



Full length article

R&D investment–cash flow sensitivity under managerial optimism

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ABSTRACT

The aim of this paper is to explore the effect of managerial optimism on the R&D cash-flow (hereafter, R&D ICF) sensitivity. Departing from 864 yearly observations between 108 public firms listed at the NYSE from 1999 to 2010, we construct a measure of managerial optimism as it described by Malmendier and Tate (2005) and we use a standard Q-model of investment. Our results report that firms with optimistic CEOs apply a strong positive and significant R&D ICF sensitivity. Running estimation for sub-sample firms, we find that the sensitivity of R&D investment to cash flows is stronger for more constrained group than the less constrained group.

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1. Introduction

Heaton (2002) argues that corporate investment distortions are led to managerial optimism. Optimistic CEOs perceive the capital market undervaluing their firms, and so they will be reluctant to issue new equity. Optimistic CEOs can reject positive NPV projects when internal funds are exhausted, and firms are constrained. While they have the tendency to invest more than non-optimistic do with the availability of internal funds. In a direct extension and test of these predictions, Malmendier and Tate (2005) empirically demonstrate that the ICF sensitivity is caused by managerial optimism bias. Similar results are also reported by Lin et al. (2005) and Campbell et al. (2011).

However, the effect of managerial optimism on R&D ICF sensitivity is still unexplored. It is for interest to discuss the potential effect of this bias on spending in a specific asset such as the R&D activities. In fact, the transaction costs' theory as it pioneered by Coase (1937) and developed by Williamson (1988) evokes the concept of a specific asset. According to Williamson (1988), asset

specificity refers to assets that once in place would be costly to redeploy to other activities in case of a contract breaks down because there would be a loss of productive value. According to this theory, R&D spending, as a specific asset, increases transaction costs on debt financing. For this, firms should prefer equity financing among debt; this is in order to avoid bankruptcy (Bah and Dumontier, 2001).

If managers are optimistic, they will see their firms always as under valued by the stock markets (Heaton, 2002). In terms of financial strategy, this means that external financing will be perceived as very costly compared with internal cash flow financing mode. The use of equity to finance a specific investment such as R&D spending will be seen as high costly and so they should return down to their internal source of financing. Then, the R&D ICF sensitivity should be more pronounced in presence of optimistic CEOs. The R&D ICF sensitivity will be more pronounced in the presence of financial constraints as it demonstrated by Heaton (2002).

This paper is an extension of previous works in ICF sensitivity under managerial optimism, especially that of Malmendier and Tate (2005). For this, we will reconsider a similar hypothesis to explore the effect of managerial optimism bias on R&D spending.

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Table 1
Full sample: summary of descriptive statistics.

| | Observations | Mean | Median | Standard deviation | Minimum | Maximum |
|------------------------------------|--------------|--------|--------|--------------------|---------|---------|
| Panel A: CEO's data | | | | | | |
| Years as CEO | 778 | 13.303 | 12 | 7.300 | 8 | 59 |
| CEO and President and Chairman | 832 | 0.673 | 1 | 0.469 | 0 | 1 |
| CEO ownership | 630 | 0.010 | 0.002 | 0.025 | 0.000 | 0.206 |
| Panel B: Firms' data | | | | | | |
| R&D expenditure(\$M) | 864 | 0.175 | 0.018 | 0.572 | 0 | 6.506 |
| Q | 864 | 1.173 | 1.120 | 0.567 | 0.003 | 4.878 |
| Cash flow(\$M) | 864 | 1.104 | 0.152 | 4.904 | −3.512 | 60.908 |
| Panel C: classifications' criteria | | | | | | |
| Interest coverage | 744 | 0.102 | 0.097 | 0.161 | −0.5308 | 0.9130 |
| Firm size | 797 | 1.328 | 1.280 | 74.601 | 0.928 | 696.504 |
| Panel D: Managerial optimism | | | | | | |
| Managerial optimism | 864 | 0.791 | 1 | 0.406 | 0 | 1 |
| Optimistic CEOs (%) | | | 0.76 | | | |

This paper is divided into four additional sections. The Section 2, deals with methodological details and variables' measurement. The Section 3 includes data description. Section 4, shows our results. Finally, the last section offers concluding remarks and discusses implications from our findings.

2. Methodology and empirical specification

We conserve the common methodology based on Q-model of investment, which is applied by previous works focusing on investment–cash flow sensitivity under behavioral corporate finance (Malmendier and Tate, 2005; Lin et al., 2005).

$$I_{it} = \beta_0 + \beta_1 Q_{it-1} + \beta_2 CF_{it} + \beta_3 \Delta_{it} + \beta_4 Q_{it-1} CF_{it} + \beta_5 \Delta_{it} CF_{it} + \beta_6 X_{it} + \beta_7 X_{it} CF_{it} + \varepsilon_{it} \quad (1)$$

where I denotes R&D expenditure, Q is the market value to its replacement value; CF stands for internal cash flows; X encloses corporate governance variables and firm' size and Δ is a dummy variable that is used as a proxy for managerial optimism. Following Malmendier and Tate (2005), we propose a measure based on CEOs first five stock net purchases. CEO will be classified as optimistic if he bought stock on net at least one more year than sold stock on net during his first five years, and he should also increase his ownership by at least ten percent of their stock ownership in his firm in a given year.

R&D expenditure represents all direct and indirect costs related with the creation and development of new processes, techniques, applications and products with commercial possibilities. We calculate cash flow as Earnings Before Interest, Taxes and Depreciation (EBITDA). Q is the market value of assets over the book value of assets from the beginning of the year. We use the board independence (IND) and the board size (BSIZE). We construct an indicator of efficient board size as it advanced by Malmendier and Tate (2005). Board is efficient if its size is fewer than 12 members. The independence of the board is directly computed by the number of outside members. We control also for the effect of ownership structure by introducing the effect of CEOs' ownership in their firms.

A standard empirical approach to study the ICF sensitivity is to estimate a fixed effect regression as it described by Eq. (1) and then we re-estimate our model for more and less financially constraint firms. For this, we split the full sample into sub-samples following the standard literature of financial constraints to construct sub-firms groups from more constrained to less constrained firms. We adopt two classifications to detect if a firm is financially constrained or not. The first classification is based on firms' size We follow Gertler and Gilchrist (1994) to classify firms into more or less constrained. The second classification is inspired from Lin et al.

(2005); we use the interest coverage to proxy for firms' financing ability. For each firm we calculate its average interest coverage, the ratio of interest expense to the sum of the interest expense and the cash flow. We rank firms from small to large and we define the smaller 50% as less constrained while, the larger 50% are defined as more constrained.

3. Data description

Our data consist of 864 annual observations concerning 108 large public industrial American firms traded at the NYSE between 1999 and 2010. A quasi-random sampling procedure was applied. In fact, only firms with available internal transactions were selected. This is because we need such transaction in order to construct our main variable; the optimism bias. We use different information sources: (1) We use the Thomson Financial database in order to construct a proxy for CEO's optimism. (2) We use the Thomson World scope in order to determinate other variables such as R&D expenditures,¹ cash flow and information to calculate Q . (3) Information concerning ownership and CEOs' tenure are deriving from SEC financial database and Thomson Reuters. Finally, corporate governance variables are from SEC Financial database and Thomson Reuters–Officers and Directors (see Table 1).

4. Empirical results

Using fixed effect panel with OLS regressions, our results show that the coefficient of R&D ICF sensitivity is positive and significant at the first-percent level. This means that optimistic CEOs will invest more in R&D activities when internal cash flows are ample. Our results corroborate previous findings by Malmendier and Tate (2005).

Column 2, 3 and 4 of Table 2 report results of regression of our model using a fixed panel effect with a proxy of board independence (IND). We find that the effect of managerial optimism still positive, and an independent board may succeed to reduce the R&D ICF sensitivity. Our result is robust to the introduction of firm size and ownership as control variables.

Table 3 reports results from the estimation of the Q-model of investment using two sub-samples constructed using the interest coverage criterion. Managerial optimism causes R&D ICF sensitivity phenomena for both groups. However, the coefficient of R&D ICF sensitivity is robust for the more constrained firms and this even with the inclusion or not of control variables. Without

¹ R&D expenditure are available from Worldscope Supplementary Report, *Annual Item; Annual ItemField 01201*, included on Thomson Worldscope.

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