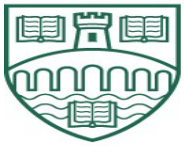

UNIVERSITY OF STIRLING

The Role of CEO Compensation in the Cost of Debt, Expectations Management, and the Investment Policy of UK Firms

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Abstract

In this thesis, I explore the topic of chief executive officer (CEO) compensation in UK publicly traded firms. My objective is threefold. First of all, I investigate debt-holders' reaction to CEO compensation in terms of the cost of debt financing. Secondly, I examine the possible link between CEO compensation and expectation management. Thirdly, I examine whether and how the interactive relation between CEO career horizon and compensation package affects a firm's research and development spending.

Multiple regression is employed in this thesis to investigate the causal relationship between these above mentioned aspects I'm interested (the cost of debt, expectation management and research and development spending) and CEO compensation. I consider all major compensation components for a typical CEO in UK publicly traded firms: defined benefit pension, bonus, restricted shares, traditional stock options and performance-vested stock options. The accumulated equity incentives, such as ownership, are also examined.

My major findings are as follows. First of all, I find that an increase in defined benefit pension and bonus in CEO compensation are associated with a lower bond yield spread, while an increase in stock options and ownership intensifies it. Secondly, I document that CEO equity incentives that will be vested in the following year are positively associated with the probability of employing expectation management to meet or beat financial analysts' forecasts about a firm's reporting earnings. Thirdly, I demonstrate that older CEOs will not spend less in research and development expenditures in general. However, older CEOs with more defined benefit pensions and ownership are reluctant to engage in such an investment.

My results generate several implications for CEO compensation research. First of all, I show that debt-holders rationally incorporate the information of CEO compensation about risk-taking and risk-avoiding incentives when pricing a firm's publicly traded debts. Secondly, I provide the evidence that CEO compensation motivates top managers to manipulate information disclosure by employing expectation management for personal gains. Thirdly, the joint influence of CEO career horizon and compensation package on a firm's research and development spending is highlighted. CEO compensation motivates a short-sighed and risk-averse investment policy when top managers have a short career horizon.

The first novel contribution in this thesis is the coverage of CEO pension, which is overlooked by the most of previous literature on compensation studies. Secondly, I provide the evidence that the popularity of expectation management in the UK, which is well documented in the literature, can be partly explained by CEO compensation. Finally, the interactive relation between CEO compensation and career horizon on a firm's investment policy is re-examined. It provides further material in the debate of career horizon problem, which has no consensus in the previous literature. Overall, this thesis generates some empirical evidence about the influence of CEO compensation on managerial behaviour. Some adverse effects of CEO compensation highlighted in this thesis may help remuneration committee to design a better pay package for top managers in the future.

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Chapter 1 Introduction

1.1. Motivations

Chief executive officer (CEO) compensation studies have drawn attention from academics for several decades. As reviewed by Devers, Cannella, Reilly and Yoder (2007), research on the topic of CEO compensation can be classified into two main categories. The first group of studies looks at the pay-performance relationship (e.g. Jensen and Murphy, 1990; Conyon and Peck, 1998; Aggarwal and Samwick, 1999; Conyon, Peck and Sadler, 2001; Leone, Wu and Zimmerman, 2006; Duffhues and Kabir, 2008; Ozkan, 2011). These studies mainly investigate the sensitivity between firm performance and CEO compensation. The basic idea behind them is that CEO compensation is expected to align interests of shareholders and managers, thus mitigating agency problems (see the review by Murphy, 1999). The second type of research on CEO compensation focuses on the issue of how compensation will affect managerial behaviour. These studies examine how pay will affect top managers' information disclosure strategies (e.g. Nagar, Nanda and Wysocki, 2003), risk preference (e.g. Low, 2009), earnings manipulation (e.g. Bergstresse and Philippon, 2006), information manipulation (e.g. Aboody and Kasznik, 2000) and shares repurchasing (e.g. Sanders and Carpenter, 2003). These studies often suggest that the effect of CEO compensation in managerial behaviour is not always in line with what shareholders expect. CEO compensation may provide incentives for goal misalignment between the agent and the principal.

The development of corporate governance mechanisms in the UK has had a great impact on CEO compensation. The publication of the Greenbury Report and the

Combined Codes (1998, 2003, 2006, and 2010) provide extensive guidance for good practices in remuneration design and disclosure. Furthermore, the introduction of the Directors' Remuneration Report Regulation (2002) requires more transparent information disclosure and a greater auditors' responsibility for directors' remuneration report. The Companies Act 2006 (section 439) mandates shareholders a power of vote for directors' remuneration in the annual general meeting (AGM). Hence shareholders are entitled to have a critical say on CEO compensation. In short, all these settings mentioned above intend to strengthen the relationship between firm performance and CEO compensation, thus limiting windfall pay for top managers.

The improved information disclosures for CEO compensation and different corporate governance settings (e.g. more detailed information disclosure for executive stock options exercise is required in the UK than the US) have inspired more and more researchers to examine CEO compensation in Britain. These studies focus on issues including the comparison between UK CEO pay and overseas CEO pay (e.g. Conyon and Schwalback, 2000; Conyon, Core and Guay, 2011), managerial opportunistic behaviour (Kuang, 2008) and pay-performance relation (e.g. Ozkan, 2011). Their work contributes to the existing literature by successfully exploring distinctive features of UK CEO compensation.

In this thesis, I intend to fill three gaps in the literature by analysing UK CEO compensation data. First of all, I would like to examine the relationship between CEO compensation and the cost of debt. Early literature mainly investigates CEO compensation from the point of view of shareholders (e.g. Jensen and Meckling, 1976), focusing on principal-agent conflicts. Recent studies begin to shed light in the conflict

between shareholders and debt-holders. One of interesting questions is whether and how shareholders and debt-holders react differently to CEO compensation (e.g. Billett, Mauer, and Zhang, 2010). A few studies have also examined the costs of debt on a single pay component (e.g. Duru, Mansi and Reeb, 2005).To the best of my knowledge, there is no study in the existing literature explores the cost of debt financing by considering all major CEO pay components and overall pay structure. In Chapter 2, I seek to provide empirical evidence to fill this gap by examining comprehensive pay components received by UK CEOs.

Secondly, I explore the possible link between CEO compensation and expectations management. Expectations management refers to information manipulation in order to lower market expectations about a firm's profitability. The literature suggests that meeting or beating financial analysts' earnings forecasts is a major concern for top managers (e.g. Graham, Harvey and Rajgopal, 2005). Earnings management by inflating accounting numbers (e.g. Cheng and Warfield, 2005) and expectations management by dampening market expectations (e.g. Bartov, Givoly and Hayn, 2002) are two tools to help CEOs to achieve market expectations. Compared with earnings management, few studies focus on expectations management. Athanasakou, Strong and Walker (2009) document that expectations management is wide spread in the UK. In Chapter 3, I seek to link expectations management with CEO compensation. I argue that CEO compensation may provide top managers with incentives to manipulate information disclosure for personal gains.

Thirdly, I re-examine the so-called career horizon problem by considering the influence of CEO compensation on research and development spending. There is a debate about

whether career horizon affects managers' investment decisions. The career horizon problem hypothesizes that older CEOs are likely to cut long-term investment because their short career horizon limits the benefits from that spending. The empirical results are mixed. Some studies find that older CEOs are less likely to spend in risky and long-term investments (e.g. Barker and Mueller, 2002), while other research documents no evidence to support investment cuts by retiring CEOs (e.g. Conyon and Florou, 2006). My re-examination adds additional material in this debate by analysing more recent UK data. In addition, few studies investigate the career horizon problem by considering all major CEO compensation components. In Chapter 4, I investigate whether and how different CEO compensation components affect top managers' investment decisions across various career horizon lengths.

1.2. Major findings and contributions

As mentioned in Section 1.1, studies on CEO compensation can be classified into two general categories (Devers, Cannella, Reilly and Yoder, 2007): (1) pay and performance relationship; and (2) pay and managerial behaviour. In this thesis, the first issue I investigate, the cost of debt, can be viewed as a special pay-performance relationship. That is how debt-holders will react to CEO compensation in terms of bond yield spread. The rest of the two issues, including expectations management and the investment decision, can be classified in the second type of studies on CEO compensation. That is how top manager pay will affect managerial behaviour. My empirical study provides some interesting results on the role of CEO compensation in the UK.

First of all, I highlight a significant CEO compensation component which has been overlooked by the most of previous studies: pensions. The role of pensions on

managerial behaviour still remains largely unknown, partly due to the poor data availability in the early period (before 2003 in the case of UK). The recent improved disclosure of CEO compensation (e.g. Directors' Remuneration Report Regulation, 2002) makes it possible to test the relationship between CEO pension and observable managerial behaviour directly. Sundaram and Yermack (2007) argue that CEO pension can be considered as inside debt, because firms are liable to pay any deficit in their pension funds, and CEOs with pensions are potential debt-holders. Therefore, pension may generate unique risk-aversion incentives for CEOs. Such a view gets supports from some recent US studies (e.g. Edmans and Liu, 2011). In a UK study, Minhat (2009) also provides some evidence that a high level of CEO pension will lead to lower firm risks, which is measured as stock return volatility. In this thesis, I generate further evidence to echo the role of CEO pension in providing risk-aversion incentives. In Chapter 2, I find that the cost of debt, which is measured as the bond yield spread, is negatively related with CEO pension compensation. This suggests that pensions' unique risk-aversion incentives may align interests of CEOs and debt-holders. Hence debt-holders will charge less for borrowing to a firm which provides more pensions to its CEOs. In Chapter 4, I document that older CEOs with more pensions are less likely to spend in research and development expenditures. This indicates that as pension vesting date approaches, CEOs with more pensions are concerned about the safety of their post-retirement funds. Consequently, they are less likely to engage in risky investments in such circumstance. Overall, my study highlights the unique incentives for risk-aversion provided by CEO pension. This indicates the potential benefits in terms of debt financing and the potential cost in the issue of investment decision if a CEO receives more pensions.

Secondly, I examine the impact on the cost of debt from CEO compensation by considering all major pay components in Chapter 2. I predict that the cost of debt will increase if pay components are able to generate risk-seeking incentives, while the cost of borrowing will decline if pay components can provide risk-aversion incentives. Consistent with my hypotheses, I find that a CEO with more stock options and ownership will face a higher cost of debt. On the other hand, firms which provide more pensions and bonuses to their CEOs will be better off in terms of their costs of borrowing. In addition, I find that debt-holders dislike stock options more than ownership. Among stock options, performance-vested stock options (PVSOs) outweigh traditional stock options (TSOs) as far as increasing the cost of debt is concerned. The distinctive features of those equity incentives are able to explain these different reactions from debt-holders. Overall, my study shows that debt-holders can rationally consider the impacts of various CEO pay components on managerial risk-taking incentives and price bonds accordingly. Compared with previous studies (e.g. Ertugrul and Hegde, 2008; Brockman, Martin and Unlu, 2010), my study considers a more comprehensive range of CEO pay components. By splitting stock options into PVSOs and TSOs, I provide a further insight into the distinctive features of different types of stock options.

Thirdly, I investigate the possible link between CEO compensation and expectations management in Chapter 3. Expectations management refers to an idea that managers purposefully dampen market expectations, so that final reported earnings are more likely to achieve market expectations. The literature documents that the stock market tends to reward firms which achieve market expectations (e.g. Bartov, Givoly and Hayn, 2002), and this achievement will benefit CEO bonuses and following insider

trading (e.g. Matsunaga and Park, 2001; Richardson, Teoh and Wysocki, 2004). Hence I expect that bonuses and equity incentives (stock options and restricted shares) which will be vested in the following year (after current year's earnings announcement) are likely to provide incentives for expectations management. I find that both bonuses and equity incentives which will be vested in the following year are positively related to the probability of achieving market expectations, as predicted. However, only equity incentives may lead to a higher probability of expectations management, while bonuses do not. My results demonstrate that although bonuses and equity incentives motivate CEOs to care about market expectations, top managers may choose different tools to achieve such a goal. Equity incentives are more likely to motivate expectations management, while bonuses may provide incentives for employing other tools (e.g. earnings manipulation) to achieve market expectations. My study echoes Athanasakou, Strong and Walker (2009; 2011) that expectations management is wide spread in the UK. My results show that the prevalence of expectations management in Britain can be partly explained by CEO compensation. This highlights the incentives for information manipulation which are provided by CEO compensation.

Fourthly, I show how CEO compensation is related to investment decisions in different lengths of CEO career horizon. I document that there is no evidence to indicate that CEOs will curtail research and development spending when their career horizons become short, which is inconsistent with early literature (e.g. Barker and Mueller, 2002), while consistent with more recent studies (e.g. Conyon and Florou, 2006). In addition, I find that pensions discourage research and development spending among older CEOs. As far as ownership is concerned, research and development spending generally increases with the level of ownership. However, older CEOs with more

ownership seem to spend less on research and development expenditure, compared with counterparts with less ownership. Overall, my results show some significant impacts on investment decisions from the interactive relationship between CEO career horizon and compensation. The role of CEO compensation in investment decisions may vary according to different lengths of career horizon. In short, this study provides further material for the debate on the career horizon problem. It is consistent with the view that CEOs' career horizon lengths should be considered vital when designing CEO remuneration packages (e.g. Cheng, 2004; Cazier, 2011).

In summary, these results in this thesis provide some evidence to explain managerial behaviour and debt-holders' reactions from the aspect of CEO compensation. The role of CEO compensation in the costs of debt, expectations management and investment decisions are significant, but not always in line with shareholders' interests. The remuneration committee should consider these "side-effects" of various pay components when structuring compensation packages for CEOs.

1.3. Thesis organization

I investigate three issues in this thesis and organize them into separate chapters. Chapter 2 examines the relationship between CEO compensation and the cost of debt. Chapter 3 presents the link between CEO compensation and expectations management. The roles of the interactive relationship between CEO pay and career horizon on investment decisions are demonstrated in Chapter 4. The conclusions, limitations and suggestions for future research are presented in the final chapter.

Chapter 2 CEO Compensation and the Cost of Debt

2.1. Introduction

Are creditors concerned with CEO compensation? In their seminal paper, Jensen and Meckling (1976) argue that if CEO compensation only aligns interests of shareholders and managers, there is a strong incentive for top managers to expropriate creditors' wealth by undertaking risky investments. Shareholders can award some specific forms of compensation to motivate CEOs towards accepting high risk investment projects. This happens primarily due to the convex payoff structure of equity incentives (e.g. stock options). Creditors can benefit from higher CEO compensation as long as increased managerial effort reduces the probability of firm default. But they are also more likely to suffer when additional risky investments amplify the firm's default probability.

John and John (1993) argue that creditors rationally anticipate the risk-shifting incentive coming from CEO compensation and therefore require a corresponding increase in risk premium. Hence, firms that use CEO compensation to closely align interests of top managers and shareholders are more likely to face a higher borrowing cost. Since a higher cost of borrowing is damaging for firms, especially those requiring additional debt financing, there is a pressure for a reduction in CEO compensation. This means that CEO compensation should be designed to optimize the trade-off between these benefits from risk-shifting and these losses from increased borrowing cost. Ortiz-Molina (2007) argues that less incentive compensation (e.g. stock options) for top managers is deliberately introduced in order to lower the borrowing cost when the conflict between shareholders and debt-holders is more severe (e.g. highly levered firms).

In this chapter, I investigate the impact of CEO compensation on a firm's borrowing cost. A few studies have previously examined various aspects of the relationship between CEO pay and the cost of debt. Duru, Mansi and Reeb (2005) analyse the impact of cash bonuses, while Shaw (2007), Ertugrul and Hegde (2008), Devos, Prevost and Rao (2008) and Brockman, Martin and Unlu (2010) examine equity compensation. These studies focus on a single pay component and relate it to a firm's cost of debt. However, if lenders rationally use CEO compensation to assess the impact of agency problems on a firm's credit risk, they should consider not only the size of each pay component separately, but also the overall structure of a CEO's compensation package. The relative proportions of various compensation elements may convey additional information about the direction and magnitude of risk-taking incentives. Therefore, I examine the effect of all main components of CEO pay on the cost of debt.

I make three key contributions to the existing literature. First of all, I investigate whether a firm's cost of debt is affected by not only cash-based performance-related pay (bonus) and equity-based incentives (share and option grants), but also by debt-like pay (defined benefit pensions). Although the latter form of CEO compensation is ubiquitous and has the potential to align interests of CEOs and debt-holders, empirical studies rarely consider it. Because the detailed CEO pension data is only required to be disclosed from 2003 in the UK. To the best of my knowledge, this study is the first empirical test to investigate the impact of CEO pensions on the cost of debt[1].

[1] Wei and Yermack (2011) study the reaction of bondholders and shareholders to the disclosure of CEOs' pensions and deferred compensation in the US. While they provide interesting evidence using the event study methodology for a limited sample of firms that disclosed their detailed compensation data, I focus on the market-wide cross-sectional effects of pension compensation on the cost of debt in the UK. Therefore, my methodology does not depend on the assumption that the capital market is unaware of the existence and extent of inside debt prior to the disclosure.

Secondly, by splitting CEO stock options into two categories (traditional and performance-vested stock options), I for the first time empirically examine whether the credit market takes into account the distinct contractual features and incentives provided by these two types of stock options. Although most of the literature treats CEO stock options as a homogeneous variable, there are two distinct categories of stock options: traditional stock options and performance-vested stock options (e.g. Johnson and Tian, 2000).The former has no specific performance target attached, while the latter requires managers to achieve a performance target prior to vesting. Johnson and Tian (2000) find that performance-vested stock options (hereafter called PVSOs) provide stronger incentives to increase risk as well as stock price than traditional stock options (hereafter called TSOs). I study whether creditors consider the award of TSOs and PVSOs compensation differently and charge a differential risk premium accordingly.

Finally, my analysis is the first study that examines the link between CEO pay and the cost of debt financing for UK firms. This provides out-of-sample evidence in addition to the very few existing studies that focus only on the US, and enables us to test whether the existing evidence holds for a market with a historically different managerial pay levels and structure. Conyon, Core and Guay (2011) document that US CEOs receive much higher pay as well as equity incentives compared with their counterparts in Britain. And such pay differences across the Atlantic can be partly explained as the risk premium: US CEOs bear higher risks.

My results show that firms awarding their CEOs with higher proportions of defined benefit pensions, a potential liability of a firm that can be viewed as debt-like compensation, experience a significant reduction in the cost of debt. On the other hand,

I observe that equity-based compensations, such as stock options, are positively related to the corporate bond yield spread. Further analysis shows that holdings of performance-vested stock options outweigh traditional stock options in terms of increasing the cost of debt. Such finding indicates that bondholders see performance-vested stock options awarded to CEOs as a stronger incentive to expropriate their wealth by means of risk-shifting. I also find that cash bonus payments to CEOs are associated with lower borrowing costs. However, I find no relationship between restricted shares grants and the cost of debt. Overall, my results show that bondholders rationally anticipate risk-taking or risk-avoiding incentives of CEOs by observing different types of compensation awards. Hence, a proper adjustment in the structure of CEO compensation is an effective way to reduce a firm's cost of borrowing, especially when it relies heavily on external debt financing.

The remainder of this chapter is organized as follows. Section 2.2 briefly reviews the relevant literature. The hypotheses of this chapter are developed in Section 2.3. The methodology and data are described in Sections 2.4 and 2.5, respectively. The empirical results are presented in Section 2.6. Section 2.7 provides a summary and the conclusions of this chapter.

2.2. Literature review

CEO compensation has mostly been investigated from the point of view of a firm's shareholders. The idea originates from the agency theory whereby managers are provided with incentives to work for the creation of more shareholder wealth. As suggested by Jensen and Meckling (1976), the separation of ownership and controlling power of a firm may cause conflicts interests between shareholders (principal) and

managers (agent). In this regard, risk-averse managers, who are also interested in job security and their own reputations, will be reluctant to take on value-increasing but risky investment projects. By providing appropriate equity incentives to managers, executives also become shareholders of their firms. Therefore, managers are motivated to undertake risky but value-added investment projects. The interests of shareholders and managers on investment decisions are expected to be aligned.

Several studies provide empirical supports for this theory. Coles, Daniel and Naveen (2006) find that CEO equity-based pay is linked with several observable risk-taking activities, such as a higher leverage and less corporate diversification. Chen, Steiner and Whyte (2006) show that the increased use of option-based compensation in the banking industry induces managerial risk-taking. Wu and Tu (2007) provide evidence that stock option compensation encourages a higher level of research and development investments by firms. Similarly, Sanders and Hambrick (2007) find that the more option compensation CEOs receive the more aggressive investments they undertake. In a recent paper, Low (2009) further confirms that a higher sensitivity of CEO portfolio value to stock return volatility, which is associated with equity-based compensation, directly contributes to managerial risk-taking behavior.

While shareholders' interests are being served and agency costs of equity decline because of incentive compensation, there can be a corresponding increase in the agency costs of debt (John and John, 1993). The reason is that managers might be inclined to choose risky investments that will be beneficial to shareholders at the expense of creditors. This phenomenon is widely known as the shareholder–debt-holder conflict. As explained by Jensen and Meckling (1976), the conflict between shareholders and

debt-holders exists because of the convex payoff structure of equity when risky debt is outstanding. The limited liability of shareholders will benefit shareholders in shifting in risky investment, while debt-holders may suffer severely. Obviously, rational debt-holders will anticipate this increased risk-taking tendency of CEOs arising out of incentive pay, and therefore charge a higher borrowing rate to compensate for any possible future loss.

While incentive compensation can hurt debt-holders, there exist other types of CEO compensation that can bring managerial interests in line with those of a firm's creditors. A common but less investigated form of such compensation is pension. Edmans and Liu (2011) argue that pension payments to CEOs can discourage risk-taking activities. By aligning managerial interests with those of debt-holders, pensions can mitigate shareholder–bondholder conflict.

The empirical examination covering the effect of CEO compensation on the cost of debt is limited. Daniel, Martin and Naveen (2004) observe that the credit spreads of corporate bonds increase with both the sensitivity of CEO wealth to stock volatility and the sensitivity of CEO wealth to stock prices. This suggests a negative reaction to equity incentives from debt-holders. However, Ertugrul and Hegde (2008) analyse the effect of stock options granted to directors of US firms and find that an increase in option compensation decreases yield spreads. Duru, Mansi and Reeb (2005) argue that earnings-based bonuses can reduce the cost of debt because they motivate top managers to seek stable cash flows to achieve the earnings target and thereby lower the risk of default. Their results show that the level of CEO cash bonuses is indeed negatively related with the bond yield spread. In addition, Gerakos (2007) documents a positive

relationship between bond ratings and CEO pensions. This suggests the positive effect of pension on firm's default risks.

A few studies provide indirect evidence. Ortiz-Molina (2007) finds that the pay–performance sensitivity, defined as the relationship between changes in a CEO's firm-specific wealth and the shareholder return, is lower for firms that issue straight debt and higher for those issuing convertible debts. Such a finding indicates that firms adopt incentive compensation toward mitigating shareholder–bondholder conflict. He also finds that option-based compensation is less attractive for firms suffering from severe shareholder–bondholder conflict. Similarly, Bryan, Nash and Patel (2006) show that firms with higher amounts of convertible debt offer more options-based compensation to their CEOs.

If a higher incentive compensation aligning shareholders' interests with those of top managers can be detrimental to debt-holders, this should also be reflected in lower bond prices. Therefore, instead of directly examining the effect on the cost of debt, several studies investigate how bond values are affected by equity-based compensation. Empirical evidence is first provided by DeFusco, Johnston and Zorn (1990) who analyse the effect on bond returns when firms announce CEO stock option plans. They find that stock returns increase while bond returns decline after these announcements. Billett, Mauer and Zhang (2010) also document an adverse bond price reaction when CEOs receive new equity-based compensation. Wei and Yermack (2011) examine how bondholders and shareholders react to the disclosure of CEO pension and deferred compensation. They find that bond prices rise, while equity prices decline for firms whose CEOs have relatively more pensions. All these studies analyse US data and

indicate that the announcement or disclosure of equity-based pay and pension to CEOs is associated with a wealth transfer between shareholders and bondholders.

2.3. Hypotheses development

The literature review in the previous section illustrates that CEO compensation can affect the risk-taking behavior of managers and subsequently a firm's cost of debt financing. Since each compensation component has its own distinctive features, their effects on the cost of debt can be unique. Therefore, I develop hypotheses on the impact of each pay component separately.

2.3.1. Cash bonus

Cash bonus is the first compensation element I consider. It is usually related to an accounting performance target. As reviewed by Murphy (1999), CEO cash bonus may generate tow fundamental problems with risk implications. First of all, accounting performance upon cash bonus is backward-looking and short-sighted. An outcome of such a target is that managers are inclined to decrease certain long-term and risky investments (e.g. research and development spending) in order to lower short-term expenditures and thereby increase the reported profit (e.g. Dechow and Sloan, 1991). Therefore, it is argued that a relatively higher proportion of cash bonuses compensation would provide more risk-avoiding incentives to CEOs. The second problem of cash bonus is that it may provide incentives to manipulate reporting earnings (e.g. accrual management) since the performance targets on cash bonus are often explicit (e.g. Holthausen, Larcker and Sloan, 1995). Therefore, cash bonus may also possibly increase certain risks, such as financial restatement and misreporting. Duru, Mansi and Reeb (2005) empirically examine debt-holders' reaction on CEO cash bonus. They find

that CEOs with high bonuses face a lower cost of borrowing. They argue that debt-holders do reward the risk-avoiding incentives of cash bonus when pricing a firm's debt. Following Durn, Mansi and Reeb (2005), I also expect a negative relation between cash bonus and the cost of debt. My first hypothesis is:

H1: Firms providing more cash bonus to their CEOs face a *lower* cost of debt.

2.3.2. Pension

Pension is a special form of compensation because it is deferred and can only be accessed upon retirement. In the UK, there are three basic types of pension arrangements: the public social security system, occupational pension and private pension plans. Defined benefit pension scheme and defined contribution pension scheme are the two basic forms of the occupational pension plan.

The defined contribution (DC) pension is also known as money purchase scheme. The firm is required to pay a prescribed fee (contributions) into the pension fund regularly. However, the firm is only liable to pay the annual contribution, but will not be responsible for the final income of the employee when he or she retires. In another word, the final income of a retired staff with DC pension scheme is not guaranteed. In the defined benefit (DB) pension scheme, the amount of money an employee is expected to receive upon retirement is often defined in advance. The firm is not only liable to pay the annual contribution, but also be responsible for the final income of its retired staff. Any deficit in DB pension fund is the liability of the firm. In this thesis, my focus is on the defined benefit pension scheme for CEOs only. Because this is the only form of pension that represents potential debts of a firm to its CEO.

The asset in defined benefit (DB) pension scheme is well protected in the UK. The pension trust is separate from the firm's (sponsor's) assets. Hence the assets already in the pension trust are independent and will not be affected in the event of the sponsor's bankruptcy. The Pensions Act of 2004 introduced further protection for the UK pension scheme. Under this Act, a statutory fund, the Pension Protection Fund (PPF), was established by the UK government. The PPF is set to pay compensation to employees if the employer (scheme sponsor) becomes insolvent and the pension trust is unfunded (has a deficit). In such a case, 100% (90%) of pension compensation, up to a certain limit, is guaranteed for members who are above (under) the normal retirement age.[2]

However, the defined benefit pension plan still presents considerable risk-avoiding incentives for CEOs. As a consequence of the falling equity market, lower interest rates and improvements in life expectancy, the defined benefit pension deficit has become increasingly severe among UK blue chip companies. According to the Watson Wyatt pension risk indicators database, the average UK FTSE 350 firm had a defined benefit pension deficit of £254 million and a funding ratio of only 79% in 2004 (Gupta, 2006). In a recent report by Pension Capital Strategies in association with JP Morgan, only five FTSE 100 firms had a defined benefit pension surplus during the period of 2007-2009 (The Guardian, 19 May 2010). In short, demands from the pension regulator, along with pressure from the huge defined benefit pension deficits, may discourage firms from pumping "excess" cash flows into risky investments.

Secondly, CEOs with a defined benefit pension scheme are still the victims in the event of bankruptcy. As mentioned earlier, the Pension Protection Fund guarantees 100%

[2] Source: www.pensionprotectionfund.org.uk

(90%) of pension for a member who is above (under) the normal retirement age in the event of insolvency. CEOs with a defined benefit pension plan are not the exception. However, there is a cap for such compensation. Based on the latest figures from the Pension Protection Fund, the maximum compensation is £29,748.68 per year in 2010,[3] which is negligible compared to the average defined benefit pension plan for top managers in UK publicly traded firms. In other words, only a tiny fraction of a CEO's defined benefit pension loss can be sheltered by the Pension Protection Fund in the event of insolvency. Compared with normal employees, top managers will suffer much more from defined benefit pension loss in the event of bankruptcy. Therefore, CEOs with a large amount of defined benefit pension have strong incentives to avoid bankruptcy, even in the presence of a pension protection scheme.

As a result, a CEO with a defined benefit pension scheme effectively becomes a firm's potential debt-holder. Sundaram and Yermack (2007), along with Edmans and Liu (2011), argue that by aligning interests of top managers with other debt-holders, pensions can reduce CEOs' incentives for risk-shifting and lead to a reduction of overall riskiness of a firm and subsequently its cost of debt. Therefore, CEOs will be discouraged from taking risky actions that may increase the probability of bankruptcy and lower the recovery value. Consequently, I formulate the next hypothesis as follows:

H2: Firms providing more pensions to their CEOs face a *lower* cost of debt.

[3] Source: www.pensionprotectionfund.org.uk

2.3.3. Stock options

A well-established view is that compensation by means of stock options will generate strong incentives for risk-increasing investments (e.g. Jensen and Meckling, 1976; Guay, 1999). This view relies on the fact that stock options have a convex payoff structure: the expected payoff will be zero as long as the share price is below the exercise price, but it can be quite high if the options are in-the-money. In addition, the value of stock options increases when stock return volatility goes up. By undertaking risky investment projects, the expected payoff from option holdings increases. At the same time, increase in the firm's risk level will lead to a higher probability of bankruptcy, and therefore a lower value of the firm's debt. Ertugrul and Hedge (2008) provide evidence that the level of directors' stock option holdings is positively related with a firms' bond yield spread. Therefore, my hypothesis is that by providing a stronger incentive for managers to take more risks, stock option awards will lead to a higher cost of borrowing.

H3: Firms providing more stock options to their CEOs face a *higher* cost of debt.

2.3.4. Comparison between PVSOs and TSOs

Two types of CEO stock options are frequently used as compensation for top managers: performance-vested stock options (PVSOs) and traditional stock options (TSOs) (e.g. Johnson and Tian, 2000). These two categories have distinctive features: PVSOs have performance targets as vesting conditions, while TSOs have no such targets. This difference in vesting conditions may provide different incentives for CEOs.

First of all, PVSOs may generate stronger incentives for interest alignment of CEOs and shareholders than TSOs. Because of the performance target attached on PVSOs, CEOs are expected to engage in value-added investments to maximize shareholders' value. Kuang and Qin (2009) document that PVSOs outperform TSOs to increase the pay for performance sensitivity. If PVSOs are more likely to align interests of shareholders and top managers, CEOs with more PVSOs are more likely to choose an investment strategy which will benefit shareholders as the priority. Anticipating such an investment tendency, bondholders will require a higher risk premium.

Secondly, PVSOs may generate incentives for managerial opportunistic behaviors which damage debt-holders' interests. For example, earnings are usually used as the main performance benchmarks for PVSOs. Kuang (2008) documents that firms providing more PVSOs to CEOs exhibit a stronger incentive for earnings management compared with TSOs. Prevost, Rao and Skousen (2008) link earnings management to the cost of debt and find that earnings management distorts the quality of earnings, which is vital for creditors to assess a firm's default risk. Therefore, by observing a higher level of PVSOs awards to top managers, creditors already anticipate a stronger incentive for earnings management and will therefore charge a higher borrowing rate. I therefore formulate my next hypothesis as follows:

H4: Firms providing their CEOs more PVSOs relative to TSOs face a *higher* cost of debt.

2.3.5. Comparison between stock options and ownership

Ownership directly links CEO's personal wealth to stock price. Compared to stock options, the relationship between CEO's wealth invested in shares is a linear function of stock price rather than a convex one. Hence, the wealth of a CEO with more ownership might be more sensitive to a decrease in share price compared to the wealth of a CEO with large stock options holdings. As high risk investment may lead to higher return volatility, a CEO with a high level of ownership may reduce risk-taking behavior as his or her wealth exposure increases. Analysing US data, Ortiz-Molina (2006) provides empirical evidence that the cost of debt soars when ownership increases, while such a relationship disappears when ownership reaches a very high level. Because of the differences in payoff structures between stock options and ownership, I expect that stock options will create stronger incentives for risk-taking compared to ownership. If rational debt-holders perceive the difference between ownership and stock options in terms of risk-taking, they will require a higher risk premium for firms granting their CEOs a large number of stock options than for firms providing high managerial ownership. This leads to my fifth hypothesis:

H5: Stock options held by CEOs increase the cost of debt *more* than ownership.

2.3.6. Restricted shares

The last compensation component I consider is restricted shares. In the UK, most CEOs in publicly traded firms must meet certain prescribed performance targets (e.g. total shareholders return, TSR) before vesting restricted shares (PWC, 2008). Hence, CEOs are expected to be motivated to increase the stock return in order to guarantee the vesting of restricted shares. The anticipation of subsequent alignment of interests of

shareholders and top managers will lead rational debt-holders to require a corresponding higher risk premium. Therefore, my hypothesis is:

H6: Firms providing more restricted shares to their CEOs face a *higher* cost of debt.

2.4. Methodology

I consider both annual compensation and cumulative compensation of CEOs. CEOs receive their compensation in a variety of forms. Each pay component received by the CEO during a particular year will be taken into account. I construct pay variables as a proportion of total CEO compensation, which is the sum of annual salary, bonuses, the estimated values of stock options and restricted shares, and the pension increment. In addition, as a robustness check, I also employ an alternative proxy for annual compensation, which is the value of each pay component scaled by the firm's total sales. Previous studies on CEO compensation did not consider pension element of pay because that information was not easily available in the early period. However, the disclosure of pension data is now mandatory following the introduction of the Directors' Remuneration Report Regulations (2002), which allows us to collect full compensation data to accurately estimate each pay component and analyse the impact of pensions. I focus on the defined benefit (DB) pension, as only DB pensions are a potential liability for a firm and therefore represent inside debts. I hand collect the actuarial value of the defined benefit pensions as reported in firm annual reports. Since defined benefit pension value is reported as cumulative number, I estimate the amount of new pension awarded in a particular year as a year-to-year change in accumulated pension.

In addition to the annual monetary amounts of compensation, I look at the total amount of equity-like (stock options and shares) and debt-like pay (pension) accumulated by a CEO during his or her tenures. This has potentially even stronger implications for firm policies, since CEOs are much more likely to be motivated by changes in their total wealth rather than changes in the value of their annual compensation. For stocks and options, I conduct this analysis by using the number of shares grants because monetary values can vary based on valuation assumptions. I therefore define new compensation variables by considering the number of stock options, unrestricted shares (ownership) and restricted shares held by a CEO as a proportion of total number of shares outstanding. These new definitions are also useful to check the robustness of my findings.

The yield spread of a corporate bond is used to measure the cost of debt. Following prior literature (e.g. Anderson, Mansi and Reeb, 2003; Ertugrul and Hegde, 2008), it is estimated as the difference in yield to maturity between a firm's bond and a UK government bond with a comparable maturity. The spread is expressed in basis points.[4] When a firm has multiple bonds outstanding in a year, I use the market value weighted average yield spread. This procedure allows me to use a single representative bond yield per firm year.

I perform ordinary least square (OLS) regression to measure the effect of CEO compensation on the cost of debt. The yield spread of corporate bonds is used as the dependent variable, and the CEO compensation components are used as the explanatory variables. Following prior studies examining yield spread (e.g. Ortiz-Molina, 2006;

[4] For a few corporate bonds with a maturity longer the longest maturity of government bonds, the yield spread is compared with the longest available maturity of the latter.

Ertugrul and Hegde, 2008; Devos, Prevost and Rao, 2008), the estimated regression model is written as follows:

$$Spread_{i,t} = \alpha_0 + \beta\, Compensation_{i,t-1} + \sum \lambda\, Bond\ Characteristics_{i,t} + \sum \delta\, Firm\ Characteristics_{i,t} + \sum \zeta\, Industry\ dummies_{i,t} + \sum \upsilon\, Year\ dummies_{i,t} + \varepsilon_{i,t}. \quad (1)$$

The regression specification considers a lagged relationship because bondholders adjust the bond price once information on compensation becomes publicly available. All bond-specific information is therefore collected three months after the end of a fiscal year.[5] We can see how bondholders react to the latest CEO compensation information.

Although OLS regression is popular and widely used, it is not short of limitations. OLS is sensitive to outlier. OLS estimator is biased and inconsistent if multicollinearity and individual effects exist among independent variables (e.g. Greene, 2007). In this study, the possible individual effects are that different firms may apply unique remuneration packages for their CEOs. Hence the variation among CEO compensations may be contaminated by unmeasured individual firm characteristics (unobserved firm heterogeneity). To address such a concern, I also use fixed effect regression, focusing on within variation of CEO compensation for individual firms.

Prior literature suggests several bond and firm characteristics that can also influence the yield spread of bonds (e.g. Ortiz-Molina, 2006; Ertugrul and Hegde, 2008). These factors are included as control variables in regression. The bond characteristics are bond

[5] UK Publicly traded firms are required to publish their annual reports within four months after the end of the fiscal year. I also randomly check the date of annual report release in Thomson Banker.

rating, duration and bond size. For the bond rating variable, I convert each rating category into a numerical scale. Following Klock, Mansi and Maxwell (2005), I assign the lowest Moody's rating D a value of 1, and then, as the bond rating increases, the numerical rating changes by an increment of 1, up to a value of 22 for the highest Moody's rating, Aaa. I further convert this rating into a rating residual to control for all information other than compensation that can affect bond rating (spread) and that is not captured by other control variables used in the regression. The residual is estimated from the regression, where the dependent variable is bond rating and the independent variables are the various compensation components. The duration of the bond is used to control for differences in bond maturity and coupon rate. The bond size is used to control the impact of liquidity on yield spread. A large bond size suggests higher liquidity and therefore a lower cost of debt. Similar to Ortiz-Molina (2007), I use the relative bond size (as the fraction of a firm's total assets) instead of the absolute bond size. The firm characteristics that can affect yield spread include firm size, debt ratio, profitability, market-to-book ratio and firm risk. These firm characteristics are found to be informative in explaining the cost of debt (e.g. Ortiz-Molina, 2007; Ertugrul and Hegde, 2008). The exact definitions of all these variables are presented in Table 2.1. The regression model also incorporates industry and time factors.

2.5. Data

The sample is selected from non-financial and non-utility UK firms in FTSE All Share Index. To be included in the sample, a firm must have a straight bond outstanding. Since the benchmark for calculating corporate bond yield spread is the corresponding UK government bond yield, I exclude firms with bond issued in currencies other than pound sterling.

Information on yield spread, bond and firm characteristics is collected from DataStream. CEO compensation data is mainly collected from BoardEx. It is a database which is specialized for analysing profile and relationship of organization leaders in Europe and North America. It captures extensive personal information about 380,000 leaders (all directors in UK publicly traded firms are covered), including date of birth, nationality, education background, working experiences, board and non-board positions, and compensation. As far as the data of compensation is concerned, BoardEx provides detailed information on the actual monetary value of cash compensation and number of shares for stock options and restricted shares. The estimated monetary values of equity incentives are also reported. In addition, stock options are classified into traditional stock options (TSOs) and performance-vested stock options (PVSOs) in BoardEx. The exercise (vesting) dates for stock options (restricted shares) are also available. [6] Firm annual reports are used to collect data on CEO defined benefit pensions. The sample period of the study is 2003-2006. It starts with 2003 because this is the year when firms were first required to publish detailed information about CEO pensions in their annual reports, according to the Directors' Remuneration Report Regulations (2002). It stops in 2006 to eliminate the potential influence of later financial crisis.

The total number of firm-year observations in my sample is 150.[7] The distribution of the sample over years and different industries is presented in Table 2.2. Firm-years steadily increase from 31 in 2003 to 44 in 2006. Sample firms are distributed over five main industries, as classified by the UK SIC (2003) code.

[6] To address the concern of the accuracy of data in BoardEx, I also randomly checked 15 firms in my sample. The data from BoardEx is identical as documented in corresponding annual reports. BoardEx is also used as a reliable data source in other published compensation studies (e.g. Kuang and Qin 2009).
[7] The relatively small sample size is mostly caused by the fact that few firms have publicly traded bonds issued in pound sterling.

Table 2.1 Variables definitions

Panel A: Bond characteristics

Variable Name	Definition
Spread	Bond yield spread expressed in basis points over UK government securities (DS[8]: SP). For multiple bonds, market value-weighted average is used.
Rating	Bond rating of Moody's (DS: MRT) converted to a numerical scale, in which the lowest rating (D) is 1 and the highest (Aaa) is 22.
Low Rating	Dummy variable equals 1 if Rating is no more than 14 (Moody's Rating Baa2), the benchmark for "investment grade bond", otherwise 0.
Rating Residual	Residual from the regression where the dependent variable is Rating and the independent variables are the relevant compensation components.
Bond Size	Relative size of bonds calculated as the market value of bonds (DS: MV) scaled by book value of total assets (WC 02999).
Duration	Duration of bonds (DS: DM). For multiple bonds, market value-weighted average is used.

Panel B: Firm characteristics

Variable Name	Definition
Firm Size	The natural logarithm of book value of total assets (WC[9] 02999).
Debt Ratio	Book value of long-term debt (WC 03251) scaled by book value of total assets (WC 02999).
Profitability	Operating income (WC 01250) before depreciation (WC 01151) scaled by book value of total assets (WC 02999).
Market-to-Book ratio	Market-to-book value ratio calculated as the book value of total debt (WC 03255) plus the market value of equity (DS: MV), scaled by the book value of total assets (WC 02999).
Risk	Standard deviation of Profitability calculated using data of year t-6 to t-1.

[8] DS is the abbreviation for DataStream.
[9] WC is the abbreviation for WorldScope.

Table 2.1 (Continued)

Panel C: CEO compensation

Variable Name	Definition
Total Compensation	The Sum of salary, bonuses, the estimated values of stock options and restricted shares grants[10], and the pension increment in a particular year.
Total compensation to Sales	Total compensation scaled by total sales (WC 01001).
Salary	Annual salary scaled by total compensation.
Salary to Sales	Annual salary scaled by total sales (WC 01001).
Bonus	Cash bonus scaled by total compensation.
Bonus to Sales	Cash bonus scaled by total sales (WC 01001).
Incremental Pension	Year-to-year change in the actuarial value of defined benefit pension scaled by total compensation.
Incremental Pension to Sales	Year-to-year change in the actuarial value of defined benefit pension scaled by total sales (WC 01001).
Pension to Equity	The total transfer value of defined benefit pension scaled by the estimated value of equity holdings (including ownership, restricted shares and options).
TSO Grants	The estimated value of traditional stock option grants scaled by total compensation.
TSO Grants to Sales	The estimated value of traditional stock option grants scaled by total sales (WC 01001).
PVSO Grants	The estimated value of performance-vested stock option grants scaled by total compensation.
PVSO Grants to Sales	The estimated value of performance-vested stock option grants scaled by total sales (WC 01001).
Option Grants	The sum of TSO grants and PVSO grants.
Option Grants to Sales	The sum of TSO grants to sales and PVSO grants to sales.
Share Grants	The estimated value for restricted share grants scaled by total compensation.
Share Grants to Sales	The estimated value for restricted share grants scaled by total sales (WC 01001).
TSO Holding	The number of traditional stock options scaled by total number of shares outstanding (DS: NOSH).
PVSO Holding	The number of performance-vested stock options scaled by total number of shares outstanding (DS: NOSH).
Option Holding	The sum of TSO holding and PVSO holding.
Restricted Shareholding	The number of restricted shares held by the CEO scaled by total number of shares outstanding (DS: NOSH).
Ownership	The number of shares owned by the CEO scaled by total number of shares outstanding (DS: NOSH).

[10] Please see the Appendix for the estimated value of stock options and restricted shares.

Table 2.2 Sample selection and distribution

	Number of firms	Number of observations
Panel A: Sample selection		
FTSE ALL firms	616	2464
Less:		
Financials & Utilities	259	1036
Observations without straight bond issued	284	1136
Observations without straight bond issued in £	29	142
Final sample	**44**	**150**
Panel B: Year distribution		
2003	31	31
2004	35	35
2005	40	40
2006	44	44
Total	**44**	**150**
Panel C: Industry distribution		
Mining and Quarrying	3	12
Manufacturing	18	59
Wholesale & Retail Trade	8	31
Hotel & Restaurant	2	8
Transport & Communication	5	20
Others	8	20
Total	**44**	**150**

Table 2.3 presents descriptive statistics of major variables used in my empirical analysis. All data is winsorized at 5% level to limit the impact of extreme values. Panel A provides information on bond characteristics. The average (median) spread for traded bonds is 148.37 (109.56) basis points with a standard deviation of 134.65 basis points. This means that the corporate bond yield has a premium of 1.48% compared with the benchmark government bonds yield on average. Debt-holders require a higher return for holding a corporate bond compared with a government bond. The mean (median) bond rating is 13.82 (14), which means about half of the bonds in my sample belongs to the investment grade category (above Moody's rating Baa2). On average, the market value of bonds is only 1.35% of a firm's total asset in our sample. Compared with Oriz-Molina (2006), the relative size of bonds in my study is much smaller than US sample. The average bond in my sample has a duration of about 6.15 years.

Descriptive statistics on annual compensation are provided in Panel B of Table 2.3. Each type of compensation is expressed as a fraction of total CEO compensation and total sales. The mean (median) of total compensation is about £3.29 million (£2.45 million). On average, the total amount of annual pay received by a CEO is about 0.13% of a firm's total annual sales. The CEO of the median firm receives 25.43% of total compensation (about £623,000) as salary and 13.44% (about £329,000) as cash bonuses. I observe that performance-vested stock options (PVSOs) dominate option compensation compared with traditional stock options (TSOs). Share grants also constitute a significant fraction of CEO compensation, accounting for 28.02% of annual compensation on average. Finally, an interesting new finding is the amount of defined benefit pension received by CEOs. The annual pension increment is on average 12.43% of total compensation, which equals to about £397,000.

Panel C of Table 2.3 provides information on CEO accumulated compensation. On average, CEOs hold traditional stock options (TSOs), performance-vested stock options (PVSOs) and restricted shares of about 0.02%, 0.08% and 0.06% of total shares outstanding, respectively. This suggests that PVSOs holdings dominate the accumulated equity compensation. The median value for TSOs holdings is zero, which means more than half of CEOs in our sample without any traditional stock options. The ratio of CEO pensions to equity compensation is on average 0.37, which is slightly higher than the figure of 0.25 reported by Wei and Yermack (2011) for US firms. This also indicates the relatively low equity incentives for UK top managers compared with the counterparts in the US. CEOs' share ownership information is shown in Panel D of Table 2.3. I find that on average CEOs in my sample hold just 0.58% of their firms' total common shares outstanding. The median value for CEO ownership even drops to 0.03%.

Panel E of Table 2.3 provides information on sample firm characteristics. The average (median) firm in the sample has total assets of £10 (£4) billion. The long-term debt amounts to about 27% of total assets on average. I find that sample firms have a mean (median) profitability of 15% (13%) and a market-to-book ratio of 1.35 (1.10).

The correlation matrix between key variables is presented in Table 2.4. I observe that bond spread has a significantly positive correlation with PVSOs grants and holding, and with debt ratio. It is negatively related with rating, duration, firm size and market-to-book ratio, which is consistent with my expectations as well as previous literature.

Table 2.3 Descriptive statistics

The sample consists of 150 firm-year FTSE ALL observations from 2003-2006. Only straight bonds issued in pound sterling are included in the sample. All variables are winsorized at 5% and defined in Table 2.1.

Variables	Mean	Median	St. Dev.	Quartile 1	Quartile 3
Panel A. Bond characteristics					
Spread (Basis Points)	148.37	109.56	134.65	81.70	144.79
Rating	13.82	14.00	2.41	13.00	15.50
Low Rating	0.61	1.00	0.49	0.00	1.00
Bond Size (%)	1.35	0.85	1.32	0.49	1.99
Duration (Years)	6.15	5.84	2.68	4.09	7.75
Panel B. Annual compensation					
Salary (%)	28.05	25.43	14.46	16.65	34.11
Bonus (%)	15.09	13.44	11.40	7.10	20.40
TSO Grants (%)	2.33	0.00	9.34	0.00	0.03
PVSO Grants (%)	14.08	8.91	16.25	0.00	23.72
Option Grants (%)	16.25	12.59	17.88	0.00	27.72
Share Grants (%)	28.02	30.00	22.83	0.00	44.72
Incremental Pension (%)	12.43	0.52	16.86	0.00	24.17
Total Compensation (£m)	3.29	2.45	2.78	1.38	4.47
Salary to Sales (%)	0.03	0.02	0.03	0.01	0.03
Bonus to Sales (%)	0.02	0.01	0.02	0.01	0.02
*TSO Grants to Sales (%)*10^2*	0.12	0.00	0.44	0.00	0.00
*PVSO Grants to Sales (%)*10^2*	1.21	0.45	1.84	1.84	1.71
*Option Grants to Sales (%)*10^2*	1.30	0.55	1.87	0.00	1.88
Share Grants to Sales (%)	0.03	0.01	0.06	0.00	0.05
Incremental Pension to Sales (%)	0.01	0.00	0.03	0.00	0.01
Total Compensation to Sales (%)	0.13	0.07	0.21	0.04	0.13
Panel C. Accumulated compensation					
TSO Holding (%)	0.02	0.00	0.07	0.00	0.00
PVSO Holding (%)	0.08	0.05	0.09	0.00	0.11
Option Holding (%)	0.09	0.05	0.13	0.00	0.12
Restricted Shareholding (%)	0.06	0.03	0.07	0.01	0.08
Pension to Equity	0.37	0.03	0.55	0.00	0.65
Panel D. Other equity incentives					
Ownership (%)	0.58	0.03	2.28	0.01	0.13
Panel E. Firm characteristics					
Firm Size (£bn)	10.42	3.99	1.87	1.92	8.88
Debt Ratio (%)	26.56	22.74	16.88	13.35	35.68
Profitability (%)	15.41	13.00	8.39	9.06	19.03
Market-to-Book ratio	1.35	1.10	0.95	0.75	1.58
Risk (%)	2.84	1.76	2.98	0.99	3.55

Table 2.4 Correlation matrix

Correlations between main variables for 150 observations. Bonus, Incremental Pension, Option Grants, Share Grants, TSO Grants and PVSO Grants are scaled by the total compensation. All variables are defined in Table 2.1. The correlations that are significant at 10% level are in bold.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1)Spread	1																				
(2)Rating	**-0.56**	1																			
(3)Bond Size	-0.01	-0.04	1																		
(4)Duration	**-0.25**	**0.31**	**0.35**	1																	
(5)Bonus	-0.07	0.10	0.09	0.11	1																
(6)Incremental Pension	-0.11	-0.07	0.00	0.03	**-0.30**	1															
(7)Pension to Equity	-0.08	-0.07	-0.01	0.02	**-0.27**	**0.72**	1														
(8)TSO Grants	0.10	-0.11	-0.12	-0.01	**-0.21**	-0.09	-0.03	1													
(9)PVSO Grants	**0.17**	**-0.15**	0.02	**-0.15**	**-0.21**	-0.13	-0.10	-0.05	1												
(10)Option Grants	**0.19**	**-0.17**	-0.04	-0.13	**-0.29**	**-0.16**	-0.11	**0.43**	**0.88**	1											
(11)Share Grants	**-0.17**	**0.23**	**-0.18**	-0.06	-0.12	**-0.34**	**-0.28**	-0.08	**-0.46**	**-0.45**	1										
(12)Ownership	0.51	0.01	0.00	**-0.17**	0.07	**-0.14**	**-0.15**	-0.06	**0.17**	0.12	**-0.18**	1									
(13)TSO Holding	0.13	-0.02	**0.24**	0.09	0.00	-0.12	-0.11	**0.19**	**0.20**	**0.26**	-0.12	-0.05	1								
(14)PVSO Holding	**0.56**	**-0.47**	0.07	**-0.37**	-0.08	0.01	-0.05	0.06	**0.48**	**0.44**	**-0.34**	**0.28**	**0.21**	1							
(15)Option Holding	**0.43**	**-0.30**	**0.22**	**-0.19**	-0.04	-0.06	-0.10	0.09	**0.46**	**0.45**	**-0.31**	**0.18**	**0.72**	**0.80**	1						
(16)Restricted Share Holding	-0.03	-0.07	**0.16**	0.10	0.13	-0.08	**-0.14**	**-0.17**	**-0.20**	**-0.26**	**0.29**	-0.10	**0.19**	-0.05	0.08	1					
(17)Firm Size	**-0.32**	**0.36**	**-0.51**	-0.07	**-0.24**	-0.09	-0.09	**0.24**	0.03	**0.17**	**0.32**	**-0.18**	-0.11	**-0.29**	**-0.26**	**-0.25**	1				
(18)Debt Ratio	**0.27**	**-0.24**	**-0.23**	0.11	**0.16**	**-0.15**	**-0.14**	0.00	0.04	0.02	-0.07	-0.09	**0.23**	0.11	**0.21**	-0.05	**-0.18**	1			
(19)Profitability	-0.11	0.04	**0.16**	-0.13	**0.18**	0.03	-0.11	-0.05	0.00	-0.03	-0.03	**-0.16**	-0.02	-0.04	-0.06	0.00	**-0.24**	0.06	1		
(20)Market-to-Book Ratio	**-0.31**	**0.25**	0.06	0.03	**0.29**	-0.04	**-0.15**	-0.12	-0.11	**-0.16**	0.12	**-0.17**	-0.09	**-0.32**	**-0.28**	-0.07	-0.01	**0.16**	**0.64**	1	
(21)Risk	-0.07	0.09	0.10	-0.13	**0.16**	-0.12	**-0.14**	0.08	-0.11	-0.05	0.06	-0.04	-0.11	**-0.14**	**-0.16**	-0.09	**-0.17**	-0.04	**0.48**	**0.45**	1

2.6. Empirical results

As discussed in Section 2.4, multivariate regressions are estimated to investigate the impact of CEO compensation on the yield spread of firms. Firstly, I estimate the full regression model with all pay components included (except for salary). Since each compensation component is scaled by the total compensation, and all the compensation components must add up to 1 by definition, I also investigate the robustness of my results by estimating a number of regressions, dropping out different compensation components sequentially. Finally, I estimate regressions for each individual pay component separately. OLS results using different components of CEO pay are presented in Panels A of Tables 2.5, 2.6 and 2.7. Fixed effects regression is also used and presented in Panels B of Tables 2.5, 2.6 and 2.7. Fixed effects regression is employed to control for the heterogeneity of unobserved firms. In each table, the column beside the variable names shows the predicted sign for each of the coefficient estimates. Table 2.5 presents results of my main regressions, estimating the relationship between annual compensation components (measured as a percentage of total compensation) and the cost of debt. Table 2.6 presents the same regressions, employing an alternative measure for the compensation variables (compensation as a fraction of total sales). Finally, I analyse the impact of the cumulative compensation (accumulated holdings of stock options, restricted shares and ownership) on the cost of debt in Table 2.7. The results of these estimations, grouped by the compensation component, are discussed below.

2.6.1. Cash bonus

In Panel A of Table 2.5 (columns 1 to 4), bonus is measured as a fraction of annual compensation. I find that the coefficients of bonus remain negative in all of these

pooled regressions. When I include all CEO pay components in a regression (column 1), the coefficient for bonus is -1.96 at the significance level of 10%. Sequentially dropping option grants and share grants variables from the regression (columns 2 and 3) does not affect this result, with coefficients for bonus becoming -1.48 and -1.63 respectively and remaining statistically significant. When I test the cash bonus component separately (column 4), the coefficient is still negative, at -1.23, with the *t*-statistic of -1.55. When I use fixed effects regression in Panel B of Table 2.5, the coefficients of bonus are -3.42 and -2.04 in columns 1 and 2, respectively. The significance level even reaches 1%. The test for the cross-effect is also found significant, with a cross-section Chi-square of 357 at 1% significance level. The cross-section effect (firms specific) does exist. In Table 2.6, I employ the fraction of bonus in total sales as an alternative proxy. The regression coefficients for cash bonus (columns 1, 2 and 4 in Panel A) are still negative, -751.08, -461.06 and -498.13, respectively, although none of them are now statistically significant. The similar results can be found in Panel B of Table 2.6 (Columns 1 and 2) when I employ fixed effects regression. This difference could be caused by the fact that scaling some pay components (such as bonus) by sales does not explicitly takes into account their relative importance for CEO total pay, and therefore provides a weaker proxy for my analysis.

Overall, this analysis provides some evidence for my first hypothesis (H1), that more cash bonus will lower the cost of debt. With more bonus compensation, risk-taking incentive for CEOs is reduced to a certain extent. As bondholders price the risk-avoiding incentives, I find a negative relationship between bonus and yield spread.

Regarding the control variables, I observe that most of the variables are related to yield spread in the expected direction in both Tables 2.5 and 2.6. The regression coefficients of rating residual and firm size in all four regressions are negative and statistically significant at 1% level, which means that higher-rated bonds are traded at lower credit spreads. Also as expected, bond size is negatively related to spread, indicating a possible liquidity effect. Larger firms and companies with lower debt ratio have a lower cost of debt. Finally, duration, profitability, market-to-book ratio and risk (as measured by the standard deviation of profitability) have little impact on the credit spread.

2.6.2. Pension

The results of regressions analysis of the effects of annual increases to CEO pension benefit on the cost of debt are presented in Tables 2.5 and 2.6. In Table 2.5, pension is measured as a fraction of total compensation. The coefficients for pension pay range from -1.52 (column 2) to -1.90 (column 1) in Panel A when OLS regression is employed, all highly statistically significant. In column 5 of Panel A, I examine pensions exclusively. The coefficient is -1.38 at 1% significance level. In another word, if CEO defined benefit pension increases by 1% as a percentage of annual pay, it would lead to a decrease in the cost of debt by 1.38 basis points. In Panel B, I use fixed effects regression instead of OLS model. The coefficient of pension increment (column 1) remains significantly negative. The coefficient of pension increment (column 3) is however positive, but fails to reach the significance level.

In Table 2.6, I scale pension increment by total sales instead of total compensation. OLS model and fixed effects model are employed in Panels A and B individually.

Table 2.5 Annual compensation and the cost of debt

Panel A OLS regression

Results of ordinary least squares regression of the bond yield spread on annual compensation components for 150 observations. Bonus, Incremental Pension, Option Grants, Share Grants, TSO Grants and PVSO Grants are scaled by the total compensation. All variables are defined in Table 2.1. Coefficients for industry and year dummies are included but not reported. The *t*-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5%, and 1% level, respectively.

Variables	Exp. Sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept		509.03***	500.04***	500.07***	389.08***	384.18***	365.28***	358.30***	369.21***
		(5.19)	(5.14)	(5.16)	(4.45)	(4.79)	(4.33)	(4.47)	(4.40)
Bonus	(-)	-1.96*	-1.48*	-1.63*	-1.23				
		(-1.79)	(-1.67)	(-1.98)	(-1.55)				
Incremental Pension	(-)	-1.90**	-1.52***	-1.60***		-1.38***			
		(-2.49)	(-2.70)	(-3.01)		(-2.74)			
Option Grants	(+)	-0.13	0.29				1.12**		
		(-0.15)	(0.48)				(2.04)		
Share Grants	(+)	-0.51						0.21	
		(-0.74)						(0.46)	
TSO Grants	(+)								1.34
									(1.34)
PVSO Grants	(+)								1.12*
									(1.91)
Rating Residual	(-)	-17.55***	-16.47***	-16.41***	-22.30***	-24.72***	-21.59***	-24.02***	-21.35***
		(-3.32)	(-3.24)	(-3.25)	(-4.75)	(-5.49)	(-4.59)	(-5.29)	(-4.52)
Bond Size	(-)	-16.07*	-16.03*	-15.76*	-19.48**	-19.12**	-20.04**	-18.45**	-20.04**
		(-1.94)	(-1.94)	(-1.92)	(-2.40)	(-2.42)	(-2.46)	(-2.29)	(-2.45)
Duration	(-)	-5.08	-5.36	-5.63					
		(-1.30)	(-1.38)	(-1.47)					
Firm Size	(-)	-38.62***	-41.48***	-41.00***	-36.44***	-37.51***	-36.89***	-38.50***	-37.37***
		(-3.91)	(-4.56)	(-4.55)	(-4.14)	(-4.49)	(-4.18)	(-4.37)	(-4.14)
Debt Ratio	(+)	1.81***	1.89***	1.90***	1.76***	1.48***	1.70***	1.73***	1.69***
		(3.06)	(3.25)	(3.27)	(3.05)	(2.63)	(2.97)	(3.04)	(2.93)
Profitability	(-)	0.09	-0.04	0.13					
		(0.06)	(-0.02)	(0.09)					
Market-to-Book Ratio	(-)	-17.53	-18.34	-18.81					
		(-1.27)	(-1.34)	(-1.38)					
Risk	(+)	-0.03	-0.06	-0.26					
		(-0.01)	(-0.02)	(-0.07)					
Adjusted R^2		0.47	0.47	0.48	0.43	0.46	0.43	0.44	0.42
Wald Tests			H_0: $\beta_{Bonus}=\beta_{Incremental\ Pension}$					H_0: $\beta_{TSO\ Grants}=\beta_{PVSO\ Grants}$	
Chi Square (p-value)			0.00 (0.97)					0.04 (0.84)	

Table 2.5 (Continued)

Panel B Fixed effects regression

Results of fixed effects regression of the bond yield spread on annual compensation components for 150 observations. Fixed effects apply to cross-section (44 firms) effect. Year dummies is included but not reported. Bonus, Incremental Pension, Option Grants, Share Grants are scaled by the total compensation. All variables are defined in Table 2.1. The *t*-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5%, and 1% level, respectively.

Variables	Exp. Sign	(1)	(2)	(3)	(4)	(5)	(6)
Intercept		1120.64***	1191.10***	1117.74***	980.17***	964.19***	1081.95***
		(3.36)	(3.69)	(3.35)	(2.98)	(2.89)	(3.19)
Bonus	(-)	-3.42***	-2.04***				
		(-4.89)	(-4.02)				
Incremental Pension	(-)	-1.01**		0.46			
		(-2.21)		(1.05)			
Option Grants	(+)	1.08			0.49		
		(1.28)			(1.33)		
Share Grants	(+)	1.81				-0.58	
		(0.87)				(-1.46)	
TSO Grants	(+)						-0.40
							(-0.56)
PVSO Grants	(+)						0.69*
							(1.68)
Rating Residual	(-)	-47.97***	-48.51***	-45.83***	-44.48***	-43.15***	-47.68***
		(-5.65)	(-5.78)	(-5.21)	(-5.30)	(-5.03)	(-5.39)
Bond Size	(-)	-18.17	-22.69	-22.68	-16.66	-13.73	-20.72
		(-1.12)	(-1.44)	(-1.39)	(-1.03)	(-0.83)	(-1.25)
Duration	(-)	10.81	8.51	8.22	9.80	8.97	9.59
		(1.52)	(1.20)	(1.12)	(1.35)	(1.23)	(1.32)
Firm Size	(-)	-99.14***	-114.71***	-111.22***	-98.84***	-93.12***	-109.84***
		(-2.87)	(-3.39)	(-3.15)	(-2.85)	(-2.68)	(-3.06)
Debt Ratio	(+)	0.79	0.65	0.89	1.11*	0.86	1.14**
		(1.39)	(1.15)	(1.56)	(1.93)	(1.51)	(2.00)
Profitability	(-)	-3.85**	-4.56***	-4.10**	-3.95**	-3.98**	-4.10**
		(-2.35)	(-2.82)	(-2.47)	(-2.33)	(-2.41)	(-2.40)
Market-to-Book Ratio	(-)	-14.82	-18.73	-19.84	-17.35	-18.52	-18.85
		(-0.77)	(-0.97)	(-0.99)	(-0.88)	(-0.93)	(-0.95)
Risk	(+)	0.29	1.06	0.82	0.52	1.23	0.44
		(0.14)	(0.52)	(0.39)	(0.25)	(0.59)	(0.22)
Adjusted R^2		0.92	0.92	0.91	0.92	0.91	0.92
Cross-section Test							Wald Test H_0: $\beta_{TSO\ Grants}=\beta_{PVSO\ Grants}$
Chi-square (p-value)		357***(0.00)	359***(0.00)	347***(0.00)	350***(0.00)	351***(0.00)	Chi-square (p-value) 1.79(0.18)

Table 2.6 Annual compensation and the cost of debt: alternative measure

Panel A OLS regression

Results of ordinary least squares regression of the bond yield spread on annual compensation components for 150 observations. Bonus, Incremental Pension, Option Grants, Share Grants, TSO Grants and PVSO Grants are scaled by total sales. All variables are defined in Table2.1. Coefficients for industry and year dummies are included but not reported. The *t*-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5%, and 1% level, respectively.

Variables	Exp. Sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept		486.18***	504.77***	460.00***	410.07***	411.50***	339.60***	321.87***	338.80***
		(4.27)	(4.43)	(4.07)	(3.93)	(4.72)	(4.21)	(3.70)	(4.16)
Bonus to Sales	(-)	-751.08	-461.06		-498.13				
		(-1.20)	(-0.77)		(-0.88)				
Incremental Pension to Sales	(-)	-625.76*	-663.66*	-687.25**		-634.64*			
		(-1.81)	(-1.92)	(-2.00)		(-1.86)			
Option Grants to Sales	(+)	1208.33**	1128.43**	1104.47**			1229.42**		
		(2.43)	(2.27)	(2.23)			(2.60)		
Share Grants to Sales	(+)	306.33						201.82	
		(1.51)						(1.09)	
TSO Grants to Sales	(+)								1272.93
									(0.64)
PVSO Grants to Sales	(+)								1243.06**
									(2.52)
Rating Residual	(-)	-16.83***	-16.58***	-17.20***	-22.22***	-22.77***	-23.35***	-23.92***	-23.16***
		(-3.13)	(-3.07)	(-3.22)	(-4.55)	(-4.87)	(-5.07)	(-5.06)	(-5.02)
Bond Size	(-)	-22.88**	-19.24**	-18.53**	-18.84**	-20.33**	-19.61**	-21.19**	-19.39**
		(-2.61)	(-2.27)	(-2.20)	(-2.30)	(-2.49)	(-2.44)	(-2.49)	(-2.42)
Duration	(-)	-3.38	-2.83	-3.79					
		(-0.80)	(-0.27)	(-0.94)					
Firm Size	(-)	-44.16***	-43.49***	-39.47***	-40.45***	-41.46***	-34.20***	-34.64***	-34.08***
		(-4.15)	(-4.07)	(-4.23)	(-4.03)	(-4.61)	(-4.08)	(-4.04)	(-4.01)
Debt Ratio	(+)	1.93***	1.85***	1.83***	1.80***	1.73***	1.53***	1.89***	1.50***
		(3.28)	(3.13)	(3.09)	(3.15)	(3.05)	(2.70)	(3.27)	(2.62)
Profitability	(-)	-0.25	-0.50	-0.38					
		(-0.16)	(-0.33)	(-0.25)					
Market-to-Book Ratio	(-)	-20.65	-23.28*	-22.02					
		(-1.50)	(-1.69)	(-1.61)					
Risk	(+)	0.56	1.57	0.85					
		(0.15)	(0.42)	(0.23)					
Adjusted R^2		0.47	0.46	0.47	0.42	0.43	0.45	0.42	0.45
Wald Tests			H_0: $\beta_{\text{Option Grants}} = -\beta_{\text{Incremental Pension}}$					H_0: $\beta_{\text{TSO grants}} = \beta_{\text{PVSO grants}}$	
Chi Square (p-value)			0.55 (0.46)					0.00 (0.99)	

Table 2.6 (Continued)

Panel B Fixed effects regression

Results of fixed effects regression of the bond yield spread on annual compensation components for 150 observations. Fixed effects apply to cross-section (44 firms) effect. Year dummies is included but not reported. Bonus, Incremental Pension, Option Grants, Share Grants, TSO Grants and PVSO Grants are scaled by total sales. All variables are defined in Table 2.1. The *t*-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5%, and 1% level, respectively.

Variables	Exp. Sign	(1)	(2)	(3)	(4)	(5)	(6)
Intercept		716.77**	968.06***	1032.69***	874.05***	853.10**	819.68**
		(2.01)	(2.84)	(3.12)	(2.66)	(2.62)	(2.51)
Bonus to Sales	(-)	-603.84	-605.37				
		(-1.51)	(-1.61)				
Incremental Pension to Sales	(-)	-181.66		-70.41			
		(-0.66)		(-0.27)			
Option Grants to Sales	(+)	-135.51			94.01		
		(-0.40)			(0.28)		
Share Grants to Sales	(+)	-42.99				-183.19	
		(-0.24)				(-1.15)	
TSO Grants to Sales	(+)						-184.59
							(-0.15)
PVSO Grants to Sales	(+)						-5439.81
							(-0.62)
Rating Residual	(-)	-25.95***	-35.48***	-41.39***	-39.27***	-36.04***	-37.22***
		(-3.74)	(-4.38)	(-4.91)	(-5.21)	(-5.11)	(-4.71)
Bond Size	(-)	-3.66	-17.21	-19.72	-13.63	-10.77	-10.33
		(-0.20)	(-1.02)	(-1.21)	(-0.81)	(-0.64)	(-0.62)
Duration	(-)	12.22	9.82	8.13	11.44	9.93	12.53*
		(1.58)	(1.30)	(1.10)	(1.58)	(1.35)	(1.71)
Firm Size	(-)	-71.46**	-95.60***	-101.21***	-88.78**	-84.12**	-84.28**
		(-1.91)	(-3.39)	(-2.90)	(-2.56)	(-2.44)	(-2.43)
Debt Ratio	(+)	1.51**	1.25**	0.95	1.31**	1.07*	1.42**
		(2.54)	(2.17)	(1.65)	(2.34)	(1.90)	(2.49)
Profitability	(-)	-2.71	-3.41**	-4.04**	-3.15*	-3.56**	-2.88*
		(-1.59)	(-2.01)	(-2.43)	(-1.97)	(-2.18)	(-1.79)
Market-to-Book Ratio	(-)	-20.42	-19.45	-18.70	-20.07	-17.27	-18.75
		(-0.94)	(-0.94)	(-0.93)	(-1.00)	(-0.84)	(-0.93)
Risk	(+)	0.58	0.49	0.99	0.13	1.26	0.17
		(0.26)	(0.23)	(0.47)	(0.06)	(0.60)	(0.08)
Adjusted R^2		0.90	0.91	0.91	0.91	0.91	0.91
Cross-section Test							Wald Test H_0: $\beta_{TSO\ Grants}=\beta_{PVSO\ Grants}$
Chi-square (p-value)		330***(0.00)	337***(0.00)	344***(0.00)	353***(0.00)	349***(0.00)	Chi-square (p-value) 0.34(0.55)

Similar to the results in Table 2.5, the coefficients for pension in Panel A (from column 1 to 3) remain negative and significant in all regressions. In a separate test (column 5), the coefficient is -634.64 at 10% significance level. This indicates that if CEO defined benefit pension increment as a percentage of total sales increases by 1%, the bond yield will decrease by 634.64 basis points. However, the coefficients of pension fail to reach the significance level in Panel B when fixed effects model is employed (columns 1 and 3). The possible explanation is that the fixed effects model focuses on within variation. The variation of pension increment is very limited for a particular CEO over period.

In summary, the evidence provided above supports my second hypothesis (H2) in general. That is deferred CEO compensation in the form of company defined benefit pension is effective in aligning interests of CEOs and debt-holders. Debt-holders appreciate the unique risk-avoiding incentives provided by CEO pensions. Hence debt-holders do take into account CEO pensions when pricing the debt. Debt-holders will require a lower risk premium if CEOs have more pensions.

2.6.3. Stock options

Both annual option grants (Table 2.5 and 2.6) and total CEO option holdings (Table 2.7) are considered in my study. In Table 2.5, I measure option grants as a percentage of total compensation. In panel A of Table 2.5, the OLS regression model is employed. When other compensation components are present in the same regression, coefficients for option grants are not significantly different from zero (columns 1 and 2). However, when I exclude all other pay components and conduct a separate test including option grants only (column 6), the coefficient estimate increases to 1.12, significant at 5% level. This suggests that when option grants as a percentage of total pay increase by 1%,

the bond yield will increase by 1.12 basis points. In Panel B of Table 2.5, I use fixed effects regression instead of OLS model. The coefficients of option grants (columns 1 and 4) remain positive, while fail to reach significance level.

My results from Table 2.5 are further corroborated by these estimates presented in Table 2.6, where I employ an alternative proxy for option grants. The option grants here are measured as a fraction of total sales, and are therefore less likely to be affected by other compensation components. In all pooled regressions (from column 1 to 3) of Panel A, the coefficients for option grants remain positive and highly significant. In a separate test (column 6), I further confirm that more option grants lead to a higher cost of debt. The coefficient is 1,229.42 at 5% significance level. This suggests that if option grants as a percentage of total sales increase by 1%, bond yield goes up by 1,229.42 basis points. When fixed effects regression is employed in Panel B of Table 2.6 (columns 1 and 4), the coefficients of option grants fail to reach any significance level.

In Table 2.7, I use cumulative equity-based compensation as the proxy. The coefficients of option holding are all positive and highly significant in pooled regression when OLS model is employed (columns1, 2 and 4 of Panel A). In a separate test (column 4), the coefficient of option holding is 346.28 at 1% significance level. This indicates that if CEO option holding as a percentage of a firm's total shares outstanding increases by 1%, the bond yield spread will soar by 346.28 basis points. In Panel B, I use fixed effects regression as the alternative model. The coefficient of option holding (column 4) is 107, at 5% significance level. Such a result also indicates the positive relationship between CEO option holding and the cost of debt.

In short, the above mentioned results provide strong evidence to support my third hypothesis (H3), that stock options will lead to a higher cost of debt. Such results will not be affected by different measurements of stock options and regression models employed.

2.6.4 .Comparison between PVSOs and TSOs

As described in Section 2.3.4, I am interested to see whether debt-holders are aware of the distinctive features of performance-vested stock options (PVSOs) and traditional stock options (TSOs). I argue that PVSOs will increase the cost of borrowing more than TSOs. One reason for this is that the performance-vested conditions provide incentives for CEOs to manipulate performance targets (e.g. earnings management), which will lower the quality of earnings and make it more difficult for bondholders to assess a firm's default risks. Hence, I expect that bondholders may react differently to PVSOs and TSOs.

In column 8 of Panel A of Table 2.5, I test the difference between PVSO grants and TSO grants by using OLS model. The coefficients of both PVSO and TSO grants are positive and similar in magnitude, while only that of PVSO grants reaches the statistically significant level. However, the Wald test fails to support the hypothesis that the difference between these coefficients is statistically significant. I conduct the same test by using an alternative definition of PVSO and TSO grants in Panel A of Table 2.6 (column 8). I also consider fixed effects regression in Panels B of Table 2.5 and 2.6 (column 6). The results are very similar.

In Table 2.7, once again, I disaggregate options holdings into PVSO holdings and TSO holdings. In panel A, OLS regression is employed. Similar to the results in columns 8 of Panel A of Table 2.5 and Table2.6, the coefficients of PVSO and TSO holdings (column 6) are positive, but only that of PVSO holdings is statistically significant. The Wald test confirms that the difference is meaningful. The p-value for the Wald test is 0.08. This suggests that the difference between the coefficients of PVSOs holdings (460.57) and that for TSOs holding (153.20) is reliable. When fixed effects regression is adopted in Panel B of Table 2.7, the coefficients of PVSO and TSO holdings are 130.01 and 103.50, respectively (Column 6). However, the following Wald test fails to confirm that the difference between PVSO and TSO holding is significant. Overall, I find weak evidence that debt-holders are more sensitive to CEO holdings of performance vested stock options (PVSOs) than traditional stock options (TSOs), and thereby require a higher rate of return if a firm uses more PVSOs to compensate its CEOs. These results support my fourth hypothesis (H4): PVSOs outweigh TSOs in terms of increasing the cost of borrowing.

2.6.5. Comparison between stock options and ownership

As described in Section 2.3.5, I would like to see whether debt-holders will consider CEO stock options and ownership differently. Because of the different pay-off structures between stock options and ownership, the downside risk of share price is relatively low for stock options compared with ownership. Hence I predict that stock options will create a stronger incentive for risk-taking compared with ownership. And creditors may consequently charge a higher price for stock options than ownership.

The results are shown in Table 2.7. As expected, and in line with previous research (e.g. Ortiz-Molina, 2006), the coefficients for option holdings and ownership are both positive and highly statistically significant in pooled regressions (columns 1 and 2 of Panel A) and separate regressions (columns 3 and 4 of Panel A). This further confirms that both option holdings and ownership lead to a higher cost of debt, likely by aligning interests of shareholders and CEOs. In column 2, I examine whether the increase in the cost of debt is similar between option holdings and ownership. The coefficient of option holdings is 293.65, while that of ownership is only 25.97. The Wald test confirms that the difference between these coefficients is statistically significant (p value is less than 0.00). In Panel B of Table 2.7, fixed effects regression is employed as the alternative model. In column 2, the coefficients of ownership and option holding are 5.13 and 35.47, respectively. However, the Wald test fails to confirm such a difference is statistically reliable. In short, the results mentioned above provide some supports for my fifth hypothesis (H5): although both ownership and option holdings have the same qualitative effects of increasing the cost of debt, higher CEO option holdings are seen by the market as a much stronger signal that a CEO will act in the interests of shareholders, to the detriment of debt-holders.

2.6.6. Restricted shares

The last pay component I analyse is restricted shares. The results are presented in Tables 2.5, 2.6 and 2.7. In hypothesis (H6), I argue that restricted shares may increase borrowing costs. However, the relationship between restricted shares and the cost of debt is not confirmed by my results. In all the regressions for equity-like compensation, including forms of annual and accumulated compensation, restricted share grants or holdings seem to have no effect on bond yield spread. This result is consistent across

different measures of compensation (Tables 2.5 and 2.6) and is supported by the estimates for restricted share holdings in Table 2.7. It seems that debt-holders are indifferent with restricted shares. The incentives for risk-seeking or risk-avoiding from restricted shares are still unclear.

2.6.7. Pension and credit quality

One of the main findings of my study so far is that, while equity-based compensation can lead to a higher cost of debt by exacerbating the conflict between shareholders and debt-holders, pension appears to have the opposite effect in mitigating this conflict.

I further investigate the relationship between CEO pensions and the cost of debt by taking into account the riskiness of corporate bond. An incentive to reduce the riskiness of the debt, provided to a CEO, is most likely to be effective when this risk is sizable enough. For firms that already have very low credit risk, the additional incentives provided by CEO compensation are likely to be less important than for companies that pay a substantial premium to debt-holders to compensate for their credit risk. Therefore, if the negative relationship that I observe in Tables 2.5 and 2.6 between the amounts of debt-like CEO compensation (pension) and the yield spread is indeed driven by the incentive effects of CEO pensions, I should expect that this relationship will be stronger for poor-rated bonds.

I test this hypothesis in Table 2.8. In columns 1 and 2, I consider the effects of total accumulated pension by employing the pension-to-equity ratio, similar to the measurement used by Wei and Yermack (2011). As expected, both coefficients are negative and statistically significant. The more debt-like wealth (pension) a CEO has relative to his or her equity holding, the more his or her interests are aligned with those

of debt-holders, and the lower the costs of debt financing will be. From columns 3 to 8, I focus on the effectiveness of pension as a risk-avoiding incentive among lower and higher rated bonds. If pension provides a CEO with risk-avoiding incentives, such incentives will be stronger when the default risk is high (low bond rating in this case). I find that the coefficients for interaction variables of incremental pension and low bond rating (columns 3 and 4) and pension-to-equity ratio and low bond rating (columns 5 and 6) are negative and highly significant. This suggests that the incentive effect of pension, found in Tables 2.5 and 2.6, are mostly concentrated among lower-rated, riskier bonds. To confirm this, I conduct an analysis on the subsample of 91 observations whose bond ratings are below investment grade. The results are reported in columns 7 and 8 of Table 2.8. I find that both pension increment and pension-to-equity ratio have a significant negative impact on the costs of debt among lower rated bonds.

Overall, this analysis strongly supports my second hypothesis (H2), that higher levels of defined benefit pension lead to a lower cost of debt. This result is likely to be driven by the fact that pension aligns the interests of outside debt-holders (e.g. bondholders) and inside debt-holders (CEOs with pension).

Table 2.7 Accumulated equity incentives, ownership and the cost of debt

Panel A OLS regression

Results of ordinary least squares regression of the bond yield spread on accumulated equity incentives and ownership for 150 observations. All variables are defined in Table 2.1. Coefficients for industry and year dummies are included but not reported. The *t*-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5%, and 1% level, respectively.

Variables	Exp. Sign	(1)	(2)	(3)	(4)	(5)	(6)
Intercept		123.66	125.97	270.10***	377.65***	472.11***	339.15***
		(1.37)	(1.47)	(3.51)	(4.78)	(5.33)	(4.22)
Ownership	(+)	25.99***	25.97***	26.18***			
		(6.96)	(7.00)	(6.86)			
Option Holding	(+)	293.17***	293.65***		346.28***		
		(4.23)	(4.67)		(4.77)		
Restricted Share Holding	(+)	10.47				-40.49	
		(0.09)				(-0.28)	
TSO Holding	(+)						153.20
							(1.24)
PVSO Holding	(+)						460.57***
							(4.57)
Rating Residual	(-)	-24.05***	-24.04***	-20.80***	-15.86***	-13.09**	-11.05**
		(-5.02)	(-5.04)	(-4.27)	(-3.10)	(-2.38)	(-2.20)
Bond Size	(-)	-15.60**	-15.57**	-13.74*	-23.51***	-21.28**	-20.04**
		(-2.18)	(-2.18)	(-1.89)	(-3.05)	(-2.54)	(-2.60)
Duration	(-)	0.04	0.07				
		(0.01)	(0.02)				
Firm Size	(-)	-9.21	-9.29	-21.94***	-32.26***	-40.93***	-28.89***
		(-1.14)	(-1.16)	(-2.79)	(-3.98)	(-4.76)	(-3.55)
Debt Ratio	(+)	2.09***	2.09***	2.38***	1.75***	2.21***	1.89***
		(4.12)	(4.21)	(4.56)	(3.08)	(3.60)	(3.41)
Profitability	(-)	1.43	1.44				
		(1.09)	(1.11)				
Market-to-Book Ratio	(-)	-30.82***	-30.99***	-26.51***	-19.13*	-32.12***	-16.36
		(-2.63)	(-2.70)	(-2.94)	(-1.92)	(-3.99)	(-1.63)
Risk	(+)	4.95	4.91				
		(1.57)	(1.58)				
Adjusted R^2		0.62	0.63	0.55	0.48	0.39	0.50
Wald Tests			H_0: $\beta_{ownership}=\beta_{Option\ Holding}$				H_0: $\beta_{TSO\ Holding}=\beta_{PVSO\ Holding}$
Chi Square (p-value)			15.02***(0.00)				3.08*(0.08)

Table 2.7 (Continued)

Panel B Fixed effects regression

Results of fixed effects regression of the bond yield spread on annual compensation components for 150 observations. Fixed effects apply to cross-section (44 firms) effect. Year dummies is included but not reported. All variables are defined in Table 2.1. The *t*-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5%, and 1% level, respectively.

Variables	Exp. Sign	(1)	(2)	(3)	(4)	(5)	(6)
Intercept		798.61**	816.46**	1092.78***	1115.09***	1107.49***	1093.17***
		(2.23)	(2.29)	(3.26)	(3.35)	(3.33)	(3.28)
Ownership	(+)	3.01	5.13	4.87			
		(0.31)	(0.55)	(0.58)			
Option Holding	(+)	33.38	35.47		107.00**		
		(0.61)	(0.66)		(2.01)		
Restricted Share Holding	(+)	183.65				138.75	
		(1.17)				(1.00)	
TSO Holding	(+)						103.50
							(1.43)
PVSO Holding	(+)						130.01
							(1.28)
Rating Residual	(-)	-19.32***	-17.61***	-45.30***	-42.89***	-45.51***	-44.17***
		(-3.36)	(-3.16)	(-5.15)	(-3.10)	(-5.33)	(--5.10)
Bond Size	(-)	-22.08	-25.31	-22.26	-25.53	-21.34	-22.29
		(-1.19)	(-1.38)	(-1.37)	(-1.54)	(-1.29)	(-1.33)
Duration	(-)	16.35**	16.83**	8.17	9.70	8.06	8.81
		(2.10)	(2.16)	(1.12)	(1.32)	(1.10)	(1.17)
Firm Size	(-)	-84.85**	-85.58**	-107.78***	-112.87***	-110.42***	-109.82***
		(-2.23)	(-2.25)	(-3.05)	(-3.21)	(-3.16)	(-3.11)
Debt Ratio	(+)	1.48**	1.48**	0.97*	0.94	0.93	0.88
		(2.43)	(4.42)	(1.69)	(1.66)	(1.63)	(1.52)
Profitability	(-)	-2.19	-2.38	-4.45**	-3.65**	-4.09**	-3.99**
		(-1.22)	(-1.33)	(-2.61)	(-2.22)	(-2.46)	(-2.35)
Market-to-Book Ratio	(-)	-26.86	-24.04	-18.77	-21.61	-20.67	-19/85
		(-1.22)	(-1.10)	(-0.94)	(-1.07)	(-1.04)	(-0.97)
Risk	(+)	1.37	1.63	1.29	0.61	0.75	0.75
		(0.56)	(0.67)	(0.58)	(0.29)	(0.36)	(0.36)
Adjusted R^2		0.90	0.90	0.91	0.91	0.91	0.91
Wald Tests			H_0: $\beta_{ownership}=\beta_{Option\ Holding}$				H_0: $\beta_{TSO\ Holding}=\beta_{PVSO\ Holding}$
Chi Square (p-value)			0.32(0.57)				0.04(0.84)
Cross-section Tests							
Chi Square (p-Value)		261***(0.00)	282***(0.00)	283***(0.00)	340***(0.00)	350***(0.00)	301***(0.00)

Table 2.8 Pensions, credit quality and the cost of debt

Results of ordinary least squares regression of the bond yield spread on annual compensation components. All variables are defined in Table 2.1. The last two columns are estimated only for observations with low bond ratings. Coefficients for industry and year dummies are included but not reported. The *t*-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5%, and 1% level, respectively.

Variables	Exp. Sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept		453.58***	425.00***	495.63***	440.59***	457.18***	346.18***	947.41***	955.89***
		(4.80)	(5.15)	(5.49)	(6.00)	(4.94)	(5.02)	(5.85)	(5.73)
Incremental Pension	(-)			1.92*	2.06**			-1.67***	
				(1.93)	(2.10)			(-2.77)	
Pension to Equity	(-)	-34.99**	-37.93*			33.06	46.46		-46.64**
		(-2.13)	(-2.34)			(1.05)	(1.50)		(-2.32)
Low Rating* Incremental Pension	(-)			-4.00***	-4.12***				
				(-3.66)	(-3.82)				
Low Rating* Pension to Equity	(-)					-88.61**	-106.6***		
						(-2.52)	(-3.10)		
Rating Residual	(-)	-17.62***	-21.43***	-20.24***	-20.86***	-20.22***	-25.84***	-25.90***	-26.72***
		(-3.13)	(-4.37)	(-3.79)	(-3.96)	(-3.60)	(-5.38)	(-3.52)	(-3.51)
Bond Size	(-)	-16.12*	-20.00**	-12.55		-12.72		-15.13	-14.82**
		(-1.94)	(-2.53)	(-1.59)		(-1.54)		(-1.25)	(-1.19)
Duration	(-)	-6.07		-1.67*	-8.24**	-5.19		-22.41***	-22.67***
		(-1.52)		(-1.70)	(-2.32)	(-1.32)		(-3.91)	(-3.86)
Firm Size	(-)	-36.39***	-37.07***	-43.16***	-36.95***	-39.56***	-32.32***	-85.62***	-86.40***
		(-4.09)	(-4.43)	(-5.01)	(-5.17)	(-4.49)	(-4.42)	(-5.49)	(-5.37)
Debt Ratio	(+)	1.83***	1.69***	2.06***	2.03***	2.01***	1.83***	3.40***	3.45***
		(3.05)	(2.87)	(3.64)	(3.64)	(3.39)	(3.12)	(4.30)	(4.21)
Profitability	(-)	-0.33		0.41		-0.04		-5.85**	-6.51**
		(-0.22)		(0.28)		(-0.02)		(-2.35)	(-2.53)
Market-to-Book Ratio	(-)	-22.70*	-21.25**	-27.29**	-27.25***	-23.89*	-22.52**	-16.99	-14.93
		(-1.64)	(-2.05)	(-2.07)	(-2.71)	(-1.76)	(-2.20)	(-0.72)	(-0.61)
Risk	(+)	0.62		-0.86		-0.01		-1.85	-1.40
		(0.17)		(-0.25)		(-0.02)		(-0.33)	(-0.25)
No. of obs.		150	150	150	150	150	150	91	91
Adjusted R^2		0.45	0.46	0.51	0.51	0.48	0.47	0.60	0.58

2.7. Conclusions

In this chapter I examine whether and how different CEO pay components affect firms' borrowing costs. I expect to observe a negative relationship between pay components that generate risk-avoiding incentives and the cost of debt, and a positive relationship between the borrowing cost and pay components that motivate CEOs to seek more risks. I consider all four common pay components: bonus, pension, stock options and restricted shares. I take the advantage of the extensive compensation disclosure requirements in the UK by using UK data for the period of 2003-2006. My findings are in general consistent with my expectations.

First of all, I document that debt-like compensation (defined benefit pension) and cash bonuses reduce borrowing costs. The existence of defined benefit pensions makes CEOs potential debt-holders of firms. It naturally aligns interests of CEOs and other debt-holders. Therefore, borrowing costs are lower for firms that provide more defined benefit pension to CEOs. In addition, most of this effect is concentrated among lower-rated bonds, where the default risk is high and the risk-reducing incentives are more desirable. In the case of cash bonuses, their main goal is to motivate CEOs to focus on short-term profitability (such as annual earnings). Consequently, it may discourage CEOs from seeking long-term risky investment projects. Hence, cash bonuses provide certain levels of risk-avoiding incentives, which I show to be favorably priced by debt-holders. My result is consistent with Duru, Manshaw and Reeb (2005). The main difference is the proxy for bonus. They adopt the log of cash bonus (the absolute value), while I use the percentage of cash bonus as total compensation (the relative value). My result may provide further implication from the view of pay structure.

Secondly, I find that firms with a high level of stock options granted to their CEOs are severely punished by the debt market. Theoretically, stock options and restricted shares are expected to link CEO wealth with that of shareholders. This may motivate CEOs to take excessive risks at the expense of debt-holders. As a result, a higher level of stock options and restricted shares grants are expected to lead to a higher cost of debt. I find a strong positive relationship between bond yield spread and the level of CEO stock option holdings and grants. Moreover, the effect of stock options on bond yields is found to be much stronger than that of CEO ownership. These results are consistent with US studies (e.g. Ortiz-Molina, 2006; Brockman, Martin and Unlu, 2010). As far as restricted shares are concerned, I do not find evidence that the cost of debt is positively related to restricted shares of CEOs

Finally, I split stock options into two categories: performance-vested stock options (PVSOs) and traditional stock options (TSOs). I argue that the performance-vested targets on stock options may further motivate CEOs to take excessive risks to meet these targets, which will further jeopardize bondholders' interests. Hence, PVSOs should outweigh TSOs in terms of increasing the cost of debt. I show that debt-holders do react differently to performance-vested stock options and traditional stock options. CEOs with relatively more performance-vested stock options holdings face a higher cost of borrowing, which confirms my hypothesis.

Overall, my study shows that the capital market rationally considers the impact of various CEO pay components on managerial risk-taking when pricing publicly traded debts. Consequently, optimally adjusting CEO compensation structure can be a useful tool in reducing a firm's borrowing cost.

Chapter 3 CEO Compensation and Expectations Management

3.1. Introduction

A recent survey by Graham, Harvey and Rajgopal (2005) indicates that top managers are truly concerned with meeting or beating financial analysts' earnings expectations. This primarily comes from the importance that top managers place on share price changes after news of reported earnings meeting or beating analysts' forecasts, or failing to do so. CEOs can meet or beat analysts' expectations either by inflating earnings numbers (e.g. Degeorge, Patel and Zeckhauser, 1999) or dampening analysts' earnings forecasts (e.g. Burgstahler and Eames, 2006). The former type of activity is popularly known as earnings management and has been extensively investigated in a variety of contexts. On the other hand, there is a growing research interest in the second type of activity, commonly known as expectations management. It follows from the remarkable discovery that analysts' forecasts exhibit an optimistic-pessimistic (also called walk-down) pattern: beginning-of-period forecasts are predominantly optimistic, while end-of-period forecasts are mostly pessimistic (e.g. Bernhardt and Campello, 2007).

Little enough is known about the causes of this phenomenon. Studies by Matsumoto (2002) and Cotter, Tuna and Wysocki (2006) show that managers guide analysts' forecasts downwards in order to avoid missing market expectations for earnings. Researchers are now examining what circumstances may encourage managers to engage in such an opportunistic activity. Kross, Ro and Suk (2010) find that managers are more likely to issue "bad news" managerial forecasts if their firms have a record of meeting or achieving market expectations consistently. Richardson, Teoh and Wysocki (2004) document that end-of-period forecast pessimism is more likely to occur towards

new equity issues and insider sales subsequent to a firm's earnings announcements. My purpose is to explore this optimistic-pessimistic forecast pattern further by examining CEO compensation. Specifically, I investigate whether a higher compensation creates a stronger incentive for CEOs to engage in expectations management.

Although CEO compensation may be an interesting context in which to evaluate whether the pattern of initial optimism and final pessimism has anything to do with expectations management, studies rarely focus on this issue. Aboody and Kasznick (2000) were among the first to investigate whether CEOs manage market expectations by influencing the timing of voluntary disclosures around stock options grants. They find that CEOs who receive their stock options before earnings announcements are more likely to issue "bad news" forecasts and less likely to issue "good news" forecasts. In another study, Cheng and Warfield (2005) document that shares and stock options grants are positively related to the incidence of meeting or just beating financial analysts' forecasts.

In this study, I focus on expectations management in the UK. An analysis of UK firms offers an attractive avenue to undertake such research for a variety of reasons. First of all, Brown and Higgins (2005) observe that expectations management is more prevalent in countries where a strong investor protection environment puts heavy emphasis on share prices and limits managers' ability to inflate earnings numbers. In their study, UK is on the top league of the prevalence of expectations management among industrialised courtesies. Athanakasakou, Strong and Walker (2009) also document that UK firms are more likely to adopt expectations management rather than earnings management in order to meet or beat analysts' forecasts. The underlying reasons behind the prevalence

of expectations management in the UK remain largely unknown. Secondly, most of equity-based compensation in the UK is conditionally vested. A survey by KPMG (2007) finds that UK directors' restricted shares and stock options are often related to the accounting profitability (e.g. EPS growth) as well as stock return (e.g. total shareholders return). Such features may provide strong incentives for UK directors to avoid missing financial analysts' earnings forecasts. Because the literature documents a strong negative stock price reaction to firms which fail to achieve the market expectations (e.g. Bhojraj, Hribar, Picconi and McInnis, 2009). If expectations management is able to help CEOs to achieve market expectations, UK CEOs may have incentives to do so.

I perform robust cross-sectional regression analysis to investigate whether CEO compensation encourages expectations management. The literature documents that CEO bonuses will suffer greatly if firms fail to achieve market expectations (e.g. Matsunaga and Park, 2001). Stock options exercises and insider sales are also found to be positively related to the use of expectations management to meet or beat financial analysts' earnings forecast (e.g. Richardson, Teoh and Wysocki, 2004). Therefore, I focus on three variable pay components that are most likely to prop up expectations management: bonuses, stock options and restricted shares. As for expectations management, I use a wide variety of measures commonly used in the literature.

The results of my analysis show that CEOs are more likely to engage in expectations management when they have a relatively high proportion of equity-based compensation (stock options and restricted shares that are to be vested soon after earnings announcements). The relationship is stronger when CEOs already possess a high level

of ownership. On the other hand, I document a negative relationship between bonuses and the incidence of expectations management. A possible explanation is that bonuses are mainly accounting performance based. CEOs may intend to employ alternative methods (e.g. earnings management) rather than expectations management, in order to achieve market expectations.

The rest of this chapter is structured as follows. In Section 3.2, I review the prior literature. The hypotheses are developed in Section 3.3. Section 3.4 discusses the methodology of this study. In Section 3.5, I describe the data. The empirical results are presented in Section 3.6. I conclude this chapter in Section 3.7.

3.2. Literature review

3.2.1. CEO compensation

It is widely acknowledged that appropriate compensation may help to reduce the principal-agent problem by aligning interests of shareholders and managers (e.g. Aggarwal and Samwick, 1999). Equity-based compensation (stock options and shares) is intended to take a leading role in this alignment.

In the UK, most equity-based compensation is conditionally vested. A survey by KPMG (2007) documents that CEOs' restricted shares and stock options are often related with a vesting condition which is based on prescribed total shareholder return (TSR). The literature also suggests that both of accounting and stock based performance targets should be considered in executive compensation package (e.g. Lambert, 1993 and Murphy, 1999). Stock price is forward-looking and a good indicator for shareholders' wealth. Hence by linking CEO compensation with stock price is able to

encourage top managers to create values for shareholders. However, stock price is noised and not only affected by managerial contributions and behaviour (e.g. internet bubble in 1990s' and the financial crisis since 2007). To reduce the noise in stock price, accounting performance is an alternative benchmark to make managerial actions accountable. Another important feature of UK CEO pay is the relatively long vesting period: most restricted shares and stock options can only be vested three years after the initial grant (KPMG, 2007). These strict vesting conditions and the long vesting period upon equity-based compensation are expected to strengthen the pay-for-performance relationship.

3.2.2. Expectations management

Expectations management refers to the practice of managers purposefully dampening analysts' earnings forecasts to produce a positive earnings surprise or avoid a negative earnings surprise upon the release of earnings announcements (Bartov, Givoly and Hayn, 2002). From an interview with US CFOs, Graham, Harvey and Rajgopal (2005) report that several firms use earnings guidance to ease the analyst's job in computing earnings forecasts. Matsumoto (2002) finds that the last consensus earnings forecasts prior to earnings announcements tend to be pessimistically biased. This suggests that expectations management may guide the final consensus earnings forecast downward, making it "beatable". Bernhardt and Campello (2007) trace the path of analysts' forecast revisions and find that forecasts become "pessimistic" step by step, from the beginning to the end of the period. They describe such a revision path as a revolution that is possibly caused by expectations management.

CEOs can use various channels to disclose information for possible expectations management. The public channels CEOs can use include managerial forecasts, press conferences, profit warnings and so on. Cotter, Tuna and Wysocki (2006) find that analysts react to managerial forecasts quickly and are more likely to issue a final "beatable" forecast afterwards. CEOs can also use private channels of information disclosure to affect analyst forecasts. Based on a case study of UK firms, Holland (2005) observes that CEOs can organize certain private or semi-private meetings with analysts to explain firm policies, discuss public issues and so on. Ivkovic and Jegadeesh (2004) find that the value of analyst forecast revision comes more from financial analysts' different channels for collecting private information rather than a better ability to interpret the public information.

CEOs may find it particularly advantageous to resort to disclosures that can influence analysts' forecasts. Firstly, expectations management is relatively under-regulated compared with earnings management. It is not against any implicit financial reporting rules and bears relatively lower costs. Secondly, analysts have their own incentives to promptly incorporate information from insiders into their forecast revisions. For example, Hong, Kubik and Solomon (2000) find that forecast accuracy is positively related to the likelihood of analysts' promotion. Therefore, analysts are motivated to quickly incorporate insiders' disclosures into their forecast revisions. Thirdly, Langberg and Sivaramakrishan (2008) argue that analysts are less suspicious of insiders' "bad news" disclosures than those of "good news". Considering that expectations management aims to dampen analysts' forecasts via "bad news" disclosures, analysts are more likely to adjust their forecasts in such circumstances.

3.2.3. CEO compensation and expectations management

The nature of expectations management is to opportunistically use information disclosure to dampen market expectations. To establish such a link, two conditions are vital: (1) CEO compensation provides incentives for certain types of disclosure; and (2) CEOs have the opportunity to control the disclosure.

CEOs naturally lack the incentive to disclose information to outsiders, because such information may be used to monitor and discipline CEOs themselves (e.g. Bushman and Smith, 2001). CEOs may also prefer to release "good news" rather than "bad news" because of the natural market reactions to news with different content (e.g. Kasznik and Lev, 1995). However, recent studies suggest that managerial voluntary disclosure can be dramatically affected by CEOs' equity-based compensation. Nagar, Nanda and Wysocki (2003) investigate the relationship between managers' disclosure activities and their stock price-based incentives. Using 1,109 US firm observations from 1995 to 1997, they find that both managerial forecast frequency and analysts' subjective ratings of disclosure practice are positively related to CEOs' equity incentives. Hence they argue that stock-based incentives encourage the voluntary disclosures of "good news" but not hold the "bad news" release. The reason is that, as they explain, equity-based compensation ties CEOs' wealth to stock price. The market reacts negatively to the "silence" of "bad news", penalizing share price as well as top managers' equity-based compensation. That is why equity-based compensation may encourage not withholding the release of "bad news". Therefore, equity incentives align interests of shareholders and CEOs on the issue of voluntary disclosure. However, Baik, Kang and Morton (2010) provide evidence that managerial ownership actually provides an incentive to create information opacity. Based on 26,000 US firm-years from 1988-2002, they

document that managerial ownership is negatively related to the accuracy of analysts' consensus forecasts and coverage. They argue that managerial entrenchment leads to a less transparent disclosure environment, jeopardizing shareholders' interests.

CEOs may also have opportunities to manipulate disclosures for their own interests. They control the time, content and target audience of voluntary disclosure. Considering that expectations management uses disclosure to dampen analysts' earnings forecasts, CEOs are capable of controlling expectations management for opportunistic objectives. I now discuss the specific link between CEO compensation and expectations management, and develop hypotheses.

3.3. Hypotheses development

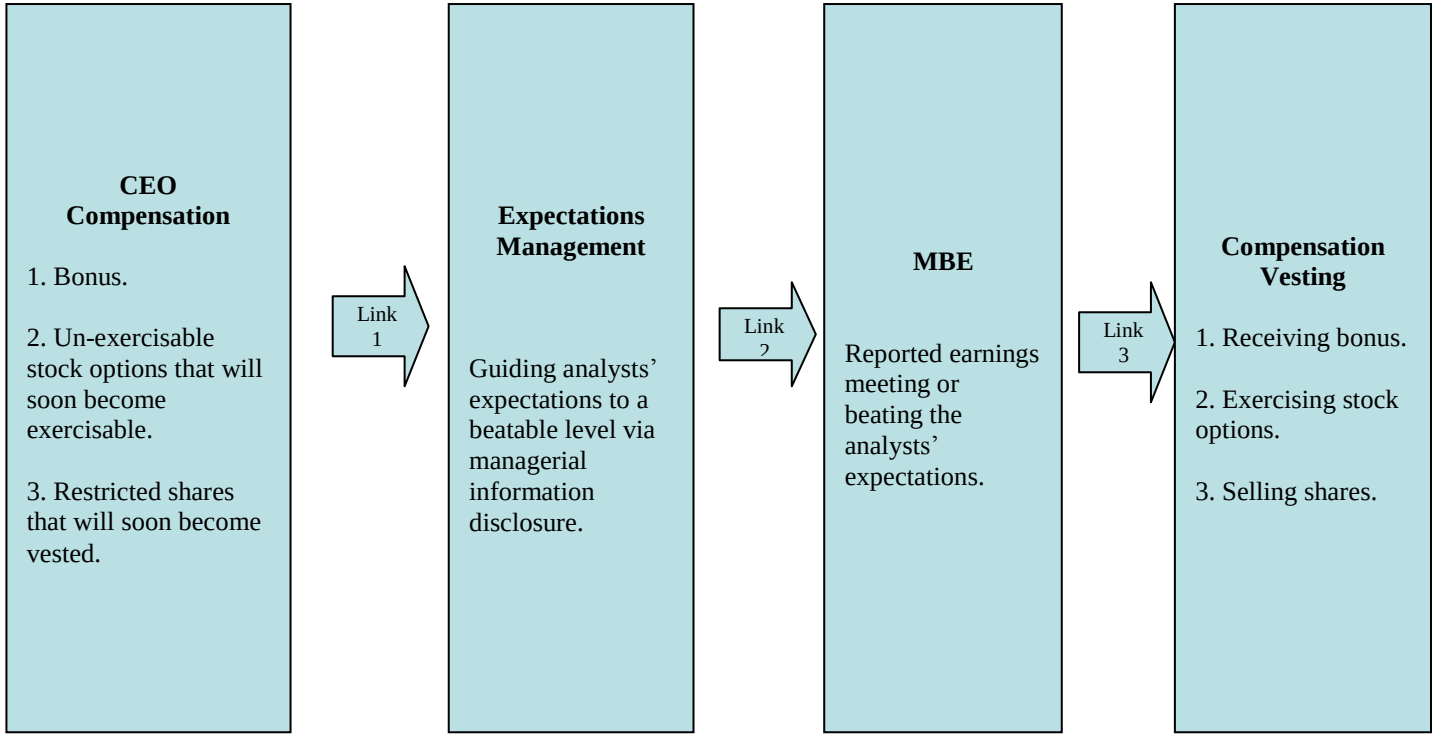
The ideas linking CEO compensation with expectations management are graphically presented in Figure 3.1. It is safe to assume that a CEO knows the bonus plan and the vesting schedule of stock options and restricted shares, because all such information is documented in the remuneration contract in advance. Hence, at the beginning of a year, a CEO is able to plan his or her effort and activities so as to receive bonuses, exercise stock options or sell shares after current year's earnings announcement. CEOs have incentives to receive the maximum bonuses and exercise stock options or sell owned shares at a good price. If expectations management is able to help CEOs to achieve their interests, they have a strong incentive to employ it. I hypothesize that link 1 exists and expectations management will actually help CEOs to maximize their wealth. Secondly, successful expectations management will lower market expectations, making the reported earnings more likely to meet or beat market expectations (see link 2). Thirdly, the market tends to interpret meeting or beating market expectations (MBE) as "good

news", and react positively (e.g. Bhojraj, Hribar, Picconi and McInnis, 2009). Such a positive reaction will justify a CEO's bonus, as well as boost the share price, which makes CEO stock options exercise and shares sale more profitable (see link 3). Therefore, expectations management is assumed to be an effective way to benefit a CEO's personal wealth. In other words, CEOs may employ expectations management for personal interests. This justifies the existence of link1.

3.3.1. Cash bonus

Annual cash bonus may provide incentives for expectations management. Matsunaga and Park (2001) investigate the effects of missing analysts' consensus forecast on CEOs' annual bonus. Analysing US data from 1993-1997, they find that the change in a CEO's bonus is lower when a firm misses the quarterly earnings forecast. This suggests that CEOs' bonuses may suffer from an incremental penalty if a firm fails to achieve market expectations. There are several possible explanations for this phenomenon. First of all, the compensation committee may view missing market expectations as a signal of poor managerial efforts, and penalize CEOs in response. Graham, Harvey and Rajgopal (2005)'s survey indicates that the capital market interprets missing market expectations as CEOs having little control over their firm performance. Hence the subsequent penalties on bonuses may be justified. On the other hand, achieving market expectations is viewed as a good sign of CEOs' credibility and efforts. It helps the compensation committee to justify their high bonus payment to top managers, overcoming the political constraints on CEO compensation (e.g. Jensen and Murphy, 1990). Thirdly, the compensation committee may tie the penalty on bonuses to missing market expectations. By doing so, CEOs are encouraged to voluntarily disclosure more accurate and detailed information to shareholders, limiting information asymmetry.

Figure 3.1 Theoretical links between CEO compensation and expectations management



The potential penalty on bonus if a firm fails to achieve market expectations may also motivate CEOs to "truthfully" communicate with analysts in order to generate more accurate earnings forecasts. Therefore, I expect that bonuses received by a CEO provide a strong incentive to avoid missing the market expectations. My hypothesis is:

H7: CEOs with more cash bonus are more likely to meet or beat market expectations.

Expectations management may lower market expectations through managerial information disclosure. These empirical studies also find that expectations management helps CEOs to meet or beat market expectations (e.g. Baik and Jiang, 2006). Therefore, I also expect a positive relationship between CEO bonus and the incidence of expectations management. My next hypothesis is developed as follows:

H8: CEOs with more cash bonus are more likely to conduct expectations management.

3.3.2. Stock options and restricted shares

Stock options and restricted shares may be also related with the likelihood of expectations management. First of all, CEOs have the incentive to exercise stock options or selling shares shortly after earnings announcements. Since an important condition for exercising stock options and vesting restricted shares is based on accounting performance, CEOs may have a large amount of exercisable stock options and increasing ownership from restricted shares vesting shortly after earnings

announcements. These increasing equity incentives make CEOs' wealth more concentrated on a single asset: namely their firms' stock. It increases CEOs' risk exposure to the stock market. To diversify such a risk, CEOs have incentive to engage in insider sales, lowering their equity incentives. Based on a large US sample from 1993 to 2000, Cheng and Warfield (2005) find that un-exercisable stock options and ownership are positively related with insider sales within six months after earnings announcements. Hence, stock options and restricted shares are sensitive to stock price movement shortly after earnings announcements.

Secondly, CEOs actively create "good news" prior to insider sales. Bartov and Mohanram (2004) show that CEOs have private information that can be used to predict future stock price. Using 17,970 CEO stock option exercise observations from 1992-2001, they document that CEOs manipulate earnings before large stock options exercise, so as to increase the cash payout of stock options exercises. Hillier and Marshall (2002) focus on UK data from 1992 to 1996 and find that CEOs sell abnormally more after "good earnings news". They interpret that CEOs have private information about the infomativeness of earnings and exploit the stock market in the following insider trading.

Thirdly, expectations management helps to increase the probability of earnings to achieve market expectations, which is interpreted as "good news" by the market. Baik and Jiang (2006) examine the role of expectations management on achieving market expectations. Based on their 5,703 observations in US from 1995 to 2002, they show that 53.3% of observations meet or exceed market expectations following managerial forecast. In contrast, the sub-sample without managerial forecast shows only 33.5% of

observations were able to beat market expectations. Hence they argue that expectations management is an effective way to meet or beat financial analysts' earnings forecasts.

In short, CEOs' stock options exercise and insider sales after earnings announcements may motivate expectations management (e.g. Richardson, Teoh and Wysocki, 2004). Such insider sales are more likely to link with two particular equity-based compensation components: the un-exercisable stock options and restricted shares which will be vested in the following fiscal year (after current fiscal year's earnings announcement). In other words, these two components may provide strong incentives for expectations management. I formulate hypotheses as follows:

H9: CEOs with more equity compensation (stock options and restricted shares) which will be vested in the following year are more likely to meet or beat market expectations.

H10: CEOs with more equity compensation (stock options and restricted shares) which will be vested in the following year are more likely to conduct expectations management.

3.4. Methodology

3.4.1. Measurement of CEO compensation

In this study I focus on three CEO pay components: bonuses, stock options and restricted shares. Bonus is measured as a fraction of cash bonus in CEO total compensation, which is the sum of salary, bonuses, and the estimated value of stock options and shares received during a fiscal year. Such a measurement is to address the

relative importance of cash bonus in total annual compensation. A bigger weight of cash bonus in CEO annual compensation indicates a stronger incentive for top managers to maximize his or her cash bonus. As far as stock options and restricted shares are concerned, I use the number of shares of each equity incentives scaled by a firm's total shares outstanding. In addition, dummy variables for bonuses, stock options and restricted shares are also introduced. All compensation variables are defined in panel A of Table 3.1

3.4.2. Measurement of expectations management

A. Bartov's method

Since managerial voluntary disclosures are not always publicly available, and surely not ones with the intention to influence market expectations, it is common practice in the literature to consider analysts' forecast revisions to be the main indicator of expectations management. Following Bartov, Givoly and Hayn (2002) and Brown and Higgins (2005), I calculate the following method to capture the possible expectations management. CEOs are more likely to dampen analysts' expectations if they observe "optimism" among analysts. The magnitude of this optimism can be captured by analysing forecast errors. A dummy variable (Optimism) is calculated as follows:

$$Optimism_{i,t} = 1 \text{ if } FE_{i,t} < 0; \text{ Otherwise} = 0. \quad (2)$$

Where FE is the forecast error defined as the difference between the reported earnings per share ($EPS_{i,t}$) and the consensus forecast that prevailed at the beginning of the year ($AFE_{i,t}$), deflated by the firm's share price 12 months prior to earnings announcement

(Price $_{i,t-1}$). The deflator is used to control any potential spurious relationship resulting from cross-sectional scale differences in earnings per share.

Managerial disclosure activities to dampen analysts' expectations will typically result in a downward forecast revision from the beginning to the end of the year. A dummy variable (DOWN) is calculated to capture such downward forecast revisions as follows:

$$Down_{i,t} = 1 \text{ if } REV_{i,t} < 0; \text{ Otherwise} = 0. \quad (3)$$

Where $REV_{i,t}$ is forecast revision defined as the difference between the latest consensus forecast prior to the earnings announcement ($AFL_{i,t}$) and the consensus forecast at the beginning of the year ($AFE_{i,t}$), deflated by the share price 12 months prior to earnings announcement (Price $_{i,t-1}$).

Successful expectations management increases the likelihood of reported earnings meeting or beating analysts' expectations. In other words, the final reported earnings will exceed the last consensus earnings forecast prior to the earnings announcement. Therefore, a dummy variable (MBE) is calculated as follows to measure whether the reported earnings meet or beat the market expectations:

$$MBE_{i,t} = 1 \text{ if } ES_{i,t} \geq 0; \text{ Otherwise} = 0. \quad (4)$$

Where ES is the amount of earnings surprise defined as the difference between the reported earnings per share ($EPS_{i,t}$) and the latest consensus forecast prior to the earnings announcement ($AFL_{i,t}$), deflated by the share price 12 months prior to earnings

announcement (Price $_{i,t-1}$). I also construct a stringent proxy of expectations management that is a combination of these above mentioned individual constructs: Optimism, Down and MBE. A dummy variable (EM_Bartov) is defined as follows:

$$EM\_Bartov_{i,t} = 1 \text{ if } Optimism_{i,t}, \ Down_{i,t} \text{ and } MBE_{i,t} = 1 \text{ ; Otherwise} = 0. \quad (5)$$

This new proxy variable suggests that CEOs are highly likely to conduct expectations management when those following conditions are met: (1) there is analysts' optimism at the beginning of a year (reported earnings are less than the first consensus forecast); (2) there is a downward forecast revision from the beginning of the year to just before the earnings announcement (the last consensus forecast is less than the first consensus forecast); and (3) analysts' expectations are met or beaten when earnings are announced (reported earnings are greater than or equal to the last consensus forecast).

The advantage of the above mentioned proxy of expectations management is that it considers both the incentive (early analysts' optimism) and the successful consequence (meeting or beating market expectations when earnings are announced). However, these measures can still disregard a group of firms that use expectations management, yet ultimately fail to meet or beat analysts' expectations. Moreover, one can argue that the identified downward forecast revision may actually be driven by "depressed news" from the wider market and firm-specific circumstances instead of managerial opportunistic disclosures. Therefore, I also conduct another proxy to capture the possible expectations management.

B. Matsumoto's method

An alternative measurement for expectations management is developed by Matsumoto (2002) and recently adopted by Athanasakou, Strong and Walker (2009) for UK data. According to this approach, the earnings surprise component is calculated as the difference between the last consensus forecast and the expected portion of forecast that takes into account overall firm-specific and market-wide developments. I model the change in current earnings (ΔEPS_t) scaled by lagged price (P_{t-1}) as a function of two variables: prior years' change in earnings (ΔEPS_{t-1}) scaled by lagged price (P_{t-2}), and the cumulative excess return ($CRET_t$) over the current year until the latest forecast is made. The change in prior years' earnings captures the trends of earnings growth, while the cumulative excess return obtains firm-specific news over the period.

$$\Delta EPS_{i,t}/P_{i,t-1} = \alpha_1 + \alpha_2 * (\Delta EPS_{i,t-1}/P_{i,t-2)} + \alpha_3 * CRET_{i,t} + e \quad (6)$$

The above equation is employed within each industry-year. To estimate the expected change in earnings $E(\Delta EPS_t)$, I adopt parameters estimated from equation (6) and employ them in each industry-year. It is assumed that analysts can not know current year's parameters (α in equation 5). They use prior years' parameters (β) instead.

$$E(\Delta EPS_{i,t}) = [\beta_1 + \beta_2 * (\Delta EPS_{i,t-1}/P_{i,t-2)} + \beta_3 * CRET_{i,t}] * p_{t-1} \quad (7)$$

In the next step, I estimate the expected earnings forecast (EF) by using the actual prior year's earnings (EPS_{t-1}) and the expected change in earnings $E(\Delta EPS_t)$.

$$EF_{i,t} = EPS_{i,t-1} + E(\Delta EPS_{i,t}). \quad (8)$$

Finally, I compute the unexpected earnings forecast (UEF) as the difference between the last consensus's forecast (AFL) and the expected earnings forecast (EF). If the UEF is negative, it suggests that analysts' forecasts are lower than what we expected (or pessimistically biased). In such a case, I suspect that expectations management may occur. Dummy variable (EM_Matsumoto) is introduced as follows.

$$UEF_{i,t} = AFL_{i,t} - EF_{i,t} \quad (9)$$

$$EM\_Matsumoto_{i,t} = 1 \; UEF < 0 \; ; \; Otherwise = 0 \quad (10)$$

3.4.3. Testing models

Prior to establishing the direct link between CEO compensation and expectations management, I should prove that CEOs do care about market expectations, because expectations management is only one of several means available for CEOs to reach market expectations. The following basic regression model is adopted:

$$MBE_{i,t} = \alpha_0 + \beta \, Compensation_{i,t} + \sum \lambda \, Controls_{i,t} + \sum \zeta \, Industry \; dummies + \sum \upsilon \, Year \; dummies + \varepsilon \quad (11)$$

Next, I test the relationship between compensation and expectations management in the following model:

$$EM\_Bartov_{i,t} / EM\_Matsumoto_{i,t} = b_0 + \delta \, Compensation_{i,t} + \sum \rho \, Controls_{i,t} + \sum S \, Industry \; dummies + \sum \kappa \, Year \; dummies + v \quad (12)$$

Following prior studies, several control variables are included in each regression model. Earlier studies (e.g. Skinner and Sloan, 2002) find that large firms with high growth opportunity are more likely to avoid missing market expectations. Richardson, Teoh, Wysocki (2004) show that firms that report loss and have negative earnings growth have stronger incentives to reach market expectations. Matsumoto (2002) argues that several industries (such biotechnology, computers, electronics and retail) may demonstrate higher concern for market expectations because of the concern of potential litigation risk. I consider those factors. All variables are defined in Table 3.1.

3.5. Data

The data for CEO compensation is collected from BoardEx. It contains detailed information on the dates when stock options become exercisable and restricted shares are to be vested. By comparing the dates of stock option (restricted share) vesting with fiscal year end and earnings announcement dates, I can compute how many shares of stock options and restricted shares are to be vested in the following year. Analysts' forecast data is collected from International Broker's Estimate System (I/B/E/S). It reports the consensus median forecasts throughout the time horizon as well as actually earnings per share when earnings are announced. The actual date of the earnings announcement and dates for each consensus forecast are also available. Other data for control variables is collected from FAME or DataStream. The sample consists of non-financial and non-utility FTSE 350 firms from the period 2002-2006. After I match CEO compensation data from BoardEx and the consensus analysts' forecasts data from I/B/E/S files, the final sample comprises of 719 firm-year observations, representing 194 large UK publicly traded firms. The sample selection and distribution are reported in Table 3.2.

Table 3.1 Variables definitions

Panel A: CEO Compensation

Variable Name	Definition
Total Compensation	The sum of salary, bonuses, the estimated values of stock options and restricted shares grants[11] in a particular year.
Bonus	Cash bonus scaled by total compensation.
Bonus_Dummy	Dummy variable equals 1 if Bonus>0, otherwise zero.
OptionNY	The number of shares of stock options which will be vested in the next fiscal year (after this year's earnings announcement), scaled by total number of shares outstanding (DS: NOSH).
OptionNY_Dummy	Dummy variable equals 1 if OptionNY>0, otherwise zero.
ShareNY	The number of shares of restricted shares which will be vested in the next fiscal year (after this year's earnings announcement), scaled by total number of shares outstanding (DS: NOSH).
ShareNY_Dummy	Dummy variable equals 1 if ShareNY>0, otherwise zero.
EquityNY	The sum of OptionNY and ShareNY.
EquityNY_Dummy	Dummy variable equals 1 if EquityNY>0, otherwise zero.
Ownership	The number of shares owned by the CEO scaled by total number of shares outstanding (DS:NOSH).

Panel B: Control Variables

Variable Name	Definition
MV	The natural log of market capitalization (DS: MV).
Growth	The market capitalization (DS: MV) scaled by the book value of equity (DS :307).
Profitable	Dummy variable equals 1 if EPS $\geq$ 0, otherwise 0.
Chearn	Dummy variables equals 1 ΔEPS >0, otherwise 0.
Lit	Indicator variables equals 1 if a firm belongs to a high risk industry (Datastream level 6 BIOTC, CMPSV, INTNT, SOFTW, ELETR, DSCST, ERETL, HARDL, MULTI, SOFTG) including biotechnology, computers, electronics and retails (See Matsumoto 2002). Otherwise Lit equals 0.

[11] Please see the Appendix for the estimated value of stock options and restricted shares

Table 3.1 (Continued)

Panel C: Expectations management

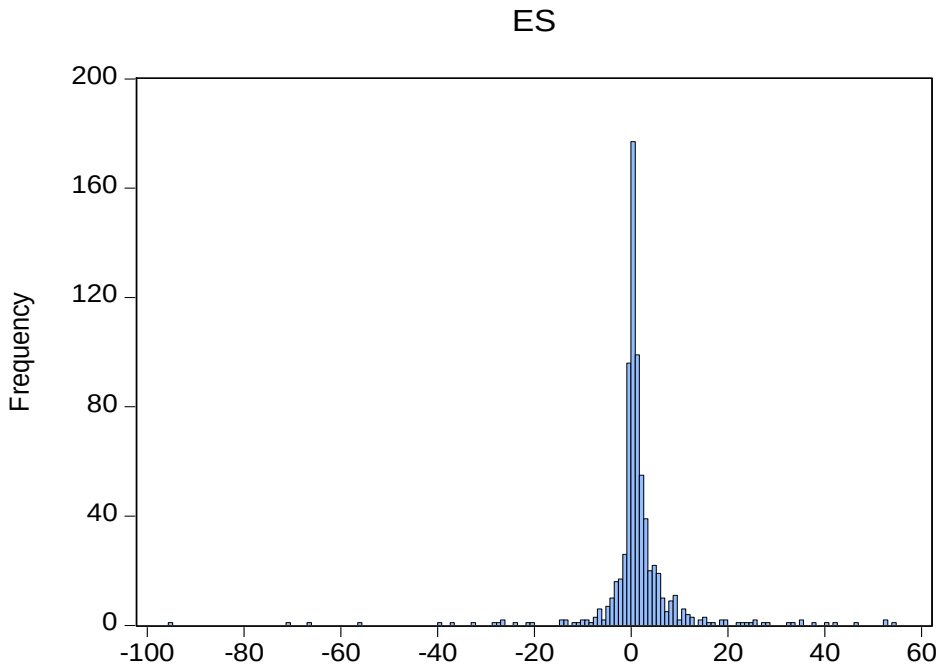
Variable Name	Definition
ES	Earnings surprise is the difference between I/B/E/S/ reported EPS and the last consensus forecast, scaled by the lag price (12 months prior to earnings announcement).
FE	Forecast error is the difference between I/B/E/S/ reported EPS and the first consensus forecast after the last year's earning announcement, scaled by the lag price(12 months prior to earnings announcement).
REV	Forecast revision is the difference between the last consensus forecast (AFL) and the first consensus forecast after the last year's earning announcement(AFE), scaled by the lag price (12 months prior to earnings announcement).
CRET	The cumulative excess monthly return following the last year's earnings announcement to the month before this year's earnings announcement. Excess return is firm return less market return (FTSE All Shares Index).
UEF	The un-expected earnings forecasts are the difference between the last consensus forecast and the "expected" forecast. The "expected forecast" is calculated by employing the regression model of change in earnings and CRET.
Optimism	Dummy variable of market optimism equals 1 if FE<0, otherwise 0.
Down	Dummy variable of expectations down equals 1 if REV< 0, otherwise 0.
MBE	Dummy variable of meeting or beating the market expectations equals 1 if ES ≥0, otherwise 0.
EM_Bartov	Dummy variable of expectations management (using Bartov's method) equals 1 if Optimism=1, Down=1 and MBE=1; otherwise 0.
EM_ Matsumoto	Indicator variable of expectations management (using Matsumoto's method) equals 1 if UEF<0; otherwise 0.

Table 3.2 Sample selection and distribution

	Number of firms	Number of observations
Panel A: Sample selection		
FTSE 350 firms	350	1750
Less:		
Financials & Utilities	99	495
Observations with incomplete information	52	400
Observations have less than 3 analysts following	5	131
Final sample	**194**	**719**
Panel B: Year distribution		
2002	98	98
2003	131	131
2004	142	142
2005	170	170
2006	178	178
Panel C: Industry distribution		
Mining and Quarrying	15	58
Manufacturing	71	255
Construction	14	55
Wholesale & Retail Trade	26	97
Hotel & Restaurant	8	30
Transport & Communication	16	66
Real Estate	12	45
Others	32	113

Figure 3.2 shows the distribution of earnings surprises in the sample. Consistent with prior literature (e.g. Athanasakou, Strong and Walker, 2009), most UK publicly traded firms are able to meet or beat market expectations. Many more observations can be found in the positive earnings surprise area. More importantly, most of observations are concentrated in a small positive earnings surprise area (1or 2 penny). It is consistent with prior studies that CEOs have strong incentives to meet or just beat market expectations (e.g. Bhojraj, Hribar, Picconi and McInnis, 2009).

Figure 3.2 Frequency distribution of Earnings Surprise



The sample consists of 719 observations during the period of 2002-2006 for 194 FTSE 350 non-financial and non-utility firms. ES is the difference between actual reported earnings and the latest analysts' forecast from I/B/E/S in the unit of pence. The size of each bin is 1 penny.

Table 3.3 reports the descriptive statistics for major variables. In Panel A, I can see that the average (median) total annual compensation is £2.14 (£1.14) million. Bonuses account for 19% of total annual compensation, with an average (median) package of £343,000 (£225,000). As far as stock options and restricted shares grants are concerned, restricted shares are more popular than stock options. The median value for the former is £278,000, while that for the latter is only £75,000.

Panel B shows great variation among CEO ownership. The mean and median value for CEO ownership is 1.02% and 0.05%, respectively. The mean (median) value for variable EquityNY is 0.07(0.02). This means that CEOs have 0.07% equity incentives (stock options and restricted shares which will be vested in the following year) out of a firm's total share outstanding on average.

Both Panel C and Panel D in Table 3.3 report the descriptive statistics of variables to capture expectations management. Similar to prior research, it is found that most UK publicly traded firms can meet market expectations. The median figure for earnings surprise (ES) is positive, and the proportion of firms meeting or beating market expectations (MBE) is around 71.07%. Finally, the proportion of observations documented as expectations management based on Bartov's method (EM_Bartov) is 17.25%. Such result is similar to those reported in Brown and Higgins (2005). The number of observations showing the sign of expectations management based on Matsumoto's method (EM_Matsumoto) is much higher, accounting for 65.79% of total observations. This suggests that Bartov's method employs more strict conditions and generates fewer suspicious observations.

Table 3.3 Descriptive statistics

The sample consists of 719 firm-year FTSE350 observations from 2002-2006. All variables are winsorized at 2% level and defined in Table 3.1

Variables	Mean	Median	St. Dev.	Quartile 1	Quartile 3
Panel A. CEO annual compensation					
Salary (£ 000s')	494.85	430.00	237.05	330.00	636.00
Bonus (£ 000s')	342.98	225.00	402.40	0.00	441.00
Options Grants (£ 000s')	392.69	75.00	900.98	0.00	389.00
Restricted Shares Grants (£ 000s')	906.69	278.00	3672.36	0.00	787.00
Total Compensation (£ 000s')	2137.20	1143.00	4200.87	706.00	2183.00
Bonus (%)	19.04	18.73	12.87	10.27	26.25
Panel B. CEO equity incentives					
Ownership (%)	1.02	0.05	4.35	0.01	0.22
OptionNY (%)	0.04	0.00	0.10	0.00	0.05
SahreNY (%)	0.03	0.00	0.10	0.00	0.01
EquityNY (%)	0.07	0.02	0.16	0.00	0.08
Panel C. Expectations management (discrete variables)					
ES	0.0101	0.0017	0.1114	-0.0003	0.0065
FE	0.0075	0.0025	0.1039	-0.0038	0.0134
REV	-0.0026	0.0003	0.0686	0.0048	0.0059
UEF(Penny)	-7.52	-3.27	59.61	-12.24	2.63

Panel D. Expectations management (dummy variables)

Variables	No. of Variables =1	N	Frequency (%)
Optimism	270	719	37.55
Down	330	719	45.90
MBE	511	719	71.07
EM_Bartov	124	719	17.25
EM_Matsumoto	473	719	65.79

The correlation matrix between key variables is reported in Table 3.4. The variable of bonus demonstrates significantly positive correlations with earnings surprise (ES) and meeting or beating market expectations (MBE). However, it is negatively related with one proxy of expectations management, EM_Bartov, which is unexpected. In terms of equity incentives which will be vested in the following year (EquityNY), it is positively related to meeting or beating market expectations (MBE) as well as another proxy to capture expectations management, EM_Matsumoto. This is consistent with my expectations.

3.6. Empirical results

3.6.1. Cash bonus

First of all, I examine CEO annual cash bonus. As discussed in Section 3.3.1, I have two hypotheses. The first is (H7): CEOs with more cash bonuses are more likely to meet or beat market expectations. The second is (H8): Bonus is positively related with the probability of expectations management.

The results of hypothesis (H7) are reported in the columns1and 2 of Table 3.5. As expected, both coefficients for variables of Bonus and Bonus_Dummy are positive, while only that for Bonus_Dummy remains statistically significant. The coefficient of Bonus_Dummy is 0.75. This indicates that the odds ratio of meeting or beating the market expectation for a CEO receives cash bonus, over that odds ratio for a CEO without cash bonus is, 2.12 ($e^{0.75}$). For example, If I assume the odds ratio of meeting or beating market expectation for a CEO without cash bonus is 2.45 (0.71/1-0.71), based on the mean value of MBE in our sample. The corresponding odds ratio for a CEO receiving cash bonus will be 5.19(2.12* 2.45). In another word, the probability of

meeting or beating the market expectations for a CEO receiving cash bonus is 0.84 (5.19/ (5.19+1). Compared with CEOs without cash bonus, the probability of meeting or beating the market expectations increases about 13% (0.84-0.71), on the condition that CEOs receive cash bonus. I also consider the extent of reported earnings meeting or beating market expectations. Such results are reported in columns 1 and 2 of Table 3.6. I find that only the variable of Bonus is positively related with earnings surprise at 5% significance level. This suggests that when CEOs receive more bonuses, the reported earnings will exceed market expectations by a greater magnitude. Therefore, I find some evidence to support my hypothesis (H7): CEOs who receives bonuses are more likely to meet or beat market expectations. Furthermore, a high level of cash bonus will lead to a greater magnitude to exceed market expectations.

In columns 1 and 2 of Table 3.7, I test my hypothesis (H8): CEOs who receive more bonuses are more likely to engage in expectations management. As mentioned in Section 3.4, I use two proxies to capture possible expectations management. Hence I split Table 3.7 in two panels: Panel A for Bartov's method; while panel B for Matsumoto's method. In columns 1 and 2 of Panel A in Table 3.7, I find that these coefficients for Bonus and Bonus_Dummy are both negative and for Bonus at 1% significance level. This suggests that if CEOs receive more cash bonuses, they are less likely to engage in expectations management (based on Bartove's method), which is inconsistent with my hypothesis (H8). Similar results can also be found in columns 1 and 2 of Panel B in Table 3.7, when I use Matsumoto's method to define expectations management. In short, I document that cash bonus is negatively related with the probability of expectations management.

Table 3.4 Correlation Matrix

This table presents correlations among main variables. Correlations that are significant at 10% level or below are in bold. All variables are defined in Table 3.1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1)Bonus	**1**																		
(2) EquityNY	**0.11**	**1**																	
(3) OptionNY	**0.08**	**0.78**	**1**																
(4) ShareNY	**0.09**	**0.76**	**0.19**	**1**															
(5) ES	**0.07**	0.00	-0.01	0.01	**1**														
(6) FE	**0.12**	0.02	0.01	0.01	**0.80**	**1**													
(7) REV	**0.06**	0.02	0.02	0.01	**-0.41**	**0.22**	**1**												
(8) OPTIMISM	**-0.22**	-0.04	**-0.07**	0.01	**-0.10**	**-0.24**	**-0.20**	**1**											
(9) DOWN	**-0.20**	-0.04	-0.05	-0.02	0.05	**-0.13**	**-0.28**	**0.62**	**1**										
(10) MBE	**0.10**	**0.06**	0.04	0.05	**0.15**	**0.15**	-0.02	**-0.43**	**-0.08**	**1**									
(11) EM_BARTOV	**-0.14**	0.02	-0.02	0.05	0.00	**-0.12**	**-0.18**	**0.59**	**0.50**	**0.29**	**1**								
(12) CRET	0.03	0.02	0.03	0.01	-0.02	0.03	**0.08**	**-0.07**	**-0.11**	0.01	-0.02	**1**							
(13) UEF	-0.02	**0.13**	**0.21**	-0.02	0.00	0.01	0.02	**-0.07**	-0.01	**0.07**	-0.04	**0.09**	**1**						
(14) EM_MATSUMOTO	-0.06	**0.07**	**0.07**	0.05	0.03	-0.06	**-0.13**	**0.20**	**0.24**	**-0.12**	**0.11**	-0.05	**-0.30**	**1**					
(15) MV	0.01	**-0.07**	**-0.12**	0.01	0.01	0.03	0.03	0.00	-0.01	-0.02	0.00	**-0.10**	-0.05	0.00	**1**				
(16) GROWTH	-0.01	0.03	0.02	0.02	0.00	0.01	0.01	-0.04	**-0.07**	0.01	-0.03	**-0.06**	-0.01	-0.01	0.02	**1**			
(17) PROFITABLE	**0.06**	0.00	-0.02	0.02	-0.04	-0.04	0.00	**-0.12**	**-0.08**	0.01	**-0.09**	**0.08**	0.05	-0.04	0.02	-0.04	**1**		
(18) CHEARN	**0.16**	-0.02	-0.02	-0.02	0.00	**0.08**	**0.13**	**-0.39**	**-0.27**	**0.24**	**-0.21**	**0.06**	**0.09**	**-0.22**	**0.07**	-0.03	**0.09**	**1**	
(19) LIT	0.04	-0.05	-0.04	-0.04	-0.06	-0.04	0.03	0.02	-0.03	-0.04	-0.04	-0.02	**0.10**	-0.03	**-0.07**	0.00	**-0.08**	0.03	**1**

Table 3.5 CEO compensation and meeting or beating the market expectations

Logit regression of Meeting or beating market expectations (MBE) on testing CEO compensation components. The data set is a pooled sample of 719 firm-years from FTSE 350 non-financial and non-utility firms for the period of 2002-2006. P value is reported in parentheses. *, **, *** denote significance at 10%, 5%, and 1% level, respectively. Industry and year dummies are included but not reported. All variables are defined in Table 3.1.

Probability (MBE $_{i,t}$=1) = Logit (α_0+ α_1* Testing Compensation $_{i,t}$+ α_2* MV $_{i,t}$ + α_3*Growth $_{i,t}$+ α_4* Profitable $_{i,t}$+ α_5* Chearn $_{i,t}$ + α_6* Lit $_{i,t}$ + $\alpha_7\sum$ INDUS+ $\alpha_8\sum$ Years + ε)

Variable	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	?	0.54	0.36	0.36	0.46	0.50	0.53	0.51	0.60
		(0.45)	(0.62)	(0.62)	(0.53)	(0.49)	(0.46)	(0.48)	(0.40)
Bonus	+	0.01							
		(0.20)							
Bonus_Dummy	+		0.75***						
			(0.00)						
EquityNY	+			1.72**					
				(0.03)					
EquityNY_Dummy	+				0.44**				
					(0.02)				
OptionNY	+					0.14			
						(0.21)			
OpionNY_Dummy	+						0.27		
							(0.13)		
ShareNY	+							2.82**	
								(0.03)	
ShareNY_Dummy	+								0.43**
									(0.03)
MV	+	-0.09	-0.09	-0.09	-0.10	-0.08	-0.09	-0.09	-0.11*
		(0.16)	(0.12)	(0.23)	(0.11)	(0.16)	(0.15)	(0.15)	(0.08)
Growth	+	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.002
		(0.58)	(0.59)	(0.65)	(0.72)	(0.61)	(0.63)	(0.64)	(0.58)
Profitable	+	-0.32	-0.48	-0.22	-0.24	-0.24	-0.23	-0.25	-0.24
		(0.53)	(0.35)	(0.65)	(0.63)	(0.62)	(0.64)	(0.61)	(0.63)
Chearn	+	1.08***	1.02***	1.13***	1.10***	1.12***	1.10***	1.14***	1.13***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Lit	+	-1.01*	-0.92	-0.85	-0.81	-0.92	-0.89	-0.90	-0.83
		(0.09)	(0.12)	(0.15)	(0.18)	(0.12)	(0.13)	(0.13)	(0.16)
McFadden R^2		0.10	0.11	0.11	0.11	0.10	0.10	0.11	0.11
LR Statistics		88.48	94.67	93.38	92.38	88.47	89.02	93.83	91.50

Table 3.6 CEO compensation and earnings surprise

OLS regression of earnings surprise (ES) on testing CEO compensation components. The data set is a pooled sample of 719 firm-years from FTSE 350 non-financial and non-utility firms for the period of 2002-2006. P value is reported in parentheses. *, **, *** denote significance at 10%, 5%, and 1% level, respectively. Industry and year dummies are included but not reported. All variables are defined in Table 3.1.

$$ES_{i,t} = \beta_0 + \beta_1 * \text{Testing Compensation}_{i,t} + \beta_2 * MV_{i,t} + \beta_3 * \text{Growth}_{i,t} + \beta_4 * \text{Profitable}_{i,t} + \beta_5 * \text{Chearn}_{i,t} + \beta_6 * \text{Lit}_{i,t} + \beta_7 \sum \text{INDUS} + \beta_8 \sum \text{Years} + \varepsilon$$

Variable	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	?	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.02
		(0.80)	(0.80)	(0.67)	(0.71)	(0.61)	(0.71)	(0.67)	(0.63)
Bonus	+	0.0007**							
		(0.04)							
Bonus_Dummy	+		0.02						
			(0.16)						
EquityNY	+			0.01					
				(0.62)					
EquityNY_Dummy	+				0.01				
					(0.23)				
OptionNY	+					-0.004			
						(0.93)			
OptionNY_Dummy	+						-0.01		
							(0.13)		
ShareNY	+							0.04	
								(0.38)	
ShareNY_Dummy	+								0.01
									(0.29)
MV	+	-0.0007	-0.0009	-0.0008	-0.0001	-0.0007	-0.0007	-0.0007	-0.0001
		(0.81)	(0.76)	(0.84)	(0.72)	(0.81)	(0.74)	(0.81)	(0.68)
Growth	+	-0.00003	-0.00002	-0.00002	-0.00002	-0.00002	-0.00002	-0.00002	-0.00002
		(0.87)	(0.86)	(0.84)	(0.79)	(0.86)	(0.82)	(0.84)	(0.80)
Profitable	+	-0.022	-0.023	-0.019	-0.018	-0.018	-0.018	-0.018	-0.018
		(0.35)	(0.32)	(0.42)	(0.43)	(0.41)	(0.45)	(0.41)	(0.42)
Chearn	+	-0.003	-0.003	-0.003	-0.001	-0.001	-0.001	-0.001	-0.001
		(0.76)	(0.78)	(0.99)	(0.94)	(0.99)	(0.91)	(0.99)	(0.99)
Lit	+	-0.055*	-0.051*	-0.052*	-0.049	-0.053*	-0.050	-0.052*	-0.050
		(0.07)	(0.09)	(0.09)	(0.11)	(0.08)	(0.10)	(0.09)	(0.50)
Adjusted R^2		0.009	0.006	0.004	0.006	0.004	0.007	0.005	0.005
F Statistics		1.39	1.27	1.16	1.24	1.15	1.29	1.20	1.22

Combining all these results mentioned above, I find that cash bonuses generate strong incentives for CEOs to meet or beat market expectations. However, cash bonuses will lead to a lower probability of expectations management. In other words, cash bonuses may generate incentives for CEOs to use alternative methods of expectations management (such as earnings management) to achieve market expectations (e.g. Holthausen, Larcker and Sloan, 1995).

3.6.2. Stock options and restricted shares

The second type of CEO compensation I am interested is equity incentives (stock options and restricted shares) which will be vested in the following year. My hypothesis (H9) is that CEOs with more equity incentives which will be vested in the following year are more likely to meet or beat market expectations. The results for this hypothesis are reported in columns 3 to 8 in Table 3.5. As expected, the coefficients for the variables of equity compensation, EquityNY and EquityNY _Dummy (columns 3 and 4), are both positive at 5% significance level. When I split equity incentives into stock options (columns 5 and 6) and restricted shares (columns 7 and 8), the results remain similar, while only those for restricted shares are statistically significant. For instance, the variable of ShareNY (column 7) has a coefficient of 2.82, which is significant at 5% level. These findings support my hypothesis (H9) that CEOs with more equity incentives which will be vested in the following year are more likely to achieve market expectations. And such an effect is mainly from restricted shares rather than stock options. I also do an additional test on hypothesis (H9) in Table 3.6. Here I look at how CEO equity incentives will affect the extent of achieving market expectations. The results are reported in the columns 3 to 8 of Table 3.6. However, I fail to establish a meaningful interpretation.

Table 3.7 CEO compensation and expectations management

Panel A. Expectations management (Bartov's method)

Logit regression of expectations management (EM_Bartov) on testing CEO compensation components. The data set is a pooled sample of 719 firm-years from FTSE 350 non-financial and non-utility firms for the period of 2002-2006. P value is reported in parentheses. *, **, *** denote significance at 10%, 5%, and 1% level, respectively. Industry and year dummies are included but not reported. All variables are defined in Table 3.1.

Probability (EM_Bartov $_{i,t}$=1) = Logit (κ_0+ κ_1* Testing Compensation $_{i,t}$ + κ_2* MV $_{i,t}$ + κ_3*Growth $_{i,t}$ + κ_4* Profitiable $_{i,t}$ + κ_5* Chearn $_{i,t}$ + κ_6* Lit $_{i,t}$ + $\kappa_7\sum$ INDUS+ $\kappa_8\sum$ Years + ε)

Variable	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	?	0.67	0.62	0.40	0.32	0.51	0.53	0.38	0.46
		(0.47)	(0.44)	(0.61)	(0.69)	(0.52)	(0.46)	(0.63)	(0.57)
Bonus	+	-0.02***							
		(0.00)							
Bonus_Dummy	+		-0.43						
			(0.15)						
EquityNY	+			0.31					
				(0.60)					
EquityNY_Dummy	+				0.46**				
					(0.04)				
OptionNY	+					-0.40			
						(0.71)			
OptionNY_Dummy	+						0.27		
							(0.13)		
ShareNY	+							1.07	
								(0.24)	
ShareNY_Dummy	+								0.57**
									(0.01)
MV	?	0.00	0.00	0.00	-0.03	-0.01	0.00	0.00	-0.04
		(0.99)	(0.98)	(0.95)	(0.73)	(0.89)	(0.99)	(0.92)	(0.56)
Growth	?	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
		(0.23)	(0.26)	(0.26)	(0.18)	(0.27)	(0.23)	(0.24)	(0.19)
Profitable	?	-0.76	-0.78	-0.86*	-0.85*	-0.88*	-0.76	-0.87*	-0.85*
		(0.13)	(0.12)	(0.08)	(0.85)	(0.07)	(0.13)	(0.08)	(0.09)
Chearn	?	-1.07***	-1.10***	-1.16***	-1.20***	-1.16***	-1.07***	-1.16***	-1.07***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Lit	?	-1.08	-1.18	-1.10	-0.94	-1.14	-1.08	-1.08	-0.92
		(0.32)	(0.28)	(0.31)	(0.38)	(0.29)	(0.32)	(0.32)	(0.40)
McFadden R^2		0.09	0.08	0.08	0.09	0.08	0.09	0.08	0.09
LR Statistics		59.80	54.33	52.61	56.43	52.49	59.80	53.71	58.87

Table 3.7 (Continued)

Panel B. Expectations management (Matsumoto's method)

Logit regression of expectations management (EM_Matsumoto) on testing CEO compensation components. The data set is a pooled sample of 719 firm-years from FTSE 350 non-financial and non-utility firms for the period of 2002-2006. P value is reported in parentheses. *, **, *** denote significance at 10%, 5%, and 1% level, respectively. Industry and year dummies are included but not reported. All variables are defined in Table 3.1.

Probability (EM_Matsumoto $_{i,t}$ =1) = Logit (ν_0+ ν_1* Testing Compensation $_{i,t}$ + ν_2* MV $_{i,t}$ + ν_3*Growth $_{i,t}$ + ν_4* Profitable $_{i,t}$ + ν_5* Chearn + $_{i,t}$ ν_6* Lit $_{i,t}$ + $\nu_7\sum$ INDUS+ $\nu_8\sum$ Years + ε)

Variable	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	?	3.33***	3.56***	3.01***	3.06***	3.03***	3.10***	3.16***	3.20***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Bonus	+	-0.01							
		(0.27)							
Bonus_Dummy	+		-0.64**						
			(0.04)						
EquityNY	+			1.17					
				(0.12)					
EquityNY_Dummy	+				0.39**				
					(0.04)				
OptionNY	+					1.57			
						(0.12)			
OptionNY_Dummy	+						0.32*		
							(0.07)		
ShareNY	+							0.87	
								(0.40)	
ShareNY_Dummy	+								0.07
									(0.73)
MV	?	-0.04	-0.04	-0.04	-0.06	-0.03	-0.05	-0.05	-0.05
		(0.49)	(0.57)	(0.56)	(0.34)	(0.62)	(0.40)	(0.47)	(0.45)
Growth	?	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
		(0.40)	(0.41)	(0.39)	(0.34)	(0.39)	(0.38)	(0.40)	(0.40)
Profitable	?	-0.81	-0.72	-0.78	-0.78	-0.78	-0.76	-0.82	-0.81
		(0.13)	(0.17)	(0.14)	(0.14)	(0.14)	(0.15)	(0.12)	(0.13)
Chearn	?	-1.33***	-1.29***	-1.35***	-1.38***	-1.36***	-1.38***	-1.35***	-1.35***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Lit	?	-0.77	-0.86	-0.71	-0.64	-0.72	-0.70	-0.76	-0.77
		(0.21)	(0.16)	(0.25)	(0.30)	(0.24)	(0.25)	(0.22)	(0.22)
McFadden R^2		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
LR Statistics		121.30	124.57	123.04	124.50	122.82	123.32	120.90	120.21

As far as hypothesis (H10) is concerned, I intend to see whether CEO equity incentives which will be vested in the following year will lead to a higher probability of expectations management. These results are reported in columns 3 to 8 of Panel A (Bartov's method) and Panel B (Matsumoto's method) of Table 3.7. In Panel A, I find that the coefficients of variables EquityNY_Dummy and ShareNY_Dummy (columns 4 and 8) are both positive at 5% significance level, as expected. For instance, the coefficient of EqutityNY_Dummy is 0.46. I can interpret such a coefficient as follows. That is the odds ratio to employ expectations management (according to Bartov's method) when CEOs have equity compensation to be vested in the following year, over that odds ratio for CEOs without equity compensation vesting in the following year is 1.58 ($e^{0.46}$). If I assume the odds ratio of using expectations management for a CEO without equity incentives vesting in the following year is 0.20 (0.17/1-0.17), based on the mean value of expectations management (according to Bartov's method) in our sample. The corresponding odds ratio for a CEO with equity incentives vesting in the following year will be 0.32 (1.58* 0.20). In another word, the probability of employing expectations management for a CEO with equity incentives vesting in the following year is 0.24(0.32/ (0.32+1). Compared with CEOs without vesting equity incentives, the probability of employing expectations management increases about 4% (0.24-0.20), if CEOs have equity incentives to be vested in the following year.

Similar results can be found in columns 3 to 8 of Panel B in Table 3.7 when using Matsumoto's method to capture possible expectations management. The coefficients of variable EquityNY_Dummy (column 4) and OptionNY_Dummy (column 6) are both positive at 10% significance level. This suggests that expectations management is more likely to occur if CEOs have equity incentives (especially stock options) to be vested in

the following year. Overall, I find some evidences to support my hypothesis (H10): equity incentives which will be vested in the following year will lead to a higher probability of expectations management.

Next, I will test whether the relationship between CEO equity compensation which will be vested in the following year and the probability of expectations management is conditional on the level of CEO ownership. Prior studies find that CEOs have stronger incentives to exercise stock options or engage in insider sales if they have a large amount of equity incentives (e.g. Cheng and Warfield, 2005). The reason for this is that CEOs would like to exercise stock options and sell shares in order to diversify the risk of wealth concentration in their own firms' shares.

Therefore I expect that CEOs who have equity compensation which will be vested in the following year will have a stronger incentive to engage in expectations management if they have a relatively high level of ownership already. I divide my sample into two groups: those with high ownership and those with low ownership, based on the median value in the sample. The results are reported in Table 3.8. Consistent with my expectations, CEOs have equity compensation which will be vested in the following year are more likely to engage in expectations management, especially if they have relatively high level of ownership already. The coefficients of EquityNY_Dummy, ShareNY and ShareNY_Dummy are all positive at the significant level (at least 10%) in high ownership group (according to Bartov's method). In contrast, only the coefficient of ShrNY_dummy is positive at 10% significance level in the low ownership group. Similar results can also be found on the right side of Table 3.8 when Matsumoto's method is employed.

Table 3.8 CEO compensation and expectations management under different levels of ownership

Logit regression of expectations management (EM_Bartov and EM_Matsumoto) on testing CEO compensation components. The sample of 719 observations is grouped based on CEOs' ownership. The high ownership group consist of 360 observations of CEO ownership from 0.049%. The low ownership group has 359 observations with CEO ownership from 0 to 0.048%. P value is reported in parentheses. *, **, *** denote significance at 10%, 5%, and 1% level, respectively. Only testing compensation variables are reported. All variables are defined in Table 3.1.

$$Pro(EM\_Bartov_{i,t}=1/\ EM\_Matsumoto_{i,t}=1) = Logit\ (\ S_0 + S_1 * Testing\ Compensation_{i,t} + S_2 * MV_{i,t} + S_3 * Growth_{i,t} + S_4 * Profitable_{i,t} + S_5 * Chearn_{i,t} + S_6 * Lit_{i,t} + S_7 \sum INDUS + S_8 \sum Years + \varepsilon\ )$$

Variable	Exp. sign	Model 1: Dependent variable= EM_Bartov						Model 2: Dependent variable= EM_Matsumoto					
		(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Panel A High Ownership Group N=360													
EquityNY	+	1.41						1.36					
		(0.17)						(0.13)					
EquityNY_Dummy	+		1.02**						0.43*				
			(0.01)						(0.10)				
OptionNY	+			-0.49						1.67			
				(0.61)						(0.16)			
OptionNY	+				0.40						0.33		
					(0.24)						(0.18)		
ShareNY	+					3.05**						0.75	
						(0.02)						(0.54)	
ShareNY_Dummy	+						0.70**						0.12
							(0.04)						(0.66)
McFadden R^2		0.14	0.16	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.17
LR Statistics		43.28	48.85	42.46	42.95	46.39	45.63	73.09	73.31	72.79	72.42	71.00	70.81
Panel B Low Ownership Group N=359													
EquityNY	+	0.20						3.82					
		(0.80)						(0.11)					
EquityNY_Dummy	+		0.14						0.44				
			(0.65)						(0.11)				
OptionNY	+			0.44						3.19			
				(0.77)						(0.20)			
OptionNY_Dummy	+				0.26						0.35		
					(0.37)						(0.19)		
ShareNY	+					0.26						8.29	
						(0.85)						(0.10)	
ShareNY_Dummy	+						0.59*						0.28
							(0.05)						(0.34)
McFadden R^2		0.08	0.09	0.08	0.09	0.08	0.09	0.16	0.16	0.16	0.16	0.16	0.16
LR Statistics		30.22	30.37	30.24	30.96	30.19	33.85	70.67	69.07	68.90	68.25	70.61	67.43

In summary, I find some evidence to support my hypotheses (H9) and (H10) based on these results mentioned above. Equity incentives which will be vested in the following year will generate strong incentives to meet or beat market expectations. Further more, the probability of expectations management is documented to be positively related to equity incentives which will be vested soon. In other words, partly because of equity incentives, CEOs do care about the market expectations and have a strong incentive to employ expectations management to achieve such a goal. This phenomenon is more prevalent if CEOs have a high level of ownership already.

3.6.3. Sensitivity analysis

I also use alternative variables to measure CEO compensation in my analysis. Specifically, I use the absolute monetary amount of cash bonus (Log of bonus) to replace the variable of Bonus in the previous discussion. I also adopt the estimated value of stock options and restricted shares which will be vested in the following year as the alternative proxy for the variables of OptionNY and ShareNY mentioned previously. Different levels of winsorization (1% or 5%) are also employed. These results are similar to those in Table 3.7(detailed results are not reported in this chapter). Hence my previous findings are not based on specific measurement methods for compensation or driven by outliers.

3.7. Conclusions

In this chapter, I examine whether and how CEO compensation is related with expectations management. Expectations management occurs when managers purposely dampen market expectations in order to generate a positive earnings surprise when earnings are announced. The literature suggests that CEO bonus, stock options exercise

and insider sales are positively related to the occurrence of meeting or beating market expectations (e.g. Matsunaga and Park, 2001; Richardson, Teoh and Wysocki, 2004). Because achieving market expectations conveys positive signals to the stock market, thus the stock market tends to reward firms which meet or beat market expectations. Such a market reward will help the board to justify high bonus payments, and benefit the option exercise or insider sales as well. Therefore, bonuses, option exercise and insider sales (after earnings announcement) may motivate CEOs to achieve market expectations when earnings are announced. If successful expectations management will help to achieve market expectations, CEOs may have strong incentives to employ it.

I link expectations management with three components of CEO pay: bonuses, stock options and restricted shares that will be vested in the following year, because these pay components can be more lucrative for CEOs if expectations management will lead to a higher probability of achieving market expectations. The well documented positive stock market reaction for firms which meet or beat financial analysts' earnings forecast (e.g. Bhojraj, Hribar, Picconi and McInnis, 2009) justify high bonus payments and benefit insider trading. I link the possible insider trading after earnings announcement with two particular CEO equity compensation components: stock options and restricted shares which will be vested in the following year. In short, I expect that CEO cash bonus and equity compensation (stock options and restricted shares) which will be vested in the following year will motivate CEOs to employ expectations management to reach market expectations. My main findings are listed below.

First of all, I find that CEO bonus and equity compensation (stock options and restricted shares) which will be vested in the following year are positively related with the

incidence of achieving market expectations. Those compensation components do motivate CEOs to care about market expectations.

Secondly, I document that if CEOs have equity compensation which will be vested in the following year, they are more likely to engage in expectations management. Such relationship is stronger when CEOs have a high level of ownership already. This is consistent with prior studies (e.g. Cheng and Warfield, 2005) showing that CEOs have strong incentives to diversify the risk in a single asset (own firms' shares). They actively create a favourable trading environment for stock options exercise and insider sales. Using expectations management to meet market expectations is one such case.

Thirdly, CEO cash bonuses are documented negatively related with the probability of expectations management. This suggests that although cash bonuses motivate CEOs to care about market expectations, they are less likely to conduct expectations management to achieve such an earnings benchmark. One possible explanation is that, cash bonuses are usually tied to an accounting performance. CEOs may be more interested in inflating the earnings number than dampening market expectations to avoid missing market expectations.

In short, the study in this chapter provides some empirical evidence about the link between CEO compensation and expectations management. CEOs may choose an information disclosure strategy to favour his or her compensation pays. Such an information manipulation motivated by CEO compensation may benefit CEOs at the expenses of shareholders' interests.

Chapter 4 CEO Compensation, Career Horizon and Research and Development Spending

4.1. Introduction

There is a debate in the literature about whether career horizon affects managers' investment decisions. As proposed by Smith and Watt (1992), the career horizon problem hypothesizes that managers with a short career horizon are likely to reject long-term investment projects, because these realized gains of such an investment may not benefit exiting managers. If different lengths of career horizon lead to different investment decisions that do not suit shareholders' interests, then the career horizon problem can be viewed as a type of agency cost (e.g. Davidson, Xie, Xu and Ning, 2007). Previous literature also provides some evidence to support the idea that older CEOs are less likely to spend on research and development (R&D hereafter) expenses (e.g. Gibbons and Murphy, 1992a; Barker and Mueller, 2002; Lundstrum, 2002). However, some recent studies find that the so-called career horizon problem regarding risky investment disappears (e.g. Conyon and Florou, 2006; Cazier, 2011). They argue that recent developments in corporate governance may limit outgoing CEOs' short-sighted behaviour. Hence it is difficult to observe obvious R&D spending cuts when CEOs approach retirement. It is interesting to examine whether the career horizon problem, which is well documented in the literature, still exists in the UK, where the corporate governance mechanism is well established.

In addition, few studies examine the interactive relationship between CEO compensation and career horizon on investment decisions. One exceptional paper is Cheng (2004). He investigates whether compensation committees deliberately adjust stock options grants to prevent opportunistic reductions in R&D expenditure. His

findings indicate that retiring CEOs (aged above 63) who receive more stock option grants will not reduce R&D spending. In a recent paper, Cazier (2011) criticizes previous career horizon studies. He argues that CEOs near retirement may have incentives to curtail R&D spending for personal gains; however, such a view assumes that compensation committees neither recognize such an agency problem nor are able to provide optimal incentive contracts to overcome it. His study clearly suggests the possible explicit role of CEO compensation in the career horizon problem. If CEO compensation does affect top managers' investment decisions, it is also interesting to ask whether such effects will vary among different career horizon lengths. For instance, it is widely believed that equity incentives may align interests of shareholders and managers in terms of investment decisions. Are the incentives for risky investment from equity incentives the same for younger CEOs, whose career horizons are long enough to fully benefit from current investment decisions, as for older CEOs who are counting down their remaining days in office?

This chapter seeks to answer these questions. First of all, I examine whether and how career horizon will affect R&D spending. Secondly, I seek to find out whether and how the interactive relationship between career horizon and CEO compensation will influence investment decisions.

I intend to make three main contributions. First of all, I re-examine the so-called career horizon problem by using more recent UK data. Compared with the US, both CEO power and pay incentives in Britain are relatively weak. Such a background may limit CEOs' ability and incentives to manipulate investment decisions for their self-interested purposes. I may observe some different results compared with US studies. In addition, I

examine UK CEOs over a wide range of career horizon. Conyon and Florou (2006) focus on a sample of CEO departures (especially for retirement) in Britain. The assumption is that any cuts in R&D spending and capital expenditure are more likely to occur in the last few years of a CEO's career horizon. My study intends to explore this issue in a larger sample and over a longer career track.

Secondly, I include CEO pension in this study. Pension (defined benefit) is overlooked in previous studies, partly because of poor data availability. Considering that the nature of a pension is deferred and debt-like, it may generate unique incentives for risk-taking, especially when CEOs approach retirement.

Thirdly, there is no consensus about the role of equity incentives in investment decisions when CEOs have a short career horizon. There are two conflicting theories: agency theory and prospect theory. Based on agency theory, CEOs with a short career horizon may not curtail long-term value added R&D spending, if they have a large amount of equity incentives. Chen (2004) provides evidence (based on stock option grants) to support such a theory. On the other hand, prospect theory suggests that CEOs with short career horizons are more likely to preserve gains from equity holdings. In such a case, equity incentives may accentuate incentives for avoiding risks. Cutting R&D expenses is one of the possible options. Matta and Beamish (2008) provide evidence that CEOs with short career horizons are less likely to engage in international acquisitions, if they have more equity incentives.

The key findings in this study are listed as follows. First of all, I do not observe the influence of career horizon problem on investment decisions. There is no evidence that

CEOs will curtail R&D spending when their career horizons become short. Secondly, I document that pension effectively discourages R&D spending among older CEOs. This suggests that a high level of pension makes CEOs more risk-averse when the date of retirement approaches. Thirdly, ownership will encourage R&D spending in general, but the opposite effect occurs when CEOs become older. This is consistent with the prospect theory for CEOs become risk-averse when their career horizon is short but have a large amount of wealth under stock market exposure. Fourthly, restricted shares seem to discourage R&D spending, while no such effects are found on stock options.

The remainder of this chapter is structured as follows. Section 4.2 provides the literature review and hypotheses development. The methodology is described in Section 4.3. Sections 4.4 and 4.5 provide detailed information about the data and empirical evidence, respectively. Conclusions are made in Section 4.6.

4.2. Literature review and hypotheses development

4.2.1. Career horizon

The career horizon problem has drawn the attention of researchers for more than a decade (see early studies such as Dechow and Sloan, 1991). The main question is whether and how investment decisions vary among younger and older top managers (e.g. Gibbons and Murphy, 1992a; Murphy and Zimmerman, 1993; Conyon and Florou, 2006; Cazier, 2011). As argued by Gibbons and Murphy (1992b), older managers have little or less career reputation concern compared with their younger counterparts. Younger managers have stronger incentives to boost their reputation via efforts involvement and improved performance. The labour market will update its belief on young managers' abilities and reward bright ones with better future employment

opportunities. However, such incentives for efforts involvement decline for older CEOs with well established reputations and shorter career horizons. In such circumstances, more pay incentives should be introduced for older CEOs (e.g. Gibbons and Murphy, 1992b).

R&D spending may be a typical investment decision which may not fully benefit CEOs with short career horizons. First of all, R&D spending has a long pay-back period. It will take away precious cash flows which may be consumed for top managers' immediate personal interests. The cash flows pay-back may occur in the long term, when older CEOs have left the firm already. Furthermore, R&D spending is required to be expensed in the current period, which will lead to lower reported earnings. The literature also provides some evidence that retiring CEOs will manipulate reported earnings for personal gains, such as bonuses and pensions (e.g. Davidson, Xie, Xu and Ning, 2007; Kalyta, 2009; Demers and Wang, 2010). Considering the direct relationship between R&D spending and current reported earnings, CEOs with short career horizons may have the incentive to sacrifice such investment for their own interests. Previous studies also generate some evidence that older top managers may curtail R&D spending (e.g. Gibbons and Murphy, 1992a; Barker and Mueller, 2002; Lundstrum, 2002).

However, some studies provide quite different evidence about the career horizon problem. Murphy and Zimmerman (1993) document that the decline in R&D expenditure for outgoing CEOs is more likely to be explained by poor accounting performance rather than short career horizons. By investigating UK data in the1990s, Conyon and Florou (2006) document that retiring CEOs will not cut R&D expenditure

on the verge of retirement. They explain that the corporate governance mechanisms (e.g. equity incentives for outside board members and the power of other executive directors) may mitigate retiring CEOs' self-interested cut-backs on R&D spending. Their findings echo a more recent study by Cazier (2011). He provides US evidence that CEOs will not cut R&D spending in their final years in office. He argues that the improved corporate governance mechanism (incentive pay, for instance) can effectively mitigate short-sighted behaviour for outgoing CEOs. In short, there are mixed empirical results and no consensus has been reached on the career horizon problem.

I intend to re-examine the career horizon problem in this chapter. Hence my hypothesis still follows a traditional view of the career horizon on investment decision making (e.g. Barker and Mueller, 2002). The specific hypothesis is listed as follows:

H11: Older CEOs will spend *less* on R&D expenses.

4.2.2. Pension

Pension (defined benefit plan) is a type of deferred pay for CEOs. It can also be viewed as an inside debt, because firms are liable to pay a promised amount of pension after CEOs retire.[12] As CEOs grow older, the impact of a pension may affect CEO investment decisions dramatically. First of all, CEOs with short career horizons are more likely to be concerned with the safety of their pension compared with younger CEOs. The cash out date for pensions is upon retirement. Hence older CEOs are closer to access their pensions. This may motivate older CEOs to take actions to maximize the probability of receiving their promised pension after retirement. If a certain type of

[12] Please see the detailed explanation of why DB pension is a type of inside debt in Section 2.3.2.

investment (R&D spending, for instance) will create a high level of risk and decrease the probability of pension payment, CEOs with a short career horizon may be reluctant to invest in such projects.

Secondly, the accumulation of pension increases with CEO tenure. Firms may hold a large amount of pension liability (defined benefit) for older CEOs, due to their previous years' services. Therefore, older CEOs are more sensitive to the safety of their firms because a large amount of their personal wealth is held in the form of their firms' potential debt. Hence CEOs with more pensions are likely to manage their firms conservatively. Sundaram and Yermack (2007) document that firms who offer CEOs more pensions are less likely to become insolvent, which is measured as the expected distance for a firm to go burst. Their findings clearly suggest the role of pension provision on CEO risk preference. If R&D spending is risky and may generate long-term uncertainty in a firm, CEOs may have stronger incentives to cut such expenditure when they hold a large amount of pension. Hence I expect that pension will accentuate CEOs' incentives to cut R&D spending when they approach retirement. I hypothesize as follows:

H12*:* Older CEOs with more pensions will spend *less* on R&D expenses

4.2.3. Equity incentives

As mentioned in Section 4.1, there is no consensus about the role of equity incentives on the career horizon problem. There are two conflicting theories which predict opposite relationships: agency theory and prospect theory. I discuss these theories and related predictions as follows.

A. Agency theory and the "interest alignment" hypothesis

CEOs with different career horizon lengths may have different career concerns. Gibbons and Murphy (1992b) argue that younger top managers have stronger incentives to take actions for firm growth. By observing firm performance, the labour market can update its belief about managers' abilities. Talented younger managers are more likely to be awarded better future employment opportunities. However, career and reputation concerns become less important as CEOs approach retirement, because older CEOs have less career mobility options as well as a shorter employment period. At such a point, additional incentives for risky but value-added investment are expected to be essential for older CEOs. Without sufficient pay incentives, retiring CEOs may further lack the motivation to make long-term and risky investments.

The role of equity pay in encouraging risk-seeking activities is well-documented (e.g. Guay, 1999; Cole, Daniel, and Naveen, 2006). By linking CEOs' personal wealth with firm value, equity incentives may motivate CEOs to make risky but value-added investments. For instance, the convex payoff structure of stock options largely sheds downward risks. In addition, CEOs have to take actions to increase stock price above the strike price of options, otherwise they can not materialize the wealth of stock options. Hence equity incentives may align interests of shareholders and CEOs in investment decisions. CEOs with more equity incentives are more likely to spend on risky but value-added investments (R&D spending in this case). My "interest alignment" hypothesis expects that equity incentive will still align interest of CEOs and shareholders on investment decisions, no matter the length of CEOs' career horizons. The specific hypothesis is listed below:

H13a: Older CEOs with more equity incentives (ownership, stock options and restricted shares) will spend *more* on R&D expenses.

B. Prospect theory and the "wealth preservation" hypothesis

Prospect theory describes how people make decisions between choices which involve different levels of risk (see Kahneman and Tversky, 1979; Kahneman and Thaler, 1991). It develops the so-called certainty effects: people have a tendency to choose strategies that obtain gains with certainty. This helps to explain certain risk-avoiding behaviour (e.g. choices in gambling and insurance purchase). Based on this theory, people will outweigh sure gains and become risk-averse when they face uncertainty. It has been widely used in behavioural finance to explain personal finance decisions.

Prospect theory also has possible implications for CEOs' investment decisions. CEOs with a short career horizon may have accumulated a large amount of equity incentives during their tenures. Such firm-specific wealth increases CEOs' risk exposure to the stock market. CEOs' wealth is extremely sensitive to their firms 'share price, considering managerial equity incentives are less diversified than that of ordinary investors. Such sensitivity becomes more severe when CEOs approach retirement for two reasons.

First of all, older CEOs have incentives to cash out equity incentives around retirement. Retiring CEOs intend to maintain their current living standard and the social circle after they leave office. By cashing out equity incentives, retiring CEOs can raise funds to supplement their pensions. Carpenter (2000) documents that retiring CEOs reduce their financial ties with their firms by cashing equity incentives in their final years in office.

Therefore, CEOs with a short career horizon are extremely sensitive to their firms' share price movement in their final years of employment. If risky investments will generate uncertain short-term returns, CEOs have incentives to cutback such spending.

Secondly, some firm policies urge retiring CEOs to cash out equity incentives soon after turnover. Hall and Murphy (2003) suggest that stock options will be forfeited or subject to shorter vesting periods upon CEO turnover. For example, when Rod Eddington retired as CEO of British Airways in September 2005, the firm required him to exercise all stock options within six months after retirement. In a US study, Dahiya and Yermack (2008) look at firms' policies for the treatment of stock options for retiring CEOs. They document that there is a large discount for the estimated value for stock options award for CEOs aged above 60, because of the shorter exercise period of stock options allowed for retiring CEOs. Therefore these strict policies for older CEOs may strengthen their sensitivity to short-term stock performance. In such circumstances, older CEOs tend to preserve short-term realized gains by reducing investments which may create uncertainty in terms of share price.

The above mentioned situation is consistent with prospect theory. When decision makers perceive a potential loss, they are more likely to preserve what they get instead of seeking additional gains. In other words, CEOs with a short career horizon intend to preserve current gains in their equity holding. Matta and Beamish (2008) find that CEOs are less likely to engage in mergers and acquisitions if they have short career horizons and a large amount of equity incentives. They explain that CEOs would prefer to reject risky mergers and acquisitions because such activities may create uncertainty for their current wealth in equity incentives. If R&D spending is risky and will create

uncertainty for top managers' gains in equity holdings, older CEOs may be less likely to invest. I conduct my "wealth preservation" hypothesis as that equity incentive will motivate older CEOs to preserve their gains in wealth, making them more risk-averse and less likely to spend on R&D expenditure. The specific hypothesis is demonstrated as follows:

H13b: Older CEOs with more equity incentives (ownership, stock options and restricted shares) will spend *less* on R&D expenses.

4.3. Methodology

4.3.1. Measurement of R&D spending

I intend to adopt several variables to define R&D spending. The first variable I use is R&D intensity. Following the literature, I scale R&D expenditure by a firm's total sales (e.g. Lundstrum, 2002; Antia, Pantzalis and Park, 2010). It is reasonable to argue that R&D intensity will be heavily influenced by the industry factors. Hence I also use the variable Abnormal R&D. This is the difference between actual R&D expenditure and "expected" R&D expenditure which is estimated by a model (Cazier, 2011). The detailed procedures are listed below.

$$R\&D_{i,t} = a_0 + a_1 * R\&D_{industry\ median,t} + \sum a_2 * Controls_{i,t} \quad (13)$$

Where R&D is actual R&D expenditure for a particular year. As far as industry is concerned, I use broad industry classifications due to the relatively small sample size in my study. I use four industries in total: Chemical and allied products (UK SIC section D: 24), Electronic products (UK SIC section D: 30-33), Other manufacturing (UK SIC

section D: 15-36) and Miscellaneous. The detailed information is available in Table 4.2. Control variables include: Firm Size, Leverage, Profitability, FCF (Free cash flows), Growth and Firm Age. The main purpose of this model is to estimate the parameter of *a1*, *a2* and $\sum a3$. The residual of this regression is the difference between the actual R&D spending and "expected" R&D spending based on equation (13).

Then, I develop the following two proxies for R&D spending: Abnormal_R&D and Abnormal_R&D_Cuts, as follows.

$$Abnormal\_R\&D_{i,t} = residual\ of\ equation\ (13) \quad (14)$$

$$Abnormal\_R\&D\_Cuts_{i,t} = 1\ if\ Abnormal\_R\&D_{i,t} < 0,\ otherwise\ 0 \quad (15)$$

4.3.2. Measurement of career horizon

Following the literature, I use CEO age as the main proxy for career horizon (e.g. Barker and Muller, 2002; Lundstrum, 2002; Demers and Wang, 2010). Older CEOs indicate relatively short career horizons. I also adopt two dummy variables to highlight the short horizon effects. One is CEO Age above 60; the other is CEO Age above 62. Because the normal retirement age is 65 in the UK, these dummy variables indicate the last 5 and 3 remaining years in the office.

4.3.3. Measurement of CEO compensation

CEO annual compensation is the sum of salary, bonuses, pension increment and the estimated value of equity (restricted shares and options) grants. As far CEO pension is concerned, I measure pension increment as a fraction of annual compensation as well as the total pension outstanding. CEO equity incentives are the number of shares of stock

options and restricted shares, scaled by a firm's total number shares outstanding. All variables are defined in Table 4.1.

4.3.4. Testing Models

As mentioned in Section 4.3.1, I adopt three proxies to represent R&D spending. The first is R&D intensity, which is measured as R&D spending scaled by a firm's total sales. My main purpose is to estimate the interactive relationship between pay and career horizon, and their joint impacts on investment decisions. Hence, career horizon variables, CEO compensation variables and their interactive variables should be included. The estimation of the dependent variable R&D intensity is listed as follows.

$$R\&D_{i,t} = b_0 + b_1 * Career\ horizon_{i,t} + b_2 * Compensation_{i,t} + b_3 * Career\ horizon_{i,t} * Compensation_{i,t} + \sum b_4\, controls_{i,t} + \sum b_5\, Industry + \sum b_6 Years + \varepsilon \quad (16)$$

As far as the second proxy for R&D spending, Abnormal_R&D, is concerned; I use a similar OLS model to equation (16) but without industry and years dummies. [13] Because the variable of Abnormal_R&D already considers these effects of industry and year.

The last proxy for R&D spending, Abnormal_R&D_Cuts, is a dummy variable. I use the following model to test its relationship between career horizon and compensation.

$$Probability\ (Abnormal\_R\&D\_Cuts_{i,t}=1) = c_0 + c_1 * Career\ horizon_{i,t} + c_2 * Compensation_{i,t} + c_3 * Career\ horizon_{i,t} * Compensation_{i,t} + \sum c_4\, Controls_{i,t} + \varepsilon \quad (17)$$

[13] Please see Page 25 (paragraph two) for the discussion of limitations of OLS regression.

4.4. Data

I use FTSE 350 non-financial and non-utilities firms in this study. The time period is between 2003 and 2007. It starts with 2003; because it is the first year UK publicly traded firms have to disclose the detailed information about their directors' pensions to the public after the introduction of the Director's remuneration report regulations (2002). Further sample restrictions include R&D data availability and R&D intensity. Previous literature suggests that only industries where R&D is intensive and crucial are meaningful in the test (e.g. Cheng, 2004). Firms which spend over a quarter of total sales on R&D expenses are also excluded, following Gibbons and Murphy (1992a). Because those outliers of R&D intensity are mainly due to firms' business models. [14] I also exclude the data if a CEO is in his or her first year in office, because it is difficult to judge whether R&D spending decisions in such cases were made by the new CEO or the previous one. The R&D expenditure and firm characteristics data is collected from DataStream and FAME. The data of CEO bonus, equity incentives and CEO age come from BoardEx, while pension data is hand-collected from firms' annual reports.

Following the selection procedure described above, I have a sample of 310 observations. About two thirds of the observations (198 in total) come from manufacturing industries, especially the chemicals and the allied products industry. R&D spending is also more intensive and crucial for those industries. Detailed information about the sample selection is available in Table 4.2.

[14] Based on the annual reports from 15 observations whose R&D intensity (R&D/Sales) >0.25, their revenues are mainly from licensing their intellectual property or contracts. It is not comparable with most my samples which sell own products.

Table 4.1 Variable definitions

Panel A: R&D Spending & Firm Characteristics

Variable Name	Definition
R&D intensity	R&D spending (WC 01201)/Total sales (WC 01001).
Abnormal_R&D	Residual from the regression where the dependent variable is actual R&D and the independent variables are economic determinants of R&D spending over the industry for a particular year (please see equation 13).
Abnormal_R&D_Cuts	Dummy variables equals 1 if Abnormal_R&D<0, otherwise zero.
Size	The natural logarithm of the firm's total assets (WC 02999).
Leverage	Total debt (WC 03255)/Total assets (WC 02999).
Profitability	Net operating income (WC 01250) plus Depreciation (WC 04049) and R&D spending (WC 01201), scaled by Total assets (WC 02999).
FCF	Free cash flows is calculated as the Operating cash flows (WC 04860) plus R&D spending (WC 01201) minus Capital expenditure (WC 0460), scaled by Total sales (WC 01001).
Growth	The market value of equity (DS: MV)/The book value of equity (WC 03501).
Firm Age	The natural logarithm of the number of years between year t and the first year the company is publicly listed (DS: BDATE).

Panel B: CEO Career Horizon

Variable Name	Definition
CEO Age	CEO age in years.
CEO Tenure	Years in the position as CEO.
CEO Age Above 60	Dummy variable equals 1 if CEO age is above 60, otherwise 0.
CEO Age Above 62	Dummy variable equals 1 if CEO age is above 62, otherwise 0.

Table 4.1. (Continued)

Panel C: CEO Compensation

Variable Name	Definition
Total Compensation	The sum of salary, bonuses, the incremental value of pension, the estimated value of option and restricted shares grants[15] for a particular year.
Bonus	The amount of bonus scaled by total compensation.
Pension Increment	The gap of total transfer value of defined benefit pension between year t and year t-1.
Pension to Equity	The total transfer value of defined benefit pension scaled by the estimated value of equity incentives.
Options Grants	The estimated value of stock option grants scaled by total compensation.
Shares Grants	The estimated value of restricted shares grants scaled by total compensation.
Ownership	The number of shares owned by the CEO scaled by total shares outstanding.
Options	The number of option shares scaled by total shares outstanding.
Shares	The number of restricted shares scaled by total shares outstanding.

[15] Please see the Appendix for the estimated valuation for stock options and restricted shares

Table 4.2 Sample selection and distributions

	Observations
All data available for R&D spending, compensation and firm characteristics	384
R&D intensity (R&D/Sales) > 0.25 *(Gibbons and Murphy, 1992a)*	(15)
CEO tenure (years) < 1 (*R&D spending may be decided by former CEOs*)	(59)
Total	310
Industry	
1 Manufacturing UK SIC (2003) section D: 15-36	198
1.1 Chemicals and allied products UK SIC (2003) section D: 24	56
1.2 Electronic products UK SIC (2003) section D: 30-33	39
1.3 Other manufacturing	103
2 Miscellaneous	112
Total	310
Year	
2003	56
2004	60
2005	62
2006	70
2007	62
Total	310

The descriptive statistics are listed in the table 4.3. In Panel A, R&D spending and firm characteristics information is provided. The average R&D spending in this sample is £144.77 million, while the median value is just over £14 million. On average, my sample firm spends about 4% of its annual sales on R&D expenses (R&D intensity). The median value of the variable Abnormal_R&D is negative, indicating that over half observations in the sample spend less than my model predicted. The general profile of sample firms is large, less geared, profitable and mature based on firm characteristics data. They also have good growth prospects and strong cash flows.

Information about CEO career horizon is available in Panel B of Table 4.3. The average (median) CEO age in my sample is about 54.04 (54.59). Less than 25% of CEOs in my sample are over 58, indicating that the general profile of CEOs in my sample is far from retirement. CEOs in my sample have spent about 5.8 years in the top management position, on average. The relatively long tenure may suggest that CEOs may be powerful enough to influence their firms' R&D spending decisions.

CEO compensation information is listed in Panel C of Table 4.3. The mean (median) value for annual compensation is £2.95 million (£1.61million). Within annual compensation, shares grants constitute the most significant pay component. On average, it comprises about 25% of total annual pay. The mean (median) value for pension increment is 11% (2%). This means that just over half the observations in my sample have defined benefit pension plans for CEOs. There is a large variation of equity incentives among CEOs. On average, CEOs have ownership, stock option and restricted shares of 1.25%, 0.24% and 0.09% of their firms' total shares outstanding, respectively. The ratio of accumulative pension value to equity incentive value is 0.44, on average.

Table 4.3 Descriptive statistics

The sample consists of 310 firm-years FTSE 350 observations from 2003-2007.All variables are winsorized at 2% level. All variables are defined in Table 4.1

Panel A. R&D Spending and Firm Characteristics

Variables	Mean	St.Dev	Min.	Quartile 1	Median	Quartile 3	Max
R&D spending (£M)	144.77	459.01	0.2	4.83	14.17	57	2839
R&D intensity	0.0402	0.0543	0.0001	0.0034	0.0165	0.0485	0.2135
Abnormal R&D	-0.0006	0.0221	-0.0549	-0.0125	-0.0002	0.0089	0.0794
Abnormal R&D Cuts	0.51	0.50	0	0	1	1	1
Firm Size (£M)	8425.47	21772	49.37	326.05	1244	4913	132365
Leverage	0.20	0.13	0	0.10	0.20	0.28	0.53
Profitability	0.19	0.09	0.05	0.12	0.17	0.23	0.50
FCF	0.12	0.10	-0.03	0.04	0.10	0.18	0.43
Growth	4.34	4.29	0.90	2.31	3.12	5.08	34.76
Firm Age (years)	27.09	0.83	0.26	12.78	34.88	40.59	43.63

Panel B. CEO Career Horizon

Variables	Mean	St.Dev	Min.	Quartile 1	Median	Quartile 3	Max
CEO Age (years)	54.04	5.58	40.46	50.14	54.59	58.02	66.27
CEO Tenure (years)	5.80	4.35	1.20	2.80	4.80	7.40	28.40

Panel C. CEO Compensation

Variables	Mean	St.Dev	Min.	Quartile 1	Median	Quartile 3	Max
Total Pay (£000s)	2954.18	3484.24	220	858	1608.50	3620	17507
Bonus	0.18	0.11	0	0.10	0.17	0.24	0.57
Pension Increment	0.11	0.16	0	0	0.02	0.19	0.56
Options Grants	0.13	0.16	0	0	0.06	0.23	0.59
Shares Grants	0.25	0.21	0	0	0.28	0.41	0.77
Ownership (%)	1.25	5.54	0	0.01	0.04	0.20	36.48
Options (%)	0.24	0.36	0	0.02	0.09	0.29	1.82
Shares (%)	0.09	0.12	0	0	0.04	0.12	0.51
Pension to Equity	0.44	0.81	0	0	0.04	0.49	3.95

The correlation matrix among major variables is listed in Table 4.4. I find that R&D intensity is positively related with CEO tenure and those dummy variables indicating a short career horizon (e.g. CEO age above 62). Ownership, firm profitability, cash flows and growth prospect are also positively related with R&D intensity, while restricted shares, firm size, leverage and firm age are negatively related with R&D intensity. Abnormal_R&D is also positively related with CEO tenure and ownership. As far as the third proxy for R&D spending, Abnormal_R&D_Cuts, is concerned; it is negatively related with CEO age, tenure and ownership. CEO age and tenure are positively related with ownership and pension value. This demonstrates that the equity incentives have been accumulated through a CEO's career path.

4.5. Empirical results

4.5.1. Career horizon

The results of the effect of career horizon on R&D spending are described in Table 4.5. As mentioned before, I adopt various career horizon variables and R&D spending variables. In Panel A, the dependent variable is the observable R&D spending data, R&D intensity. The coefficients for variables of CEO Age, CEO Age above 60 and CEO Age above 62 are all positive in eight regressions, while only that for the dummy variable of CEO Age above 60 (columns 3 and 4) are at 5% significance level. I then replace R&D intensity with Abnormal R&D and Abnormal R&D Cuts as the dependent variables, and these results are reported in the Panels B and C, respectively. These results are similar to those in Panel A. I do not find that R&D spending declines when CEOs approach retirement. The coefficient for CEO Age in column 2 of Panel C is -0.04 at 10% significance level. This indicates that CEOs are less likely to cut R&D spending as they grow older. It is inconsistent with my hypothesis (H11).

Table 4.4 Correlation Matrix

Correlations among main variables. All variables are defined in Table 4.1. The correlations, which are significant at 10% level, are in bold.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1)RD_INTENSITY	1																	
(2)ABNORMAL_RD	**0.53**	1																
(3) ABNORMAL_RD_CUTS	**-0.34**	**-0.72**	1															
(4)CEO_AGE	-0.06	0.00	**-0.10**	1														
(5)CEO_AGE_ABOVE_60	**0.14**	0.09	**-0.11**	**0.60**	1													
(6)CEO_AGE_ABOVE_62	**0.12**	0.08	-0.08	**0.49**	**0.69**	1												
(7)CEO_TENURE	**0.18**	**0.09**	**-0.13**	**0.32**	**0.39**	**0.41**	1											
(8)PENSION_INCREMENT	-0.07	-0.01	0.09	**0.23**	**0.10**	-0.03	0.06	1										
(9)PENSION_TO_EQUITY_RATIO	-0.05	-0.08	**0.10**	**0.26**	**0.15**	0.05	0.08	**0.75**	1									
(10)OWNERSHIP	**0.22**	**0.15**	**-0.13**	**0.12**	**0.22**	**0.35**	**0.57**	**-0.13**	**-0.11**	1								
(11)OPTIONS	-0.05	-0.08	0.09	**0.15**	**0.11**	**0.14**	-0.05	**-0.14**	-0.05	**-0.12**	1							
(12)SHARES	**-0.12**	-0.01	-0.09	**-0.16**	-0.03	-0.05	**0.10**	-0.09	-0.07	-0.09	-0.03	1						
(13)SIZE	**-0.24**	-0.02	0.00	**0.15**	-0.07	**-0.12**	**-0.23**	0.02	-0.03	**-0.18**	**-0.23**	**-0.27**	1					
(14)LEVERAGE	**-0.41**	-0.02	-0.04	0.08	**-0.10**	**-0.10**	**-0.26**	0.00	0.02	**-0.21**	0.00	0.06	**0.34**	1				
(15)PROFITABILITY	**0.40**	0.00	-0.03	0.09	**0.23**	**0.17**	**0.20**	0.04	0.06	**0.18**	-0.04	0.01	**-0.19**	**-0.38**	1			
(16)FCF	**0.72**	0.06	-0.03	-0.04	0.05	0.05	**0.17**	-0.07	-0.04	**0.11**	**-0.14**	**-0.16**	0.03	**-0.35**	**0.49**	1		
(17)GROWTH	**0.09**	-0.01	-0.05	0.03	-0.01	0.00	0.07	-0.09	**-0.10**	0.00	-0.01	**0.10**	**-0.12**	0.08	**0.34**	**0.18**	1	
(18)FIRM_AGE	**-0.28**	-0.03	0.00	**0.17**	0.02	-0.04	0.03	**0.27**	**0.22**	**-0.19**	-0.05	0.01	**0.28**	**0.16**	**-0.20**	**-0.24**	**-0.17**	1

Table 4.5 CEO career horizon and R&D spending

Panel A: R&D intensity

The panel presents OLS regression results of R&D spending intensity (R&D/Sales) on various variables for CEO career horizons. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1 Coefficients for industry and year dummies are included but not reported. The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp	(1)	(2)	(3)	(4)	(5)	(6)
Intercept		**0.10*** **	**0.10*** **	**0.12*** **	**0.10*** **	**0.11*** **	**0.10*** **
		(4.24)	(4.37)	(6.06)	(6.62)	(5.85)	(5.71)
CEO Age	(-)	0.0003	0.0002				
		(0.63)	(0.39)				
CEO Age Above 60	(-)			**0.02** **	**0.01** **		
				(2.40)	(1.98)		
CEO Age Above 62	(-)					0.01	0.01
						(1.62)	(1.45)
CEO Tenure	(+)	-0.0003		-0.001		-0.005	
		(-0.55)		(-1.15)		(-0.91)	
Size	(+)	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **
		(-5.17)	(-6.79)	(-5.51)	(-5.62)	(-5.33)	(-6.55)
Profitability	(+)	-0.01		-0.02		-0.02	
		(-0.45)		(-0.82)		(-0.57)	
Leverage	(-)	-0.03		**-0.03***	**-0.03***	-0.03	
		(-1.64)		(-1.67)	(-1.87)	(-1.65)	
FCF	(+)	**0.37*** **	**0.38*** **	**0.38*** **	**0.36*** **	**0.37*** **	**0.37*** **
		(15.38)	(19.09)	(15.74)	(17.10)	(15.58)	(18.81)
Growth	(+)	**-0.001***	**-0.001** **	-0.001		-0.001	
		(-1.65)	(-2.30)	(-1.47)		(-1.54)	
Firm Age	(-)	-0.002		-0.002		-0.002	
		(-0.81)		(-0.70)		(-0.63)	
Adjusted R^2		0.58	0.58	0.59	0.59	0.59	0.58

Table 4.5 (Continued)

Panel B: Abnormal R&D

The panel presents OLS regression results of Abnormal R&D on various variables for CEO career horizons. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp	(1)	(2)	(3)	(4)	(5)	(6)
Intercept		0.004	-0.001	-0.003	-0.001	-0.003	-0.001
		(0.28)	(-0.04)	(-1.30)	(-0.69)	(-1.24)	(-0.46)
CEO Age	(-)	-0.0001	0.0001				
		(-0.52)	(0.03)				
CEO Age Above 60	(-)			0.005	0.01		
				(1.05)	(1.61)		
CEO Age Above 62	(-)					0.005	0.01
						(0.75)	(1.36)
CEO Tenure	(+)	**0.001***		0.0004		0.0004	
		(1.74)		(1.12)		(1.21)	
Adjusted R^2		0.003	0.003	0.006	0.005	0.004	0.003

Panel C: Abnormal R&D Cuts

The panel presents logit regression results of Abnormal_R&_Cuts on various variables for CEO career horizons. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The Z-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

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Variables	Exp	(1)	(2)	(3)	(4)	(5)	(6)
Intercept		1.60	**1.93***	**0.37***	0.11	**0.36***	0.07
		(1.40)	(1.71)	(1.83)	(0.92)	(1.81)	(0.60)
CEO Age	(+)	-0.02	**-0.04***				
		(-1.08)	(-1.70)				
CEO Age Above 60	(+)			-0.41	**-0.64***		
				(-1.14)	(-1.88)		
CEO Age Above 62	(+)					-0.29	-0.63
						(-0.58)	(-1.37)
CEO Tenure	(-)	**-0.05***		-0.05		**-0.06***	
		(-1.75)		(-1.60)		(-1.81)	
Mc Fadden R^2		0.01	0.01	0.01	0.01	0.01	0.01

As far as control variables are concerned, R&D intensity is high if a firm is less geared and has strong cash flows. Bigger firms will have a relatively lower R&D intensity. In short, the above mentioned results are inconsistent with my hypothesis (H11): older CEOs may spend less on R&D expenditures. It seems that older CEOs may spend even more on R&D expenditure compared with their younger counterparts. The coefficient of dummy variable of CEO age above 60 is positive and reaches 5% significance level in the Panel A. A possible explanation is that I omit corporate governance factors (e.g. incentive pay) in the above estimations. I will include those factors in following discussions.

4.5.2. Pension

The first pension variable I examine is pension increment, the fraction of pension value in annual compensation. The results are reported in Table 4.6. In the column 1 of panel A, I find that the coefficient for pension increment alone is not significant. Then I add different career horizon variables and interactive variables of career horizon and pension increment in columns 3, 5 and 7. Interestingly, I observe that those interactive variables of pension increment * CEO Age above 60 and Pension increment * CEO Age above 62 are negative at lest 5% significance levels. This suggests that pension increment discourages R&D spending if a CEO is above 60. Pension increment seems has no effect on R&D intensity for other CEO age groups. I find similar results in Panels B and C when I employ Abnormal R&D and Abnormal R&D Cuts as the dependent variables. The coefficient for the interactive variable CEO Age above 60 * pension increment in the column 5 of panel C is 4.43 at 5% significance level. This indicates that a firm is more likely to cut R&D spending if its CEO is above 60 and has more defined benefit pensions as a fraction of his or her annual compensation.

Table 4.6 Pension Increment, CEO career horizon, and R&D spending

Panel A: R&D intensity

The panel presents OLS regression results of R&D spending intensity (R&D/Sales) on various variables for CEO career horizons and pension increment. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1 Coefficients for industry and year dummies are included but not reported. The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		**0.11*** **	**0.10*** **	**0.09*** **	**0.12*** **	**0.12*** **	**0.11*** **	**0.12*** **
		(6.17)	(4.12)	(3.37)	(6.12)	(6.18)	(5.81)	(5.87)
Pension Increment	(-)	-0.003	-0.004	0.16	-0.004	0.01	-0.001	0.003
		(-0.20)	(-0.32)	(1.01)	(-0.33)	(0.72)	(-0.09)	(0.24)
CEO Age	(-)		0.0003	0.001				
			(0.68)	(1.07)				
CEO Age Above 60	(-)				**0.02****	**0.03*** **		
					(2.41)	(3.38)		
CEO Age Above 62	(-)						0.01	**0.02****
							(1.61)	(2.02)
CEO Age	(-)			-0.003				
* Pension Increment				(-1.05)				
CEO Age Above 60	(-)					**-0.07****		
* Pension Increment						(-2.37)		
CEO Age Above 62	(-)							**-0.06***
***** Pension Increment								(-1.70)
CEO Tenure	(+)	-0.0002	-0.0003	-0.0003	-0.001	-0.001	-0.001	-0.001
		(-0.34)	(-0.55)	(-0.60)	(-1.14)	(-1.61)	(-0.90)	(-1.12)
Size	(+)	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **
		(-5.22)	(-5.18)	(-5.23)	(-5.50)	(-5.63)	(-5.32)	(-5.38)
Profitability	(+)	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
		(-0.37)	(-0.43)	(-0.41)	(-0.80)	(-0.83)	(-0.56)	(-0.57)
Leverage	(-)	-0.03	-0.03	-0.03	**-0.03***	**-0.04***	-0.03	**-0.03***
		(-1.61)	(-1.64)	(-1.64)	(-1.68)	(-1.89)	(-1.64)	(-1.72)
FCF	(+)	**0.37*** **	**0.37*** **	**0.37*** **	**0.37*** **	**0.38*** **	**0.37*** **	**0.37*** **
		(15.39)	(15.33)	(15.36)	(15.67)	(15.81)	(15.51)	(15.51)
Growth	(+)	-0.001	**-0.001***	**-0.001***	-0.001	-0.001	-0.001	-0.001
		(-1.62)	(-1.69)	(-1.71)	(-1.48)	(-1.38)	(-1.54)	(-1.52)
Firm Age	**(-)**	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001
		(-0.74)	(-0.72)	(-0.70)	(-0.61)	(-0.61)	(-0.59)	(-0.49)
Adjusted R^2		0.58	0.58	0.58	0.59	0.60	0.59	0.59

Table 4.6. (Continued)

Panel B: Abnormal R&D

The panel presents OLS regression results of Abnormal R&D on various variables for CEO career horizons and pension increment. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		-0.003 (-0.18)	0.004 (0.25)	0.003 (0.20)	-0.003 (-1.07)	-0.003 (-1.13)	-0.003 (-1.06)	-0.003 (-1.05)
Pension Increment	(-)	-0.003 (-0.31)	-0.002 (-0.20)	0.001 (0.01)	-0.004 (-0.40)	0.003 (0.35)	-0.002 (-0.27)	0.001 (0.01)
CEO Age	(-)		0.0001 (0.46)	-0.0001 (-0.40)				
CEO Age Above 60	(-)				0.005 (1.07)	**0.01*** (1.84)		
CEO Age Above 62	(-)						0.004 (0.73)	0.01 (1.08)
CEO Age * Pension Increment	(-)			-0.001 (-0.03)				
CEO Age Above 60 * Pension Increment	(-)					-0.004 (-1.58)		
CEO AgE Above 62 * Pension Increment	(-)							-0.03 (-0.86)
CEO Tenure	(+)	**0.001*** (1.67)	**0.001*** (1.73)	**0.001*** (1.73)	0.0004 (1.12)	0.0003 (0.78)	0.0004 (1.22)	0.0004 (1.03)
Adjusted R^2		0.003	0.002	0.001	0.003	0.008	0.001	0.001

Panel C: Abnormal R&D Cuts

The panel presents logit regression results of Abnormal_R&_Cuts on various variables for career horizons and pension increment. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The Z-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		0.27 (1.26)	**2.00*** (1.70)	2.13 (1.59)	0.24 (1.14)	0.27 (1.25)	0.26 (1.20)	0.26 (1.20)
Pension Increment	(+)	**1.21*** (1.65)	**1.47*** (1.95)	-0.30 (-0.03)	**1.30*** (1.76)	0.54 (0.66)	1.19 (1.63)	1.00 (1.32)
CEO Age	(+)		-0.04 (-1.51)	-0.04 (-1.43)				
CEO Age Above 60	(+)				-0.48 (-1.29)	**-1.22**** (-2.30)		
CEO Age Above 62	(+)						-0.26 (-0.51)	-0.55 (-0.89)
CEO Age * Pension Increment	(+)			0.03 (0.19)				
CEO Age Above 60 * * Pension Increment	(+)					**4.43**** (2.05)		
CEO Age Above 62* * Pension Increment	(+)							2.46 (0.84)
CEO Tenure	(-)	**-0.07**** (-2.22)	**-0.05*** (-1.75)	**-0.06*** (-1.75)	**-0.05*** (-1.66)	-0.04 (-1.28)	**-0.06*** (-1.93)	**-0.06*** (-1.77)
Mc Fadden R^2		0.02	0.02	0.02	0.02	0.03	0.03	0.02

In Table 4.7, I consider another pension variable, pension to equity ratio, which is measured as the ratio of pension value to equity incentive value. These results are very similar to those in Table 4.6. For example, the coefficient for the interactive variable CEO Age above 60* Pension to equity in column 5 of Panel A is -0.01 at 10% significance level. This suggests that R&D intensity is falling if a CEO is over 60 and has more defined benefit pension value relative to the value of his or her equity incentives. In Panels B and C of Table 4.7, I use the alternative proxies of R&D spending: Abnormal R&D and Abnormal R&D Cuts. These coefficients of interactive variables between career horizon and pension to equity value are in the direction of what I expected (columns 5 and 7 of Panel B and C in Table 4.7), though fail to reach a significance level.

In short, the above mentioned results in table 4.6 and 4.7 provide some evidence that pension (defined benefit) may discourage CEOs from getting involved in research and development expenditures as they approach retirement. This is consistent with my hypothesis (H12): Older CEOs with more pensions are less likely to spend in R&D expenditure.

4.5.3. Ownership

Ownership is the first type of equity incentive I consider. The results are reported in Table 4.8. The coefficients for the variable of ownership are positive at least10% significance levels in all regression in Panel A, when I use R&D intensity as the dependent variable. This suggests that ownership encourages CEOs to spend more on R&D spending.

Table 4.7 Pension to Equity ratio, CEO career horizon, and R&D spending

Panel A: R&D intensity

The panel presents OLS regression results of R&D spending intensity (R&D/Sales) on various variables for CEO career horizons and pension to equity ratio. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1 Coefficients for industry and year dummies are included but not reported. The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		**0.11*** **	**0.10*** **	**0.09*** **	**0.12*** **	**0.12*** **	**0.11*** **	**0.11*** **
		(5.68)	(3.94)	(3.61)	(6.06)	(6.13)	(5.82)	(5.82)
Pension to Equity	(-)	-0.002	-0.003	0.01	-0.004	-0.001	-0.003	-0.002
		(-0.95)	(-1.17)	(0.17)	(-1.30)	(-0.50)	(-1.03)	(-0.81)
CEO Age	(-)		0.0004	0.0004				
			(0.93)	(0.95)				
CEO Age Above 60	(-)				**0.02****	**0.03*** **		
					(2.55)	(3.10)		
CEO Age Above 62	(-)						**0.01***	**0.02***
							(1.67)	(1.69)
CEO Age	(-)			-0.0002				
* Pension to Equity				(-0.25)				
CEO Age Above 60	(-)					**-0.01***		
* Pension to Equity						(-1.77)		
CEO Age Above 62	(-)							-0.005
* Pension to Equity								(-0.56)
CEO Tenure	(+)	-0.0001	-0.0003	-0.0003	-0.001	-0.001	-0.001	-0.001
		(-0.25)	(-0.55)	(-0.58)	(-1.08)	(-1.47)	(-0.83)	(-0.93)
Size	(+)	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **
		(-5.28)	(-5.30)	(-5.29)	(-5.61)	(-5.63)	(-5.40)	(-5.38)
Profitability	(+)	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		(-0.27)	(-0.34)	(-0.33)	(-0.69)	(-0.75)	(-0.45)	(-0.47)
Leverage	(-)	-0.03	-0.03	-0.03	-0.03	**-0.03***	-0.03	-0.03
		(-1.52)	(-1.55)	(-1.57)	(-1.59)	(-1.82)	(-1.56)	(-1.60)
FCF	(+)	**0.37*** **	**0.37*** **	**0.37*** **	**0.37*** **	**0.38*** **	**0.37*** **	**0.37*** **
		(15.43)	(15.40)	(15.38)	(15.74)	(15.79)	(15.55)	(15.53)
Growth	(+)	**-0.001***	**-0.001***	**-0.001***	-0.001	-0.001	-0.001	-0.001
		(-1.71)	(-1.80)	(-1.80)	(-1.60)	(-1.50)	(-1.64)	(-1.63)
Firm Age	(-)	-0.002	-0.002	-0.002	-0.001	-0.002	-0.001	-0.001
		(-0.58)	(-0.54)	(-0.53)	(-0.39)	(-0.31)	(-0.39)	(-0.35)
Adjusted R^2		0.58	0.58	0.58	0.59	0.60	0.59	0.59

Table 4.7 (Continued)

Panel B: Abnormal R&D

The panel presents OLS regression results of Abnormal R&D on various variables for CEO career horizons and pension to equity ratio. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		-0.002 (-0.96)	-0.004 (-0.03)	-0.001 (-0.01)	-0.002 (-0.82)	-0.002 (-0.75)	-0.002 (-0.80)	-0.002 (-0.79)
Pension to Equity	(-)	-0.003 (-1.58)	-0.003 (-1.49)	-0.004 (-0.15)	**-0.003*** (-1.72)	-0.002 (-0.99)	-0.003 (-1.59)	-0.003 (-1.45)
CEO Age	(-)		-0.0001 (-0.14)	-0.0001 (-0.14)				
CEO Age Above 60	(-)				0.01 (1.25)	**0.01*** (1.80)		
CEO Age Above 62	(-)						0.005 (0.79)	0.01 (0.72)
CEO Age * Pension to Equity	(-)			0.001 (0.05)				
CEO Age Above 60 * Pension to Equity	(-)					-0.01 (-1.30)		
CEO Age Above 62 * Pension to Equity	(-)							-0.001 (-0.11)
CEO Tenure	(+)	**0.001*** (1.79)	**0.001*** (1.74)	**0.001*** (1.74)	0.0004 (1.17)	0.0003 (0.83)	0.0004 (1.31)	0.0004 (1.25)
Adjusted R^2		0.01	0.01	0.004	0.01	0.01	0.01	0.01

Panel C: Abnormal R&D Cuts

The panel presents logit regression results of Abnormal_R&_Cuts on various variables for career horizons and pension to equity ratio. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The Z-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		0.30 (1.44)	**2.20*** (1.85)	**2.34*** (1.82)	0.27 (1.29)	0.26 (1.25)	0.26 (1.20)	0.28 (1.32)
Pension to Equity	(+)	**0.28*** (1.88)	**0.35**** (2.22)	-0.33 (-0.14)	**0.31**** (2.04)	0.20 (1.20)	1.19 (1.63)	**0.27*** (1.71)
CEO Age	(+)		-0.04 (-1.63)	-0.04 (-1.62)				
CEO Age Above 60	(+)				-0.53 (-1.41)	**-1.07**** (-2.06)		
CEO Age Above 62	(+)						-0.26 (-0.51)	-0.42 (-0.69)
CEO Age * Pension to Equity	(+)			0.01 (0.29)				
CEO Age Above 60 * Pension to Equity	(+)					0.70 (1.58)		
CEO Age Above 62 * Pension to Equity	(+)							0.13 (0.26)
CEO Tenure	(-)	**-0.07**** (-2.28)	**-0.06*** (-1.79)	**-0.06*** (-1.78)	**-0.05*** (-1.68)	-0.04 (-1.33)	**-0.06*** (-1.93)	**-0.06*** (-1.86)
Mc Fadden R^2		0.02	0.03	0.03	0.03	0.03	0.03	0.02

Table 4.8 Ownership, CEO career horizon R&D spending

Panel A: R&D intensity

The panel presents OLS regression results of R&D spending intensity (R&D/Sales) on various variables for CEO career horizons and ownership. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1 Coefficients for industry and year dummies are included but not reported. The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

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Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		**0.11*** **	**0.10*** **	**0.08*** **	**0.12*** **	**0.12*** **	**0.12*** **	**0.12*** **
		(5.87)	(4.20)	(3.23)	(6.27)	(6.19)	(5.97)	(5.89)
Ownership	(+)	**0.13*** **	**0.13*** **	**0.71** **	**0.14*** **	**0.12***	**0.12*** **	**0.11***
		(2.84)	(2.91)	(2.14)	(3.01)	(1.87)	(2.68)	(1.69)
CEO Age	(-)		0.0004	0.001				
			(0.92)	(1.32)				
CEO Age Above 60	(-)				**0.02*** **	**0.02** **		
					(2.60)	(2.55)		
CEO Age Above 62	(-)						0.01	0.01
							(1.33)	(1.22)
CEO Age	?			**-0.01***				
* Ownership				(-1.75)				
CEO Age Above 60	?					0.03		
* Ownership						(0.37)		
CEO Age Above 62	?							0.03
* Ownership								(0.31)
CEO Tenure	(+)	**-0.001***	**-0.001** **	**-0.001***	**-0.002** **	**-0.002** **	**-0.001** **	**-0.001** **
		(-1.85)	(-2.06)	(-1.68)	(-2.07)	(-2.58)	(-2.13)	(-2.12)
Size	(+)	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **
		(-5.50)	(-5.52)	(-5.42)	(-5.83)	(-5.83)	(-5.57)	(-5.57)
Profitability	(+)	-0.02	-0.02	-0.02	-0.03	-0.03	-0.02	-0.02
		(-0.60)	(-0.70)	(-0.58)	(-1.07)	(-1.06)	(-0.74)	(-0.73)
Leverage	(-)	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
		(-1.47)	(-1.51)	(-1.46)	(-1.53)	(-1.52)	(-1.51)	(-1.50)
FCF	(+)	**0.37*** **	**0.38*** **	**0.37*** **	**0.37*** **	**0.38*** **	**0.38*** **	**0.38*** **
		(15.81)	(15.77)	(15.62)	(16.14)	(16.12)	(15.89)	(15.85)
Growth	(+)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
		(-1.47)	(-1.53)	(-1.51)	(-1.31)	(-1.32)	(-1.42)	(-1.42)
Firm Age	(-)	0.001	0.001	0.001	0.001	0.003	0.004	0.001
		(0.03)	(0.04)	(0.36)	(0.19)	(0.12)	(0.13)	(0.07)
Adjusted R^2		0.59	0.59	0.60	0.60	0.60	0.60	0.59

Table 4.8 (Continued)

Panel B: Abnormal R&D

The panel presents OLS regression results of Abnormal R&D on various variables for CEO career horizons and ownership. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		-0.001 (-0.52)	0.004 (0.26)	-0.01 (-0.74)	-0.001 (-0.44)	-0.001 (-0.73)	-0.001 (-0.47)	-0.002 (-0.74)
Ownership	(+)	**0.07**** (2.19)	**0.07**** (2.15)	**0.64***** (2.80)	**0.07**** (2.18)	**0.09**** (2.14)	**0.07**** (2.08)	**0.09**** (2.06)
CEO Age	(-)		-0.0001 (-0.37)	0.0001 (0.52)				
CEO Age Above 60	(-)				0.01 (1.04)	0.01 (1.15)		
CEO Age Above 62	(-)						0.002 (0.40)	0.004 (0.59)
CEO Age * Ownership	?			**-0.01**** (-2.53)				
CEO Age Above 60 * Ownership	?					-0.05 (-0.82)		
CEO Age Above 62 * Ownership	?							-0.05 (-0.78)
CEO Tenure	(+)	0.001 (0.14)	0.001 (0.25)	0.001 (0.80)	-0.001 (-0.21)	0.001 (0.11)	0.001 (0.03)	0.001 (0.31)
Adjusted R^2		0.02	0.01	0.03	0.02	0.02	0.01	0.01

Panel C: Abnormal R&D Cuts

The panel presents logit regression results of Abnormal_R&_Cuts on various variables for career horizons and ownership. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The Z-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		0.30 (1.42)	1.74 (1.49)	1.95 (1.55)	0.29 (1.35)	0.24 (1.06)	0.20 (1.39)	0.24 (1.09)
Ownership	(-)	-4.32 (-1.31)	-4.97 (-1.39)	-14.69 (-0.66)	-4.46 (-1.32)	-2.64 (-0.71)	-4.21 (-1.27)	-2.29 (-0.63)
CEO Age	(+)		-0.03 (-1.26)	-0.03 (-1.33)				
CEO Age Above 60	(+)				-0.42 (-1.17)	-0.37 (-1.02)		
CEO Age Above 62	(+)						-0.21 (-0.43)	-0.05 (-0.08)
CEO Age * Ownership	?			0.17 (0.44)				
CEO Age Above 60 * Ownership	?					-12.43 (-0.46)		
CEO Age Above 62 * Ownership	?							-36.09 (-0.21)
CEO Tenure	(-)	-0.04 (-1.20)	-0.03 (-0.80)	-0.03 (-0.83)	-0.03 (-0.80)	-0.02 (-0.56)	-0.04 (-1.08)	-0.03 (-0.83)
Mc Fadden R^2		0.02	0.02	0.02	0.02	0.02	0.02	0.02

I then add the career horizon variables and the interactive variables of both career horizon and ownership in regressions (columns 3, 5 and 7 in Panel A of Table 4.8). I find that the interactive variable of CEO age and ownership (column 3) becomes negative at 10% significance level. Such a coefficient suggests that although ownership is a good setting to encourage R&D spending, older CEOs with more ownership dislike risky investments dramatically. I find the similar result in column 3 of panel B in Table 4.8, when I replace R&D intensity with Abnormal R&D as the dependent variable. The coefficient for the interactive variable CEO Age * Ownership is -0.01, at 5% significance level. In short, these results in Table 4.8 provide some evidence to support the prospect theory in my hypothesis (H13b): Older CEOs with more ownership will spend less on R&D expenditure. A possible explanation is that CEOs who have a large amount of equity incentives and a relatively short career horizon are more likely to preserve gains in equity incentives. Hence they become more risk-averse in such a situation.

4.5.4. Stock options

Stock options constitute the second type of equity incentives I examine. Table 4.9 demonstrates the related results. In Panel A, I did not find a positive relationship between stock options holding and R&D intensity as expected. The coefficients for the variable of options are not statistically significant in all regressions. The interactive effects of stock options on different career horizons are examined in columns 3, 5 and 7 of Panel A in Table 4.9. Those coefficients for interactive variables also fail to reach any statistically significant level. Similar results are found when Abnormal R&D and Abnormal R&D Cuts are introduced as dependent variables in the Panels B and C.

Table 4.9 Stock Options, CEO career horizon and R&D spending

Panel A: R&D intensity

The panel presents OLS regression results of R&D spending intensity (R&D/Sales) on various variables for CEO career horizons and stock options. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1 Coefficients for industry and year dummies are included but not reported. The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		**0.11*** **	**0.10*** **	**0.10*** **	**0.12*** **	**0.12*** **	**0.12*** **	**0.12*** **
		(5.57)	(4.26)	(3.95)	(5.99)	(6.00)	(5.77)	(5.75)
Options	(+)	-0.18	-0.29	0.27	-0.38	-0.16	-0.35	-0.16
		(-0.30)	(-0.46)	(0.04)	(-0.63)	(-0.24)	(-0.56)	(-0.24)
CEO Age	(-)		0.0003	0.003				
			(0.72)	(0.66)				
CEO Age Above 60	(-)				**0.02****	**0.02****		
					(2.46)	(2.46)		
CEO Age Above 62	(-)						**0.02***	**0.02***
							(1.69)	(1.77)
CEO Age	?			-0.01				
* Options				(-0.08)				
CEO Age Above 60	?					-0.90		
* Options						(-0.68)		
CEO Age Above 62	?							-0.97
* Options								(-0.65)
CEO Tenure	(+)	-0.001	-0.001	-0.003	-0.001	-0.001	-0.001	-0.001
		(-0.39)	(-0.63)	(-0.64)	(-1.24)	(-1.28)	(-0.99)	(-1.09)
Size	(+)	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **
		(-5.18)	(-5.12)	(-5.08)	(-5.52)	(-5.52)	(-5.33)	(-5.28)
Profitability	(+)	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.01
		(-0.38)	(-0.47)	(-0.46)	(-0.83)	(-0.83)	(-0.58)	(-0.52)
Leverage	(-)	-0.03	-0.03	-0.03	**-0.03***	**-0.03***	-0.03	-0.03
		(-1.59)	(-1.63)	(-1.62)	(-1.65)	(-1.65)	(-1.63)	(-1.64)
FCF	(+)	**0.37*** **	**0.37*** **	**0.37*** **	**0.37*** **	**0.37*** **	**0.37*** **	**0.37*** **
		(15.33)	(15.29)	(15.27)	(15.62)	(15.60)	(15.45)	(15.43)
Growth	(+)	-0.001	**-0.001***	**-0.001***	-0.001	-0.001	-0.001	-0.001
		(-1.60)	(-1.65)	(-1.65)	(-1.46)	(-1.44)	(-1.52)	(-1.50)
Firm Age	(-)	-0.002	-0.002	-0.002	-0.001	-0.002	-0.001	-0.002
		(-0.79)	(-0.80)	(-0.79)	(-0.69)	(-0.80)	(-0.61)	(-0.71)
Adjusted R^2		0.58	0.58	0.58	0.59	0.59	0.59	0.59

Table 4.9 (Continued)

Panel B: Abnormal R&D

The panel presents OLS regression results of Abnormal R&D on various variables for CEO career horizons and stock options. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Intercept		-0.001 (-0.70)	0.002 (0.14)	0.002 (0.15)	-0.001 (-0.53)	-0.001 (-0.47)	-0.001 (-0.45)	-0.001 (-0.44)
Options	(+)	-0.55 (-0.40)	-0.54 (-1.32)	-0.77 (-0.16)	-0.62 (-1.56)	-0.72 (-1.54)	-0.63 (-1.56)	-0.66 (-1.46)
CEO Age	(-)		-0.0001 (-0.27)	-0.0001 (-0.27)				
CEO Age Above 60	(-)				0.01 (1.25)	0.01 (0.84)		
CEO Age Above 62	(-)						0.01 (1.02)	0.01 (0.75)
CEO Age * Options	?			0.004 (0.05)				
CEO Age Above 60 * Options	?					0.35 (0.38)		
CEO Age Above 62 * Options	?							0.13 (0.13)
CEO Tenure	(+)	0.001 (1.59)	0.001 (1.59)	0.001 (1.58)	0.0003 (0.96)	0.001 (0.11)	0.003 (1.02)	0.003 (1.02)
No. of Obs. Adjusted R^2		310 0.01	310 0.02	310 0.01	310 0.01	310 0.01	310 0.01	310 0.01

Panel C: Abnormal R&D Cuts

The panel presents logit regression results of Abnormal_R&_Cuts on various variables for career horizons and stock options. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The Z-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		0.25 (1.16)	1.82 (1.57)	1.82 (1.36)	0.22 (0.99)	0.18 (0.81)	0.21 (0.96)	0.21 (0.97)
Options	(-)	50.75 (1.52)	59.37 (1.55)	58.13 (0.15)	57.62 (1.60)	74.10 (1.61)	56.43 (1.56)	53.92 (1.43)
CEO Age	(+)		-0.03 (-1.38)	-0.03 (-1.22)				
CEO Age Above 60	(+)				-0.51 (-1.37)	-0.32 (-0.72)		
CEO Age Above 62	(+)						-0.45 (-0.88)	-0.51 (-0.79)
CEO Age * Options	?			0.02 (0.01)				
CEO Age Above 60 * Options	?					-59.20 (-0.77)		
CEO Age Above 62 * Options	?							13.20 (0.15)
CEO Tenure	(-)	**-0.06**** (-2.07)	-0.05 (-1.58)	-0.05 (-1.58)	-0.05 (-1.44)	-0.05 (-1.46)	-0.05 (-1.62)	-0.05 (-1.60)
No. of Obs. Mc Fadden R^2		310 0.02	310 0.02	310 0.02	310 0.02	310 0.02	310 0.02	310 0.02

In short, I do not observe a positive relationship between CEO stock options holding and R&D spending. There is also no evidence to support that stock option will encourage or discourage R&D spending among CEOs with short career horizons.

4.5.5. Restricted shares

The last type of equity incentives I consider is restricted shares. The related results are shown in Table 4.10. In Panel A, there is some evidence suggesting that restricted shares may discourage R&D spending. The coefficients remain negative for the variable of shares in all regressions, and most of them reach 10% significance levels. For instance, the coefficient for the variable of shares in column 1 of Panel A in Table 4.10 is -3.48 at 10% significance level. This suggests that if a CEO has 1% more restricted shares out of a firm's total shares outstanding, the firm will reduce 3.48% R&D spending in terms of R&D intensity. A Possible explanation for the negative effect of restricted shares on R&D spending relies on vesting conditions of restricted shares. Total shareholder return (TSR) is the most common vesting condition for restricted shares (KPMG, 2007). If risky investments (e.g. R&D spending) create uncertainty of stock return, it may lower the possibility of vesting restricted shares. Hence restricted shares may discourage CEOs from getting involved in R&D spending. Ryan and Wiggins (2002) report similar results for the relationship between R&D spending and restricted shares grants by analysing US data. They document a negative relationship between R&D spending and restricted shares grant. As far as the interactive effect of restricted shares and the career horizon is concerned, I find no evidence in columns 3, 5 and 7 of Panel A. Similar results hold when I use alternative R&D spending variables in Panels B and C.

Table 4.10 Restricted Shares, CEO career horizon and R&D spending

Panel A: R&D intensity

The panel presents OLS regression results of R&D spending intensity (R&D/Sales) on various variables for CEO career horizons and restricted shares. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1 Coefficients for industry and year dummies are included but not reported. The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		**0.12*** **	**0.12*** **	**0.13*** **	**0.13*** **	**0.13*** **	**0.13*** **	**0.13*** **
		(6.01)	(4.61)	(4.52)	(6.32)	(6.34)	(6.10)	(6.09)
Shares	(+)	**-3.48***	**-3.37***	-21.33	**-3.31***	-2.81	**-3.25***	-3.14
		(-1.84)	(-1.76)	(-1.20)	(-1.77)	(-1.31)	(-1.72)	(-1.60)
CEO Age	(-)		0.0001	-0.0002				
			(0.32)	(-0.36)				
CEO Age Above 60	(-)				**0.02** **	**0.02** **		
					(2.33)	(2.27)		
CEO Age Above 62	(-)						0.01	0.01
							(1.48)	(1.37)
CEO Age * Shares	?			0.34				
				(1.02)				
CEO Age Above 60 * Shares	?					-2.99		
						(-0.62)		
CEO Age Above 62 * Shares	?							-1.31
								(-0.19)
CEO Tenure	(+)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
		(-0.15)	(-0.26)	(-0.16)	(-0.94)	(-0.98)	(-0.68)	(-0.69)
Size	(+)	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **
		(-5.56)	(-5.48)	(-5.34)	(-5.81)	(-5.83)	(-5.62)	(-5.61)
Profitability	(+)	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		(-0.28)	(-0.32)	(-0.16)	(-0.71)	(-0.79)	(-0.46)	(-0.48)
Leverage	(-)	-0.03	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03
		(-1.39)	(-1.40)	(-1.52)	(-1.45)	(-1.35)	(-1.42)	(-1.41)
FCF	(+)	**0.36*** **	**0.37*** **	**0.36*** **	**0.37*** **	**0.37*** **	**0.37*** **	**0.37*** **
		(15.15)	(14.98)	(14.77)	(15.42)	(15.39)	(15.25)	(15.18)
Growth	(+)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
		(-1.58)	(-1.60)	(-1.53)	(-1.44)	(-1.47)	(-1.51)	(-1.52)
Firm Age	(-)	-0.001	-0.002	-0.002	-0.001	-0.002	-0.001	-0.002
		(-0.67)	(-0.68)	(-0.72)	(-0.58)	(-0.63)	(-0.52)	(-0.51)
Adjusted R^2		0.59	0.59	0.59	0.59	0.59	0.59	0.59

Table 4.10 (Continued)

. Panel B: Abnormal R&D

The panel presents OLS regression results of Abnormal R&D on various variables for CEO career horizons and restricted shares. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The t-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		-0.003 (-1.19)	0.005 (0.38)	0.001 (0.54)	-0.002 (-1.13)	-0.003 (-1.20)	-0.003 (-1.09)	-0.003 (-1.08)
Shares	(+)	-0.38 (-0.32)	-0.53 (-0.43)	-5.04 (-0.43)	-0.29 (-0.24)	0.01 (0.01)	-0.30 (-0.24)	-0.31 (-0.24)
CEO Age	(-)		-0.0001 (-0.60)	-0.0002 (-0.71)				
CEO Age Above 60	(-)				0.01 (1.02)	0.01 (1.17)		
CEO Age Above 62	(-)						0.004 (0.72)	0.004 (0.61)
CEO Age * Shares	?			0.08 (0.38)				
CEO Age Above 60 * Shares	?					-1.92 (-0.58)		
CEO Age Above 62 * Shares	?							0.11 (0.12)
CEO Tenure	(+)	**0.001*** (1.68)	**0.001*** (1.78)	**0.001*** (1.80)	0.0004 (1.13)	0.0004 (0.10)	0.004 (1.23)	0.004 (1.22)
Adjusted R^2		0.003	0.001	0.001	0.002	0.001	0.001	0.001

Panel C: Abnormal R&D Cuts

The panel presents logit regression results of Abnormal_R&_Cuts on various variables for career horizons and restricted shares. The sample consists of 310 observations in 2003-2007.All variables are defined in Table 4.1.The Z-statistics are reported in parentheses. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.

Variables	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		**0.46**** (2.23)	**2.08*** (1.74)	2.24 (1.51)	**0.46**** (2.17)	**0.49**** (2.27)	**0.45**** (2.13)	**0.46**** (2.17)
Shares	(-)	-124.75 (-1.27)	-154.56 (-1.52)	-329.08 (-0.33)	-134.32 (-1.35)	-171.61 (-1.60)	-131.34 (-1.42)	-149.03 (-1.45)
CEO Age	(+)		-0.03 (-1.37)	-0.03 (-1.22)				
CEO Age Above 60	(+)				-0.45 (-1.23)	-0.66 (-1.53)		
CEO Age Above 62	(+)						-0.35 (-0.70)	-0.54 (-0.94)
CEO Age * Shares	?			3.28 (0.18)				
CEO Age Above 60 * Shares	?					252.91 (0.94)		
CEO Age Above 62 * Shares	?							257.06 (0.68)
CEO Tenure	(-)	**-0.06**** (-2.01)	-0.04 (-1.57)	-0.04 (-1.46)	-0.04 (-1.42)	-0.04 (-1.38)	-0.05 (-1.60)	-0.05 (-1.55)
Mc Fadden R^2		0.02	0.02	0.02	0.02	0.02	0.02	0.02

To summarize, I find some evidence to suggest that restricted shares may discourage R&D spending, in general. However, I do not find the role of restricted shares on R&D spending when the factors of CEO career horizon are added.

4.6. Conclusions

In this chapter, I intend to examine two questions: (1) whether career horizon will affect R&D investment decisions, and (2) whether and how the interaction of career horizon and CEO compensation may change the pattern of R&D spending. Based on previous literature, I expect to observe a positive relationship between CEO career horizon lengths and R&D spending, because the uncertainty of return and long pay-back period of R&D spending may not fully benefit CEOs with short career horizon.

As far as CEO compensation is concerned, I expect that pension will discourage risky investments as CEOs approach retirement, because pension will make CEOs potential debt-holders of the firm, and a short career horizon means that the access day to pension cash out is approaching. I have two opposite hypotheses for equity compensation: the "interest alignment" hypothesis and the "wealth preservation "hypothesis. The former suggests that equity incentives are able to align interests of shareholders and CEOs, no matter how short the career horizon a CEO has. Hence, equity incentives may encourage R&D spending even as CEOs approach retirement. The latter theory indicates that a CEO whose career horizon is short is less likely to spend on risky investments if they have a high level of equity incentives. The reason is that outgoing CEOs may intend to preserve wealth gains in their equity holdings. If R&D spending may jeopardize the certainty of their "realized gains", they will curtail such investments.

By using UK FTSE 350 data from 2003-2007, I document some empirical results for the above mentioned questions. First of all, I do not find that CEOs will spend less on R&D when their career horizons become shorter. After control for equity incentives, I even find that older CEOs (aged above 62) spend more on R&D expenses. Such result is not consistent with my hypothesis (H11), but similar to some recent empirical evidence (e.g. Conyon and Florou, 2006; Cazier, 2011). A possible explanation is that the recent corporate governance system realizes the incentives for R&D cuts when CEOs approach retirement. The enhanced corporate governance mechanisms (e.g. increasing monitoring roles of outside directors) may limit CEOs' short-sighted behaviour.

Secondly, I document that pension will discourage R&D spending among older CEOs. This is consistent with my hypothesis (H12) that the debt-like compensation (defined benefit pension) makes CEOs more risk-averse when the day to access such assets approaches (retirement). The unique role of pension in risk aversion is highlighted in the condition of a short career horizon.

Thirdly, I observe that ownership will encourage R&D spending in general. However, older CEOs with more ownership become dramatically risk-averse, which is consistent with my "wealth preservation" hypothesis (H13b). A high level of ownership combined with a short career horizon makes CEOs more sensitive to share price and generate the intention to preserve gains when they are still in office. Hence they are less likely to spend on R&D expenditures in such circumstances.

Fourthly, restricted shares demonstrate some negative effects on risky investments. The vesting conditions of restricted shares and the linear pay-off structure may explain parts of the "un-expected" risk-averse incentives. Those results are consistent with US studies (e.g. Ryan and Wiggins, 2002) suggesting that the roles of restricted shares, stock options and ownership on risky investments are complicated.

Overall, the study in this chapter shows some evidence to support the interactive relationship between career horizon, CEO compensation and risky investment decisions. The remuneration committees should consider the combined "side-effects" of certain pay components and career horizons on value-added investment decisions. Appropriate adjustment for CEO compensation structure is required as CEOs approach the end of their career life.

Chapter 5 Conclusions

In this thesis, I examine the role of CEO compensation in the cost of debt, expectations management and the investment policy. This study provides some interesting evidence explaining managerial behavior and debt-holders' reaction from the viewpoint of CEO compensation. It also echoes and extends a growing number of studies that demonstrate the link between CEO compensation and managerial opportunistic behavior (e.g. Cheng and Warfield, 2005; Kalyta, 2009).

Chapter 2 examines the link between CEO compensation and the cost of debt. I expect that rational debt-holders will consider the impact of CEO compensation on risk-seeking or risk-avoiding incentives, and incorporate such information when pricing debts. I argue that CEO pay components that may provide risk-avoiding incentives will be favoured by debt-holders, while pay components which generate risk-seeking incentives will lead to a higher cost of borrowing. Consistent with my expectations, I find that cash bonus and pension reduce the cost of debt, because of their unique roles in risk-aversion incentive generation. On the other hand, equity- based compensation results in a soaring cost of borrowing, which is consistent with previous literature (e.g. Brockman, Martin and Unlu, 2010). Among equity incentives, stock options outweigh ownership in terms of increasing the cost of debt. In addition, debt-holders are more sensitive to performance-vested stock options (PVSOs) compared with traditional stock options (TSOs), due to the different features of these stock options. In short, I provide some evidence that bondholders do take various types of CEO compensation into account when pricing publicly traded debt.

In Chapter 3, I investigate the possible link between CEO compensation and expectations management. By dampening the market expectations, expectations management will help CEOs to achieve financial analysts' earnings forecasts, benefiting subsequent CEO bonuses and insider trading. Hence I expect that the possibility of expectations management is positively related to bonus and equity-based compensation which will be vested in the following year. My results confirm part of my hypotheses. I find that although bonus and equity-based compensation may motivate CEOs to care about achieving market expectations, only equity incentives lead to a higher probability of expectations management. This suggests that the wide spread expectations management in the UK (e.g. Athanasakou, Strong, and Walker, 2009) can be partly explained by CEO compensation. CEOs are motivated to manipulate information disclosure for personal gains.

The issue of the career horizon problem is examined in Chapter 4. The career horizon problem hypothesizes that CEOs with a short career horizon are likely to reject long-term investment projects. The long pay-back period and the uncertainty of the outcome from that investment may not fully benefit exiting managers. However, there is no conclusive view on the career horizon problem (e.g. Conyon and Florou, 2006). My re-examination provides some additional material in this debate. In addition, I argue that the role of CEO compensation on investment may be varied in different lengths of CEO career horizon. Pension may make CEOs more risk-averse, especially as top managers approach retirement. Equity incentives may also discourage risky investments, because older CEOs are likely to preserve sure gains from equity incentives based on prospect theory. In this empirical study, I find no evidence to support the career horizon problem in the UK, which is similar with Conyon and Florou (2006). Older CEOs do not spend

less on research and development expenditures. Furthermore, I document that pensions effectively discourage research and development spending among older CEOs only. CEOs with more ownership and a shorter career horizon are also less likely to invest in research and development expenditure. Overall, these findings suggest that a firm's investment decision will be affected by the joint effects of CEO career horizon and his or her pay package. CEOs are motivated to adopt an investment strategy that will fit their own interests.

This thesis contains both merits and limitations in sample and methodology. First of all, panel data is used in this thesis. The advantages of using panel data compared with cross section and time series data are significant. Panel data contains a larger sample size and more sample variability. It helps to control the impact of omitted bias and firm heterogeneity. For instance, different firms may have different compensation package design for their CEOs. Panel data allows me to use fixed effect analysis to control such firm heterogeneity, focusing on the within variation of CEO compensation in individual firms. Secondly, there are possible limitations of sample selection. In Chapter 2, the sample selection condition is firms which issue straight bond in pound sterling. It reduces the sample size from more than 600 firms in FTSE ALL to 44 firms finally. Such a relatively small sample may not represent the underlying population very well. More importantly, sample firms may have some particular characteristics (e.g less popular in New York and Frankfurt), so that they choose to issue straight bonds in British pound. If that is the case, the sample is not randomly selected. Thirdly, OLS analysis is used throughout this thesis. OLS analysis can help to ascertain relationship but not guarantee the underlying casual relationship. For instance, I study the casual relationship between CEO compensation and the cost of debt in Chapter 2. My

explanation is that different CEO compensation structure will lead to high or low costs of debt. The alternative explanation may be that different costs of debt may force remuneration committee to adjust CEO compensation structure. Fourthly, there is possible endogeneity problem in this study. For instance, I investigate the relationship between R&D spending, CEO compensation and career horizon in Chapter 4. Both variables of CEO compensation and career horizon are treated as right-hand-side variables. A sensible question is whether CEO compensation is also decided by CEO career horizon. If that is the case, the variable of CEO compensation is endogenous as an independent variable in the analysis. The two-stage instrumental variables procedure is a possible solution to overcome the suspicious endogeneity problem. In the first step, variable of CEO compensation is treated as dependent variable, and then regressed on selected instrumental variables along with CEO career horizon. The appropriate instrumental variables include corporate governance variables (board size and independence), CEO education level, lagged value of CEO compensation, stock return volatility and the number of directorship for CEOs (e.g. Palia, 2001; Ertugrul and Hegde, 2008). In the second step, the variable of R&D spending is treated as dependent variables, and regressed on career horizon, control variables and the predicted value of CEO compensation from the first regression. Therefore, by employing the two-stage instrumental variables procedure, the suspicious endogenous variable of CEO compensation becomes exogenous.

This thesis also has several limitations in other aspects with room to grow in future studies. For the study of the cost of debt in Chapter 2, the data covers the time period from 2003 to 2006 only. It may be interesting to extend the data after the financial crisis in 2007. If debt-holders are rational and informed, how will the financial crisis change

their attitude to CEO compensation when pricing a firm's debt? Will debt-holders reward firms that provide more risk-avoiding incentives pay to their CEOs, and require a higher risk premium from firms that grant more risk-seeking incentives pay in the post-financial crisis period? For the study of expectations management in Chapter 3, I use methods developed by the literature to capture so-called expectations management (e.g. Bartov, Givoly and Hayn, 2002; Matsumoto, 2002). Examining observable managerial information disclosure activities (e.g. earnings warning and managerial earnings forecasts) may provide additional support for my results. For the study of career horizon and investment decision in Chapter 4, I focus on one type of investment activity (R&D spending) only. Other investment decisions (e.g. firm restructuring, mergers and acquisitions and capital expenditure) may be additional appropriate proxies. Will the joint effect of CEO career horizon and compensation on R&D spending remains the same for other types of investment? In addition, some corporate governance variables (e.g. board structure and outside directors' incentives) are omitted in this study. Those corporate governance variables may provide a better explanation for the non-existence of the career horizon problem in the UK.

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Appendix

Valuation of stock options and restricted shares from BoardEx

1. Black Scholes calculation and assumptions for Stock option

$C = SN(d1) – Xe^{-rt}N(d2)$

Where $d1 = (\ln(S/X) + (r + \sigma^2/2)T) /\sigma(\text{sqrt}(T))$

Where $d2 = (\ln(S/X) + (r - \sigma 2/2)T) /\sigma(\text{sqrt}(T))$

Black-Scholes requires a series of data items which are defined below:

- No. of Options = to that entered
- Share Price = to that of the company at the Annual Report date selected
- Time to expiry = Expiry date – annual report date
- Dividend Yield = 0
- Volatility = a 100-day historic moving average
- Risk Free Interest Rate: UK = 6 months Libor rate
- Exercise Price = to that entered or a calculated exercise price (a calculated price is derived as follows: from information disclosed an Intrinsic Value, the No. Of Options and the Date of valuation the exercise price

  = Share Price - (Intrinsic Value/No. of Options).

2. Calculation and assumptions for Share granted and ownership

- The estimated value of restricted shares = number of restricted shares (Max.) * Share price (end of year)
- The estimated value of ownership = number of shares owned by executives * Share price (end of year)