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# Analysing Managers' Financial Motivation for Sustainable Investment Strategies

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Received: 29 April 2019; Accepted: 11 July 2019; Published: 15 July 2019

**Abstract:** The purpose of the research is to examine the importance of financial rewards and managers' motivations, including sustainable investment projects. For that, the role of financial motivation for managers is analysed to understand strategic priorities for sustainable investment policies. Panel data for non-financial listed companies in China are used to determine the best-fit values of the proposed model, and the results of the Lagrange multiplier (LM) and Hausman tests are discussed for sustainable investment strategies. The results demonstrate that both low-paid and highly-paid managers in valuable project firms tend to be conservative and that managers consolidate their positions through underinvestment. This finding is clear evidence that managers are reluctant to take a risk on sustainable investment strategies. However, highly-paid managers of non-valuable project firms are generally willing to obtain high productivity through advanced technologies. The results are also generalized for strategies that are related to project managers' financial motivation to increase the efficiency of sustainable investment decisions.

**Keywords:** sustainable investments; financial motivation; managers; project management

## 1. Introduction

Investment decisions are among the most prominent issues for sustainable project management. Several debates on successful project selection include financial and non-financial conditions. Financial issues generally address macroeconomic factors and the budgeting of the target market. On the other hand, the non-financial component is a set of qualitative factors with behavioural financing. Whereas owner and manager conflicts persist, there are many novelties in constructing investment policies in the competitive market environment [1–3]. However, the rewards of increasing managerial success are among the best tools for sustainable business results [4], and the personal motivation and personalities of managers could promote valuable projects for long-term business success [5].

The financial and non-financial indicators of organizational motivation are effective arguments to measure job performance and project success [6]. To increase employee satisfaction in the organization, rewards, including overpayment, promotions, bonuses, and incentives, could be used [7]. Even if non-financial factors could help provide motivation in the working group because the financial rewards of firms exceed the average level of the industry, financial motivations are widely used for employee motivation in the target setting. It is not easy to accurately understand the effects of nonfinancial indicators on employee reactions and behaviour [8].

Additionally, sustainable performance results of the investment projects with uncertain future cash flows could be promoted by creating a good relationship between owners and managers. For that, the business aims, project priorities, and strategies should be clearly stated to all project personnel and managers alongside the potential motivations. In this way, all personnel of investment projects could give their full efforts to commit the required resources for sustainable investment strategies [9]. Similarly, investors seek the maximum returns on projects with sustainable investment strategies under acceptable risk policies [10], and ask for motivations, persuasive strategies, and obstacles to sustainable investment decisions [11].

Managerial incentives could increase the organization's motivations for successful investment projects [12–15]. In particular, there is a clear linkage between managers' benefits, such as extra payments, bonuses and investment opportunities for sustainable business projects, and motivation. [16]. Managerial skills and performance in sustainable investment strategies are highly related to payments for managers and decrease the risks of investment projects with respect to the resolution of agency conflict [17]. Thus, the financial motivation of managers is one of the best indicators of the market value of firms and sustainable investment projects [18]. In this context, the payments for incentives generally depend on the organizational structure and strategic priorities for the sustainable investment project [19], and executive compensation against the agency problem boosts project outcomes for successful business results [20].

However, inefficient investment, including overinvestment and underinvestment, constitutes an important topic and has not been widely discussed in recent academic research. Overinvestment refers to managers who invest in profitless projects with a negative net present value (NPV). In contrast, underinvestment refers to not investing in profitable projects with a positive NPV. In this process, selecting the best projects with high profits is essential for effective decision-making. Thus, managers have an important role in optimal investment decision-making [21–23]. Managers who have a financial motivation could increase the firm's value through their investment decision policies. Therefore, the relationship between inefficient investment and managers' pay is an essential topic for exploring sustainable investment strategies.

This research differs from the traditional view of proxy problems by attempting to determine the relationship between managers' pay and inefficiency of investment in terms of overinvestment and underinvestment. For this purpose, the investment decisions are divided into valuable and non-valuable projects according to the productivity results, and the financial motivation and project success are analysed to uncover the possible directions among them. A limitation of the study is the difficulty of understanding the effects of managers' financial motivation on sustainable investment projects and selecting the best strategies for a successful business environment.

The remainder of the paper is divided into the following sections. Section 2 addresses the literature on project management and investment strategies. Section 3 highlights the theoretical background of the proposed methodology. Section 4 constructs an empirical model and gives results for further discussion. Section 5 presents the analysis outcomes and provides some recommendations for sustainable investment strategies.

## 2. Literature Review

In the previous studies on investment, the free cash flow theory [24] is the essential argument against overinvestment. However, the main arguments against underinvestment are the asset substitution hypothesis [25], the moral hazard theory [26], and the adverse selection theory [27,28]. The literature on symmetric information generally emphasises the proxy conflicts between stockholders, managers, and creditors. Heaton [29] proposed that a company's internal mechanism and corporate culture can help to avoid managers' irrational conduct. Additionally, the mechanism can be used to provide fewer payments to managers who make the wrong judgment on investment plans. On the other hand, Holmstrom and Milgrom [30] and Aggarwal and Samwick [31] recommended that firms incentivize managers with effective payment policies in a project. Michael et al. [32] believe that high payment induces overconfidence and could lead to wealth losses, such as overinvestment and value-destroying mergers and acquisitions. In addition, Humphery-Jenner et al. [33] evaluated managers' overconfidence in overestimating the returns on investment. On the other hand, Bebchuk and Fried [34] and Morse et al. [35] explored the agency problem and executive compensation. Additionally, Strobl [36] summarizes the relationship between managerial incentives and investment policy. Furthermore, Baxamusa [37] examined policies to reduce risk or overinvestment in production capacity through incentives.

However, in the recent literature, there are several studies on project management for sustainable investment development [38–40]. Kivilä et al. [41] concluded that sustainability as a project goal brings about important results with holistic project control for infrastructure investments. Mavi and Standing [42], Banihashemi et al. [43] and Fernández-Sánchez and Rodríguez-López [44] have reviewed the critical success factors of sustainable project management in construction. Martens and Carvalho [45] discussed the importance of sustainability in developing project management strategies. Carvalho and Rabechini [46] proposed a project sustainability management model to analyse the impact on the project success dimensions. Økland [47] applies a gap analysis to incorporate sustainability in project management. Martens and Carvalho [48] explained the key factors, including strategic and tactic issues of sustainability, in project management. Silvius et al. [49] revealed four distinct perspectives with the sustainability and triple constraint criteria. Sánchez [50] applied a simultaneous analysis of eco-impacts to organizational goals by integrating sustainability issues into project management. Brook and Pagnanelli [51] analysed sustainability for innovation project portfolio management. Labuschagne and Brent [52], Baraki and Brent [53] and Blengini et al. [54] discussed the principles of sustainable development for project life cycle management. Wang et al. [55] highlighted the role of project management in sustainable organizational growth.

In the literature, the topics on project managers' financial motivation and sustainable investment strategies are extremely limited, and few studies are related to financial motivations and sustainable investments. Executive compensation as an agency problem for obtaining profitable investment opportunities [16] and the role of managerial incentives for corporate investment in reducing agency problems [56] are notable examples of sustainable investment strategies. In this way, the literature review demonstrates that analysing the role of financial motivation in project management is a novel issue for sustainable investment strategies.

## 3. Theoretical Background

The theoretical model in this research aims to measure the strategic priorities of managers' financial motivation in terms of sustainable and valuable investment projects. Thus, it is possible to determine potential strategies by considering the optimal choices of managerial incentives, such as bonuses and high payments. Firms could have more valuable investment projects than conventional decisions with sustainable investment strategies, including the financial motivations. Thus, sustainable investment strategies could be widened not only by considering the quantitative parameters of future cash flows, but also by using qualitative measurements of internal and external parameters for investment projects.

For that, companies are divided into valuable (VP) and non-valuable (NVP) project firms by measuring the output of their productivity. Therefore, companies' over- and underinvestment decisions are influenced by managers who are highly paid or poorly paid, respectively. In addition, managers of VP or NVP firms have different kinds of inefficient investment decisions. This research is deeply interested in the investment efficiency under different pay schemes for VP and NVP firms.

The theoretical background of asset pricing developed by Dodonova and Khoroshilov [57] is considered for the model in this paper. The verification of Hsiao et al. [58] is also applied for empirical soundness. Based on the development of firms' productive efficiency, we use the constant elasticity of substitution (CES) as a production function. In general, NVP firms have unsuccessful technologies, and managers are not willing to spend the time to manage the performance. Our research mainly addresses the patterns and levels of investments of highly-paid or low-paid managers. When investment funds are advised by managers, managerial efforts are meaningful for productivity. Accordingly, the firm's production function is defined as follows:

$$f_b(I) = S_b\Big[\alpha I_b^{\rho} + (1-\alpha)e_b^{\rho}\Big]^{\frac{1}{\rho}} = S_b\alpha^{\frac{1}{\rho}}I_b, \tag{1}$$

where $I$ defines the level of investment, i.e., invested funds. In the function mentioned below, $S$ is the parameter of technical efficiency, $\rho$ is the approximation of substitution function, and $b$ refers to NVP firms.

Firms with VP have productive technologies and the essential productive factors are managers' spending $e(I)$ and invested funds $I$. Managers' payments for the VP projects are equal to the level of investment, $e_g = I_g$; g represents VP firms, so the production function is as follows:

$$f_g(I) = S_g\Big[\alpha I_g^{\rho} + (1-\alpha)e_g^{\rho}\Big]^{\frac{1}{\rho}} = S_g I_g \qquad S_g > S_b. \tag{2}$$

Following the model derived by Dodonova and Khoroshilov [57], we assume that pay will influence managers' emotions when firms make an investment decision. From the perspective of psychological science, highly-paid managers are more likely to display positive emotions and increase the expected utility, while low-paid managers are more likely to experience negative emotions and reduce the expected utility. In addition, to examine the comparative effectiveness of managers' investment decisions, including the effect of present value related to managers' pay, the research can ultimately be divided into two categories:

When a manager earns higher pay, then $u^{f_1} = h(S)u^{f_0}$. "0" represents the present and "1" represents the future; "$u^f$" stands for the effectiveness of productive performance; "$h(S)$" stands for the factor compensation. $h(S_g) > h(S_b)$; $h(S) > 1 > \delta$, where the "$\delta$" represents the discount rate or discount factor, $\delta h(S_g) > 1$ and $\delta h(S_b) < 1$ (for $h(S_b)$, go to 1).

When a manager earns lower pay, then $u^{f_1} = p(S)u^{f_0}$. "$p(S)$" stands for the compensation factor. $p(S_g) > p(S_b)$ and $\delta < p(S) < 1$; then, $\delta p(S_b) < \delta p(S_g) < 1$.

In general, larger performance (f) indicates higher managerial effectiveness. Even though great effort is generally needed, the utility value of managers is relatively lower than the expected values for a successful business plan. Based on the methodology, our utility function is

$$u^f = \theta^f f - r \times e^{\beta}. \tag{3}$$

As mentioned above,$\theta^f$ is the firm's productive performance response coefficient:

$\beta > 0$ is the cost of the spending response coefficient;
$r > 0$ is the effectiveness of the spending response coefficient.

If the managers more closely align their actions with shareholders' interests, then it may occur that all funds are invested in VP firms (NPV > 0), but this is not insured or guaranteed. In contrast, if the managers choose to act in their own self-interest, then the performance of their investment projects would be weak, or generally not efficient. Therefore, this research assumes that when managers do not work hard to protect shareholders' interests, their performance can be affected by decreased productivity. Accordingly, all investment projects with positive NPV could be negative because of the inefficiency of managers. Following this methodology, to avoid this inconvenience, managers should make a decision that is in the best interest of shareholders. When a balance is achieved, assuming $e(I) = I$, managers' effort level is equal to the spending level. From $\theta^f f - r \times e^{\beta} \geq 0$, we learn that $\frac{\theta^f}{r} \geq S_g^{\frac{1}{\rho}(\beta-1)-1}$. When managers of NVP firms do not work hard, $e = 0$ when the non-valuable project (NPV < 0) is invested and the utility value is $\theta^f f > 0$. If the effectiveness of VP firms is not enough, during the next period, they will leave the NVP firms, and maintain their low effectiveness over time.

Assume that the optimal investment level is $I_g^* = S_g^{\frac{1}{\rho}}$, and the optimal investment level of NVP firms is $I_b^* = S_b^{\frac{1}{\rho}}$. In order to consolidate their status, managers will erroneously pursue projects that have negative NPV (NPV < 0). If managers actually pursue projects, they have negative NPV (NPV < 0), and their effectiveness will decline; eventually, they can be fired after the period of project management.

In the two-period model, assume that in each period, the utility value is independent, and managers pursue the total utility value of optimal options. In this situation, the turnover ratio is $\varepsilon$, representing managers' opportunity to switch jobs across VP and NVP firms; between the two periods, the total expected present utility value of managers for VP and NVP firms can be expressed as follows ("0" stands for present, "1" stands for future):

$$\begin{cases} u_b^{f_0} = \theta^{f_0} f_b^{f_0}(I) + \delta\varepsilon u_g^{f_1} + \delta(1-\varepsilon)u_b^{f_1} \\ u_g^{f_0} = \theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta} + \delta\varepsilon u_b^{f_1} + \delta(1-\varepsilon)u_g^{f_1} \end{cases}. \tag{4}$$

If the performance coefficient $\theta^{f_0}$ is not enough, good companies cannot maintain the level of optimal investment for a long time. In this situation, managers may engage in an investment project with a negative NPV in order to hide the efforts. If the amount of $\theta^{f_0}$ is relatively low, it will disrupt the utility equilibrium, leading to a difference. The following section analyses the balanced investment level under different levels of pay related to the type of managers. Good managers invest in valuable investment projects, and the expected utility value of such projects (NPV > 0) should be equal to or greater than non-valuable projects (NPV < 0).

The total expected utility equilibrium value of highly-paid managers is (for more information about the derivation process, please refer to Appendix A):

$$\begin{cases} u_b^{f_0} = \frac{\theta^{f_0} f_b(I)}{1-H_b} + \frac{\delta\varepsilon h(S_g)\left[(1-H_b)\left(\theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta}\right) + \delta\varepsilon h(S_b)\theta^{f_0} f_b^{f_0}(I)\right]}{(1-H_b)\left[1-H_b-H_g+\delta^2 h(S_b)h(S_g)(1-2\varepsilon)\right]} \\ u_g^{f_0} = \frac{(1-H_b)\left[\theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta}\right] + \delta\varepsilon h(S_b)\theta^{f_0} f_b^{f_0}(I)}{1-H_b-H_g+\delta^2 h(S_b)h(S_g)(1-2\varepsilon)} \end{cases}. \tag{5}$$

In the function,$H_b \equiv \delta(1-\varepsilon)h(S_b)$; $Hg \equiv \delta(1-\varepsilon)h(Sg)$.

If managers engage in non-valuable investment projects, they are at risk of dismissal. In VP firms, highly-paid managers cannot avoid this risk in the decision-making process. The differences between expected value and expected utility are as follows:

$$A^f(I_g^f) = u_g^f - \left(\theta^f S_b \alpha^{\frac{1}{\rho}} I_g - re_g^{\beta} + \delta u_b^{f_1}\right); \tag{6}$$

when $A^f\left(I_g^f\right) \geq 0$, managers will conduct a detailed due diligence to process the investment project. If $A^f\left(I_g^f\right)$ is larger, the utility value of a valuable project is larger than a non-valuable one. When $e_g = I_g$, and $\varepsilon$= 0, we obtain the following formula:

$$A^{f_0}(I_g^{f_0}) = \frac{\theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta}}{1-\delta h(S_g)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} I_g + rI_g^{\beta} - \frac{\delta h(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}}{1-\delta h(S_b)} + \varepsilon(1). \tag{7}$$

It can be inferred that the optimal level of investment of highly-paid managers in VP firms is $I_g^{f^*}$. Through the mathematical inference presented in Appendix B, we find that the best investment level is lower than the optimal investment level and should be ($I_g^{f^*} < I_g^*$). This means that the optimal investment decision-making by highly-paid managers in VP firms exhibits an underinvestment phenomenon. Accordingly, Ariely et al. [59] tested whether high monetary rewards can decrease performance. They conducted a set of experiments in which subjects receive performance-contingent payments that vary in the typical levels of pay. Lastly, they documented that high reward levels have a detrimental effect on project performance.

In this research, four hypotheses are presented in Table 1.

**Table 1.** Summary of four hypotheses.

| | VP Firms | NVP Firms |
|---|---|---|
| High Pay | H1: underinvest | H2: overinvest |
| Low Pay | H3: underinvest | H4: underinvest |

The first hypothesis of our research is presented below.

**Hypothesis 1.** *With other parameters being equal, managers of VP firms with high pay tend to underinvest.*

NVP firms' managers cannot completely anticipate the benefits and weaknesses when they make investment decisions. However, highly-paid managers believe that if they protect shareholder interests, they will be able to engage in valuable investment projects (NPV > 0); otherwise, they will engage in non-valuable investment projects (NPV < 0). The expected utility difference between valuable and non-valuable investment projects is

$$A^f(I_b^f) = \left(\theta^f S_g \alpha^{\frac{1}{\rho}} I_b - rI_b^\beta + \delta u_g^{f_1}\right) - u_b^{f_0}. \tag{8}$$

In a similar way, if $A^f\left(I_b^f\right) \geq 0$, managers conduct an appropriate investment strategy. Additionally, a larger $A^f\left(I_b^f\right)$ means that it is more likely that firm managers who are highly paid will struggle and increase the value of utility. When $e_g = I_g$ and $\varepsilon$= 0, we obtain the following formula:

$$A^{f_0}(I_b^{f_0}) = \theta^{f_0} S_g \alpha^{\frac{1}{\rho}} I_b - rI_b^\beta + \frac{\delta h(S_g)(\theta^{f_0} f_g^{f_0}(I) - rI_g^\beta)}{1 - \delta h(S_g)} - \frac{\theta^{f_0} f_b^{f_0}(I)}{1 - \delta h(S_b)} + \varepsilon(1); \tag{9}$$

when $A^f(I_b^f)$ is maximized, NVP firms' highly-paid managers believe that as long as they focus on work, the technology of their firms can be improved, and a larger $\frac{S_g}{S_b}$ means that the managers are more willing to strive. Accordingly, if the ratio of the good technology level to the bad technology level $(\frac{S_g}{S_b})$ is larger than $\frac{1}{1-\delta h(S_b)}$ and $\frac{\alpha^{\frac{1}{\rho}}}{\beta}\left(\frac{S_g}{S_b} - \frac{1}{1-\delta h(S_b)}\right)^{\frac{-1}{1-\beta}} > 1$, Equation (A7) shows $I_b^{f_0^*} > I_b^* = S_b^{\frac{1}{\rho}}$, which means that there is overinvestment (please see Appendix C for more details regarding the derivation process). Holmstrom and Milgrom [30] and Aggarwal and Samwick [31] suggest that payments incentivize managers. Michael et al. [32] and Humphery-Jenner et al. [33] believe that managers with high payments are prone to be overconfident and to overinvest. The second hypothesis to test in our research is:

**Hypothesis 2.** *With other parameters being equal, managers of NVP firms with high pay tend to overinvest.*

Similarly, managers' expected equilibrium utility value of VP or NVP firms with low pay is

$$\begin{cases} u_b^{f_0} = \frac{\theta^{f_0} f_b(I)}{1-L_b} + \frac{\delta\varepsilon\ell(S_g)\left[(1-L_b)\left(\theta^{f_0} f_g^{f_0}(I) - rI_g^\beta\right) + \delta\varepsilon\ell(S_b)\theta^{f_0} f_b^{f_0}(I)\right]}{(1-L_b)\left[1-L_b-L_g+\delta^2\ell(S_b)\ell(S_g)(1-2\varepsilon)\right]} \\ u_g^{f_0} = \frac{(1-L_b)\left[\theta^{f_0} f_g^{f_0}(I) - rI_g^\beta\right] + \delta\varepsilon\ell(S_b)\theta^{f_0} f_b^{f_0}(I)}{1-L_b-L_g+\delta^2\ell(S_b)\ell(S_g)(1-2\varepsilon)} \end{cases}. \tag{10}$$

In Equation (10), $L_b \equiv \delta(1-\varepsilon)\ell(S_b)$; $L_g \equiv \delta(1-\varepsilon)\ell(S_g)$.

It is difficult for low-paid managers in VP firms to completely assess the benefits and costs of an investment project when they make a decision. Therefore, managers should measure the risk of utility differences after the investment project (if managers choose to invest in a non-valuable project, they will have the risk of dismissal), and the difference value of utility is as follows:

$$A^f(I_g^f) = u_g^f - \left(\theta^f S_b \alpha^{\frac{1}{\rho}} I_g - re_g^\beta + \delta u_b^{f_1}\right). \tag{11}$$

To avoid being fired, managers will exercise due diligence when $t = 0$, and only when $A^f\left(I_g^f\right) \geq 0$ will low-paid managers in VP firms assess their investment strategies. A larger $A^f\left(I_g^f\right)$ means a larger amount is invested in valuable projects than in non-valuable projects.

$$A^{f_0}(I_g^{f_0}) = \frac{\theta^{f_0} f_g^{f_0}(I) - rI_g^\beta}{1 - \delta\ell(S_g)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} I_g + rI_g^\beta - \frac{\delta\ell(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}}{1 - \delta\ell(S_b)} + \varepsilon(1). \tag{12}$$

When $A^f(I_g^f)$ is maximized, the balanced investment level of VP firms' low-paid managers is $I_g^{f_0^*} < I_g^* = S_g^{\frac{1}{\rho}}$ (for additional details, please see Appendix D). Low-paid managers believe that the difference in utility value of conducting investment projects is smaller than the risk of dismissal, so they tend to underinvest in projects. Zyung and Sanders [60] argue for the tendency to engage in risky behaviours and to eventually endanger the firm with volatile performance, and vice versa.

The third hypothesis to test in our research is:

**Hypothesis 3.** *With other parameters being equal, managers of VP firms with low pay tend to underinvest.*

Low-paid managers with NVP believe that efforts do not have any impact on firm performance, so the differences in utility among valuable and non-valuable projects is

$$A^f(I_b^f) = \left(\theta^f S_g I_b + \delta u_g^{f_1}\right) - u_b^{f_0}. \tag{13}$$

When $A^f\left(I_b^f\right) \geq 0$, managers will conduct an investment project. Additionally, a larger $A^f\left(I_b^f\right)$ means that the low-paid managers in NVP firms cannot afford the project and the utility value gained from valuable projects is larger than that gained from non-valuable ones.

$$A^{f_0}(I_b^{f_0}) = \theta^{f_0} S_g I_b + \frac{\delta\ell(S_g)(\theta^{f_0} f_g^{f_0}(I) - rI_g^\beta)}{1 - \delta\ell(S_g)} - \frac{\theta^{f_0} f_b^{f_0}(I)}{1 - \delta\ell(S_b)} + \varepsilon(1) \tag{14}$$

The optimal level of investment is $I_b^{f_0} = I_b^* = S_b^{\frac{1}{\rho}}$,

$$A^{f_0}(I_b^{f_0}) = \theta^{f_0} S_g S_b^{\frac{1}{\rho}} + \frac{\delta\ell(S_g)(\theta^{f_0} f_g^{f_0}(I) - rI_g^\beta)}{1 - \delta\ell(S_g)} - \frac{\theta^{f_0} S_b^{\frac{1}{\rho}+1} \alpha^{\frac{1}{\rho}}}{1 - \delta\ell(S_b)} + \varepsilon(1) \tag{15}$$

$$A^{f_0}(0) = \frac{\delta\ell(S_g)(\theta^{f_0} f_g^{f_0}(I) - rI_g^\beta)}{1 - \delta\ell(S_g)} + \varepsilon(1) < 0 \tag{16}$$

$$A^{f_0}(I_b^{f_0}) - A^{f_0}(0) = \frac{\theta^{f_0} S_b^{\frac{1}{\rho}+1}\left(\frac{S_g}{S_b}(1 - \delta\ell(S_b)) - \alpha^{\frac{1}{\rho}}\right)}{1 - \delta\ell(S_b)} + \varepsilon(1) < 0. \tag{17}$$

$A^{f_0}(I_b^{f_0}) - A^{f_0}(0) < 0$ means $A^{f_0}(I_b^{f_0}) < A^{f_0}(0) < 0$, so the investment of low-paid managers is $I_b^{f_0^*} = 0 < S_b^{\frac{1}{\alpha}} = I_b^*$ (please check Appendix E in this research for more details).

The fourth hypothesis to test in our research is:

**Hypothesis 4.** *With other parameters being equal, managers of NVP firms with low pay tend to underinvest.*

Low-paid managers cannot estimate the benefits and costs of investment projects. If the managers do not believe in efforts to improve their performance, they will not invest by not considering the outcome or returns. Accordingly, low-paid managers in NVP firms tend to seriously underinvest in projects.

## 4. Analysis

### 4.1. Empirical Model

The literature provides evidence of the impact of managerial optimism/overconfidence on corporate investment, revealing the efficiency of an investment and comparing the efficiency of different investments. This research partly deals with the difficulties in the measurement process for the optimal level of investment. Based on the model of Hsiao et al. [58], we determine whether a quadratic relationship between firm value and investment can imply an optimal level of investment for each firm, depending on the quality of investment opportunities.

Optimal investment decisions in a frictionless environment are measured by Tobin's marginal q [61]. Therefore, we classify firms into two different groups: when firms' q ratio is greater than 1 they are considered VP firms; all other firms would be regarded as NVP firms.

Following the research of Hsiao et al. [58], we develop a model to link the value of a firm on a per-share basis and its major financial decisions by considering the behavioural variables influencing individual investment decision makers. Model I can be described as follows:

$$\begin{aligned}\frac{V_{i,t}}{K_{i,t-1}} &= \beta_0 + [\beta_1 + \gamma_{11}G_{i,t} \times (Q_{i,t} - 1) + \gamma_{12}H_{i,t} \times (Q_{i,t} - 1)] \times \left(\frac{I_{i,t}}{K_{i,t-1}}\right) \\ &+ [\beta_2 + \gamma_{21}G_{i,t} \times (Q_{i,t} - 1) + \gamma_{22}H_{i,t} \times (Q_{i,t} - 1)] \times \left(\frac{I_{i,t}}{K_{i,t-1}}\right)^2 \\ &+ \beta_3\left(\frac{\Delta\beta_{i,t}}{K_{i,t-1}}\right) + \beta_4\left(\frac{D_{i,t}}{K_{i,t-1}}\right) + \beta_5 ROA_{i,t} + e_{i,t}\end{aligned},$$

where $V_{i,t}$ is the market value of the shares outstanding of a publicly traded company $i$ at the end of period $t$; $I_{i,t}$ is the investment undertaken by firm $i$ in period $t$; $\Delta B_{i,t}$ is the increment of the market value of long-term debt; $D_{i,t}$ is the dividend paid in period $t$; and $K_{i,t-1}$ is the replacement value of the assets at the end of period $t-1$. Thus, we can define a dummy variable for each firm. (See the Appendix of Hsiao et al. (2011) for detailed definitions of these variables ($I_{i,t}$; $\Delta B_{i,t}$; $K_{i,t-1}$; $Q_{i,t}$); however, we use the book value of (long-term) debt to replace its market value.) $Q_{i,t}$ is Tobin's $q$ value of firm $i$ at the end of period $t$; $G_{i,t}$ is equal to 1 for firms that have a Tobin's $q$ value of greater than one during the period, and 0 otherwise; and $H_{i,t}$ is equal to 1 for firms that have a Tobin's $q$ value of less than 1 during the period, and 0 otherwise. $ROA_{i,t}$ is the return on assets in period $t$. As expected, there is a negative relationship between a firm's incremental debt and firm value; considering the inherent risk of financial distress, the incremental debt will have a negative effect on shareholders' wealth. However, the effect of incremental dividends and the operating performance on shareholder wealth is positive. Therefore, increasing shareholder wealth increases the value of the firm.

After estimating the model, if we differentiate the variable of firm value from the investment variable, the first derivative is taken; then, we obtain the following formula:

$$\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*} = -\frac{\beta_1+\gamma_{11}G_{i,t}\times(Q_{i,t}-1)+\gamma_{12}H_{i,t}\times(Q_{i,t}-1)}{2(\beta_2+\gamma_{21}G_{i,t}\times(Q_{i,t}-1)+\gamma_{22}H_{i,t}\times(Q_{i,t}-1))}$$
$$\Rightarrow \begin{cases} \left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*}_{VP_{i,t}} = -\frac{\beta_1+\gamma_{11}(Q_{i,t}-1)}{2(\beta_2+\gamma_{21}(Q_{i,t}-1))} & if Q_{i,t} > 1, then \text{VPfirms} \\ \left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*}_{NVP_{i,t}} = -\frac{\beta_1+\gamma_{12}(Q_{i,t}-1)}{2(\beta_2+\gamma_{22}(Q_{i,t}-1))} & if Q_{i,t} < 1, then \text{NVPfirms} \end{cases} . \quad (18)$$

Finally, if the second partial derivative of the firm value regarding the investment variable, $\beta_1 + \gamma_{21}G_i, t \times (Q_{i,t} - 1) + \gamma 22H_{i,t} \times (Q_{i,t} - 1)$, is negative, the value obtained from Equation (18) will be maximized. Furthermore, depending on the quality of a firm's investment opportunities, the optimal level of investment determined by Equation (18) will be different for each firm.

In addition, managers use earnings management to meet their expectations. In general, positive and negative earnings cause actual pre-tax earnings to increase and decrease, and we add an earnings manipulation variable to control for the possible bias in examining the impact of managerial optimism. Therefore, we control for managerial pay (high pay or low pay) and manipulation to investigate the relationship between firm investment and value. Model II can be described as follows:

$$\begin{aligned} \frac{V_{i,t}}{K_{i,t-1}} &= \beta_0 + [\beta_1 + \delta_{11}G_{i,t}(Q_{i,t}-1) + \delta_{12}H_{i,t}(Q_{i,t}-1) + \alpha_1 MP_{i,t,s}]\left(\frac{I_{i,t}}{K_{i,t-1}}\right) \\ &+ \left[\beta_2 + \delta_{21}G_{i,t}(Q_{i,t}-1) + \delta_{22}H_{i,t}(Q_{i,t}-1) + \alpha_2 MP_{i,t,s}\right]\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^2 \\ &+ \beta_3\left(\frac{\Delta B_{i,t}}{K_{i,t-1}}\right) + \beta_4\left(\frac{D_{i,t}}{K_{i,t-1}}\right) + \beta_5 ROA_{i,t} + e_{i,t} \\ & \qquad s = H: high\text{-}payment; \quad s = L: low\text{-}payment \end{aligned} , \quad (19)$$

where $MP_{i,t,H}$ is a dummy variable that is equal to 1 if the CEO is classified as highly paid, and 0 otherwise. $MP_{i,t,L}$ is a dummy variable that is equal to 1 if the CEO is classified as poorly paid, and 0 otherwise.

By maximizing Equation (19), the level of investment in VP ($j$ = 1) or NVP ($j$ = 2) firms under different managerial pay levels will be

$$\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{**} = -\frac{[\beta_1+\delta_{11}G_{i,t}\times(Q_{i,t}-1)+\delta_{12}H_{i,t}\times(Q_{i,t}-1)+\alpha_1 MP_{i,t}]}{2[\beta_2+\delta_{21}G_{i,t}\times(Q_{i,t}-1)+\delta_{22}H_{i,t}\times(Q_{i,t}-1)+\alpha_2 MP_{i,t}]}$$
$$\Rightarrow \begin{cases} \left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{**}_{i,t,j} = \frac{\beta_1+\delta_{1j}(Q_{i,t}-1)+\alpha_1}{2[\beta_2+\delta_{2j}\times(Q_{i,t}-1)+\alpha_2]} & if \quad MP_{i,t,H} = 1, \ then\ high\text{-}payment \\ \left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{**}_{i,t,j} = \frac{\beta_1+\delta_{1j}(Q_{i,t}-1)}{2[\beta_2+\delta_{2j}\times(Q_{i,t}-1)]} & if \quad MP_{i,t,L} = 1, \ then\ low\text{-}payment \end{cases} . \quad (20)$$
$$j = 1; VP\ firms; 2: NVP\ firms$$

As mentioned above, Holmstrom and Milgrom [30] and Aggarwal and Samwick [31] found that investment may be affected by the managerial pay levels. For VP or NVP firms, the investment level under highly-paid and low-paid managers is illustrated in Equation (20).

We empirically investigate the relative magnitudes of firms' under- and overinvestment caused by managerial pay levels. Inefficiencies in managers' investment are analysed in relation to the different pay (represented by symbol "s") of VP or NVP firms:

$$\begin{aligned} &\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{**}_{i,t,j} - \left(\frac{I_{i,t}}{K_{i,t-1}}\right)^{*}_{i,t,j} \\ &= -\frac{\beta_1+\delta_{1,j}(Q_{i,t}-1)+\alpha_{1,s}}{2(\beta_2+\delta_{2,j}(Q_{i,t}-1)+\alpha_{2,s}} - \left[-\frac{\beta_1+\gamma_{1,j}(Q_{i,t}-1)}{2(\beta_2+\gamma_{2,j}(Q_{i,t}-1)}\right] = \begin{cases} > 0 & overinvestment \\ < 0 & underinvestment \end{cases} \\ & \qquad j = 1: VP\ firms; 2: NVP\ firms \\ & \qquad s =: High\text{-}payment; 2: low\text{-}payment \end{aligned} . \quad (21)$$

### 4.2. Results

Our empirical study uses panel data for non-financial listed companies in China, with the primary source of information in the Taiwan Economic Journal (TEJ) database. In order to avoid endogeneity and unobservable heterogeneity, we construct an unbalanced panel comprising 2029 companies with at least eight consecutive years from 2006 to 2015, resulting in 19,275 observations according to Morgado and Pindado's specified model [62]. The structure of the panel, by the annual number of observations for each company, is provided in Table 2.

**Table 2.** Structure of the sample: a panel of non-financial Chinese quoted companies.

| Number of Annual Observations Per Company | Number of Companies | Number of Observations |
|---|---|---|
| 10 | 1320 | 13,200 |
| 9 | 403 | 3627 |
| 8 | 306 | 2448 |
| Total | 2029 | 19,275 |

The variables are summarized in Table 3. The mean of V/K is 9.7890 and the standard deviation is 671.0664, which indicate the companies' market values in the Chinese open market, which tend to be overvalued, and there are big differences between companies. The reasons for overvaluation can be divided into two theories: The first is the agency theory of overvalued equity [63]. Under the agency theory of overvalued equity, firms become overvalued for various reasons, and managers become caught up in a game of meeting expectations.

**Table 3.** Summary statistics for 2030 non-financial companies (19,275 observations).

| Variable | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| $\left(V_{i,t}/K_{i,t-1}\right)$ | 9.7890 | 671.0664 | −148.8311 | 84,722.9400 |
| $\left(I_{i,t}/K_{i,t-1}\right)$ | 0.0702 | 3.2442 | −381.7243 | 125.1796 |
| $\left(V_{i,t}/K_{i,t-1}\right)^2$ | 10.5291 | 1109.8920 | 0.0000 | 14,5713.4000 |
| $\left(\Delta B_{i,t}/K_{i,t-1}\right)$ | 0.1317 | 11.6074 | −7.8094 | 1529.1480 |
| $\left(D_{i,t}/K_{i,t-1}\right)$ | 0.0018 | 0.0211 | −0.1094 | 0.7893 |
| ROA (%) | 5.3905 | 55.9125 | −6479.4100 | 2078.7700 |

In the agency scenario, managers play a direct role in reporting the inflated earnings from overvaluation. Therefore, investors could misinterpret the outcomes of reported earnings with the manipulated data. The second is accruals theory. Under the fixation hypothesis, cognitive errors are a direct cause of mispricing. Investors do not properly distinguish between the cash flow (permanent) and accrual (reversing) components of earnings in forecasting future performance. Firms with a high (low) component of accruals in earnings become over- (under-) valued. The misevaluation rapidly adjusts (as accruals reverse in the next few quarters) the low returns for high-accrual firms, and high returns for low-accrual firms [64].

The table shows that the mean of I/K is 10.5291. Per the Company Law of the People's Republic of China, there are specific regulations regarding the ratio of registered capital to investment for foreign-invested enterprises (e.g., if the total investment is above 3000 million dollars, the registered capital should be no less than 1/3 of the total investment). For Chinese-funded enterprises, there are no specific regulations. The causes of this phenomenon may be related to other aspects of investment and the capital.

The results of investment and firm value are presented in Table 4. We also include the dummy variable dt to measure the time effect, to control for the effect of macroeconomic variables on firm value. Consequently, we split the error term that we used to construct our test statistic into three components:

the individual effect, $\eta_i$; the time effect, dt; and the random disturbance, $V_{i,t}$. Accordingly, the final specification of the model (Model I) is estimated as follows:

$$\begin{aligned}\frac{V_{i,t}}{K_{i,t-1}} = \ & \beta_0 + (\beta_1 + \gamma_{11}G_{i,t} \times (Q_{i,t}-1) + \gamma_{12}H_{i,t} \times (Q_{i,t}-1))\left(\frac{I_{i,t}}{K_{i,t-1}}\right) + (\beta_2 + \gamma_{21}G_{i,t} \times (Q_{i,t}-1) + \gamma_{22}H_{i,t} \times (Q_{i,t}-1))\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^2 \\ & +\beta_3\left(\frac{\Delta\beta_{i,t}}{K_{i,t-1}}\right) + \beta_4\left(\frac{D_{i,t}}{K_{i,t-1}}\right) + \beta_5 ROA_{i,t} + d_i + \eta_i + v_{i,t}\end{aligned}, \quad (22)$$

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* ($I_{i,t} = NF_{i,t} - NF_{i,t\text{-}1} + BD_{i,t}$ where $NF_{i,t}$ represents net fixed assets, and $BD_{i,t}$ is the book depreciation costs corresponding to year *t*.); $\Delta B_{i,t}$ is the incremental market value of long-term debt (since this variable has proven difficult to measure, we use the book value of long-term debt instead); $D_{i,t}$ is the dividend paid in period *t*; $K_{i,t-1}$ is the replacement value of the assets at the end of period $t-1$ ($K_{i,t} = RF_{i,t} + RI_{i,t} + (TA_{i,t} - BF_{i,t} - BI_{i,t}$ ), 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); and $ROA_{i,t}$ is the return on assets in period t. We define a dummy variable for each firm; $Q_{i,t}$ ($Q_{i,t} = (V_{i,t} + MVD_{i,t}$ ) $\div K_{i,t}$, where $MVD_{i,t}$ is the market value of debt; however, we use the book value of debt instead) is the Tobin's *q* value of firm *i* at the end of period *t*; $G_{i,t}$ is equal to one for firms that have a Tobin's *q* value of more than 1 during the period, and 0 otherwise; and $H_{i,t}$ is equal to one for firms that have a Tobin's *q* value of less than 1 during the period, and 0 otherwise. The model defines the investment and firm value, while the other main decisions (financing and dividends strategy) will be controlled for, which could have direct effects on firm value due to market imperfections, and the operating performance will be controlled for, such as return on assets (ROA).

**Table 4.** Estimation of the manager's investment decision model using the panel data methodology. Model I.

$$\begin{aligned}\frac{V_{i,t}}{K_{i,t-1}} = \ & \beta_0 + (\beta_1 + \gamma_{11}G_{i,t} \times (Q_{i,t}-1) + \gamma_{12}H_{i,t} \times (Q_{i,t}-1))\left(\frac{I_{i,t}}{K_{i,t-1}}\right) + (\beta_2 + \gamma_{21}G_{i,t} \times (Q_{i,t}-1) + \gamma_{22}H_{i,t} \times (Q_{i,t}-1))\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^2 \\ & +\beta_3\left(\frac{\Delta\beta_{i,t}}{K_{i,t-1}}\right) + \beta_4\left(\frac{D_{i,t}}{K_{i,t-1}}\right) + \beta_5 ROA_{i,t} + d_i + \eta_i + v_{i,t}\end{aligned}$$

| | $\beta_0$ | $\beta_1$ | $\beta_2$ | $\beta_3$ | $\beta_4$ | $\beta_5$ |
|---|---|---|---|---|---|---|
| Coefficient | 56.1250<br>(2.9622) *** | −10.1880<br>(5.6969) * | 0.5012<br>(0.2409) ** | 0.5282<br>(1.4947) | 571.2005<br>(4.0200) *** | −9.3560<br>(0.0496) *** |
| | $\gamma_{11}$ | $\gamma_{12}$ | $\gamma_{21}$ | $\gamma_{22}$ | | |
| Coefficient | −2.1767<br>(0.2119) *** | −43.8982<br>(20.4990) ** | −0.0057<br>(0.0006) *** | 1.8234<br>(0.8467) ** | | |
| R-sq | 0.6512 | | | | | |

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

Recall that ($\beta_1 + \gamma_{12}(Q_{i,t} - 1)$) and ($\beta_2 + \gamma_{22}(Q_{i,t} - 1)$) are the coefficients on investment and the square investment variables for NVP firms, respectively, with the coefficients for these variables in VP firms being ($\beta_1 + \gamma_{11}(Q_{i,t} - 1)$) and ($\beta_2 + \gamma_{21}$ $(Q_{i,t} - 1)$). Since $\beta_1$ is −10.1880 and $\beta_2$ is 0.5012, we can confirm that the relationship between firm value and investment is quadratic for NVP firms with $\gamma_{12}$ of −43.8982 and $\gamma_{22}$ of 1.8234. Furthermore, $\gamma_{11}$ is −2.1767 and $\gamma_{21}$ is −0.0057, and both are significantly different from 0, which enables us to confirm the quadratic relationship for VP firms.

By maximizing the value of the firm, the level of investment of VP and NVP firms will be different and also depend on the quality of investment opportunities. The coefficient for the "incremental debt" as a separate variable is 0.5282 and significant at the 10% level. The "dividends" variable is 571.2005 and significant at the 1% level. Therefore, current dividends are a source of value creation for shareholders.

Holmstrom and Milgrom [30] and Aggarwal and Samwick [31] suggest that managers are more likely to reduce agency problems when they are exposed to high payments. They are committed to having good performance because their wealth is highly related to it. Thus, managerial pay (high pay or low pay) affects the firm's strategic investments depending on the quality of investment opportunities. For this reason, our model also controls for managerial pay and managerial manipulation while examining the relationship between firm value and investment. High payment is defined as the CEO's total income, including the options and bonuses that have higher values than the average annual income for the selected industry. Accordingly, low payment indicates weak earnings for the managers of similar projects. However, the industrial diversification of the managerial payments is not considered because of the significant differences between the industries. Additionally, several types of manager-specific investments and different industries are highly sensitive to the analysis results [65,66]. The managerial payment during the construction process and the distribution of forecasts are described in Table 5.

**Table 5.** Details of managerial payments as a measure of the construction process and the distribution of forecasts used to identify CEOs' high payment and low payment.

| **Panel A: Details of High (low) Payment as a Measure of the Construction Process** | | |
|---|---|---|
| | Firm | Forecast |
| Number of the sample | 2029 | 19,275 |
| Less: Forecasts possibly due to incentives rather than high payments: | | |
| 1. Forecasts the firms conducting 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 | | |
| Forecasts that meet any one of the above three criteria | 2029 | 19,275 |
| Less: Samples with unqualified data (fewer than eight consistent periods) | | |
| Sum sample analysed in this paper | 2029 | 19,275 |

| **Panel B: Distribution of CEOs' High and Low Payment Over the Years** | | |
|---|---|---|
| Year | Number of high payments | Number of low payments |
| 1 | 76 | 1524 |
| 2 | 109 | 1549 |
| 3 | 145 | 1670 |
| 4 | 184 | 1811 |
| 5 | 199 | 1839 |
| 6 | 204 | 1833 |
| 7 | 226 | 1814 |
| 8 | 131 | 1909 |
| 9 | 150 | 1882 |
| 10 | 102 | 1918 |
| Total | 1526 | 17,749 |

In Panel A of Table 5, we are left with a total of 19,275 forecasts published by 2029 firms. Details on the distribution of the forecasts are used to identify the high pay/low pay of CEOs during the period. In Panel B, 19,275 forecasts released by these 2029 firms, 1526 are highly paid and 17,749 are poorly paid.

The results are presented in Table 6. Thus, the final specification of the models to estimate is as follows:

**Table 6.** Estimation of managers' specification and investment decisions using panel data for managerial payments.

$$\begin{aligned}\frac{V_{i,t}}{K_{i,t-1}} &= \beta_0 + [\beta_1 + \delta_{11}G_{i,t}(Q_{i,t}-1) + \delta_{12}H_{i,t}(Q_{i,t}-1) + \alpha_1 MP_{i,t,s}]\Big(\frac{I_{i,t}}{K_{i,t-1}}\Big) \\ &+[\beta_2 + \delta_{21}G_{i,t}(Q_{i,t}-1) + \delta_{22}H_{i,t}(Q_{i,t}-1) + \alpha_2 MP_{i,t,s}]\Big(\frac{I_{i,t}}{K_{i,t-1}}\Big)^2 \\ &+\beta_3\Big(\frac{\Delta B_{i,t}}{K_{i,t-1}}\Big) + \beta_4\Big(\frac{D_{i,t}}{K_{i,t-1}}\Big) + \beta_5 ROA_{i,t} + d_i + \eta_i + \nu_{i,t}\end{aligned}$$

| **Panel A: Managerial High Payment** | | | | | | |
|---|---|---|---|---|---|---|
| | $\beta_0$ | $\beta_1$ | $\beta_2$ | $\beta_3$ | $\beta_4$ | $\beta_5$ |
| Coefficient | 55.7978<br>(2.9830) *** | −10.8930<br>(5.8940) * | 0.5440<br>(0.2516) ** | 0.2818<br>(1.5931) | 598.8988<br>(177.2142) *** | −9.3588<br>(0.0018) *** |
| | $\delta_{11}$ | $\delta_{12}$ | $\alpha_{1H}$ | $\delta_{21}$ | $\delta_{22}$ | $\alpha_{2H}$ |
| Coefficient | −2.1764<br>(0.2126) *** | −45.3576<br>(20.6648) ** | 44.0667<br>(35.7105) | −0.0057<br>(0.0006) *** | 1.9634<br>(0.8911) ** | −1.5494<br>(1.2294) |
| R-sq | 0.6527 | | | | | |
| **Panel B: Managerial Low Payment** | | | | | | |
| | $\beta_0$ | $\beta_1$ | $\beta_2$ | $\beta_3$ | $\beta_4$ | $\beta_5$ |
| Coefficient | 55.5978<br>(2.9830) *** | −1.0054<br>(35.2730) | −2.1764<br>(0.2126) *** | 0.2818<br>(1.5931) | 598.8988<br>(177.2142) *** | −9.3588<br>(0.0498) *** |
| | $\delta_{11}$ | $\delta_{12}$ | $\alpha_{1L}$ | $\delta_{21}$ | $\delta_{22}$ | $\alpha_{2L}$ |
| Coefficient | −2.1764<br>(0.2126) *** | −45.3576<br>(20.6648) ** | −44.0667<br>(35.7105) | −0.0057<br>(0.0006) *** | 1.9634<br>(0.8911) ** | −1.5494<br>(1.2294) |
| R-sq | 0.6514 | | | | | |

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

Model II

$$\begin{aligned}\frac{V_{i,t}}{K_{i,t-1}} &= \beta_0 + [\beta_1 + \delta_{11}G_{i,t}(Q_{i,t}-1) + \delta_{12}H_{i,t}(Q_{i,t}-1) + \alpha_1 MP_{i,t,s}]\left(\frac{I_{i,t}}{K_{i,t-1}}\right) \\ &+[\beta_2 + \delta_{21}G_{i,t}(Q_{i,t}-1) + \delta_{22}H_{i,t}(Q_{i,t}-1) + \alpha_2 MP_{i,t,s}]\left(\frac{I_{i,t}}{K_{i,t-1}}\right)^2 \\ &+\beta_3\left(\frac{\Delta B_{i,t}}{K_{i,t-1}}\right) + \beta_4\left(\frac{D_{i,t}}{K_{i,t-1}}\right) + \beta_5 ROA_{i,t} + d_i + \eta_i + \nu_{i,t}\end{aligned}$$

By using the results of LM and Hausman tests and the assumption that there is one true effect size of the managerial payments for the project success stated in the study of Hsiao et al. [58], it follows that the combined effects are the estimation of this common effect size [64], so the fixed effects model is selected for the analysis.

The results of Model II are provided in Table 6, and the two coefficients of managerial payment, $\alpha 1$ and $\alpha 2$, are −44.0667 and −1.5494, respectively. At the 10% level, the former is insignificant and the latter is significant. Since $\beta_1$ is −10.8930 and $\beta_2$ is 0.5440, highly-paid management combined with $\beta_1$ is −1.0054, and with $\beta_2$ is −2.1764, while low-paid management combined with δ11 is −2.1764 and with δ21 is −0.0057; it is confirmed that the relationship between firm value and investment is quadratic for VP firms. Furthermore, δ12 is −45.3576 and δ22 is 1.9634, both significantly different from 0, which also enabled us to confirm the quadratic relationship for NVP firms. Coefficients of all parameters for low and high managerial payments are almost the same, except β0 and β1. This finding is clear evidence that the direction and effects of all parameters are identical for the managers' character and investment decisions, even if the payment policies are different. Additionally, the overall outcomes of Model II demonstrate that the panel results for both high and low payments are coherent at all significance levels.

Managerial payments (high pay or low pay) affect the firm's strategic investment depending on the quality of investment opportunities. The inefficient (under/over) investment level is provided in Table 7. Among the 19,275 observations, highly-paid managers comprise 1526 observations of the overinvestment phenomenon, with 86.98% in VP firms and 0.76% in NVP firms, and low-paid managers comprise 17,749 observations of the underinvestment phenomenon, with 64.83% in VP firms and 73.22% in NVP firms. Altogether, managerial payments affect firms' inefficient investment.

**Table 7.** Estimation of investment on the quality of the investment opportunities and managerial payments affects the levels of under-/overinvestment (19,275 observations).

| | High-Payment Manager (1526 Observations) | | Low-Payment Manager (17,749 Observations) | |
|---|---|---|---|---|
| | Overinvestment | Underinvestment | Overinvestment | Underinvestment |
| VP firms | 86.98% | 13.02% | 35.17% | 64.83% |
| NVP firms | 0.76% | 99.24% | 26.78% | 73.22% |

In Table 8, highly-paid managers overestimate the project value; therefore, based on the above analysis, it is concluded that Hypotheses 1 and 2 have not been supported, while Hypotheses 3 and 4 have been supported.

**Table 8.** Test of how managerial payments affect the difference in the level of under-/overinvestment between VP firms and NVP firms.

| | Mean | Standard Deviation | Wilcoxon Rank Sum Test |
|---|---|---|---|
| Panel A: Highly-paid manager (1526 observations) | | | |
| VP firms | 3.6499 | 6.6681 | |
| NVP firms | −19.4558 | 73.4409 | |
| Z (H0: same population distribution in VP firms and NVP firms) | | | 50.675 *** |
| P (overinvestment phenomenon in VP firms more than in NVP firms) (Proportion test: $H_0$:$P \leq 0.5$; $H_a$:$P > 0.5$, $Z = \frac{\hat{p}-p_0}{\sigma_{\hat{p}}}$, where $p_0$ is estimation value; $\hat{p}$ is sample proportion; $\sigma_{\hat{p}} = \sqrt{p_0(1-p_0)/n}$ is standard deviation.) | | | 0.981 ** |
| Panel B: Low-paid manager (17,749 observations) | | | |
| VP firms | −12.176 | 1500.44 | |
| NVP firms | −2.5087 | 888.1281 | |
| Z (H0: same population distribution in VP firms and NVP firms) | | | 31.437 *** |
| P (underinvestment phenomenon in VP firms more than in NVP firms) | | | 0.595 *** |

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

## 5. Discussion and Conclusions

In the globalized world, sustainable project management plays a key role in strategic investment success. A multidimensional outlook on project evaluation could provide more comprehensive outcomes than conventional methods by considering both internal and external factors of the competitive market environment. Thus, the behavioural approach to financial issues remains a prominent factor for analysing successful competitive projects. Accordingly, in this study, the theory of behavioural corporate finance and managerial biases (overconfidence) have been used to explain corporate investment. The debates in the literature on the effect of executive pay on the agency, along with several conflicts, are ripe for further investigation. As evidence, Holmstrom and Milgrom [30] and Aggarwal and Samwick [31] addressed the role of payments for managers to create successful business projects and to solve the agency problems. Accordingly, Le Breton–Miller and Miller [9] recommended that the inputs of investment projects could be properly reconciled with the active commitments of the project team, especially project managers against the agency problems. Additionally, Lewis and Juravle [11] examined the motivations and strategies for managerial skills in successful investment decisions. De Souza Cunha and Samanez [10] argued that risk-taking behaviours in sustainable projects obtain balanced benefits for all parties.

Another policy recommendation regarding managerial incentives is to understand the capacity of firm investments and market value for the sustainable investment decisions. Project managers are generally keen on motivation with monetary rewards. Thus, Inderst and Klein [16] and Bloom and Michel [19] discussed the investment alternatives that could be the best choices for sustainable development by using bonuses and extra payments. Successful executive policies against the agency problem during the project process could also be applied by understanding the managerial potential of the project team [17] and adjusting managers' incomes after positive project outcomes in the long term [20]. Additionally, Bebchuk and Fried [34] strongly argued that compensation schemes that "weaken managers' incentives" increase firm value and that creative incentives could reduce long-term firm value. For that, we examine the propensity of highly-paid (low-paid) managers to overvalue (undervalue) their investment projects and how this can lead them to invest more (less) than others with lower (higher) payments.

Our research divides companies into valuable and non-valuable project firms according to their project performance and examines whether highly- and low-paid managers have problems with sustainable investment strategies. Optimal strategy selection leads to successful business projects and could be evaluated through the results for over- and underinvestment. In firms with valuable projects, highly-paid and low-paid managers tend to be conservative and underinvest to consolidate their status and avoid dismissal. For non-valuable firms, highly paid managers could increase their efforts to improve technology for sustainable investment strategies. Thus, sustainable projects with valuable cash flows could be generated and the results might trigger the managers to overinvest. However, low-paid managers in non-valuable projects act by increasing the performance results of the investment decision, which could be a reason to underinvest. Additionally, several integrated methods, including data envelopment analysis and multi-criteria decision-making methods, can be applied in future studies to evaluate sustainable investment strategies.

**Author Contributions:** Conceptualization, H.-F.H., T.Z. and H.D.; Methodology, H.-F.H. and T.Z.; Software, H.-F.H. and T.Z.; Validation, H.-F.H., T.Z. and H.D.; Formal Analysis, H.-F.H., T.Z. and H.D.; Investigation, H.-F.H., T.Z. and H.D.; Resources, H.-F.H., T.Z. and H.D.; Data Curation, H.-F.H. and T.Z.; Writing—Original Draft Preparation, H.-F.H., T.Z. and H.D.; Writing—Review and Editing, H.D.; Visualization, H.-F.H., T.Z. and H.D.; Supervision, H.D.; Project Administration, H.-F.H. and T.Z.; Funding Acquisition, H.-F.H. and T.Z.

**Funding:** This research is partially sponsored by Soft Science Research Project of Fujian Province, China under Grant2019R0080, Supported by Chongqing Federation of Social Science Project(2018YBGL052).

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

The total expected utility value of VP and NVP companies can be expressed as follows:

$$\begin{cases} u_b^{f_0} = \theta^{f_0} f_b^{f_0}(I) + \delta\varepsilon u_g^{f_1} + \delta(1-\varepsilon)u_b^{f_1} \\ u_g^{f_0} = \theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta} + \delta\varepsilon u_b^{f_1} + \delta(1-\varepsilon)u_g^{f_1} \end{cases} . \tag{A1}$$

Assume that both good and bad managers own the high payments, $u^{f_1} = h(S)u^{f_0}$, $h(S_g) > h(S_b)$, and $h(S) > 1 > \delta$, $\delta$ is the discount factor, and $\delta h(S_g) > 1$, $\delta h(S_b) < 1$, (for $h(S_b)$ to become 1). Put the relationship mentioned above into function (A1), and get (make $H_b \equiv \delta(1-\varepsilon)h(S_b)$, $Hg \equiv \delta(1-\varepsilon)h(S_g)$):

$$\begin{aligned} u_b^{f_0} &= \theta^{f_0} f_b^{f_0}(I) + \delta\varepsilon h(S_g)u_g^{f_0} + \delta(1-\varepsilon)h(S_b)u_b^{f_0} \\ &= \frac{\theta^{f_0} f_b^{f_0}(I) + \delta\varepsilon h(S_g)u_g^{f_0}}{1-\delta(1-\varepsilon)h(S_b)} \\ &= \frac{\theta^{f_0} f_b^{f_0}(I) + \delta\varepsilon h(S_g)u_g^{f_0}}{1-H_b} \end{aligned} .$$

$$\begin{aligned} u_g^{f_0} &= \theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta} + \frac{\delta\varepsilon h(S_b)\left(\theta^{f_0} f_b^{f_0}(I) + \beta\delta\varepsilon u_g^{f_1}\right)}{1-H_b} + \delta(1-\varepsilon)h\left(S_g\right)u_g^{f_0} \\ &\left[1 - \frac{(\delta\varepsilon)^2 h(S_b)h\left(S_g\right)}{1-H_b} - \delta(1-\varepsilon)h\left(S_g\right)\right]u_g^{f_0} = \theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta} + \frac{\delta\varepsilon h(S_b)\theta^{f_0} f_b^{f_0}(I)}{1-H_b} . \\ u_g^{f_0} &= \frac{[1-H_b]\left[\theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta}\right] + \delta\varepsilon h(S_b)\theta^{f_0} f_b^{f_0}(I)}{1-H_b-H_g+\delta^2 h(S_b)h\left(S_g\right)(1-2\varepsilon)} \end{aligned}$$

Recognize the former two equations as follows:

$$\begin{aligned} u_g^{f_0} &= \frac{[1-H_b]\left[\theta^{f_0} f_g^{f_0}(I)-rI_g^\beta\right]+\delta\varepsilon h(S_b)\theta^{f_0} f_b^{f_0}(I)}{1-H_b-H_g+\delta^2 h(S_b)h(S_g)(1-2\varepsilon)} \\ u_b^{f_0} &= \frac{\theta^{f_0} f_b^{f_0}(I)}{1-H_b} + \frac{\delta\varepsilon h(S_g)\left[(1-H_b)\left(\theta^{f_0} f_g^{f_0}(I)-rI_g^\beta\right)+\delta\varepsilon h(S_b)\theta^{f_0} f_b^{f_0}(I)\right]}{(1-H_b)\left[1-H_b-H_g+\delta^2 h(S_b)h(S_g)(1-2\varepsilon)\right]} \end{aligned}. \tag{A2}$$

## Appendix B

For VP firms, when managers with high payments conduct investment strategies, they cannot completely predict the advantages and disadvantages of projects. Managers, therefore, should measure whether they would like to undertake the risk of utility value differences after investing in the projects (if managers invest in non-valuable projects, they will have the risk of dismissal); the differences of utility values are:

$$A^f(I_g^f) = u_g^f - \left(\theta^f S_b \alpha^{\frac{1}{\rho}} I_g - re_g^\beta + \delta u_b^{f_1}\right).$$

Managers will make efforts when $t = 0$ to avoid being fired; when $A^f\left(I_g^f\right) \geq 0$, only managers of VP firms with high payments will conduct the investment strategy, and a larger $A^f\left(I_g^f\right)$ shows that the utility values of valuable projects are larger than non-valuable projects.

Assume: $\varepsilon$ is very small, $\varepsilon = \varepsilon(1)$.

$$\begin{aligned} A^{f_0}\left(I_g^{f_0}\right) &= \frac{(1-H_b)\left[\theta^{f_0} f_g^{f_0}(I)-rI_g^\beta\right]+\delta\varepsilon h(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}}{1-H_b-H_g+\delta^2 h(S_b)h\left(S_g\right)(1-2\varepsilon)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} I_g + rI_g^\beta \\ &\quad -\delta h(S_b)\left[\begin{array}{l} \frac{\theta^{f_0} S_b^{\frac{1}{\rho}}}{1-H_b} + \\ \frac{\delta\varepsilon h\left(S_g\right)\left[(1-H_b)\left(\theta^{f_0} f_g^{f_0}(I)-rI_g^\beta\right)+\delta\varepsilon h(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}\right]}{(1-H_b)\left[1-H_b-H_g+\delta^2 h(S_b)h\left(S_g\right)(1-2\varepsilon)\right]} \end{array}\right] \\ &= \frac{(1-\delta h(S_b))\left(\theta^{f_0} f_g^{f_0}(I)-rI_g^\beta\right)}{1-\delta\left(h(S_b)+h\left(S_g\right)\right)+\delta^2 h(S_b)h\left(S_g\right)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} I_g + rI_g^\beta - \frac{\delta h(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}}{1-\delta h(S_b)} + \varepsilon(1) \\ &= \frac{\theta^{f_0} f_g^{f_0}(I)-rI_g^\beta}{1-\delta h\left(S_g\right)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} I_g + rI_g^\beta - \frac{\delta h(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}}{1-\delta h(S_b)} + \varepsilon(1) \end{aligned}. \tag{A3}$$

When $A^f(I_g^f)$ is maximized, we can get the balanced investment level of VP firms' managers with high payments, learning from the first-order differential:

$$\begin{aligned} \frac{\partial A^{f_0}\left(I_g^{f_0}\right)}{\partial I_g} &= \frac{\theta^{f_0} S_g - \beta r I_g^{\beta-1}}{1-\delta h\left(S_g\right)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} + \beta r I_g^{\beta-1} = 0 \\ & \beta r I_g^{\beta-1}\left(\frac{1}{1-\delta h\left(S_g\right)} - 1\right) = \frac{\theta^{f_0} S_g}{1-\delta h\left(S_g\right)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} \\ & I_g^{\beta-1} = \frac{\theta^{f_0}}{\beta r \delta h\left(S_g\right)}\left[S_g - S_b \alpha^{\frac{1}{\rho}}\left(1-\delta h\left(S_g\right)\right)\right] \\ & I_g = \left[\frac{\theta^{f_0}}{\beta r \delta h\left(S_g\right)}\left(S_g - S_b \alpha^{\frac{1}{\rho}}\left(1-\delta h\left(S_g\right)\right)\right)\right]^{\frac{1}{\beta-1}} \end{aligned}. \tag{A4}$$

Second-order differential:

$$\begin{aligned} \frac{\partial^2 A^{f_0}(I_g^{f_0})}{\partial^2 I_g} &= -\frac{\beta r(\beta-1)I_g^{\beta-2}}{1-\delta h(S_g)} + \beta r(\beta-1)I_g^{\beta-2} \\ &= \beta r(\beta-1)\left(\frac{-1}{1-\delta h(S_g)} + 1\right) < 0 \end{aligned} \quad \text{gives the maximum.}$$

So, if $\frac{\theta^{f_0}}{r} \approx S_g^{\frac{1}{\rho}(\beta-1)-1}$, and $\frac{S_b}{S_g} < 1$, then $I_g^{f_0^*}$ can be recognized as follows:

$$I_g^{f_0^*} = \left[\frac{\theta^{f_0}(S_g - S_b\alpha^{\frac{1}{\rho}}(1-\delta h(S_g))}{\beta r\delta h(S_g)}\right]^{\frac{1}{\beta-1}} \approx S_g^{\frac{1}{\rho}}\left[\frac{1}{\beta\delta h(S_g)}(1-\frac{S_b}{S_g}\alpha^{\frac{1}{\rho}}(1-\delta h(S_g))\right]^{\frac{-1}{1-\beta}} < S_g^{\frac{1}{\rho}} = I_g^*. \tag{A5}$$

When the discount rate is $\delta \in [0,1]$, $h(S_g) > 1$, and $\delta h(S_g) > 1$ then $\left[\frac{1}{\beta\delta h(S_g)}\left(1-\frac{S_b}{S_g}\alpha^{\frac{1}{\rho}}(1-\delta h(S_g))\right)\right]^{\frac{-1}{1-\beta}} < 1$, so Equation (A4) shows $I_g^{f_0^*} < I_g^* = S_g^{\frac{1}{\rho}}$, meaning that managers tend to underinvest.

## Appendix C

While managers of NVP firms with high payments conduct investment strategies, they cannot completely know whether the projects are valuable, so managers with high payments believe that they will invest in valuable projects (NPV > 0) if they make efforts; on the contrary, they will invest in non-valuable projects (NPV < 0), if no efforts are put in, and the value differences of the two kinds of projects are: $A^f(I_b^f) = \left(\theta^f S_g\alpha^{\frac{1}{\rho}}I_b - rI_b^\beta + \delta u_g^{f_1}\right) - u_b^{f_0}$,and $A^f\left(I_b^f\right) \geq 0$. A larger $A^f\left(I_b^f\right)$ means that NVP firms' managers with high payments have more reasons to make efforts to increase the utility values.

Assume: $\varepsilon$ is very small, $\varepsilon = \varepsilon(1)$.

$$\begin{aligned} A^{f_0}\left(I_b^{f_0}\right) &= \theta^{f_0}S_g\alpha^{\frac{1}{\rho}}I_b - rI_b^\beta + \delta h\left(S_g\right)\left[\frac{(1-H_b)\left[\theta^{f_0}f_g^{f_0}(I)-rI_g^\beta\right]+\delta\varepsilon h(S_b)\theta^{f_0}f_b^{f_0}(I)}{1-H_b-H_g+\delta^2 h(S_b)h\left(S_g\right)(1-2\varepsilon)}\right] \\ &\quad -\frac{\theta^{f_0}f_b^{f_0}(I)}{1-H_b} - \frac{\delta\varepsilon h\left(S_g\right)\left\{(1-H_b)\left[\theta^{f_0}f_g^{f_0}(I)-rI_g^\beta\right]+\delta\varepsilon h(S_b)\theta^{f_0}f_b^{f_0}(I)\right\}}{(1-H_b)\left[1-H_b-H_g+\delta^2 h(S_b)h\left(S_g\right)(1-2\varepsilon)\right]} \\ &= \theta^{f_0}S_g\alpha^{\frac{1}{\rho}}I_b - rI_b^\beta + \frac{\delta h\left(S_g\right)(1-\delta h(S_b))\left(\theta^{f_0}f_g^{f_0}(I)-rI_g^\beta\right)}{1-\delta\left(h(S_b)+h\left(S_g\right)\right)+\delta^2 h(S_b)h\left(S_g\right)} - \frac{\theta^{f_0}f_b^{f_0}(I)}{1-\delta h(S_b)} + \varepsilon(1) \\ &= \theta^{f_0}S_g\alpha^{\frac{1}{\rho}}I_b - rI_b^\beta + \frac{\delta h\left(S_g\right)\left(\theta^{f_0}f_g^{f_0}(I)-rI_g^\beta\right)}{1-\delta h\left(S_g\right)} - \frac{\theta^{f_0}f_b^{f_0}(I)}{1-\delta h(S_b)} + \varepsilon(1) \end{aligned}. \tag{A6}$$

From $\frac{S_g}{S_b} > 1$, and the conditions of the first- and second-order differentials, we can get:

$$\begin{aligned} I_b^{f_0^*} &= \left[\frac{\theta^{f_0}\left(S_g\alpha^{\frac{1}{\rho}}(1-\delta h(S_b))-S_b\alpha^{\frac{1}{\rho}}\right)}{\beta r(1-\delta h(S_b))}\right]^{\frac{1}{\beta-1}} \geq \left[\frac{\alpha^{\frac{1}{\rho}}}{\beta}S_b^{\frac{1}{\rho}(\beta-1)-1}S_b\left(\frac{S_g}{S_b}-\frac{1}{1-\delta h(S_b)}\right)\right]^{\frac{-1}{1-\beta}} \\ &= S_b^{\frac{1}{\rho}}\left[\frac{\alpha^{\frac{1}{\rho}}}{\beta}\left(\frac{S_g}{S_b}-\frac{1}{1-\delta h(S_b)}\right)\right]^{\frac{-1}{1-\beta}} > S_b^{\frac{1}{\rho}} = I_b^* \end{aligned}. \tag{A7}$$

When the discount rate is $\delta \in [0,1]$, $h(S_b) < 1$, and $\delta h(S_b) < 1$, whether the investment strategy made by managers of NVP firms with high payments is the optimal option under the situation of maximization of utility values, $\left[\frac{\alpha^{\frac{1}{\rho}}}{\beta}\left(\frac{S_g}{S_b}-\frac{1}{1-\delta h(S_b)}\right)\right]^{\frac{-1}{1-\beta}} > 1$, so, as Equation (A7) shows, $I_b^{f_0^*} > I_b^* = S_b^{\frac{1}{\rho}}$ displays the phenomenon of overinvestment.

**Appendix D**

Assume both good and bad managers have low payments; then $u^{f_1} = \ell(S)u^{f_0}$, $\ell(S_g) > \ell(S_b)$, and $\ell(S) < 1$,$\delta < 1$,for $\ell(S_g)$ to become 1, then $\delta\ell(S_b) < \delta\ell(S_g) < 1$.

$$\begin{aligned} u_b^{f_0} &= \theta^{f_0} f_b^{f_0}(I) + \delta\varepsilon\ell(S_g)u_g^{f_0} + \delta(1-\varepsilon)\ell(S_b)u_b^{f_0} \\ &= \frac{\theta^{f_0} f_b^{f_0}(I) + \delta\varepsilon\ell(S_g)u_g^{f_0}}{1-\delta(1-\varepsilon)\ell(S_b)} \\ &= \frac{\theta^{f_0} f_b^{f_0}(I) + \delta\varepsilon\ell(S_g)u_g^{f_0}}{1-L_b} \end{aligned}$$

$$\begin{aligned} u_g^{f_0} &= \theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta} + \frac{\delta\varepsilon\ell(S_b)\left(\theta^{f_0} f_b^{f_0}(I) + \beta\delta\varepsilon u_g^{f_1}\right)}{1-L_b} + L_g u_g^{f_0} \\ &= \left[1 - \frac{(\delta\varepsilon)^2\ell(S_b)\ell(S_g)}{1-L_b} - L_g\right]u_g^{f_0} = \theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta} + \frac{\delta\varepsilon\ell(S_b)\theta^{f_0} f_b^{f_0}(I)}{1-L_b} \\ u_g^{f_0} &= \frac{(1-L_b)\left[\theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta}\right] + \delta\varepsilon\ell(S_b)\theta^{f_0} f_b^{f_0}(I)}{1-L_b-L_g+\delta^2\ell(S_b)\ell(S_g)(1-2\varepsilon)} \\ u_b^{f_0} &= \frac{\theta^{f_0} f_b^{f_0}(I)}{1-L_b} + \frac{\delta\varepsilon\ell(S_g)\left[(1-L_b)\left(\theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta}\right) + \delta\varepsilon\ell(S_b)\theta^{f_0} f_b^{f_0}(I)\right]}{(1-L_b)\left[1-L_b-L_g+\delta^2\ell(S_b)\ell(S_g)(1-2\varepsilon)\right]} \end{aligned} \quad \text{(A8)}$$

The utility value differences when valuable project firms' managers with low payments invested in good projects (NPV > 0) and bad projects (NPV < 0), (if managers invest in non-valuable projects, then they will be fired):

$$A^f(I_g^f) = u_g^f - \left(\theta^f S_b \alpha^{\frac{1}{\rho}} I_g - re_g^{\beta} + \delta u_b^{f_1}\right).$$

To avoid dismissal, managers make efforts when $t = 0$, when $A^f\left(I_g^f\right) \geq 0$, only valuable firms' managers with low payments will conduct the investment strategy; and a larger $A^f\left(I_g^f\right)$, means the utility values gained from investing in valuable projects are larger than non-valuable projects.

Assume: $\varepsilon$ is very small, $\varepsilon = \varepsilon(1)$.

$$\begin{aligned} A^{f_0}\left(I_g^{f_0}\right) &= \frac{(1-L_b)\left[\theta^{f_0} f_b^{f_0}(I) - rI_g^{\beta}\right] + \delta\varepsilon\ell(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}}{1-L_b-L_g+\delta^2\ell(S_b)\ell(S_g)(1-2\varepsilon)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} I_g + rI_g^{\beta} \\ &\quad -\delta\ell(S_b)\left[\begin{array}{c} \frac{\theta^{f_0} S_b^{\frac{1}{\rho}}}{1-L_b} + \\ \frac{\delta\varepsilon\ell(S_g)\left[(1-L_b)\left(\theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta}\right) + \delta\varepsilon\ell(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}\right]}{(1-L_b)\left[1-L_b-L_g+\delta^2\ell(S_b)\ell(S_g)(1-2\varepsilon)\right]} \end{array}\right] \\ &= \frac{(1-\delta\ell(S_b))\left(\theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta}\right)}{1-\delta\left(\ell(S_b)+\ell(S_g)\right)+\delta^2\ell(S_b)\ell(S_g)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} I_g + rI_g^{\beta} - \frac{\delta\ell(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}}{1-\delta\ell(S_b)} + \varepsilon(1) \\ &= \frac{\theta^{f_0} f_g^{f_0}(I) - rI_g^{\beta}}{1-\delta\ell(S_g)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} I_g + rI_g^{\beta} - \frac{\delta\ell(S_b)\theta^{f_0} S_b^{\frac{1}{\rho}}}{1-\delta\ell(S_b)} + \varepsilon(1) \end{aligned} \quad \text{(A9)}$$

From the maximization of $A^f(I_g^f)$, we can get the balanced investment level of VP firms' managers with low payments.

$\max A^f(I_g^f)$

From the condition of the first-order differential, we can get:

$$\begin{aligned} \frac{\partial A^{f_0}(I_g^{f_0})}{\partial I_g} &= \frac{\theta^{f_0} S_g - \beta rI_g^{\beta-1}}{1-\delta\ell(S_g)} - \theta^{f_0} S_b \alpha^{\frac{1}{\rho}} + \beta rI_g^{\beta-1} = 0 \\ \beta rI_g^{\beta-1}&\left(\frac{1}{1-\delta\ell(S_g)} - 1\right) = \theta^{f_0}\left[\frac{S_g}{1-\delta\ell(S_g)} - S_b \alpha^{\frac{1}{\rho}}\right] \\ I_g &= \left[\frac{\theta^{f_0}}{\beta r\delta\ell(S_g)}\left(S_g - S_b \alpha^{\frac{1}{\rho}}(1-\delta\ell(S_g))\right)\right]^{\frac{1}{\beta-1}} \end{aligned}$$

Condition of second-order differential:

$$\begin{aligned}\frac{\partial^2 A^{f_0}(I_g^{f_0})}{\partial I_g^2} &= -\frac{\beta r(\beta-1)I_g^{\beta-2}}{1-\delta\ell(S_g)} + \beta r(\beta-1)I_g^{\beta-2} \\ &= \beta r(\beta-1)I_g^{\beta-2}\left(\frac{-1}{1-\delta\ell(S_g)}+1\right) < 0\end{aligned} \quad \text{gives the maximum.}$$

For $\frac{S_b}{S_g} < 1$, $\frac{\theta^{f_0}}{\alpha} = S_g^{\frac{1-2\beta}{\beta}}$, get:

$$\begin{aligned} I_g^{f_0^*} &= \left[\frac{\theta^{f_0}(S_g - S_b\alpha^{\frac{1}{\rho}}(1-\delta\ell(S_g))}{\beta r\delta\ell(S_g)}\right]^{\frac{1}{\beta-1}} = S_g^{\frac{1}{\beta-1}}\left[\frac{\theta^{f_0}}{\beta r\delta\ell(S_g)}(1-\frac{S_b}{S_g}\alpha^{\frac{1}{\rho}}(1-\delta\ell(S_g))\right]^{\frac{1}{\beta-1}} \\ &= S_g^{\frac{1}{\rho}}\left[\frac{1}{\beta\delta\ell(S_g)}(1-\frac{S_b}{S_g}\alpha^{\frac{1}{\rho}}(1-\delta\ell(S_g)))\right]^{\frac{-1}{1-\beta}} < I_g^* = S_g^{\frac{1}{\rho}} \end{aligned} \quad . \tag{A10}$$

So, when discount rate $\delta \in [0,1]$, $\ell(S_g) \geq 1$, so $\delta\ell(S_g) < 1$. Equation (A10) shows that managers with low payments tend to underinvest under the situation of maximization of value differences.

## Appendix E

Managers of NVP firms with low payments think the efforts they put in cannot change the investment structure, so the utility value differences when invested in valuable projects (NPV > 0) and non-valuable projects (NPV < 0) should be:

$A^f(I_b^f) = \left(\theta^f S_g I_b + \delta u_g^{f_1}\right) - u_b^{f_0}$.

If $A^f\left(I_b^f\right) \geq 0$, a larger $A^f\left(I_b^f\right)$ means the utility values gained from valuable projects is larger than non-valuable projects, when low-payment managers of NVP firms have no interest in making efforts.

Assume:$\varepsilon$ is very small, $\varepsilon = \varepsilon(1)$.

$$\begin{aligned} A^{f_0}\left(I_b^{f_0}\right) &= \theta^{f_0}S_g I_b + \delta\ell\left(S_g\right)\left[\frac{(1-L_b)\left[\theta^{f_0}f_g^{f_0}(I) - rI_g^\beta\right] + \delta\varepsilon\ell(S_b)\theta^{f_0}f_b^{f_0}(I)}{1-L_b-L_g+\delta^2\ell(S_b)\ell\left(S_g\right)(1-2\varepsilon)}\right] \\ &- \frac{\theta^{f_0}f_b^{f_0}(I)}{1-L_b} - \frac{\delta\varepsilon\ell\left(S_g\right)\left\{(1-L_b)\left[\theta^{f_0}f_g^{f_0}(I)-rI_g^\beta\right]+\delta\varepsilon\ell(S_b)\theta^{f_0}f_b^{f_0}(I)\right\}}{(1-L_b)\left[1-L_b-L_g+\delta^2\ell(S_b)\ell\left(S_g\right)(1-2\varepsilon)\right]} \\ &= \theta^{f_0}S_g I_b + \frac{\delta\ell\left(S_g\right)(1-\delta\ell(S_b))\left(\theta^{f_0}f_g^{f_0}(I)-rI_g^\beta\right)}{1-\delta\left(\ell(S_b)+\ell\left(S_g\right)\right)+\delta^2\ell(S_b)\ell\left(S_g\right)} - \frac{\theta^{f_0}f_b^{f_0}(I)}{1-\delta\ell(S_b)} + \varepsilon(1) \\ &= \theta^{f_0}S_g I_b + \frac{\delta\ell\left(S_g\right)\left(\theta^{f_0}f_g^{f_0}(I)-rI_g^\beta\right)}{1-\delta\ell\left(S_g\right)} - \frac{\theta^{f_0}f_b^{f_0}(I)}{1-\delta\ell(S_b)} + \varepsilon(1) \end{aligned} \quad . \tag{A11}$$

The optimal investment level is $I_b^{f_0} = I_b^* = S_b^{\frac{1}{\rho}}$

$A^{f_0}(0) = \frac{\delta\ell(S_g)(\theta^{f_0}f_g^{f_0}(I)-rI_g^\beta)}{1-\delta\ell(S_g)} + \varepsilon(1) < 0$.

Assuming $\frac{\theta^f}{r} \geq S_g^{\frac{1}{\rho}(\beta-1)-1}$, we can get:

$$\begin{aligned} A^{f_0}(I_b^{f_0}) - A^{f_0}(0) &= \theta^{f_0}S_g S_b^{\frac{1}{\rho}} - \frac{\theta^{f_0}S_b^{\frac{1}{\rho}+1}\alpha^{\frac{1}{\rho}}}{1-\delta\ell(S_b)} + \varepsilon(1) \\ &= \frac{\theta^{f_0}S_b^{\frac{1}{\rho}+1}\left(\frac{S_g}{S_b}(1-\delta\ell(S_b))-\alpha^{\frac{1}{\rho}}\right)}{1-\delta\ell(S_b)} + \varepsilon(1) < 0 \end{aligned} \quad . \tag{A12}$$

For $\frac{S_g}{S_b} > 1$, $A^{f_0}(I_b^{f_0}) - A^{f_0}(0) < 0$, means $A^{f_0}(I_b^{f_0}) < A^{f_0}(0) < 0$.

From the maximization of $A^f(I_b^f)$, we can get the balanced investment level of low managers of NVP firms.

$$\begin{aligned} &\max A^f(I_b^f) \\ &\frac{\partial A^{f_0}(I_b^{f_0})}{\partial I_b^{\alpha}} = \theta^{f_0} S_g - \frac{\theta^{f_0} S_b \alpha^{\frac{1}{\rho}}}{1-\delta\ell(S_b)} = \frac{\theta^{f_0}\left(S_g(1-\delta\ell(S_b)) - S_b\alpha^{\frac{1}{\rho}}\right)}{1-\delta\ell(S_b)} \\ &= \frac{\theta^{f_0} S_b\left(\frac{S_g}{S_b}(1-\delta\ell(S_b)) - \alpha^{\frac{1}{\rho}}\right)}{1-\delta\ell(S_b)} < 0 \end{aligned} \quad \text{(A13)}$$

For $A^{f_0}(I_b^{f_0}) < A^{f_0}(0) < 0$, the investment of low-payment managers is $I_b^{f_0^*} = 0 < S_b^{\frac{1}{\rho}} = I_b^*$. Low-payment managers of bad firms, therefore, tend to seriously underinvest.

## References


1. Crotty, J.R. Owner–manager conflict and financial theories of investment instability: A critical assessment of Keynes, Tobin, and Minsky. *J. Post Keynes. Econ.* **1990**, *12*, 519–542. [CrossRef]
2. Müller, R.; Turner, J.R. The impact of principal–agent relationship and contract type on communication between project owner and manager. *Int. J. Proj. Manag.* **2005**, *23*, 398–403. [CrossRef]
3. Nishihara, M.; Shibata, T. The agency problem between the owner and the manager in real investment: The bonus–audit relationship. *Oper. Res. Lett.* **2008**, *36*, 291–296. [CrossRef]
4. Kerr, J.; Slocum, J.W., Jr. Managing corporate culture through reward systems. *Acad. Manag. Perspect.* **2005**, *19*, 130–138. [CrossRef]
5. Malach-Pines, A.; Dvir, D.; Sadeh, A. Project manager-project (PM-P) fit and project success. *Int. J. Oper. Prod. Manag.* **2009**, *29*, 268–291. [CrossRef]
6. Lau, C.M.; Roopnarain, K. The effects of nonfinancial and financial measures on employee motivation to participate in target setting. *Br. Account. Rev.* **2014**, *46*, 228–247. [CrossRef]
7. Yousaf, A.; Yang, H.; Sanders, K. Effects of intrinsic and extrinsic motivation on task and contextual performance of Pakistani professionals: The mediating role of commitment foci. *J. Manag. Psychol.* **2015**, *30*, 133–150. [CrossRef]
8. Dunnette, M.D.; Campbell, J.P.; Hakel, M.D. Factors contributing to job satisfaction and job dissatisfaction in six occupational groups. *Organ. Behav. Hum. Perform.* **1967**, *2*, 143–174. [CrossRef]
9. Le Breton–Miller, I.; Miller, D. Why Do Some Family Businesses Out–Compete? Governance, Long–Term Orientations, and Sustainable Capability. *Entrep. Theory Pract.* **2006**, *30*, 731–746. [CrossRef]
10. de Souza Cunha, F.A.F.; Samanez, C.P. Performance analysis of sustainable investments in the Brazilian stock market: A study about the corporate sustainability index (ISE). *J. Bus. Ethics* **2013**, *117*, 19–36. [CrossRef]
11. Lewis, A.; Juravle, C. Morals, markets and sustainable investments: A qualitative study of 'champions'. *J. Bus. Ethics* **2010**, *93*, 483–494. [CrossRef]
12. Dinçer, H.; Yüksel, S. (Eds.) *Handbook of Research on Managerial Thinking in Global Business Economics*; IGI Global: Hershey, PA, USA, 2018.
13. Dinçer, H.; Hacioğlu, Ü. (Eds.) *Risk Management, Strategic Thinking and Leadership in the Financial Services Industry: A Proactive Approach to Strategic Thinking*; Springer: Berlin, Germany, 2016.
14. Hacioglu, U.; Dincer, H. *Managerial Issues in Finance and Banking*; Springer: Berlin, Germany, 2016.
15. Dincer, H.; Gencer, G.; Orhan, N.; Sahinbas, K. The significance of emotional intelligence on the innovative work behavior of managers as strategic decision-makers. *Procedia-Soc. Behav. Sci.* **2011**, *24*, 909–919. [CrossRef]
16. Inderst, R.; Klein, M. Innovation, endogenous overinvestment, and incentive pay. *RAND J. Econ.* **2007**, *38*, 881–904. [CrossRef]
17. Hutchinson, M.; Gul, F.A. Investment opportunity set, corporate governance practices and firm performance. *J. Corp. Financ.* **2004**, *10*, 595–614. [CrossRef]
18. Hayes, R.M.; Schaefer, S. CEO pay and the Lake Wobegon effect. *J. Financ. Econ.* **2009**, *94*, 280–290. [CrossRef]
19. Bloom, M.; Michel, J.G. The relationships among organizational context, pay dispersion, and among managerial turnover. *Acad. Manag. J.* **2002**, *45*, 33–42.

20. Bebchuk, L.A.; Fried, J.M. Executive compensation as an agency problem. *J. Econ. Perspect.* **2003**, *17*, 71–92. [CrossRef]
21. Dincer, H.; Yuksel, S. IT2-Based Fuzzy Hybrid Decision Making Approach to Soft Computing. *IEEE Access* **2019**, *7*, 15932–15944. [CrossRef]
22. Hacioğlu, B.; Hacıoğlu, Ü.; Dinçer, H.; Yarbağ, P.Ş.; Tuğsal, T. Emotional Intelligence Skills, Leadership, and Conflict in Effective Decision Making Process. In *Handbook of Research on Behavioral Finance and Investment Strategies: Decision Making in the Financial Industry*; IGI Global: Hershey, PA, USA, 2015; pp. 378–392.
23. Dinçer, H.; Hacıoğlu, Ü.; Yüksel, S. Balanced scorecard based performance measurement of European airlines using a hybrid multicriteria decision making approach under the fuzzy environment. *J. Air Transp. Manag.* **2017**, *63*, 17–33. [CrossRef]
24. Jensen, M.C. Agency costs of free cash flow, corporate finance, and takeovers. *Am. Econ. Rev.* **1986**, *76*, 323–329.
25. Jensen, M.C.; Meckling, W.H. Theory of the firm: Managerial behavior, agency costs and ownership structure. *J. Financ. Econ.* **1976**, *3*, 305–360. [CrossRef]
26. Myers, S.C. The determinants of corporate borrowing. *J. Financ. Econ.* **1977**, *5*, 147–175. [CrossRef]
27. Stiglitz, J.; Weiss, A. Credit rationing in markets with imperfect information. *Am. Econ. Rev.* **1981**, *71*, 393–410.
28. Myers, S.C.; Majluf, N.S. Corporate financing and investment decisions when firms have information that investors do not have. *J. Financ. Econ.* **1984**, *13*, 187–221. [CrossRef]
29. Heaton, J. Managerial optimism and corporate finance. *Financ. Manag.* **2002**, *31*, 33–45. [CrossRef]
30. Holmstrom, B.; Milgrom, P. Aggregation and linearity in the provision of intertemporal incentives. *Econometrica* **1987**, *55*, 303–328. [CrossRef]
31. Aggarwal, R.K.; Samwick, A.A. The other side of the tradeoff: The impact of risk on executive compensation. *J. Political Econ.* **1999**, *107*, 65–105. [CrossRef]
32. Cooper, M.J.; Gulen, H.; Run, P.R. Performance for Pay? The Relation between CEO Incentive Compensation and Future Stock Price Performance. 2016. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1572085 (accessed on 11 July 2019).
33. Humphery-Jenner, M.; Lisic, L.L.; Nanda, V.; Silveri, S.D. Executive overconfidence and compensation structure. *J. Financ. Econ.* **2016**, *119*, 533–558. [CrossRef]
34. Bebchuk, L.A.; Fried, J.M. Pay without performance: Overview of the issue. *J. Corp. Law* **2005**, *30*, 647–673. [CrossRef]
35. Morse, A.; Nanda, V.; Seru, A. Are incentive contracts rigged by powerful managers? *J. Financ.* **2011**, *66*, 1779–1821. [CrossRef]
36. Strobl, G. Stock-based managerial compensation, price informativeness, and the incentive to overinvest. *J. Coporate Financ.* **2012**, *29*, 594–606. [CrossRef]
37. Baxamusa, M. The Relationship between Underinvestment, Overinvestment and managers' Compensation. *Rev. Pac. Basin Financ. Mark. Policies* **2012**, *15*, 1250014-1–1250014-26. [CrossRef]
38. Dinçer, H.; Yüksel, S. Multidimensional evaluation of global investments on the renewable energy with the integrated fuzzy decision-making model under the hesitancy. *Int. J. Energy Res.* **2019**, *43*, 1775–1784. [CrossRef]
39. Dincer, H.; Yuksel, S. Balanced scorecard-based analysis of investment decisions for the renewable energy alternatives: A comparative analysis based on the hybrid fuzzy decision-making approach. *Energy* **2019**, *175*, 1259–1270. [CrossRef]
40. Dinçer, H.; Yüksel, S. Selecting investment strategies for European Tourism Industry using the hybrid decision making approach based on interval type-2 fuzzy sets. *J. Intell. Fuzzy Syst. (Prepr.)* **2019**, *37*, 1343–1356. [CrossRef]
41. Kivilä, J.; Martinsuo, M.; Vuorinen, L. Sustainable project management through project control in infrastructure projects. *Int. J. Proj. Manag.* **2017**, *35*, 1167–1183. [CrossRef]
42. Mavi, R.K.; Standing, C. Critical success factors of sustainable project management in construction: A fuzzy DEMATEL-ANP approach. *J. Clean. Prod.* **2018**, *194*, 751–765. [CrossRef]
43. Banihashemi, S.; Hosseini, M.R.; Golizadeh, H.; Sankaran, S. Critical success factors (CSFs) for integration of sustainability into construction project management practices in developing countries. *Int. J. Proj. Manag.* **2017**, *35*, 1103–1119. [CrossRef]

44. Fernández-Sánchez, G.; Rodríguez-López, F. A methodology to identify sustainability indicators in construction project management—Application to infrastructure projects in Spain. *Ecol. Indic.* **2010**, *10*, 1193–1201. [CrossRef]
45. Martens, M.L.; Carvalho, M.M. The challenge of introducing sustainability into project management function: Multiple-case studies. *J. Clean. Prod.* **2016**, *117*, 29–40. [CrossRef]
46. Carvalho, M.M.; Rabechini, R., Jr. Can project sustainability management impact project success? An empirical study applying a contingent approach. *Int. J. Proj. Manag.* **2017**, *35*, 1120–1132. [CrossRef]
47. Økland, A. Gap analysis for incorporating sustainability in project management. *Procedia Comput. Sci.* **2015**, *64*, 103–109. [CrossRef]
48. Martens, M.L.; Carvalho, M.M. Key factors of sustainability in project management context: A survey exploring the project managers' perspective. *Int. J. Proj. Manag.* **2017**, *35*, 1084–1102. [CrossRef]
49. Silvius, A.G.; Kampinga, M.; Paniagua, S.; Mooi, H. Considering sustainability in project management decision making; An investigation using Q-methodology. *Int. J. Proj. Manag.* **2017**, *35*, 1133–1150. [CrossRef]
50. Sánchez, M.A. Integrating sustainability issues into project management. *J. Clean. Prod.* **2015**, *96*, 319–330. [CrossRef]
51. Brook, J.W.; Pagnanelli, F. Integrating sustainability into innovation project portfolio management—A strategic perspective. *J. Eng. Technol. Manag.* **2014**, *34*, 46–62. [CrossRef]
52. Labuschagne, C.; Brent, A.C. Sustainable project life cycle management: The need to integrate life cycles in the manufacturing sector. *Int. J. Proj. Manag.* **2005**, *23*, 159–168. [CrossRef]
53. Baraki, Y.A.; Brent, A.C. Technology transfer of hand pumps in rural communities of Swaziland: Towards sustainable project life cycle management. *Technol. Soc.* **2013**, *35*, 258–266. [CrossRef]
54. Blengini, G.A.; Garbarino, E.; Šolar, S.; Shields, D.J.; Hámor, T.; Vinai, R.; Agioutantis, Z. Life Cycle Assessment guidelines for the sustainable production and recycling of aggregates: The Sustainable Aggregates Resource Management project (SARMa). *J. Clean. Prod.* **2012**, *27*, 177–181. [CrossRef]
55. Wang, N.; Yao, S.; Wu, G.; Chen, X. The role of project management in organisational sustainable growth of technology-based firms. *Technol. Soc.* **2017**, *51*, 124–132. [CrossRef]
56. Agrawal, A.; Mandelker, G.N. Managerial incentives and corporate investment and financing decisions. *J. Financ.* **1987**, *42*, 823–837. [CrossRef]
57. Dodonova, A.; Khoroshilov, Y. A dynamic model of diversification and divestiture. *SSRN Electron. J.* **2005**, 1–29. [CrossRef]
58. Hsiao, H.F.; Hsu, C.Y.; Li, C.A.; Hsu, A.C. The Relationship between Managerial Sentiment, Corporate Investment and Firm Value: Evidence from Taiwan. *Emerg. Mark. Financ. Trade* **2011**, *72*, 99–111. [CrossRef]
59. Ariely, D.; Gneezy, U.; Loewenstein, G.; Mazar, N. Large stakes and big mistakes. *Rev. Econ. Stud.* **2009**, *76*, 451–469. [CrossRef]
60. Zyung, D.J.; Sanders, W.G. Effects of Accumulated CEO Pay and Relative Performance on Risk Taking and Performance Variance. Academy of Management Proceedings. *Acad. Manag.* **2014**, *2014*, 17176.
61. Tobin, J. A General Equilibrium Approach to Monetary Theory. *J. Money Credit Bank.* **1969**, *1*, 15–29. [CrossRef]
62. Morgado, A.; Pindado, J. The underinvestment and overinvestment hypotheses: An analysis using panel data. *Eur. Financ. Manag.* **2003**, *9*, 163–177. [CrossRef]
63. Sawickia, J.; Shresthab, K. Overvalued equity and the accruals anomaly: Evidence from insider trades. *Procedia Econ. Financ.* **2012**, *2*, 91–100. [CrossRef]
64. Borenstein, M.; Hedges, L.; Rothstein, H. Meta-Analysis: Fixed Effect vs. Random Effects. 2007. Available online: http://www.Meta-Analysis.com (accessed on 24 April 2019).
65. Shleifer, A.; Vishny, R.W. Management entrenchment: The case of manager-specific investments. *J. Financ. Econ.* **1989**, *25*, 123–139. [CrossRef]
66. Smith, C.W., Jr.; Watts, R.L. The investment opportunity set and corporate financing, dividend, and compensation policies. *J. Financ. Econ.* **1992**, *32*, 263–292. [CrossRef]