DOES OPTIMISM AFFECT CORPORATE INVESTMENT? NEW EVIDENCE FROM TAIWANESE PANEL DATA

Ai-Chi Hsu [a], Hsiao-Fen Hsiao [a]

Abstract

We set out in this study to examine the relationship between managerial optimism and corporate investment, and demonstrate that firms with valuable investment opportunities tend to invest less than the optimal level; the classic problem of underinvestment. On the other hand, however, firms which do not have valuable investment opportunities often tend to invest more than the optimum level; a problem of overinvestment. We present evidence on the relationship between such investment behavior and managerial optimism. Within those firms that do not have valuable investment opportunities, overinvestment is more likely to occur amongst optimistic managers than non-optimistic managers; conversely, for those firms with valuable investment opportunities, underinvestment is less likely amongst optimistic managers than non-optimistic managers.

Keywords: Managerial optimism; Overinvestment; Underinvestment; Earnings manipulation; Cost of capital.

[a] *Department of Finance at National Yunlin University of Science & Technology in Taiwan.*

[*] *Corresponding author, Department of Finance, National Yunlin University of Science and Technology, 123 University Road, Section 3, Douliou, Yunlin 64002, Taiwan, ROC. Tel: +886-5-534-2601, Ext. 5413; E-mail: g9320804@yuntech.edu.tw*

1. Introduction

One of the most important topics in corporate finance is the formulation of the optimal investment strategies of firms to make maximized firms value. On many occasions, managers tend to invest stray from optimal investment which is called underinvestment/ overinvestment. In this paper, we focus on the way in which managerial optimism and managerial manipulation of earnings influence the underinvestment or overinvestment behavior of firms. This study shows that manager could revise the investment level from underinvestment/ overinvestment to increase firms' value.

Many of the prior studies within the financial literature have demonstrated numerous examples of underinvestment (involving a firm's real investment level being lower than the optimum level). Heaton (2002) suggested that optimistic managers who are dependent on external financing will sometimes decline positive net present value (NPV) projects based upon their belief that the cost of the external financing is simply too high. Similarly, when the firm is again faced with positive NPV projects, in those cases where optimistic managers may have declined to invest as a result of the incorrectly perceived costs of external financing, free cash flow can prevent the social losses from such underinvestment. Bertrand and Mullainathan (2003), for example, suggested that managers will tend to reject new positive NPV investment projects simply because they prefer a quiet life, whilst Myers and Majluf (1984) had earlier argued that the conflicts existing between current and prospective shareholders may also lead to underinvestment as a result of 'adverse selection'. Indeed, a firm may forgo positive NPV projects due to pre-contract asymmetric information about the investment projects and the assets in place.

Since informational asymmetry results in prospective shareholders being unaware of the true value of the firm, it can also raise the price at which they are prepared to offer funds. However, at such a price, existing shareholders may well stand to lose more if such investment projects were to be undertaken, than if they were to be simply abandoned. Myers (1977), Jensen and Meckling (1976) and Jensen (1986) argued that the conflicts existing between shareholders and bondholders also give rise to the problem of underinvestment as a result of moral hazard. Such conflicts impel shareholders to either avoid or abandon profitable projects whenever their NPV is lower than the amount of debt issued.

Conversely, many other studies within the financial literature have demonstrated numerous examples of overinvestment (where a firm's real investment is higher than the optimum level). Jensen (1986), for example, suggested that managers had incentives to use their free cash flow to engage in negative NPV projects, which would not occur if they were required to raise their capital externally at higher costs. In other words, fluctuations in free cash flow can lead to overinvestment behavior. Managers will find incentives to overinvest because of the (non-) pecuniary benefits associated with firms of larger dimensions (Jensen, 1986; Stulz, 1990).

Pinkowitz and Williamson (2005) and Faulkender and Wang (2006) reported a general decline in firm values as a direct result of overinvestment; however, since investments in cash will yield only nominal returns, investors generally tend not to place such a high value on such assets. Essentially, for those companies within which managers' interests are not perfectly aligned with those of the company's shareholders, there will be a tendency to invest in negative NPV projects (Morck et al., 1990; Lang et al., 1991; Harford et al., 2006).

Within the recent literature on behavioral finance, apart from the tendency for over/underinvestment, the personality traits or characteristics of corporate managers have also started to come under close scrutiny. Malmendier and Tate (2005), for example, reported a strong positive relationship between the overconfidence of executives and the sensitivity of investment to cash flow. Optimistic managers invariably expect that the NPV of potential projects will be greater than it actually is, and will often undertake such projects with much more haste than would otherwise be the case for a rational manager. At times, they will even undertake projects that actually have negative expected NPV.

The results suggest the existence of an under/overinvestment tradeoff with free cash flow, without invoking asymmetric information or rational agency cost theories (Heaton, 2002). Optimistic managers will overestimate the growth rate in the cash flow, whereas optimistic managers will underestimate the inherent riskiness (March and Shapira, 1987; De Long et al., 1991; Gervais et al., 2007).

Irrespective of the personality traits of managers, earnings management can also have some influence on over/underinvestment. There is considerable evidence within the literature to suggest that the systematic manipulation of performance measures by insiders will precipitate overinvestment. Teoh et al. (1998a,b), for example, found that earnings management prior to IPOs and SEOs could explain their long-term underperformance, whilst Dechow et al. (1996) saw firms committing fraud as a result of their higher ex-ante needs for additional funds. Wang (2004) also noted that firms in the rapid growth stage, with substantial external financing needs, were more likely to commit fraud.

In our study, however, we argue that potential manipulation by managers is not necessarily of the actual earnings *per se*, but instead, of the perception of earnings. Loss firm managers are perfect candidates for the manipulation of investor perceptions, essentially because their firms are not doing well. Bergstresser et al. (2006) suggested that earnings manipulation emanating from managerial motivation had a significant influence on managerial investment decisions. Xie et al. (2003) argues that board and audit committee activity and their members' financial sophistication may be important factors in constraining the propensity of managers to engage in earnings management.

This paper is seen as contributing to the literature in this field in two ways. First, we find the relationship existing between firm value and investment to be quadratic rather than linear, thereby implying an optimal level of investment. We also study the connection between firm value and investment dependent upon the quality of the investment opportunities.

Second, we develop a model to explain the processes involved in under/overinvestment, taking managerial optimism, managerial manipulation of earnings, and weighted average cost of capital into consideration.

The remainder of this paper is organized as follows. A description of our empirical approach is provided in Section 2, along with the presentation of the models. The model variable measures are described in Section 3, followed in Section 4 by a description of the dataset and the results. The closing section presents the conclusions drawn from this study.

2. The Model

2.1 Manager's investment decisions

We set out to determine whether the relationship between firm value and investment is quadratic, which would thereby imply an optimal level of investment, and which would in turn differ, depending upon the quality of the investment opportunities; the optimal level must of course be higher for firms with more valuable investment opportunities.

Within a frictionless environment, the only determinants of optimal investment decisions are the investment opportunities themselves, as measured by Tobin's marginal q (Tobin, 1969). Thus, we classify firms into two groups, those where Tobin's q is less than 1, with the firms in this group being regarded as 'non-valuable project' firms (hereafter, NVP firms), and all other firms, which are regarded as 'valuable project' firms (hereafter, VP firms).

Following Morgado et al. (2003), we develop a model which relates the value of a firm's shares to its main financial decisions, taking into account the behavior of the investment variable described above. Model I is described as follows:

$$\frac{V_{i,t}}{K_{i,t-1}} = \beta_0 + (\beta_1 + \gamma_1 Q_{i,t})\left(\frac{I_{i,t}}{K_{i,t-1}}\right) + (\beta_2 + \gamma_2 Q_{i,t})\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^2 + \beta_4\left(\frac{\Delta B_{i,t}}{K_{i,t-1}}\right) + \beta_5\left(\frac{\Delta D_{i,t}}{K_{i,t-1}}\right) + e_{i,t} \quad (1)$$

where $V_{i,t}$ is the market value of the shares of firm i at the end of period t; $I_{i,t}$ is the investment undertaken by firm i in period t;[28] $\Delta B_{i,t}$ is the increment in the market value of long-term debt;[29]

[28] $I_{i,t} = NF_{i,t} - NF_{i,t-1} + BD_{i,t}$ where $NF_{i,t}$ represents net fixed assets, and $BD_{i,t}$ are the book depreciation costs corresponding to year t.

[29] Since this has proved difficult to measure, we use the book value of long term debt instead.

$\Delta D_{i,t}$ is the dividend increment paid in period t; and $K_{i,t-1}$is the replacement value of the assets at the end of period $t - 1$.[30] We define a dummy variable for each firm, $Q_{i,t}$, which is equal to 1 if, during the period, the firms has an Tobin's q value of less than 1, otherwise 0.[31] The model defined in Equation (1) relates to investment and firm value, whilst controlling for the two other main decisions of the firm (financing and dividends) which could have direct effects on firm value as a result of market imperfections.

The expected relationship between the increment in debt and firm value is negative; as a result of the inherent risk of financial distress, the increment in debt will have a negative effect on the wealth of shareholders. The expected relationship between dividends and firm value is positive, because, in addition to the potential effects relating to imperfections, dividends are a source of value creation for the firm's shareholders, with any increment in the dividends having a positive effect on the wealth of the shareholders. Hence, an increase in the wealth of the shareholders will tend to raise the value of the firm.

Consequently, after estimating the model, if we differentiate the firm value variable with regard to the investment variable, we obtain:

$$\frac{\partial\left(\frac{V_{i,t}}{K_{i,t-1}}\right)}{\partial\left(\frac{I_{i,t}}{K_{i,t-1}}\right)} = (\beta_1 + \gamma_1 Q_i) + 2(\beta_2 + \gamma_2 Q_i)\left(\frac{I_{i,t}}{K_{i,t-1}}\right) \quad (2)$$

With the first derivative equal to 0, and solving for the investment variable, we get:

$$\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*} = -\frac{\beta_1 + \gamma_1 Q_i}{2(\beta_2 + \gamma_2 Q_i)} \quad (3)$$

Finally, if the second partial derivative of the firm value variable, with regard to the investment variable, is negative, the value obtained from Equation (3) will be maximized.

$$\frac{\partial^2\left(\frac{V_{i,t}}{K_{i,t-1}}\right)}{\partial^2\left(\frac{I_{i,t}}{K_{i,t-1}}\right)} = 2(\beta_2 + \gamma_2 Q_i) \quad (4)$$

Accordingly, in order to obtain the maximum from Equation (4), β_2 should be negative, and since the optimal level of the investment determined in Equation (3) must be positive, β_1 should be positive. As a result, we propose the following additional hypothesis:

The optimal level of investment for VP firms, $\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*q>1}$ is higher than the optimal level for NVP firms, $\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*q<1}$.

With $\left(\frac{I_{i,t}}{K_{i,t-1}}\right)$ as the real investment level for the whole sample of firms, we logically expect $\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*q<1} < \left(\frac{I_{i,t}}{K_{i,t-1}}\right) < \left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*q>1}$. The difference between the real investment and optimal investment levels are the underinvestment and overinvestment process measures:

$$OI_{i,t} = \left(\frac{I_{i,t}}{K_{i,t-1}}\right) - \left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*} \quad (5)$$

Moreover, we expect to obtain $OI_{i,t} > 0$ as the overinvestment for NVP firms, and $OI_{i,t} < 0$ as the underinvestment for VP firms.

2.2 Investment Decisions and the Characteristics of Managers

We examine the propensity for optimistic managers to overvalue their investment projects, which thereby leads to such managers investing more than other managers of a more non-optimistic nature. The levels of underinvestment and overinvestment are affected by managerial optimism and manipulation, plus the cost of capital; thus, Model II is described as follows:

$$OI_{i,t} = \beta_0 + (\beta_1 + \delta DA_{i,t})O_{i,t} + \beta_2 DA_{i,t} + \beta_3 D_{i,t} \mid DA_{i,t} \mid + \beta_4 \Delta WACC + \varepsilon_{i,t} \quad (6)$$

where $O_{i,t}$ is a dummy variable which is equal to 1 if the CEO is classified as being optimistic, otherwise 0; discretionary accruals ($DA_{i,t}$) represents the measurement indicator of managerial manipulation; $D_{i,t}$ is a dummy variable which is equal to 1 if $DA_{i,t} > 0$,otherwise 0, and $\Delta WACC$ is the incremental cost of capital.

The model defined in Equation (6) relates to over/underinvestment and managerial optimism, with additional controls for managerial manipulation and the cost of capital, these being the other two main factors of investment. By including $|DA_{i,t}|$, the model could capture asymmetric effect for managerial manipulation. The expected relationship between over/underinvestment and the managerial optimism dummy variable is positive, because optimistic managers will tend to overstate the value and importance of the project; however, managerial optimism will, nevertheless, render them more willing to invest.

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[30] $K_{i,t} = RF_{i,t} + RI_{i,t} + (TA_{i,t} - BF_{i,t} - BI_{i,t})$ where $RF_{i,t}$ is the replacement value of tangible fixed assets; $RF_{i,t} = NBF_{i,t}$ + revaluation increments of tangible fixed assets; $NBF_{i,t}$ refers to net tangible fixed assets; $RI_{i,t}$ is the replacement value of inventories; $TA_{i,t}$ is the book value of total assets; $BF_{i,t}$ is the book value of tangible fixed assets; and $BI_{i,t}$ is the book value of inventories.

[31] $Q_{i,t} = (V_{i,t} + MVD_{i,t}) \div K_{i,t}$, where $MVD_{i,t}$ is the market value of debt; however, we use the book value of debt instead.

Managers view earnings management as a tool to ensure that their firms meet earnings expectations. Generally speaking, positive (negative) manipulation of earnings induces of actual pre-tax earnings go upward (downward) and we add manipulation of earnings variable to control for possible bias of managerial optimism. The expected relationship between over/underinvestment and managerial manipulation is negative, as is the interaction relationship between managerial manipulation and the optimism dummy variable.

Managerial manipulations of earnings reduce the total influence that their level of optimism has on investment. The expected relationship between over/underinvestment and the incremental cost of capital is also negative, since managers should reduce their level of investment as a result of the elevated cost of capital.

3. Model Measurement Description

3.1 Measure of Managerial Optimism

We follow Lin et al. (2005) to construct a measure of managerial optimism on a personal basis. Given that the optimism of a manager in assessing future outcomes is likely to result in upwardly-biased forecasts, we classify managers as being optimistic if their first and last forecasts overestimated the earnings for a fiscal year; i.e., if all were upwardly-biased. A forecast is defined as upwardly-biased if its error is positive, where the definition of forecast error is:

FE ≡ Manager's pre-tax earnings forecast – Actual pre-tax earnings

However, it has been confirmed in the prior literature that managers may have other incentives leading to biased forecasts; thus, in order to address concerns that the measure may in fact reflect incentives other than the optimism of managers, we exclude from the measurement construction any forecasts that may potentially be contaminated by incentive effects.

Having determined that there were three potential incentives, the forecasts were subsequently removed from the sample if they met any of the following three criteria: (i) intention to make stock offerings at a favorable price, because some firms may knowingly release upwardly-biased forecasts to temporarily boost their stock price (see: Chin et al., 1999; and Lang and Lundholm, 2000); (ii) the release of upwardly-biased forecasts by managers of financially-distressed firms, so as to mislead investors for employment concerns; although such 'cheating' can only be maintained for a short period. Frost (1997) found clear evidence of managers of distressed firms releasing grossly overestimated financial results for the current year, as compared to actual outcomes, whilst Koch (2003) found that management earnings forecasts issued by distressed firms exhibited greater upward bias and were viewed by analysts as being less credible than similar forecasts by non-distressed firms; (iii) self-interest actions by managers involving the release of upwardly (downwardly) biased forecasts, then selling (buying) shares for the sole purpose of profiting from trades.

The optimistic manager dummy variable is defined as:

$$O_{i,t} = \begin{cases} 1 & \text{if the manager is classified as optimistic, } FE > 0 \\ 0 & \text{if the manager is classified as unoptimistic, } FE < 0 \end{cases} \quad (7)$$

Nevertheless, the measurement construction process may still fail to capture all the forecasts contaminated by incentive effects, despite all of these exclusions, since insiders may be able to trade through untraceable accounts. In order to alleviate this particular problem, we minimize the potential earnings manipulation. Kasznik (1999) demonstrated the ways in which managers could engage in income increasing (decreasing) accounting when earnings would otherwise be below (above) the management forecasts, and that earnings management activity leads to an increase in expected forecast error costs.

3.2 Measure of Earnings Management

Following Dechow et al. (1995), we consider a modified version of the Jones Model, which implies the following model for total accruals:

$$TAC_{i,t} = \frac{ONI_{i,t} - CFO_{i,t}}{A_{i,t-1}} \quad (8)$$

where $ONI_{i,t}$ is earnings before extraordinary items and the discontinued operations of firm i during period t; $CFO_{i,t}$ is the operating cash flow from the continuing operations of firm i during period t; and $A_{i,t-1}$ refers to the total assets of i firm at the end of period $t-1$.

Within the modified model, nondiscretionary accruals are estimated as:

$$T\hat{A}C_{i,t} = \alpha_{0i}\left(\frac{1}{A_{i,t-1}}\right) + \alpha_{1i}\left(\frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}}\right) + \alpha_{2i}\left(\frac{PPE_{i,t}}{A_{i,t-1}}\right) \quad (9)$$

where $\Delta REV_{i,t}$ is the change in revenue for firm i in year t; $\Delta REC_{i,t}$ is the change in net receivables for firm i in year t; and $PPE_{i,t}$ is the gross property plant and equipment of firm i at the end of period t.

Discretionary accruals ($DA_{i,t}$) are then estimated by subtracting the predicted level of non-discretionary accruals ($T\hat{A}C_{i,t}$) from the total accruals:

$$DA_{i,t} = TAC_{i,t} - T\hat{A}C_{i,t} \quad (10)$$

where discretionary accruals ($DA_{i,t}$) represents the measurement indicator of earnings manipulation range.

3.3 Measure of the Weighted Average Cost of Capital

In the majority of the finance textbooks (Myers and Marcus, 1996; Gallagher and Andrew, 2000) the 'weighted average cost of capital' (*WACC*) calculation is presented as:

$$WACC = K_d \times (1-t) \times \frac{D}{A} + K_e \times \frac{E}{A} \quad (11)$$

where K_d is the pre-tax cost of debt,[32] t is the tax ratio; $\frac{D}{A}$ is the debt to total assets ratio; $\frac{E}{A}$ is the stockholder's equity to total assets ratio; and K_e is the cost of equity capital.[33] A negative relationship is anticipated between the increased cost of capital and over/underinvestment.

4. Empirical Evidence

4.1 Data Sources

Panel data on non-financial quoted companies in Taiwan was adopted for our empirical study, with the primary source of information being the Taiwan Economic Journal (TEJ) database. Our panel was constructed to cover the 1996-2005 period in order to avoid endogeneity and unobservable heterogeneity; i.e., an unbalanced panel comprising of 542 companies on which information was available for at least eight consecutive years during that period, resulting in 5,137 observations. The structure of the panel, by annual number of observations per company, is provided in Table 1.

Table 1. Structure of the sample: Panel of Taiwan non-financial quoted companies (period 1996-2005)

Number of annual observations per company	Number of companies	Number of observations
10	356	3,560
9	89	801
8	97	776
Total	542	5,137

The models were estimated for only 4,595 of these companies, since a year of the data was lost due to the way in which some variables were constructed. The variables used in the estimation are summarized in Table 2, with the optimism measurement construction process being described in Table 3.

Table 2. Summary statistic of 542 Taiwan non-financial companies (4,595 observations).

Variable	Mean	Standard deviation	Minimum	Maximum
$(V_{i,t}/K_{i,t-1})$	0.9594	1.3020	0.0022	25.3693
$(I_{i,t}/K_{i,t-1})$	0.0370	0.1045	-0.5547	4.2397
$(I_{i,t}/K_{i,t-1})^2$	0.0123	0.2690	0.0000	17.9751
$(\Delta B_{i,t}/K_{i,t-1})$	0.0083	0.0703	-0.6834	1.1574
$(\Delta D_{i,t}/K_{i,t-1})$	0.0021	0.0178	-2.7844	0.2385

Table 3. Details of (non-)optimism measuring construction process and regression analysis

	Firm	Forecast
Number of the sample	542	4,968
Less: Forecasts possibly due to incentives rather than optimism:		
1. Forecasts the firms conduct stock offerings within 12 months		
2. Forecasts released within 24 months before financial distress.		
3. Forecasts viewed as bad [good] news by the market and the shareholding of director increases/decreases within three months of the forecast.		(1,600)
Forecasts that meet any one of the above three criteria	542	3,368
Less: Forecasts that are not the last for the fiscal year		
Forecasts by CEOs who have only one forceast	(24)	(484)
Sumsample analyzed in this paper	518	2 ,884

After removing those forecasts that were potentially contaminated by incentive effects, we were left with a total of 4,968 forecasts published by 542 firms; of these, 884 firms had produced only one forecast and were therefore dropped from the sample. Retaining the resultant 2,884 forecasts, we subsequently classified the CEOs in the remaining 518 firms as either optimistic or non-optimistic. Details on the distribution of the forecasts used to identify the optimism/non-optimism of the CEOs over the period under examination are provided in Table 4. Of the 2,884 forecasts released by these 518 firms, 1,051 were optimistic and 1,833 were non-optimistic.

Table 4. Distribution of forecasts used to identify CEO's optimism and non-optimism over year

Year	Number of optimism	Number of non-optimism
1996	81	195
1997	106	243
1998	172	237
1999	150	247
2000	170	237
2001	133	239
2002	99	192
2003	53	132
2004	77	100
2005	10	11
Total	1,051	1,833

4.2 Results

This section presents the main results of our study, including the effects of under/overinvestment on managerial optimism, managerial manipulation and the increment in *WACC*. The details of the LM and

[32] K_d = (interest expense + interest capitalization) ÷ (average long – short-term liability) × 100.
[33] K_e = (cash dividend + stock dividend) ÷ (stock price) × 100.

Hausman tests, used to determine the model with the best fit for our analysis, are provided in Table 5. Based upon the results of the LM and Hausman tests on the manager's investment decisions (Model I), the manager's characteristics and investment decisions (Model II) and earnings management (the modified Jones Model), and using panel data methodology, we determined that the fixed effects model was more appropriate than the random effects model.

Table 5. Models of LM-test and Hausman test

	Chi square	P-value	Estimate result
Panel A : Manager's Investment Decisions model (Model I)			
LM	1587.07	0.0000***	Panel data
Hausman	208.19	0.0000***	Fixed-effects
Panel B : managers character and investment decisions model (model II)			
LM	462.72	0.0000***	Panel data
Hausman	16.89	0.0047***	Fixed-effects
Panel C: earnings management model (modified Jones model)			
LM	21.98	0.0000***	Panel data
Hausman	15.41	0.0001***	Fixed-effects

Note : *:10%, **:5%, ***:1% significance level

The results of our examination of the relationship existing between firm value and investment, dependent upon the quality of investment opportunities, are presented in Table 6. We also included the dummy variables d_t to measure the time effect, so as to control the effect of macroeconomic variables on firm value. Consequently, we split the error term into three components: the individual effect, η_i ; the time effect, d_t, and , finally, the random disturbance, $v_{i,t}$. As a result, the final specification of the models to estimate is as follows:

$$\frac{V_{i,t}}{K_{i,t-1}} = \beta_0 + (\beta_1 + \gamma_1 Q_i)\left(\frac{I_{i,t}}{K_{i,t-1}}\right) + (\beta_2 + \gamma_2 Q_i)\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^2 + \beta_3\left(\frac{\Delta B_{i,t}}{K_{i,t-1}}\right) + \beta_4\left(\frac{\Delta D_{i,t}}{K_{i,t-1}}\right) + d_i + \eta_i + v_{i,t} \quad (12)$$

Recall that β_1 and β_2 were the respective coefficients for the investment and the square investment variables for VP firms, with the coefficients for these variables in NVP firms being ($\beta_1 + \gamma_1$) and ($\beta_2 + \gamma_2$). Since β_1 was 7.7734 and β_2 was −1.9097, we can confirm that the relationship between firm value and investment is quadratic for VP firms. Furthermore, γ_1 was −7.3131 and γ_2 was 2.0011, both significantly different from zero, which also enabled us to confirm the same quadratic relationship for NVP firms.

The optimal level of investment of NVP firms, for maximum firm value, is non-investment; thus, we assume the optimal level of investment to be zero for NVP firms. The results indicate that investment is lower than the optimal level for VP firms (underinvestment), whilst it is above zero for NVP firms (overinvestment). The coefficient for the 'increment of debt' variable was −0.0969 and insignificant at the 10 percent level, whilst the coefficient for the 'increment in dividends' variable was 4.6825 and significant. Any increment in dividends provides good information for shareholders, ultimately pushing up firm value.

Table 6. Estimation of the manager's investment decisions model using panel data methodology to avoid endogeneity and heterogeneity.

$$\text{Model I}: \frac{V_{i,t}}{K_{i,t-1}} = \beta_0 + (\beta_1 + \gamma_1 Q_i)\left(\frac{I_{i,t}}{K_{i,t-1}}\right) + (\beta_2 + \gamma_2 Q_i)\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^2 + \beta_3\left(\frac{\Delta B_{i,t}}{K_{i,t-1}}\right) + \beta_4\left(\frac{\Delta D_{i,t}}{K_{i,t-1}}\right) + d_i + \eta_i + v_{i,t}$$

	β_0	β_1	β_2	β_3	β_4	γ_1	γ_2
Coefficient	0.7867 (0.0598)***	7.7734 (0.3487)***	-1.9097 (0.5412)***	-0.0969 (0.2175)	4.6825 (0.7993)***	-7.3131 (0.4268)***	2.0011 (0.7867)***

Note: standard errors in ( ). *:10%, **:5%, ***:1% significance level

The results of the estimates of Model II are provided in Table 7, which shows that the coefficient of optimism was 0.1012 and significant at the 5 percent level. In conditions of underinvestment (overinvestment), the behavior of optimistic managers will be to reduce (increase) their level of underinvestment (overinvestment). Beside, we also want to check if there exist asymmetric effect for managerial manipulation coefficient was 0.4451 and insignificant at 10 percent level. The positive (negative) asymmetric effect of earning managerial was not significant.

The coefficient of the interaction between the optimism dummy variable and managerial manipulation was −0.6529 and significant at the 5 percent level. This result demonstrates that managerial manipulation should lead to a raise in the overall level of optimism, thus influencing over/underinvestment. The coefficient for the 'increment in *WACC*' was 0.0002 and insignificant at the 10 percent level.

Table 7. Estimation of managers' character and investment decisions model using panel data for managerial optimism, managerial manipulation and cost of capital affect level of under-/overinvestment.
Model II:

$$OI_{i,t} = \beta_0 + (\beta_1 + \delta DA_{i,t})O_{i,t} + \beta_2 DA_{i,t} + \beta_3 D_{i,t} \mid DA_{i,t} \mid + \beta_4 \Delta WACC + \varepsilon_{i,t}$$

	β_0	β_1	β_2	β_3	β_4	δ
coefficient	-0.9306 (0.0315)***	0.1012 (0.0427)**	-1.4534 (0.4182)***	0.4451 (0.5614)	0.0002 (0.0003)	-0.6529 (0.3806)**

Note: standard errors in ( ). *:10%, **:5%, ***:1% significance level

5. Conclusions

This paper makes two fundamental contributions to the understanding of investment policy decisions. First, the quadratic term of the relationship between firm value and investment is significant, which implies there is an optimal level of investment. The optimal level of investment will vary with the quality of the investment opportunities, as measured by Tobin's marginal q. The results indicate that those firms with valuable investment opportunities can tend to invest less than the optimal level (underinvestment), whilst the investment level for those firms that do not have such valuable investment opportunities invariably tends to be greater than zero (overinvestment).

Second, we offer evidence that optimistic managers in Taiwanese firms have a tendency to overinvestment conditional on several factors including managerial manipulation of earnings. We also find that if mangers use manipulation of earnings to make actual pre-tax earnings go upward, they will not increase real investment to raise earnings. For the same reason, managerial manipulations of earnings reduce the influence of managerial optimism on overinvestment.

References

1. Bertrand, M., Mullainathan, S., 2003. Enjoying the quiet life? Corporate governance and managerial preferences. *Journal of Political Economy* 111, 1043-1075.
2. Bergstresser, D., Desai, M., Rauh, J., 2006. Earnings manipulation, pension assumptions and managerial investment decisions. *Quarterly Journal of Economics* 121, 157-195.
3. Dechow, P. M., Sloan, R.G., Sweeney, A.P., 1995. Detecting earnings management. *The Accounting Review* 70 (2), 193-225.
4. De Long, J.B., Shleifer, A., Summers, L.H., Waldmann, R.J., 1991. The survival of noise traders in financial markets. *Journal of Business* 64, 1-19.
5. Dechow, P., Sloan, R., Sweeney, A., 1996. Causes and consequences of earnings manipulation: an analysis of firms subject to enforcement actions by the SEC. *Contemporary Accounting Research* 13(1), 1-36.
6. Faulkender, M., Wang, R., 2006. Corporate financial policy and the value of cash. *Journal of Finance* 61(4), 1957-1990.
7. Frost, C., 1997. Disclosure policy choices of UK firms receiving modified audit reports, *Journal of Accounting and Economics* 23, 163-187.
8. Harford, J., Mansi, S., Maxwell, W., 2006. Corporate governance and firm's cash holdings. *AFA 2006 Boston Meetings Paper*.
9. Gervais, S., Heaton, J.B., Odean, T., 2007. Overconfidence, investment policy, and executive stock options. *Working Paper.*
10. Heaton, J.B., 2002. Managerial optimism and corporate finance. *Financial Management* 31, 33-45.
11. Jensen, M.C., 1986. Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review* 76, 323-329.
12. Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: managerial behavior agency cost and ownership structure. *Journal of Financial Economics* 3, 305-360.
13. Kasznik, R., 1999. On the association between voluntary disclosure and earnings management. *Journal of Accounting Research* 37, 57-81.
14. Koch, A., 2003. Financial distress and the credibility of management earnings forecasts. Working Paper. University of Carnegie Mellon.
15. Lang, L., Stulz, R., Walkling, R., 1991. A test of the free cash flow hypothesis: the case of bidders returns. *Journal of Financial Economics* 29, 315-335.
16. Lin, Y., Hu, S., Chen, M., 2005. Managerial optimism and corporate investment: some empirical evidence from Taiwan. *Pacific-Basin Finance Journal* 13, 523-546.
17. Malmendier, U., Tate, G., 2005. CEO overconfidence and corporate investment. *The Journal of Finance* 60(6), 2661-2700.
18. March, J.G., Shapira, Z., 1987. Managerial perspectives on risk and risk taking. *Management Science* 33(11), 1404-1418.
19. Morgado, A., Pindado, S., 2003. The underinvestment and overinvestment hypotheses: an analysis using panel data. *European Financial Management* 9(2), 163-177.
20. Morck, R., Shleifer, A., Vishny, R., 1990. Do managerial objectives drive bad acquisition. *Journal of Finance* 45, 31-48.
21. Myers, S., 1977. Determinants of corporate borrowing. *Journal of Financial Economics* 5, 147-175.
22. Opler, T., Pinkowitz, L., Stulz, R., Williamson, R., 1999. The determinants and implications of corporate cash holdings. *Journal of Financial Economics* 52, 3-46.
23. Stulz, R., 1990. Managerial discretion and optimal financing policies. *Journal of Financial Economics* 26, 3-27.
24. Teoh, S.H., Welch, I., Wong, T.J., 1988a. Earnings management and the underperformance of seasoned public offerings. *Journal of Financial Economics* 50, 63-99.
25. Teoh, S.H., Welch, I., Wong, T.J., 1988b. Earnings management and the long-run market performance of initial public offerings. *Journal of Finance* 53, 1935-1974.
26. Wang, T., 2004. Investment, shareholder monitoring and the economics of corporate securities fraud. *Working Paper*.
27. Xie, B., Davidson III, W. N., DaDalt, P. J., 2003. Earnings management and corporate governance: the role of the board and the audit committee. *Journal of Corporate Finance* 9(3), 295-316.