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The influence of moral hazard on investment in financially constrained and unconstrained firms

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A B S T R A C T

We extend Triole (2006) to link together two seemingly different cases – firms facing potential free cash flow problems versus firms facing financial constraints. The model predicts a large number of disparate findings in the empirical literature and so demonstrates its usefulness.

1. Introduction

We extend Tirole (2006) and in doing so determine the optimum level of investment for a firm. Based on this determination, we identify two cases. First, if the firm's cash is greater than the optimal investment, then the firm faces the free cash flow problem as first identified by Jensen (1986). Second, if the firm's cash plus borrowing capacity is less than the optimal investment, then the firm is financially constrained. For borrowing to take place, the borrower agrees to a contract that incentivizes high effort, implying a positive relationship between investment and firm value.

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In the first case, the firm possesses cash in excess of that required to fund the optimal investment. According to Jensen (1986) this excess cash represents *free cash flow*. Because the firm does not need to borrow, management is not constrained to work hard by an incentive compatible contract and instead may shirk and pursue private benefits. Our model shows the reward for shirking increases as the probability of success (conditional on working hard) decreases and as private benefits increase. Thus, we provide a rationale for several recommended solutions to the free cash flow problem, as well as the implications of different conditions for how the market values such firms' cash holdings.

In the second case, the firm possesses cash that is less than the optimal level of investment. Hence, to borrow the firm must enter into a contract that incentivizes management to work hard and not pursue private benefits. The incentive compatible contract combined with a possible sub-optimal investment level implies the return on an additional dollar of cash is greater than the firm's cost of capital. Consistent with this prediction, Faulkender and Wang (2006) find empirical evidence that the marginal value of cash is higher in financially constrained firms. Our model also predicts the value of cash is tied to the value of the investment and larger for growth firms. Pinkowitz and Williamson (2007) find empirical evidence supportive of both predictions.

In addition, we show that lender risk aversion increases the cost of debt and decreases borrowing capacity, implying that the marginal value of cash increases with cash flow volatility. Our model is consistent with the empirical evidence. Minton and Schrand (1999) show that cash flow volatility tightens financial constraints; Opler et al. (1999) show that firms with high cash flow volatility hold more cash; and Pinkowitz and Williamson (2007) show that firms with high cash flow volatility have higher market values of cash.

Thus, in a simple model we link together two seemingly different cases – firms facing potential free cash flow problems versus firms facing financial constraints – and thereby explain a number of disparate results in the empirical literature within a common framework. To demonstrate these results, the paper proceeds as follows. Section 2 sets up a simple model of continuous investment with moral hazard. Section 3 explores the free cash flow and financially constrained cases. Section 4 explores the effect of lender risk aversion. Section 5 concludes.

2. Model set-up of investment with moral hazard

To insure an optimum level of investment exists, we add decreasing returns to scale to the credit rationing investment model of Tirole (2006). At $t = 0$ an entrepreneur invests $I \in \mathbb{R}^+$ in a project. At $t = 1$, the project generates cash flow of $\widetilde{R}I^\alpha$ in the case of success and zero in the case of failure. We let $0 < \alpha < 1$, which generates decreasing returns to scale to the investment I. The risk free rate is assumed to be zero. To show the impact of economic growth on return, we define $\widetilde{R} = (1 + \tilde{g})(1 + \tilde{m})$ where $E[\tilde{g}|t = 0] = g$ represents expected product market return (conditional on zero macroeconomic growth) and $E[\tilde{m}|t = 0] = m$ represents the effect of macroeconomic growth. We further assume the entrepreneur is a price taker and doesn't affect the macroeconomy (i.e. both g and m are exogenous).

At $t = 0$ the entrepreneur chooses whether to work hard or shirk. If she works hard, the probability of project success is p_H. If she shirks, the probability of success drops from p_H to p_L so that $\Delta p = p_H - p_L > 0$. If she shirks she enjoys a private benefit of BI where $B \in (0, 1)$. Also, we restrict $\alpha + B > 1$. We assume the entrepreneur can not pledge the private benefit BI to the lender. The entrepreneur has an endowment at $t = 0$ of cash C. We define the NPV maximizing investment as I^*. If $C < I^*$, then the entrepreneur invests C and seeks to borrow $I^* - C$, which implies a total possible investment I^*. In the case of project success, the entrepreneur receives a payment of R_b.[1] We assume a competitive market for loans so that the lender enters into a contract with zero expected utility. In the case of a risk neutral lender, the lender earns zero NPV in expectation. Lastly, both the entrepreneur and lender share the same beliefs.[2]

[1] Alternatively, R_b represents the cash flow claimed by the entrepreneur after paying off the loan.

[2] Specifically, the entrepreneur and lender have common beliefs relative to exogenous parameters in the model. For example, both the entrepreneur and lender have the same the probabilities of success with high and low effort.

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