readers are left to identifying and procuring relevant databases to implement empirical exercise procedures suggested in Section 3. As a concluding remark, the regulatory authorities can alleviate the costs of asymmetric information among banks and corporations by pressing the transparency of accounting information publication and the internal control of credit users.

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AUTHOR BIOGRAPHY

Paul Moon Sub Choi (first author) is Associate Professor of Finance at the College of Business Administration, Ewha Womans University. He served on the faculty at the State University of New York at Binghamton, as a lecturer, and at the Samuel Curtis Johnson Graduate School of Management, Cornell University, as Fulbright Visiting Scholar. He earned his degrees from Yonsei (B.A., economics), Harvard (A.M., statistics) and Cornell (Ph.D., financial economics) Universities.

Joung Hwa Choi (corresponding author) is a visiting scholar at the Samuel Curtis Johnson Graduate School of Management, Cornell University. She served on the faculty at Seoul National University, the Hankuk University of Foreign Studies, Kwangwoon University, and Korea National Open University as a lecturer. Before she earned her Ph.D. in finance from Seoul National University, she worked as an economist at the Bank of Korea.

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