Executive Compensation & Share Options in UK Quoted Companies

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Abstract

The topic of executive compensation has recently emerged as a legitimate field for academic study. The rapid growth in publications has almost been matched by the well-publicised growth in CEO remuneration. From the time of the first utility privatisation in the UK, right up to current day, the topic of board room pay has rarely been out of the news headlines or the academic journals.

This thesis makes several new contributions to the executive compensation literature, primarily by providing an in depth analysis of the executive option holdings of directors in the UK. Data on this aspect of executive compensation has until recently been unavailable and as such this thesis represents the first work in the UK to fully incorporate this element of remuneration for a large sample of companies.

Executive options have become an increasingly significant component in executive compensation, yet their valuation and the incentive effects they create are relatively poorly understood. This thesis attempts to undo these shortcomings by providing a thorough analysis of the determinants and consequences of the level of option information disclosure. Furthermore, it develops the rational for granting executive options and describes the creation and distribution of the pay for performance sensitivities created by holdings of executive options. Finally, it deals with valuation issues that are particular to executive options.

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There have been many times when I wondered if I would ever finish this thesis, and probably more when I was sure that I wouldn't. It may have taken a long time but finally I am there, and for that I offer my thanks and gratitude to my friends and colleagues who have supported me over the years.

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Declaration

- This dissertation was written by Graham Sadler based on work undertaken at Warwick Business School.

- The work has not been accepted for any previous degree.

- Chapter Three is based on work carried out jointly with Martin Conyon and Chris Mallin. A paper based on material contained in this chapter is forthcoming in the Journal of Applied Financial Economics.

- Chapter Six is based partly on work carried out jointly with Martin Conyon and Simon Peck.

Abbreviations

ABI	Association Of British Insurers
CEO	Chief Executive Office
EPS	Earnings Per Share
LBS	London Business School
LHS	Left Hand Side
LR	Likelihood Ratio
PPS	Pay Performance Sensitivity
RHS	Right Hand Side
RRA	Relative Risk Aversion
S&P	Standard & Poors
SAYE	Save As You Earn (Option Schemes)
TSR	Total Shareholder Return
UK	United Kingdom
US	United States

Chapter One

Introduction

1.1 Introduction

The topic of executive compensation has received widespread attention in recent years, particularly in the US and UK, and not just from academics, but from the media, the public and governments alike. Much of this attention derived from what was described as "excessive" payments made to top company directors without due regard to company performance. In the UK, headlines such as 'Fat Cats in the Dock'[1] and 'Executive Gluttony under Attack'[2] stoked the debate as to whether shareholders were receiving value for money from their company directors.

While one can argue about the merit of large increases in executive compensation one cannot argue about their existence. Median cash-compensation paid to S&P-500 chief executive officers has doubled since 1970, adding in realised gains from long term incentives such as options, the figure has quadrupled (Murphy, 1999). Compensation amongst the FTSE-100 company chief executive officers has shown a similar dramatic rise (Conyon, Gregg and Machin, 1995, Conyon and Peck, 1998a). The UK government's response to this has been to set up successive commissions (Cadbury, 1992; Greenbury, 1995; Hampel 1998) in an effort to establish guidelines for the determination of executive pay. However, while many such guidelines have now been introduced, as yet there seems to be little evidence of them actually managing to restrict the growth in executive pay – if indeed this is the desired objective of government policy.

[1] Economist, 4th March 1995
[2] Financial Times 26th/27th November 1994

Academic interest in the subject ignited in the late 1980's. Prior to 1985, executive compensation papers were limited to one or two per year, but by 1995, this figure had hit sixty (Hallock and Murphy, 1999). Although undoubtedly fuelled by the public interest, the growth in publications has been assisted on both theoretical and empirical grounds. On a theoretical level, the widespread acceptance of agency theory provided a solid foundation for research into optimal compensation contracts. At the same time, increases in the levels of information disclosure have provided a means by which such theories can be tested. This thesis contributes to that academic literature by providing a fuller and richer understanding of UK chief executive officer (CEO) compensation contracts than has hitherto been provided.

1.2 Pay And Performance

The focus of much of the executive compensation literature has been on the link between executive pay and company performance. The large increases in CEO pay both in the UK and US have largely coincided with huge increases in the stock market performance, the question is, is this merely a coincidence or evidence of efficiency?

Historically the link between pay and performance has been thought to be small or non-existent (see Jensen & Murphy, 1990a,b; Conyon, Gregg & Machin, 1995). However, recent research using broader measures of pay have called these findings into doubt (see Hall & Liebman, 1998). One of the main aims of this thesis is to investigate this relationship using data previously unavailable to UK researchers.

The main focus of this thesis then is an analysis of the mechanisms by which executive directors, or in particular the CEO, are remunerated in the UK. More specifically, the use of executive options as part of the overall compensation package has become the norm rather than the exception, yet such instruments have rarely been addressed by the UK compensation literature.

1.3 The UK Data

One of the main reasons for this lack of analysis has been the historically poor levels of disclosure in the UK with respect to executive share options. Subsequent to the implementation of the Greenbury reports' recommendations in 1995 however, companies for the first time began disclosing full information on the movements in, and holdings of, company share options held by all directors. This level of information was previously unavailable in the UK[3], and the share option data now presented in today's annual company reports is even more detailed than that currently available in the US. The analysis undertaken in this thesis is among the first to utilise this rich source of data, representing a key contribution to the UK executive compensation literature. This is especially the case since the results from the thesis are based on a large and economically significant set of UK listed companies.

1.4 Structure And Aims Of The Thesis

The aim of the following chapter is to provide a foundation on which the remainder of the thesis can be built. It begins with an explanation of the principal-agent problem that underpins much of the pay-performance link, providing a

[3] Other than from direct access to each company's Register of Directors' Interests

theoretical example of a typical principal agent model. It continues, by reviewing the empirical studies that have attempted to isolate the link between executive pay and company performance. The early compensation literature managed only to establish a weak link between pay and performance both in the US and the UK, while more recent US works using broader measures of pay have demonstrated a much stronger link. Subsequent chapters attempt to fill the gap in the literature by using similar broader measures of pay in a UK setting.

The next section of Chapter Two summarises basic option theory and the valuation of options using the Black-Scholes pricing formula. It also provides an introduction to the option delta which is fundamental to the understanding of how option holdings create incentive effects. The chapter concludes by introducing the topics of disclosure and tournament theory which form the focus of Chapters Four and Six respectively.

Chapter Three details the construction and content of the main data set of 510 UK quoted companies which supports the thesis. As mentioned above, the richness of the data collected and used in this thesis represents a significant advance over similar earlier work carried out in the UK. The data set described here is used primarily in Chapter Five. The remaining two empirical chapters (Chapters Four and Six) use data that are subsets of this main data set, with additional variables added where appropriate. The relationship between the data sets is clearly set out in Section 3.1.

The unique feature of the main data set is the identification of all details of each and every tranche of options held by company CEOs. While still not possible for every CEO, this data set identifies such information in over 80% of the cases where the CEO has outstanding options at the end of the company's financial year. This allows a more accurate determination of the value of the stock of options held by the directors and the incentives provided by them, than has ever been possible before. In addition to option holdings, all details on other elements of CEO remuneration are collected along with company specific variables representing firm size and performance in order to fully investigate the pay-performance link.

Chapter Four considers the empirical determinants of the quality of information disclosed about directors' share options in a sample of nearly 300 large UK companies in 1994 and 1995. Policy recommendations, consolidated in the recommendations of the Greenbury report, argue for full and complete disclosure of director option information. This chapter makes two further contributions to the UK empirical literature. Firstly, it documents the degree of option information disclosure in the FTSE-350 companies immediately prior to the implementation of the Greenbury recommendations. Secondly, it models option information disclosure as a function of variables that are thought to influence corporate costs of disclosure in an effort to explain why, when not yet required to do so, some companies choose to voluntarily disclose information on directors' share option holdings while others did not.

Chapter Five begins by providing a methodological framework for evaluating the impact of changes in corporate performance on CEO wealth. The chapter

continues by actually calculating rather than estimating the real values of directors' share option holdings and the incentives provided by them. The main contribution of Chapter Five is an analysis of the impact on the valuation of options and changes in the pay-performance sensitivity created by differing levels of disclosure. The Greenbury report outlined two distinct mechanisms for disclosing directors' share option details in the UK, while current Securities Exchange Commission (SEC) regulations in the US provide a third alternative. The results presented here have significant implications for US researchers with regard to the effect of the SEC reporting regulations.

The implications of tournament theory are discussed in Chapter Six. The chapter makes use of data on over 550 individual executives from 105 UK stock market companies in the late 1990s. This work represents the first empirical test of tournament theory using UK data on corporate executives. It is significant and unique also in that it is the first to utilise a broader measure of pay which includes the value of annual grants made under option schemes or other long term incentive plans. The results of this chapter though, provide only some evidence consistent with the operation of tournament mechanisms within a business context and question whether tournaments are an appropriate explanation for executive pay outcomes in the UK. The results are discussed in the context of other (mainly US) research that has considered the empirical relevance of tournament models in a business (i.e. non-sporting / laboratory) context.

Chapter Seven provides a comprehensive framework, for the understanding of options as incentive tools. It seeks to provide a rational for the use of options as a

preferred means of creating incentives (for example, relative to the use of equity). These findings are then discussed in light of the "four-times" rule in the UK. Current Association of British Insurers (ABI) guidelines recommend that the total aggregate value of directors' option holdings should not exceed four times their basic salary. The analysis presented here shows how the majority of UK firms adhere to this recommendation and how, through the leverage effect of options, the pay-performance link could be increased by its withdrawal.

The chapter continues by addressing the implication of CEO risk aversion on the valuation of executive options. The Black-Scholes option pricing formula assumes that the holder of the option is free to hedge the risk of his long position. This arbitrage argument allows the utility preferences of individuals to be ignored when pricing options. However, executive directors are effectively prohibited from hedging their options, consequently the value placed on executive options must reflect their risk aversion. By adopting a utility approach to the valuation of executive option, the chapter provides a means to optimise the incentives created through granting options. An understanding of the relaxation of the risk neutrality assumption when examining the valuation and incentive effects from executive options is new to the compensation literature. The analysis of the chapter, therefore, is novel in that it shows some of the implications of incorporating the more realistic assumption of risk averse CEOs into the analysis. The chapter concludes by offering a number of recommendations for policy makers in the UK.

Finally, Chapter Eight draws the thesis together reviewing the main findings of the preceding chapters. A full list of the 510 companies constituting the main data set

can be found in Appendix One, while Appendix Two details the variables collected for each of the companies included. The next chapter then introduces the main topics covered by the thesis beginning with a review of agency theory and the principal-agent model.

Chapter Two

Modelling Executive Compensation: A Survey of Recent Literature

2.1 Introduction

As highlighted in Chapter One, academic interest in the field of executive compensation has soared in recent years. Fundamental to much of this research has been the principal agent model which has become the preferred theoretical framework, around which further results can be established. The pioneering study of the conflict of interests between mangers and shareholders by Jensen and Meckling (1976) formalised the problems associated with the 'separation of ownership and control' identified by Berle and Means (1932) and initiated much of the 'agency theory' literature.

The principal agent literature was developed contemporaneously to, but largely independent of this agency theory literature. The principal agent literature, including influential early works by Ross (1973), Mirrlees (1974, 1976) Holmstrom (1979) and Grossman and Hart (1983) focused primarily on deriving optimal incentive contracts for risk-averse agents.

Early empirical studies began by focusing on the relationship between CEO (or the highest paid director) pay and company performance (Murphy, 1985; Jensen and Murphy, 1990b; Abowd, 1990; Main, 1992) and generally concluded that there was little pay performance sensitivity in executive compensation. However, early studies, especially in the UK, focused almost entirely on cash compensation measuring pay solely as the total of salary and bonus.

The structure of executive compensation has changed greatly in recent years with non-cash elements of remuneration becoming increasingly significant. This along with recent improvements in the levels of disclosure, particularly in relation to details of holdings of executive share options, both in the US and the UK, have provided for the first time the opportunity to analyse a total compensation measure that includes the values of long term incentives. These advances have led recent studies (Hall and Liebman, 1998; Conyon and Murphy, 1999) to establish much larger pay performance sensitivities.

Agency theory is not, however, the only model put forward to explain executive pay. Lazear and Rosen (1981) compared linear incentive contracts with rank-order tournaments in which a predetermined prize is awarded to the manger with the highest output. O'Reilly, Main and Crystal (1988) further test whether the level of CEO pay is better explained by tournament theory or by social comparison theory.

The aim of this chapter then is threefold. Firstly, to provide a theoretical framework for the work undertaken later in this thesis. This itself has two elements, the understanding of the principal agent problem which lies at the heart of most of the executive compensation literature and an introduction to the nature and valuation of options, without which, a complete analysis of modern day executive compensation can no longer be undertaken. Secondly, to provide a review of the pay for performance literature. As mentioned in the Chapter One, the number of executive compensation papers has soared in recent years and as such, a review of the entire broad literature is beyond the scope of this thesis.

Instead this chapter will focus on the pay for performance literature over the past two decades, highlighting the major findings along with the shortcomings of past work. This is especially the case in the UK where the previous lack of information in regards to share options means that an important element of CEO pay was neglected from the research agenda. For an excellent review of the broad compensation literature see Murphy (1999) and the collection of seminal works presented by Hallock and Murphy (1999).

Finally, to provide an introduction to the remaining topics considered in this thesis. Firstly, the level of information disclosure surrounding executive compensation, in particular the amount of option information disclosure and the incentives for firms to voluntarily reveal such information. Secondly, an overview of tournament theory which this has been advanced theoretically as a means of providing incentives for CEOs in a way that does not require pay to be explicitly linked to performance. In this framework incentives are instead generated through prizes (e.g. promotion) offered to tournament winners. These final subject areas (disclosure and tournaments) are dealt with in more depth in the appropriate chapters of this thesis (Chapters Four and Six respectively).

The rest of this chapter is organised as follows. Section 2.2 deals with the principal agent model and forms the general background to the thesis. It provides an underlying rational of corporate governance within the agency paradigm. This is followed by a theoretical exposition of the principal agent model. Section 2.3 considers more extensively the empirical literature on the relationship between executive pay and company performance. These substantive sections form the

background to the thesis as a whole since they deal with the main issue that has characterised the managerial compensation literature, namely, executive incentives in the face of moral hazard and the empirical relationship between compensation and performance.

Section 2.4 deals with share options. The valuation procedure used here provides the general background to Chapters Five (option incentives and reporting style), Six (tournament theory) and Seven (incentives and CEO risk aversion). The literature review will indicate that the majority of UK research on executive compensation has ignored equity based compensation, such as stock options. This thesis explicitly addresses the role of options in executive contracts, accordingly Section 2.4 provides a review and analytical framework for understanding such options. The section considers the underlying theory of options, executive options and the Black-Scholes formula and importantly the role of the so called option delta. The option pricing formula and option delta are explicitly used in the analysis contained in the above mentioned chapters.

Section 2.5 considers information disclosure relating to executive stock options and forms the specific background to Chapter Four. Compared with the literature on pay for performance and agency theory, the literature on executive compensation disclosure is relatively small. Accordingly, Section 2.5 deals mainly with the institutional reporting changes surrounding executive pay that have occurred since the publication of the Greenbury report in 1995. The theoretical determination of why companies choose to reveal information about options voluntarily is left until Chapter Four.

Section 2.6 deals with tournament theory and forms the specific background to Chapter Six. Again, although a large theoretical literature exists, applications to the managerial labour market (as distinct from sporting examples) are less frequent. This section introduces the main ideas of tournament theory and begins a review of the empirical literature. The literature is further considered along with the theoretical model in the main body of Chapter Six.

2.2 The Principal Agent Model

Before outlining a theoretical principal agent model, the following section details the conditions under which agency issues are significant, and identifies the mechanisms used to overcome such issues when they are present.

2.2.1 Corporate Governance And The Principal Agent Model

Corporate governance refers to the mechanisms by which companies are controlled, directed and made accountable. The issue of corporate governance arises when one departs from the owner-managed firm and introduces the concept of a separation between ownership and control. Under this separation, ownership confers the responsibility to hire management, determine their remuneration, the bearing of the uninsurable risk but with the rights to all residual income after all contractual obligations have been met. Management implies the direct control of all the firm's resources (Hallock and Murphy, 1999).

The growing interest in the mechanisms by which companies are owned and governed bears testimony to the fact that there is an increasing belief that the

institutions of ownership and control can directly affect economic performance (see Nickell, 1995). Many practical forms of governance exist and these are often tailored to the demands of a particular company, institution, time period, culture or country. The efficacy of these structures in the UK has recently been called into question, be it by alleged financial irregularities e.g. Mirror Group and Barings or through the perceived excessive compensation of top executives e.g. the privatised utilities (Conyon, 1995).

This separation of ownership and control creates an example of an agency relationship where one party - the principal, in this case the owners - delegate work to another - the agent, represented here by managers. It is the classic agency problem (Jensen and Meckling, 1976; Tirole, 1988; Hart, 1995), characterised by imperfect and asymmetric information. In particular, an informational advantage lies with the agent, such that their behaviour or level of effort, creates the potential for opportunistic behaviour. The theory attempts to explain this agency relationship through the use of contracts, which specify the rights of each party.

The costs of such a contract are known as agency costs and include the cost of monitoring the activities of the agent and the cost of losses incurred by the principal when the agent fails to act in the principal's best interests.

In a situation where the principal has complete information over the actions of an agent, a behaviour-based contract will be most efficient and corporate governance is not an issue. In these circumstances, an outcome-based contract would unnecessarily shift risk from the principal to the risk-averse agent

since it would make the agent's payoff contingent on realised performance, which is not completely under the agent's control. Consequently, as a reward for carrying the higher level of risks, agents may demand increased remuneration.

A contract that makes the principal as well off as possible is one that pays the *threshold wage.* A contract paying this wage is known as the first-best efficient contract from the principal's point of view. However, this is largely unattainable since it depends on the agent possessing no hidden information and that all actions and outcomes are observable (Besanko *et al.*, 1996). The optimal solution to the moral hazard problem is thus only available where monitoring is perfect and cost-less, clearly however, imperfect monitoring may provide gains on the second best sharing rule (Zajac, 1990; Hart, 1995). As Holmstrom (1979) shows, *any* signal of the individual action is of value if it possesses an association with the observed payoff.

Hart (1995) provides a coherent analysis of the conditions under which corporate governance issues are important. Two conditions must be met. First an agency problem must exist between members of the organisation (e.g. owners and managers). Secondly, transaction costs must be prohibitive, such that the agency problem cannot be resolved by a well-defined contract.

These principal-agent considerations alone may be necessary but are *not* sufficient to provide a role for governance structure (see Hart, 1995 p. 679). The reason is that although agency issues suggest contracts that relate agent rewards to observable profits rather than effort, these contracts are nevertheless incomplete.

They are complete, though, in the sense that the contract specifies the parties' obligations in possible future states of the world contingent on these obligations being observable and verifiable. In a general model the contract would, as a matter of detail, specify the conditions under which management should be rewarded or replaced, the conditions for the adoption of new technologies, the conditions under which workers are hired and fired, etc. The point is that agency contingencies are governed by a contract and this is the lesson drawn from a standard principal-agent solution. Hart (1995) remarks "in a comprehensive contracting world, everything has been specified in advance, i.e. there are no 'residual' decisions". Governance structure in such a world is deemed irrelevant.

Governance structure however does matter in a world with transaction costs and incomplete contracts. Given an agency problem, governance structures can be seen as a mechanism for making decisions that have not been specified in the initial contract. Transactions costs in writing contracts may be considerable and numerous. Hart (1995a) identifies three such costs; (i) the cost of specifying all eventualities and their resolution during the lifetime of the contract; (ii) the costs of negotiating with all the contract parties about the plans; (iii) the costs of formally writing down the contract such that they can be enforced by a third party in the event of a dispute arising.

Where prohibitive transaction costs are present, the parties are not able to write a comprehensive contract. So, incomplete contracts, in conjunction with the agency costs of incomplete and asymmetric information, provide a role for governance mechanisms. Corporate governance, in this framework, is seen as a

mechanism for enacting decisions about events that have not been specified in an initial contract.

The preferred solution to the principal agent problem then is the use of outcome-based contracts, which align the preferences of both principals and agents. These can be efficient in curbing agent opportunism and thus the conflict of self-interest. They are reinforced by governance systems such as boards, which further restrict the self-serving behaviour of agents by allowing principals to better monitor the behaviour of agents. Thus boards of directors can play a key role in monitoring the opportunism of top executives (Fama and Jensen 1983) and indeed in curbing it, by seeking to replace part or all of the management team (Jensen 1993).

2.2.2 A Theoretical Principal Agent Model

The previous section established the conditions under which corporate governance is relevant. The analysis below presents a simple example of an incentive scheme within a principal agent framework. The model links the agents' payoff directly to the firms' output (i.e. performance), as will be seen in Section 2.3, it is an estimation of this pay performance sensitivity that has dominated the empirical literature.

The principal's payoff is a function of output net of incentive pay to the agent (i.e. they care about corporate value). The agent's payoff is a function of their incentive pay net of the cost of effort or action (i.e. they care about private rewards). The problem facing the principal is to design a contract, subject to the

imposed constraints of the agent's optimising behaviour. The first issue is the existence of a participation constraint (individual rationality) i.e. the pay-off must be at least as great as those presented by outside opportunities. Secondly, there is an incentive compatibility constraint, that is, given the incentive schedule the agent should choose the best self-interested course of action.

The following basic model based on Holmstrom and Milgrom (1987), captures the main ideas in solving the moral hazard problem so that the agent promotes the "best" (i.e. optimal) interests of the principal. Let a be the effort of the agent and let $x = a + \varepsilon$ be the output observed by the principal where the random variable ε is Normally distributed: $\varepsilon \sim N(0, \sigma^2)$. Let the principal's choice of incentive scheme be linear so that the payoff to the agent is given by $s(x) = \delta + \gamma x = \delta + \gamma a + \gamma\varepsilon$ where δ and γ are to be determined by the principal. The term x, may be thought of as shareholder wealth or profit while, δ can be interpreted as the fixed salary component of pay. Finally, γ represents the pay performance sensitivity and it is this term in particular, that Chapter Five, along with other research, attempts to estimate.

The principal is assumed to be well diversified and hence risk neutral, accordingly their utility can be represented by their payoff which is equivalent to output net of incentive pay. The principal's expected wealth is thus given by;

$$E[x - s(x)] = E[a + \varepsilon - \delta - \gamma a - \gamma\varepsilon] = (1 - \gamma)a - \delta$$

Suppose now that the agent by contrast is risk averse with a constant absolute risk averse utility function given by $U(w) = -e^{-rw}$, where w is wealth and r is the absolute risk aversion level of the agent. By definition:

$$E[U(w)] = \int U(w) f(w) dw$$

Where $f(w)$ is the probability density function of w. Thus, in this case:

$$E[U(w)] = \int -e^{-rw} f(w) dw$$

If wealth is Normally distributed $w \sim N(\overline{w}, \sigma_w^2)$ then using the properties of the Normal function this simplifies to give:

$$E[U(w)] = -e^{-r\left(\overline{w} - \frac{r\sigma_w^2}{2}\right)}$$

Given the properties of the exponential function, the same ordering will be preserved by using

$$\overline{w} - \frac{r\sigma_w^2}{2}$$

as an equivalent utility measure. Furthermore, since $x \sim N(a, \sigma^2)$ and $s(x) = \delta + \gamma x$ then $s(x) \sim N(\delta + \gamma a, \gamma^2\sigma^2)$, the agents utility of wealth is thus given by:

$$\delta + \gamma a - \frac{r\gamma^2}{2}\sigma^2$$

The problem for the agent is determine the level of effort (a) in order to maximise this utility minus the cost of that effort c(a)

$$\max \text{ (a): } \delta + \gamma a - \frac{\gamma^2 r}{2}\sigma^2 - c(a)$$

The first order condition is simply $c'(a) = \gamma$. The principal's problem is to maximise his own utility by determining δ and γ subject to the above first order condition and a second constraint that the agent receives a reservation utility = u^*. Thus the problem becomes:

$$\max (\delta, \gamma, \text{a}): (1-\gamma)a - \delta$$

subject to

$$\delta + \gamma a - \frac{\gamma^2 r}{2}\sigma^2 - c(a) \geq u^*$$

and

$$c'(a) = \gamma$$

Substituting and simplifying gives:

$$\max \text{ (a): a} - \frac{c'(a)^2 r}{2}\sigma^2 - c(a)$$

where the first order condition is simply

$$1 - rc'(a)c''(a)\sigma^2 - c'(a) = 0$$

Solving for $c'(a) = \gamma$, yields:

$$\gamma = \frac{1}{1 + rc''(a)\sigma^2}$$

This equation displays the essential properties of the solution to the principal agent problem. The solution relates the optimal pay for performance term to three factors that condition its magnitude. The optimal pay for performance sensitivity will be equal to one when output is certain ($\sigma^2 = 0$) or when the agent is risk neutral ($r = 0$). As the uncertainty in the firm value increases, and/or the risk aversion of the agent increases, the resulting optimal pay performance sensitivity declines. The intuition is clear, when output is known with certainty and observed by the principal, then a one to one relation exists between managerial actions and rewards. Similarly if the agent is risk neutral, in effect he willingly assumes the riskiness embodied within the firms assets, hence a pay performance parameter of one. This optimality condition is further discussed in Murphy (1999).

Note, in this example the optimal γ depends on agent risk aversion r, the cost of effort function $c''(a)$ and risk (σ^2). Since each company has a different CEO/agent, it is likely that there will be heterogeneity in each of these factors.

Accordingly, it is most unlikely that circumstances will conspire to promote a common γ across all agents (see Garen, 1994). This point is important since (as will be shown below) most researchers in the executive compensation literature retrieve an average pay-performance term using econometric techniques. This issue is addressed in Chapter Five where the distribution of the pay performance term is considered by calculating γ across all agents individually using non-econometric methods. Indeed, the analysis will conclude that the pay-performance term is not homogenous across agents and does display cross section heterogeneity.

To summarise the model, the pay-off to a higher level of effort stochastically dominates that to a lower level. This payoff, whose probability distribution is affected by the unobservable effort, is verifiable however, and provides an enforceable argument in the optimal (but second best) contract set by the principal (see Hart, 1995). Subject to the constraints imposed by ensuring the participation and the individual rationality of the agent, the argument focuses on defining the optimal contract or sharing rule $s(x)$

Over recent years many studies have investigated the concept of agency theory. Early research focused on the separation of ownership and control in organisations. Amihud and Lev (1981) found that manager-controlled firms, where no individual or institution owns in excess of 5% of the company stock, engaged in significantly more conglomerate acquisitions and were more diversified than owner-controlled firms. This is consistent with the existence of

an agency problem since such activities are not generally in the interests of shareholders, who can diversify directly through their own share portfolio.

Other studies have lent further support to agency theory. Examples include the investigation into the use of the golden parachutes by Singh and Harianto (1989), the analysis into the use of greenmail (Kosnik 1987) and the study into managers' resistance to take-over bids by Walking and Long (1984). The diversity of possible applications of agency theory has made its widespread acceptance easier although it should be noted that it has not met with universal acceptance. Perrow (1986) for example claims agency theory is trivial and addresses no clear problems.

The focus of this research however is not agency theory in general, but more specifically how it relates to the determination of executive compensation and the pay performance sensitivity. To recap, agency theory proposes that the aim of a behaviour-based contract is to use information systems to improve agent monitoring.

The adoption of a remuneration committee is in line with this as it further distances the link between decision management and decision control (Fama and Jensen 1983). However recent studies have not always reported results in line with those anticipated under agency theory. Conyon and Peck, (1998b) report that remuneration committees comprising a higher proportion of outside directors are actually associated with higher levels of top executive pay. Daily *et al.* (1998) further state that the presence of affiliated directors on the compensation

committee does not lead to higher levels of CEO compensation. Core and Guay (1999) however show that firms with weaker governance structures (measured by board and ownership variables) do have greater agency problems. In particular, in their cross section of US companies, CEO compensation is found to be higher in companies with less effective governance structures.

Given the difficulties associated with directly observing a manager's effort or behaviour, the use of outcome based contracts that align the interests of principals and agents are more often used as a primary means of dealing with the agency conflict.

Risk averse managers however will want their compensation structured so that they bear less personal risk, i.e. they will prefer cash-compensation to an equivalent value of equity based compensation and may engage in activities which reduce the firms risk which may in turn reduce shareholder wealth. Previous research however, suggests that tying managers compensation to firm performance motivates them to overcome this conflict and pursue more value maximising decisions (Grossman and Hart, 1983). Other researchers have shown more formally that incentive compensation plans can motivate managers to take on more risk (see Hirshleifer and Suh, 1992).

Thus in the absence of complete and symmetric information, shareholders interests can be promoted by a second best contract that relates executive reward to a variable that shareholders are interested in. It is this relationship that becomes the central focus of the following section of this chapter.

2.3 Pay And Performance

The principal agent model described above predicts an optimal solution for the pay performance term dependent on the risk aversion of the agent, the uncertainty of firm value and the function describing the cost of effort to the agent. Empirical studies have thus attempted to estimate how sensitive executive compensation actually is to measures of company performance. The usual way in which such empirical models proceed is to estimate a simple reduced form equation rather than the parameters of a specific principal-agent model (see Conyon, Gregg and Machin, 1995). A standard regression equation would model the compensation of an individual director *i* at time *t* as:

$$\Delta\log(\text{Compensation})_{it} = \alpha + \beta\Delta\text{Performance}_{it} + \varepsilon_{it} \qquad (2.1)$$

where the term β is the reaction coefficient reflecting the sensitivity of director compensation to corporate performance. The magnitude of the coefficient is interpreted as reflecting the operation of principal-agent type mechanisms with higher values of β suggesting closer alignment of owner and management interests. The value of β is thus an estimate of the δ term in the principal agent model described in Section 2.2.3. An important feature of this modelling procedure is that by estimating in first differences the β estimate is free from company fixed effects bias (see Murphy, 1985). There has now been a certain amount of UK research estimating such models but this contrasts to the much more voluminous US literature (see Bruce and Buck, 1997). So, what estimates of β have been reported in the literature?

The US literature has frequently found the link between directors' compensation and company performance to be small. In the widely cited analysis of US executives, Jensen and Murphy (1990b) estimate that the pay performance relation (including pay, options, stockholdings, and dismissal) is $3.25 for every $1000 dollar change in shareholder wealth. They concluded that such a value for pay performance term was too low to be consistent with principal-agent theory. "We believe that our results are inconsistent with the implications of formal agency models of optimal contracting" (p227).

Such a small pay-for-performance sensitivity might be a matter of concern for shareholders and policy makers since the implied small private returns to CEOs for significant changes in shareholder worth implicitly questions the incentives for top management to pursue shareholder interests.

The early UK evidence, too, suggests that directors' compensation is only weakly related to company performance i.e. that estimates of β are small or insignificant (see Conyon, Gregg and Machin, 1995). Before looking at the evidence in detail however, it is important to stress some general features of the early UK data.

Firstly, the measure of compensation typically used in UK studies is a time series on the cash compensation i.e. salary and bonus, of the highest paid director. This contrasts with the relevant unit of analysis, which is the individual executive. This can cause problems for the estimated relationship between pay and performance since the compensation time series may actually represent rewards to

several different individuals. For instance, a large annual increase in the salary and bonus of the highest paid director may reflect a recruitment payment (golden handshake) for a new CEO and not a pay rise to the particular individual who was the highest paid director in the previous year.

Secondly, there is the controversial area of how exactly to measure director compensation. Until comparatively recently most UK studies have used only the direct emoluments of the highest paid director which are available from the company accounts. This measures only current compensation and excludes long term compensation such as the estimated value of share options and other forms of deferred compensation. Bruce and Buck (1997) argue that by excluding these extra components of the directors' overall compensation the estimated relationship between compensation and performance may be biased (see also Conyon, Gregg and Machin, 1995).

The use of cash received as the sole measure of compensation does however have an empirical grounding. Lewellen and Huntsman (1970) reported that cash compensation represented an excellent proxy for total compensation (estimated as the sum of cash and the equivalent value of all deferred and contingent compensation) and even provided superior results when regressed on independent variables such as company size and profits. The structure of compensation however has dramatically changed since the Lewellen and Huntsman study. In the US non-cash elements of pay are now often larger than the cash elements (Murphy, 1999) and executive compensation packages in the UK are following a similar trend (Conyon and Murphy, 1999). A second and

more fundamental reason as to why the wider compensation measures have typically not used in the UK context is due to lack of available and consistent data.

Finally, there is the question of how to measure company performance. Some empirical models use market-based measures of corporate performance such as shareholder returns or shareholder wealth, whereas others use accounting-based measures such as earnings per share or return on capital employed. It is not immediately apparent which is the correct performance measure to use, however, since principal-agent mechanisms stress returns to shareholders, a market based measure reflecting share price appreciation and dividend yield (i.e. total shareholder return) does seem more intuitive.

Table 2.1 extends that provided by Conyon and Peck (1998a) and reports some recent UK evidence on the relationship between directors' pay and company performance along with significant US studies. Some important general themes emerge. First, estimates of the pay for performance relationship in the UK are small. This suggests that incentives are not very strong. Second, the statistical link between directors' pay and corporate performance in UK companies appeared to have been decoupled in the period since 1989 (Gregg, Machin and Szymanski, 1993). By the early 1990s one could not detect any significant relationship between the basic pay of UK executives and the stock market performance of their companies. Even allowing for the changing nature of compensation packages (i.e. towards more long-term performance pay in the form of stock options and other deferred mechanisms), Gregg *et al.* (1993) found little change in the estimate of β.

Main, Bruce and Buck (1996), were the first to produce a UK study that used a pay measure which incorporated the value of option grants. Their paper identified the change in the Black-Scholes value of options over a given year and added this to the cash compensation to yield total pay figure. Although their sample was only of 60 large UK firms over the period 1983 to 1989, they did find a much stronger relationship between pay and performance than had previously been reported. However, some immediate observations with their approach are noteworthy.

First is the measurement of the compensation variable. Two distinct measures were used, one being the standard cash compensation measure of base pay plus bonus. The second measure is termed "total remuneration" which they define as "the sum of the emoluments and any change in value that year in the Black and Scholes 'cash-equivalent' value of option holdings" these two measures were applied to three categories of employee, the highest paid director, the CEO and the total board. The total remuneration measure more accurately reflects the change in firm specific wealth owned by the CEO. For instance, other authors (e.g. Murphy 1999; Conyon and Murphy 1999; Yermack 1995) distinguish between annual pay which includes the value of current grants of options and wealth effects which refer to the change in value of the whole portfolio of options held.

Second is their econometric method. In essence Main, Bruce and Buck estimate a panel data econometric model equivalent in form to equation (2.1) in Section 2.3 above. The compensation variable can be alternatively salary and

bonus or total remuneration, yet they still estimate a single common, average pay for performance term (β). However, as indicated in Section 2.2 above, the pay for performance term is likely to display cross-sectional, i.e. firm, heterogeneity. This is due to the fact that the optimal β depends on the (second derivative) agent cost of effort function, variability of firm wealth and agent risk aversion, all of which are likely to vary over different agents and companies.

Thus, in common with much of the US and UK literature Main, Bruce and Buck provide the mean estimate of the pay performance term. However, recent US and international comparisons have calculated directly the pay performance term for each CEO separately. Examples of this are, Jensen and Murphy (1990b), Murphy (1999), Conyon and Murphy (1999) and Yermack (1995). This observation may be important if the distribution of pay for performance sensitivities is non-normal. Indeed, Chapter Five shows marked differences between the calculated mean and median option pay for performance sensitivities.

The Main, Bruce and Buck results are easily summarised. The mean (median) salary and bonus compensation of the highest paid director in 1989 was £223,000 (£165,000). In contrast, the mean (median) total remuneration of the highest paid director was £317,000 (£199,000). The econometric results based on the dynamic panel of 60 companies revealed a statistically significant relationship between salary and bonus and current dated share price. Similarly, there is a significantly positive relationship between total remuneration and current dated share price. Specifically, their estimated models forecast that a 10% increase in stock returns yields a 2.25% increase in salary and bonus. This translates into an

£8018 increase on the median highest paid director salary and bonus in 1989 of £357,000. The specification that uses total remuneration as the dependent variable forecasts that a 10% increase in stock returns yields an 8.94% increase in total remuneration, translating into a £50,600 increase on the median highest paid director total remuneration of £566,000. These results, the authors suggest, demonstrate "a more robust connection between executive pay and performance in British firms than has hitherto been reported" (Main, Bruce and Buck, p1641).

Although the results produced in Chapter Five onwards draw similar conclusions to this only existing UK published study using options information, there are marked differences in the two approaches. In particular, two improvements of the results presented here are: (1) The use of 510 companies representing 98% by value of the London Stock Exchange as opposed to a sample of just 60 firms. (2) The explicit use of option pricing theory to calculate the value of options and the underlying incentives from them, as opposed to using econometric methods to yield only mean estimates.

To recap, much of the evidence from early empirical work both in the US and UK concluded that there was no link between direct executive compensation and the stock market performance of their companies. Even where a link had been identified its magnitude seemed to be extremely small (Jensen and Murphy, 1990b; Gregg, Machin and Szymanski, 1993) and thus seemed to offer little support to principal agent model.

Haubrich (1994) however, argued that despite being small, given the risk aversion of CEOs, such estimates of the pay for performance term could still indeed be consistent with the predictions of agency theory. Garen (1994) empirically tested the principal agent model by examining whether CEOs' stock-related compensation is decreasing in the standard deviation of firm returns and whether CEOs' salary based compensation is increasing in the standard deviation of the firm returns. Using the Jensen-Murphy (1990b) sample of 430 US firms in 1988, he does find weak evidence in support of these propositions, although none of his regressions providing a statistically significant coefficient on the standard deviation of firm returns variable. More recent studies however have reported results that lend even greater support to the theoretical model.

Results presented by Aggarwal and Samwick (1999) for example strongly support the principal agent model. They use the variation in stock return volatility across firms to test whether executives at riskier firms have lower pay performance sensitivities, as is predicted by most principal agent models. They find that the pay-performance sensitivity of a manager's compensation is decreasing in the variance of the firm's returns and that the pay performance sensitivity for executives at firms with low stock price volatility is an order of magnitude greater than it is for executives at firms with highly volatile stock returns.

Study	*Data*	*Compensation measure*	*Performance measure*	*Estimated β (standard error)*	*Remarks*
Jensen and Murphy (1990b)	US data on 2213 CEOs, 1974-86	1. Change in salary and bonus of CEO 2. Change in wealth (=salary+bonus+ value of restricted stock+ other benefits+present value of salary increment+ change in value of options) of CEO	Change in shareholder return dated at a) period t and b). period t-1	1a) 0.0000139 (0.0000017) 1b) 0.0000080 (0.0000015) 2a) 0.000176 (0.000034) 2b) 0.000131 (0.000034)	Performance effects regarded as small
Main (1992)	512 UK companies 1969-89	Change in salary and bonus of highest paid director	Stock market return	0.038 (0.012)	
Gregg, Machin and Szymanski (1993)	288 UK companies, 1983-91	Change in salary and bonus of highest paid director	Change in shareholder returns	1983-8 0.027 (0.013) 1989-91 -0.024 (0.022)	Effect of performance on compensation displays time heterogeneity. Disappears after 1988.
Main and Johnston (1993)	220 UK companies, 1990	Salary and bonus of highest paid director	Risk adjusted market return	0.100 (0.135)	Cross section evidence
Conyon and Leech (1994)	294 UK companies, 1983-86	Change in salary and bonus of highest paid director	Change in shareholder wealth	0.052 (0.020)	Effects of governance discussed
Conyon and Gregg (1994)	169 UK companies, 1985-90	Change in salary and bonus of highest paid director	Shareholder return	1985-87 0.076 (0.032) 1988-90 0.020 (0.036)	Role of unions, mergers and financial structure on director compensation evaluated
Conyon (1995)	28 UK privatised companies, 1990-94	Change in salary and bonus of highest paid director	Return on shareholders equity;	0.0039 (0.0042)	Levels modelled, rather than first differences; fixed effects
Cosh and Hughes (1997)	44 UK companies in electrical engineering sector, 1989-94	Level and change in CEO pay	1. Return on capital employed; 2. shareholder return	1. -0.02 (0.5) 2. 0.11 (0.047)	Effects of shareholdings evaluated; relative performance considered

Table 2.1: Recent Evidence On The Pay - Performance Relationship

Study	*Data*	*Compensation measure*	*Performance measure*	*Estimated β (standard error)*	*Remarks*
Smith and Szymanski (1995)	51 quoted UK companies, 1981-1991	Level of directors remuneration including performance related pay, benefits and basic salary (for all directors)	1) Sales; 2) Earnings per share	Cross section 1) 0.43 (0.06) 2) 0.03 (0.10) Time series 1) 0.41 (0.20) 2) 0.03 (0.24)	Argue for the need to include effect of average executive pay as an 'outside option'
Conyon (1997b)	213 large UK companies, 1988-93	Change in salary and bonus of highest paid director	Shareholder return	0.061 (0.020)	Effects of board-room controls evaluated : outcomes ambiguous
Main, Bruce and Buck (1996)	60 large UK companies, 1983-89	Board and top directors' remuneration. 1) Salary and bonus 2) Total remuneration (including stock options)	Share performance	For CEO : 1) 0.146 (0.113) 2) 0.729 (0.282)	Models include sector performance term and lagged dependent variable
Conyon and Peck (1998b)	94 FT-SE 100 companies, 1991-94	Change in salary and bonus of highest paid director in companies where 1) Proportion of outside directors on remuneration committee is above the median 2). Same proportion is below the median	Shareholder return	1) 0.088 (0.047) 2) 0.033 (0.087)	Data derived directly from annual reports. Board structure effects on pay evaluated. Outcome ambiguous.
Hall and Liebman (1998)	478 US companies, 1980-1994	1) Change in salary and bonus of CEO 2) Change in salary, bonus and value of current option grants of CEO	Shareholder return dated at a) period t and b). period t-1	1a) 0.163 (0.012) 1b) 0.0596 (0.011) 2a) 0.280 (0.022) 2b) -0.016 (0.024)	Option data derived by tracking option holdings through progressive proxy statements.
Aggarwal and Samwick (1999)	1500 US companies, 1993-1996	1) Change in salary, bonus and value of current option grants of CEO 2)The above plus change in value of option and equity holdings of CEO	Change in Shareholder wealth	1) 0.432 (0.053) 2) 1.036 (0.313)	Model also considers other compensation measures and extends analysis to other executives

Table 2.1: Recent Evidence On The Pay - Performance Relationship (Cont.)

Other more recent evidence also suggests the pay-performance link may be becoming stronger. Murphy (1999) reports that pay performance sensitivities in the US have nearly doubled between 1988 and 1996. This has been driven primarily by executive share options and direct equity ownership with the author stating that 95% of the estimated 1996 pay-performance sensitivity for CEOs in manufacturing companies comes from options (64%) and equity (31%).

Furthermore, Murphy reports an inverse relation between company size and pay-performance sensitivity. This can be intuitively explained since the CEOs of large companies tend to own a small proportion of their company through shares and options. While increases in the pay-performance sensitivity would suggest a lessening of agency problems, Murphy (1999) also offers evidence which suggests that agency problems might be increasing. This stems from the observation that although the value of shares held by S&P-500 CEOs has increased substantially over the past decade, the percentage of outstanding equity held by such CEOs has been declining and it is the percentage ownership, rather than the absolute value of shareholdings that indicates the severity of the agency problem.

Several other authors have also documented recent increases in the pay-performance sensitivity. Hall and Liebman (1998) used data from 478 companies over a period of 15 years from 1980 to 1994 and further concluded that there was a strong relationship between firm performance and CEO pay. Their method differed from most previous studies because, in a similar vein to Main Bruce and Buck (1996), they constructed a pay measure that included changes in the value of

the stock of equity and options held by the CEO. Excluding these elements they find similar although slightly larger pay performance to that of Jensen and Murphy. But when these elements are included, their elasticity of pay estimates are some thirty times larger than previously reported elasticities. In terms of dollar returns, Hall and Liebman estimate median and mean values of the pay performance sensitivity at $5.29 and $25.11 per $1000 in 1994, compared with Jensen and Murphy's median estimate of $3.25

Aggarwal and Samwick (1999) find even larger pay performance sensitivities. Using their sample of 1500 companies over the period 1993-1996 they construct a pay measure that, like Hall and Liebman, includes the change in the market value of the executive's holdings of shares and options as well as salary, bonus and the value of any grants of options or other long term incentives. Based on this measure of pay they find median and mean dollar pay performance sensitivities of $14.52 and $69.41 per $1000, even excluding the revaluation of option holdings the respective figures are $6.59 and $58.61.

In addition, to rewarding managers based on their own company performance, the owners of a company may wish to make pay dependent on performance relative to that of other companies operating in the same industry or sector (see Nickell, 1995, Tirole, 1988 or Holmstrom, 1982). The idea is simple. In the model outlined above owners want to reward effort, but can only observe the output. Some shocks, though, are common to the industry or sector as a whole (e.g. industry profits may fall independent of the actions of the manager). To control for such shocks the owner of the company merely looks at the profit

outcome of the company relative to other firms in the same industry. One would expect then to see managerial pay not only directly related to company performance but also to the performance relative to other companies (see Gibbons and Murphy, 1992).

The evidence on the whole issue is mixed, and still an under-investigated area in the UK. Antle and Smith (1986) and Barro and Barro (1990) find no strong association between executive compensation and relative performance using US data. Janakiraman, Lambert and Larcker (1992) on the other hand find that compensation increases with industry performance using accounting data and decreases with industry performance using stock return data. Gibbons and Murphy (1990) assess the impact of relative performance on compensation using data on 1688 CEOs from 1049 US corporations between 1974 and 1986. They find that compensation is significantly (negatively) related to industry and market rates of return. In addition, they note that the wider market, rather than firms in the more narrowly defined industry group, are the more important comparison firms.

Bertrand and Mullainathan (1999) use annual cash compensation plus the value of option grants during the year to test whether CEOs are rewarded for exogenous shocks in oil prices, but find little evidence to support the relative performance theory, although the link they do find is stronger for negative shocks in the oil price than it is for positive ones. Aggarwal and Samwick (1999) also test for relative performance evaluation, but again find little support for the model. They find minimal evidence that the industry pay performance sensitivity is

negative and no evidence that the ratio of the industry pay performance sensitivity to the own firm pay performance sensitivity is decreasing in a firm's stock beta, both of which would be predicted by the theory.

The UK evidence on relative performance is also mixed; though no papers to date have address the issue directly. Conyon and Leech (1994) and Conyon (1998) find little support for the effect of share performance in other companies influencing executive compensation. Cosh and Hughes (1997) find that a measure of overall performance, defined as shareholder return net of the median total shareholder return for the sample in the relevant period, has a positive effect on compensation.

To summarise, early studies found little evidence of a link between executive pay and company performance typically when using econometric methods and when not dealing with the role of options. Namely, these early studies focused on a narrow pay measure that included only salary and bonus. Recent changes in the structure of compensation packages together with increased levels of disclosure have led later studies to estimate much larger pay performance sensitivities. These studies universally conclude that the main driver of this sensitivity is equity based compensation such as ordinary shares and executive options. While incentive effects of ordinary shares are fundamental, options are much more complex. The following section then introduces option valuation and the mechanism through which incentives are created by holding such instruments.

2.4 Options

Executive options have now become a fundamental part of modern day executive compensation packages. Recent improvements in the level of information disclosure with regard to director option holdings means that a thorough analysis of the impact of executive options is now not only desirable, but also empirically possible. Chapters Five and Six undertake such an empirical analysis. As a grounding therefore, the following section provides an introduction to options in general and a model for their valuation, for a more rigorous analysis see Hull (1993).

2.4.1 An Introduction To Option Theory

A derivative security is a security whose value depends on the value of other more basic underlying assets. A standard option is a particular form of a derivative security that gives the holder the right to trade in a particular asset at a fixed price, known as the exercise or strike price, at some time in the future. There are two basic types of option, a call option, which gives the holder the right to buy the underlying asset, and a put option, which gives the holder the right to sell the underlying asset.

Options can further be classed as either European or American. A European option is one that can only be exercised on the expiration date of the contract, that is the final day in the life of the option. American options however, are capable of being exercised at any time during the life of the contract.

Options are written on all types of assets such as gold and oil, interest and currency rates and since there introduction on traded exchanges in 1973 have become incredibly diverse in their specification. However, for the purpose of this thesis only the valuation of a standard European call option written on a publicly traded stock is considered.

Black and Scholes (1973) were the first to provide a closed form solution for the valuation of European calls. They demonstrated that given the assumption of frictionless markets and continuous trading opportunities, it was possible to form a risk-free 'hedge portfolio' consisting of a long position in the share and a short position in the European call written on that share. The reason the portfolio is risk-less is because both the share price and the option value are affected by the same single underlying source of uncertainty, thus over any short period of time the two are perfectly correlated and the value of the portfolio at the end of the period is known with certainty.

If risk-less arbitrage opportunities are to be avoided, then the above risk-less portfolio must earn the risk-free rate of interest. This insight led Black and Scholes to develop their famous option pricing formula. Their initial analysis considered the case where the underlying asset paid no dividends, however Merton (1973) showed how their formula could easily be modified for the case where the stock paid continuous dividends. Accordingly, the value of one European call option (c) on a stock paying dividends at a continuous rate (q) is given by;

$$c = Se^{-qt}N(d_1) - Xe^{-rt}N(d_2) \tag{2.2}$$

where

$$d_1 = \frac{\ln(S/X) + \left(r - q + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}} \tag{2.3}$$

and

$$d_2 = \frac{\ln(S/X) + \left(r - q - \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}} = d_1 - \sigma\sqrt{t}$$

The other five variables in the above equations are the share price (S), the exercise price (X), the risk-free rate of interest (r), the time to maturity (t) and the volatility or standard deviation of the share price returns (σ). N(.) is the cumulative normal function.

At any moment in time the value of a call option can be split into two components, an intrinsic value and a time value. The former represents the gain (if any) that could be achieved from exercising the option immediately and is thus derived from the difference between the exercise price and the share price. The time value, represents the potential for the intrinsic value of the option to increase over the remainder of the option's life. These, two elements can be seen in Figure 2.1 which plots the value of a typical call option with an exercise price of 100 against the underlying share price. The upper curve represents the total value of the option while the lower line depicts the intrinsic value. The time value of the option is thus represented by the distance between the two lines.

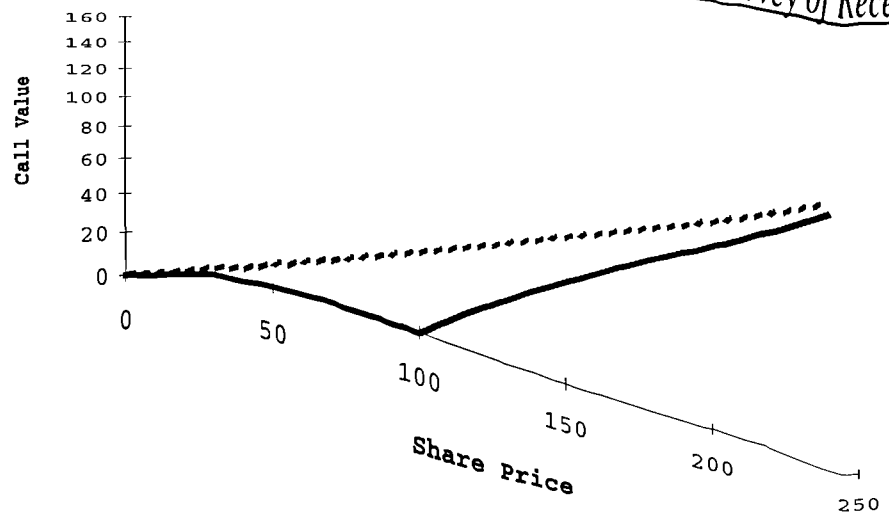

Figure 2.1: Value of a Call Option

A call option that has some intrinsic value, i.e. where the share price is greater than the exercise price is said to be in the money. An option with no intrinsic value is said to be out of the money, or in the specific case where the share price exactly equals the exercise price, at the money.

Holding the other variables constant, the value of the call will increase as the share price increases, or as the exercise price decreases since this directly increases the intrinsic value of the option. Increasing the volatility of the underlying asset also increases the value of the option, since greater returns can be made from big increases in the share price, while the return is still bounded by zero for large falls in the share price.

Call option values are negatively related to dividends, since dividends have the effect of reducing the share price. Increasing the time to maturity of the option generally has the impact of increasing the value of the option, since it

provides a greater opportunity for the share price to rise. However, this is not always the case, if the dividend yield is sufficiently large to significantly reduce or even prevent growth in the share price, then increasing the life of the option can reduce its value.

The way the risk-free interest rate affects the value of a call option is less clear-cut. As interest rates in the economy increase, the expected growth rate of the underlying share increases. However, the present value of any future cash flows received by the holder of the option decrease. The first effect will increase the value of the call option, while the second tends to decrease it. It can be shown however that the first effect always dominates the second, and as such the value of a call will increase as the risk-free rate of interest increases.

The *delta* (δ) of an option is defined as the rate of change in the option value with respect to the price of the underlying asset. This is thus equal to the slope of the upper line in Figure 2.1. For example, a delta of 0.6 implies that for any small change in the share price, the option value changes by 60% of that amount.

For a stock paying dividends at a continuous rate (q) the delta of a call option on that stock is given by:

$$\delta = e^{-qt} N(d_1)$$

Where d_1 is as defined in equation (3). The value of delta varies between zero and one, being close to zero for deep out of the money options, while approaching one for deep in the money options. As will be demonstrated later, the delta is fundamental to the understanding of the incentives provided by options.

2.4.2 Executive Options And The Black-Scholes Formula

The Black-Scholes formula is widely used by both academics and practitioners alike. It has been almost universally accepted and used as the standard option pricing model within the executive compensation literature (e.g. Conyon and Murphy, 1999; Hall and Liebman, 1998; Hall, 1998; Aggarwal and Samwick, 1999; Main, Bruce and Buck, 1996) and is effectively endorsed by the SEC as the preferred pricing model.

Accordingly, the model is used throughout this thesis. There are however, a number of drawbacks to using the Black-Scholes formula to price executive options which are addressed below.

Firstly, the Black-Scholes formula is based on an arbitrage argument which assumes the holder of an option can hedge away risk. Holding a long position in the option, this would be done by taking a short position in the underlying asset. In terms of a corporate executive however, this is not possible. They are prohibited from short-sell their company shares and cannot openly trade their executive options. As such the value a risk averse company executive places on an executive option will be lower than that placed on it by an outsider. Furthermore, because directors are inherently undiversified, with both their labour

and capital invested in the company, the impact of the inability to hedge is likely to be greater than would otherwise be the case. The impact of risk aversion is developed more fully in Chapter Seven.

Secondly, the Black-Scholes formula prices a European option which by definition can only be exercised at maturity. Executive options however can usually be exercised at any time in the options' life after an initial vesting period (typically three years). This has ambiguous implications in determining the value of the option. The right to exercise the option early will increase its value. However, Carpenter (1998) showed that executives tend to exercise their options earlier than a rational outsider would, thus reducing the expected value of the option.

Finally, executive options are subject to forfeiture in certain circumstances, for example, most executive options immediately lapse as soon as the director leaves the company. Alternatively, many UK executive options have performance criteria attached to them, preventing exercise unless some predetermined performance threshold is reached. This probability of forfeiture again reduces the expected payoff of the option and consequently its value.

2.4.3 The Option Delta

As mentioned above, the option delta is crucial in understanding the incentive effects created by holding options. It establishes the link between shareholder wealth, represented by the share price and CEO wealth represented by

the option value. For every one pound rise in the share price[4], the value of an executive option goes up by the delta, e.g. 60 pence if the delta is 0.6. For any given increase in shareholder wealth then, the total increase in the CEO option wealth will depend on two variables. Firstly the delta of the options, and secondly, the number of options that the CEO holds. For example, holding five options each with a delta of 0.6, would produce the same increase in option wealth as holding 10 options each with a delta of 0.3, namely £3 for every £1 increase in the share price.

The option delta of course is not constant, it is determined by the five inputs to the Black-Scholes equation and a change in any one of these variables will change the delta. Of particular interest is the way the option delta varies with respect to the share price and time to maturity of the option.

Figure 2.2 shows how the delta of a typical call option with a strike price of £4 written on a low dividend paying stock, changes as the underlying share price is increased. When the share price is close to zero, the delta of the option is very small. As the share price increases so does the delta, however the increase in the delta is largely dependent on the remaining time to maturity of the option. If the option is close to maturity, then the delta will only begin to rise significantly as the share price approaches the exercise price and quickly approaches unity as the share price climbs above the exercise price. For longer dated options, the option

[4] Strictly speaking delta is only defined over a small change in the share price. A change of £1 is only used for simplicity.

delta initially increases more quickly as the share price rises, however even at share prices well above the exercise price the option delta remains well below one.

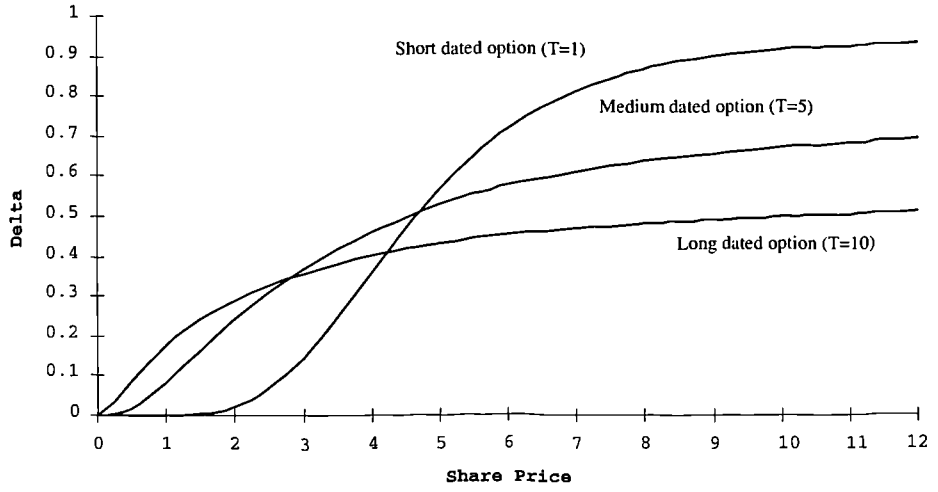

Figure 2.2: Option Delta Against Share Price (Exercise Price = 4)

The explanation for this is simply. The delta can be thought of as the probability that the option will end up in the money. The further the option is currently in the money, the greater the probability will be that it will end up in the money and the higher will be the delta. However, for long dated options, there is still plenty of time for the share price to rise or fall and consequently the delta of the option will not be close to one or zero. As the time to maturity shortens the payoff to the option becomes more certain. At the instant before maturity either the option is in the money and will have a positive payoff with probability one, or the option is out of the money and will have a positive payoff with probability zero. Thus as the time to maturity shortens, the delta begins to converge to either one or zero depending on whether the option is in or out of the money. This is demonstrated in Figure 2.3.

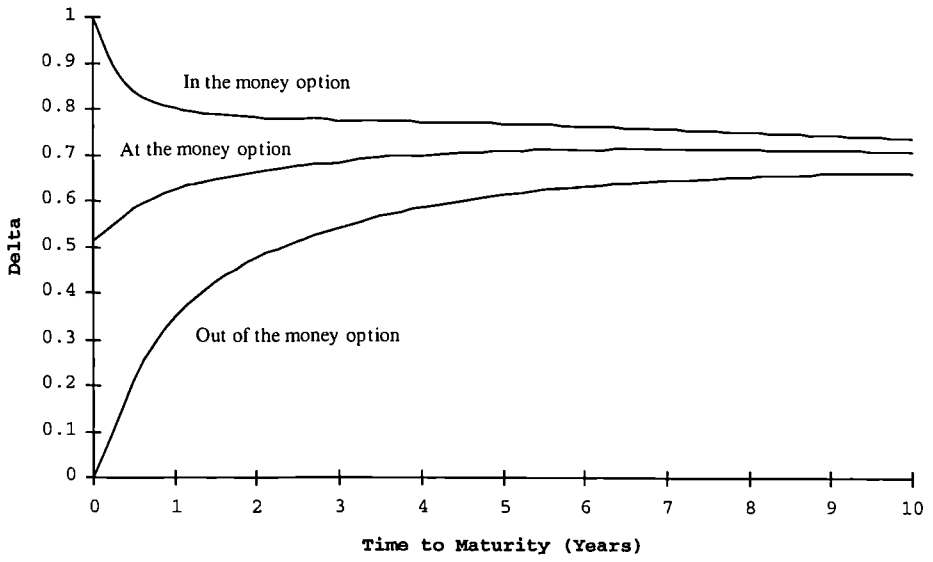

Figure 2.3: Option Delta Against Time to Maturity

Note for at the money options, as the time to maturity approaches zero, the delta approaches 0.5 reflecting the probability that at the moment of maturity the option is effectively equally likely to have moved into or out of the money.

2.5 Information Disclosure

The next section of this chapter introduces the theme of disclosure which is the main topic under discussion in Chapter Four and also has relevance to the work presented in Chapter Five. A thorough review of the disclosure literature (and its relation to option information in particular) is undertaken in Chapter Four, while current disclosure requirements are dealt with comprehensively as part of the description of the main data set presented in Chapter Three. As such the topic is only introduced here for completeness.

2.5.1 The Significance Of The Level Of Disclosure

In the context of this thesis, disclosure refers specifically to the level of information companies choose to report with respect to the option holdings of their directors. The motivation for considering levels of disclosure is twofold. As highlighted previously, most of the empirical work in the UK to date has focused exclusively on the direct cash compensation of directors, that is the total of salary, benefits and bonus. However, non-cash elements of compensation, such as options, have become increasingly significant in modern day compensation contracts (Murphy, 1999; Perry and Zenner, 1998). A total pay measure though can only be accurately calculated if companies report sufficient information to allow a valuation of these non-cash elements. The absolute level of disclosure is thus important since it determines how accurately total compensation can be calculated. The impact of different levels of disclosure on the valuation of directors option holdings, and consequently the incentives derived from them is the focus of Chapter Five.

The second issue concerns the motivation for firms to choose varying levels of disclosure. Information released by managers, especially financial information, represents a signal of the firm's fundamental value albeit with some element of noise. As such, differing levels of disclosure relating to director's option holdings may reflect different signals about the companies remuneration strategy. For example, case study evidence by Dial and Murphy (1995) showed that compensation strategies are associated with stock market performance of General Dynamics in the United States. See also, the review by Murphy (1999). This general issue of option disclosure signals is the focus of Chapter Four.

2.5.2 Current Levels Of Disclosure

There are of course statutory requirements that companies in the UK must adhere to, for example the Companies Act (1985) or the Stock Exchange Continuing Obligations for listed companies, and such requirements have necessitated greater levels of disclosure in recent years. However, even the regulations as they stand today, provide for considerable discretion in the amount of information that can be presented.

The disclosure of directors' emoluments is primarily governed by the Companies Act (1985). In addition, information on share options must be given in compliance with the Yellow Book Listing Rules of the London Stock Exchange. Reviews of this are provided in Clark and Main (1997). Moreover, the revelation of information surrounding executive share options is influenced by the policy statements of institutions such as the Association of British Insurers[5] (ABI).

Forker (1992), and Egginton, Forker and Grout (1993) discussed the information requirements in order to appraise option schemes. Forker (1992) remarked "the value of options when they are granted represents the biggest component of the cost of options to shareholders". The valuation of the stock of options held by a director requires information on the number of options (N), the exercise prices (X), the remaining life of the options (T), the volatility of the underlying share (σ), the dividend yield (q) and risk-less rate of interest (r). While the last three variables can be readily determined from general stock market information, the first three can only be obtained from the company in question,

either through direct contact with the company, or through their annual publications.

Main, Bruce and Buck (1996) note that this information has always been available from the Register of Directors' Interests, but collecting such information from this source is extremely costly to the investigator. The only real alternative source is from the information contained in the company accounts which until recently, was all too often incomplete.

Section 5.13 of the Greenbury report recommended that companies should disclosure full details of each individual director's option entitlement in accordance with the Urgent Issue Task Force's (UITF) Abstract 10. This implies companies should provide information on the exercise price and time to maturity of every tranche of options held by every director.

However, the Greenbury report goes on to state that "In the disclosure of share option details there is some risk that the abundance of information will mask rather than highlight the nature and scale of the option schemes. Remuneration committees may wish, therefore, to consider the more concise disclosure models also described by the UITF".

These "concise" disclosure models as defined by the UITF Abstract 10 state that companies can instead disclose only the weighted average exercise price and the maturity date of the longest dated option. The abstract does add that

[5] See Chapter Seven for a further discussion on ABI guidelines

where this alternative is taken, some additional disclosure may be necessary. These take the form of distinguishing between in-the-money options and out-of-the-money options and noting "unusually large individual items" to prevent misleading conclusions being drawn from an average. The precise disclosure requirements of both the full and concise disclosure models are presented in Section 3.3.

2.5.3 Discretionary Disclosure

Verrecchia (1983) presented a discretionary disclosure model in which a manager of a risky asset can exercise a choice in the disclosure of information. In his model market participants form rational expectations concerning the manager's motivation. The information released by the manager is then seen as a signal of the asset's fundamental value perturbed by noise.

The significance of a proprietary cost is that if information is withheld, then market traders are unsure whether it is withheld because (a) the news really is bad or (b) that the news is good but not good enough to out-weigh the proprietary cost associated with its release. The proprietary cost then, introduces noise into the system by making the interpretation of the withholding of information ambiguous. In short, non-disclosure can be associated with both "good" and "bad" news.

To move to an empirical framework in the analysis later in the thesis it is important to identify accounting and economic variables which co-vary with the (proprietary) costs of disclosure. Pierce-Brown and Steele (1999) review the

voluminous literature relating to accounting policy choice. Also, Forker (1992) considers explicitly those factors which affect the costs of disclosing share option information. Chapter Four thoroughly reviews these factors before presenting an appropriate econometric model.

2.6 Tournament Theory

The main focus of this chapter to date has been the principal agent model and the associated literature investigating the link between company performance and executive compensation. As detailed above, most early studies suggested this link was neither strong nor consistent (Jensen and Murphy 1990b; Conyon, Gregg and Machin 1995) although more recent research in the US, has suggested a strengthening of the link (Murphy 1999, Hall and Liebman, 1998, Aggarwal and Samwick, 1999).

In an attempt to further align economic theory and empirical reality, economists proposed an alternative theory of executive pay known as tournament theory. Tournament theory was initially developed by Lazear and Rosen (1981), in part, to explain the large disparity between CEO pay and the pay of executives located one level down the organisational hierarchy. The authors state "On the day that a given individual is promoted from vice-president to president, his salary may triple. It is difficult to argue that his skills have tripled in that one-day period, presenting difficulties for standard theory where supply factors should keep wages in those two occupations approximately equal. It is not a puzzle, however, when interpreted in the context of the prize" (p847).

Lazear and Rosen suggest that even though the salary of the top executive may well exceed all measures of his marginal product, it can still be economically efficient. The justification is that the high salary of the CEO acts as an incentive to those on lower management levels to accept wages at less than their own expected marginal product. Chapter Six provides some empirical evidence on tournament theory using a sample of British companies to test the usefulness of this theory for explaining executive pay outcomes.

The underlying theme of tournament theory then is that agents will exert effort in order to get promoted to a higher position in the management hierarchy associated with which is a higher level of compensation. Individual agents thus compete with each other, increasing their effort in an attempt to increase the likelihood of winning the prize of promotion. In this framework, it is of course only relative performance that is of importance. As in a competitive sports game, agents need not be concerned with their absolute level of performance, only that they outperform their rivals.

One of the earliest works to address tournament theory was that of Green and Stokey (1983), who demonstrated that when individual productivity within an organisation is subject to a sufficiently diffuse common shock, then using the optimal tournament dominates other forms of remuneration. Similarly, Malcomson (1984), showed how tournament compensation arrangements can be superior to other structures of executive compensation.

Tournament theory can also be applied to lower levels within an organisation's hierarchy, which is usually triangular in shape (Beckmann 1978). At lower levels, the prizes for promotion are likely to be smaller since a larger number of positions exist within a particular hierarchical level. This indicates that a relatively large proportion of individual competitors can be promoted. Closer to the top of the hierarchy the number of positions available for competitors decreases and so the prize needs to be greater to motivate tournament survivors (Rosen 1986). Tournament theory thus predicts a convex relationship between executive compensation and organisational level.

Tournament theory has not though gained universal acceptance. Dye (1984) for example, provides a comprehensive critique of tournament theory raising doubts about several features including the feasibility of constructing appropriate handicaps, the difficulty of judging multidimensional performance in an ordinal sense and the problems of collusion and sabotage among contestants under such arrangements. Baker, Jensen and Murphy (1988) also question the wisdom of using promotions as an incentive device, pointing to the costs of promoting an individual with skills inappropriate to the promoted post.

On an empirical level there have been few tests of tournament theory in general and only a handful in the context of executive compensation. Strong evidence for tournament models has however been obtained from studies into sport. Ehrenberg and Bognanno (1990) demonstrated that professional golfers on the European circuit produced better rounds (i.e. fewer number of strokes) when the prize money on offer increased. In a similar vein Becker and Huselid (1992)

showed that professional NASCAR drivers produced faster times in races with higher prizes. Their results also showed however, that greater prizes can induce drivers to pursue riskier driving strategies.

A further example is Fernie and Metcalf (1996), they undertook an empirical test based on the pay and performance of an unbalanced panel of 50 jockeys over a period of eight years. Again, the transparency of not only the pay but more importantly the performance of, in this case, the jockeys, made the pay-performance link much easier to observe. Jockeys are usually paid a percentage of any winnings, and their opportunity to win, that is the number of rides they are offered, depends on their reputation and standing. Fernie and Metcalf concluded that the existence of this, almost "ideal" payment system did improve the level of effort and hence the performance of the riders when compared to other non-performance related compensation packages.

Outside a sports setting, Bull, Schotter and Weigelt (1987) produced a laboratory study which used paid undergraduate student volunteers as subjects to test whether tournaments produced desired effort responses, concluding that tournament theory might have some predictive validity. Knoeber and Thurman (1994) in a study on the broiler chicken industry, further reported results that were in support of tournament theory. They also reported that farmers who were unlikely to win the tournament engage in riskier actions in an attempt to improve their chances.

The first recognised test of tournament theory in an executive compensation setting was carried out by O'Reilly, Main and Crystal (1988). In their study O'Reilly *et al.*, tested the hypothesis that the larger the number of candidates competing for a CEO position, represented by the number of vice-presidents, the greater would be the disparity in pay between the CEO and other executive levels. However, although they did report a statistically significant result, it was in the opposite direction to that predicted by tournament theory.

In a further test of tournament theory, the authors re-defined the boundaries for inclusion within the tournament. Rather than including all executives, only those with significant responsibilities were included. It was proposed this was a fairer representation of those individuals who would be most likely to be involved in succeeding the CEO. However, with this refined sample no statistically significant results were reported.

Main, O'Reily and Wade (1993) however do isolate a positive relationship between the number of tournament participants and pay differentials. Further support is provided by Lambert, Larcker and Weigelt (1993), using internal firm data, they show that differences in compensation between hierarchical levels are consistent with tournament theory.

Main *et al.* (1993) however while finding results that were consistent with the operation of tournaments, concluded that there was little "support for the empirical importance of consideration of pay equity at the top of corporations" (p606)

In a more recent study Eriksson (1999) using data on 2600 managers from 210 Danish firms during a four year period from 1992 to 1995, concluded that "almost all of my findings are consistent with tournament models" (p241) finding a positive relationship between the number of participants and the prize of the tournament and a stable convex relation between pay and job level.

To conclude, tournament theory has been proposed by economists in an attempt to explain the motivation of executives and the provision of incentives within companies. Also, it can be used to explain the apparent lack of a strong link between organisational performance and executive pay. Whilst theoretically sound, the empirical evidence in support of tournament theory, other than in a sports setting, is perhaps limited and at best mixed. This issue is further explored in Chapter Six.

2.7 Concluding Comments

This chapter has introduced the fundamental concepts behind the modern day analysis of executive pay. It also provided a background to the subsequent more detailed chapters. The chapter began with a review of agency theory and presented a typical principal agent model. It also provided a review of the pay performance literature, suggesting that thc link between executive pay and corporate performance is strengthening. Much of that strengthening comes from the increased use of equity based pay such as shares and executive options. The chapter also introduced the topics of tournament theory and levels of information disclosure with particular reference to executive share option information.

As highlighted above, the strengthening of the pay-performance link is largely a result of the broader pay measures being used, in particular the inclusion of long term elements of remuneration such as share options. The contribution of much the work presented in the following chapters of this thesis stems from the richness of the data collected which, for the first time for a large sample of UK firms, includes detailed option information. The next chapter describes in detail the structure and content of that data.

Chapter Three

The Data

3.1 Introduction

The three main empirical chapters in this thesis are all based on unique but interrelated data sets. This chapter details the construction and content of the main data set consisting of 510 UK quoted companies for the financial year 1997/8. The empirical work in Chapter Five which estimates pay for performance sensitivities and option values is based on this entire data set. The data used in the remaining chapters is related as follows.

3.1.1 Disclosure Data Set (Chapter Four)

The data used in Chapter Four is for companies making up the FTSE350 during the period 1995/6. All non-investment trust companies included in this sample are also included in the main data set where they continued to survive into 1997/8. The variables collected in this data set relate to the levels of disclosure of share option information at a time when new disclosure guidelines were being put forward. Section 4.4 of Chapter Four provides more details on the construction and content of this data set.

3.1.2 Tournaments Data Set (Chapter Six)

The tournaments data set, used in Chapter Six, includes data from 105 of the largest (by market capitalisation) companies listed in the main data set. All variables collected in the main data described below are replicated, but in addition all Director Specific Variables, as described in Section 3.4.2, are collected for all serving directors, executives and non-executives, at the company year end. Further details describing this data are given in Chapter Six, Section 6.3.

The remainder of the chapter is solely concerned with the construction and content of the main data set of 510 companies. The main strength of this data set is the rich source of option information collected. The improved disclosure levels in the UK over the last few years mean that this data set is vastly superior to that that could currently be constructed in the US, or until very recently, in the UK.

This chapter continues as follows. The next section illustrates how the final sample of companies was arrived at for the main data set. Section 3.3 illustrates the current disclosure requirements for UK listed companies with respect to directors' option holdings. The following section discusses the variables collected and provides a general overview of the nature of the data set. Section 3.5 compares the data set with that available under current US reporting regulations while Section 3.6 discusses the overall strengthens and weaknesses of the data.

3.2 The Main Sample

The main data set consists of a sample of 510 UK companies quoted on the London stock market. The companies were selected as follows. Using Datastream, the top 550 traded equity shares by market capitalisation on 17th July 1998 were listed. At this time nine companies, as shown in Table 3.1, had two classes of shares listing on the London Stock Exchange, such as B or Non-Voting shares. These repetitions were removed to leave 541 distinct companies.

Company and Equity Class
Diageo 'B'
Southern Electric 'B'
Schroders NV.
Laing (John) 'A'
HSBC Holdings (HK$)
EMI 'B'
Charter BR.
Caradon 'B'
Cable & Wireless Communications[6]

Table 3.1: Companies With Multiple Shares Listed On The London Stock Exchange On The 17/7/98

From this sample all companies that had been listed on the London Stock Exchange since the 30th June 1997 were removed so that all remaining companies had been listed for at least six months by the time they produced their first annual report as a public company. This removed recently floated companies who may not have had chance to implement option schemes and long term incentive plans if they so wished. The 29 companies removed at this stage are shown in Table 3.2.

This reduced the sample to 512 companies. For these companies the annual report that included the month of June 1997 was than collected. This was obtained either through direct contact with the company or through the Financial Times' Annual Report Service. This was only possible for 510 of the remaining companies. The two companies excluded at this stage were Hambros, who were taken over, and Geo Interactive who are registered in Israel, neither of which produced an appropriate set of report and accounts.

[6] Cable and Wireless Communications is not strictly a double listing. It is however controlled by Cable and Wireless Plc and was only listed in April 1997 – for these reasons it was considered unsuitable and removed from the main sample.

Company Name	Listing Date	Company Name	Listing Date
Coca Cola Beverages	10/07/98	Saatchi & Saatchi	12/12/97
Ecsoft Group	23/06/98	Energis	11/12/97
New Look	18/06/98	Bovis Homes Group	08/12/97
Itnet	11/06/98	Holmes Place	03/11/97
Computacenter	20/05/98	Ultraframe	22/10/97
Taylor & Francis	15/05/98	Newsquest	15/10/97
Matalan	13/05/98	Creative Publishing	03/10/97
Thomson Travel Grp	08/05/98	Northern Rock	30/09/97
Arm Holdings	23/04/98	Aggreko	26/09/97
LLP Group	16/04/98	Billiton	25/07/97
Express Dairies	27/03/98	Woolwich	04/07/97
Oxford Asymmetry	16/03/98	SGB Group	24/06/97
Guardian IT	13/03/98	PowderJect Pharmaceuticals	16/06/97
Monsoon	10/02/98	Norwich Union	13/06/97
Debenhams	23/01/98		

Table 3.2: Sample Companies Listed On The London Stock Exchange Since 01/06/97[7]

The final sample of the 510 companies is listed at the end of the thesis in Appendix One on page 237. The initial sample of 550 listed shares represented 98% of the UK stock market by market capitalisation, even after the above exclusions, the remaining 510 companies still accounted for 97% by value of the London equity market on the selection date.

[7] The date given in the table represents the Base Date as defined by Datastream

3.3 Disclosure Of Directors' Share Options

As highlighted previously, most of the empirical work in the UK to date has focused exclusively on the direct cash compensation of directors, that is the total of salary, benefits and bonus. It is only since the general adoption of the Greenbury recommendations that companies have increased the level of disclosure in their reporting and made a full analysis of executive option holdings and other long term incentive holdings possible.

Section 5.13 of the Greenbury report recommended that companies should disclose full details of each individual director's option entitlement in accordance with the Urgent Issue Task Force's (UITF) Abstract 10. This implies for each director, companies should provide;

- the number of shares under option at the beginning of the year (or date of issue if later) as well as at the end;
- the number of options granted, exercised and lapsed unexercised during the year;
- the exercise prices of all options;
- the dates from which the options may be exercised and the expiry dates;
- the cost of the options (if any);
- the market price of the shares at the date of exercise for options exercised during the year; and
- a summary of any performance criteria on which exercise of the options is conditional.

However, the Greenbury report goes on to state that "In the disclosure of share option details there is some risk that the abundance of information will mask rather than highlight the nature and scale of the option schemes. Remuneration committees may wish, therefore, to consider the more concise disclosure models also described by the UITF". These 'concise' disclosure models as defined by the UITF Abstract 10, state companies can instead disclose the following;

- total shares under option at the beginning and end of the year for each director, with appropriate weighted average exercise prices applicable to shares under option at the year end;
- full details of any movements during the year (covering options granted and lapsed during the year with disclosure of the exercise price and the share price at the date of exercise).

The abstract does add that where this alternative is taken, some additional disclosure may be necessary. These take the form of distinguishing between in the money options and out of the money options and noting "unusually large individual items" to prevent misleading conclusions being drawn from an average.

3.4 The Variables

A total of 57 variables were collected for each company. A full listing of these variables together with brief definitions and the appropriate codings is given in Appendix Two at the end of thesis.

The variables can be split into two groups. Firstly, company specific variables, that is, variables that are unchanged irrespective of the choice of company director and secondly, director specific variables that naturally are dependent on the individual named as the company's leading executive. A full explanation of each variable is given below, with the name of variable shown capitalised in brackets.

3.4.1 Company Specific Variables

With the company name (COMPANY), Datastream code (DSCODE) and initial market value (MV) established through the creation of the sample, the next variable collected was the company's sedol number (SEDOL), used as a unique reference number for each company thereafter. The 3-digit (ICODE3) and 1-digit (ICODE1) FTSE industrial classification codes and industry description (ITYPE) were then recorded based on the company's entry in the Hemmington Scott Corporate Register for June 1998. Table 3.3 shows the distribution of the sample companies over the six main industrial groupings. The majority of the companies are either service companies or general manufacturing companies, with these two sectors alone accounting for 66% of the sample. Note, no investment trusts are included within the sample.

From the annual report the financial year end date (YREND) was recorded. Almost half of the sample companies (47%) had a December 1997 year end, with a further 20% having a year end of March 1998. Overall, the accounting period end dates begin in June 1997 and are distributed right through until August 1998.

The reason this covers a period in excess of twelve months is that a number of companies changed their year end dates. In particular, Diageo, Photobition and WH Smith Group changed their fiscal year end dates resulting in accounting periods of fifteen months ending on June 30th, June 30th and August 31st 1998 respectively. Excluding these three companies, the sample period covers twelve months ending in May 1998.

Industry Sector	Number Of Companies
Mineral Extraction	16
General Manufacturing	146
Consumer Goods	55
Services	190
Utilities	19
Financials	84
Total	510

Table 3.3: Industry Sector Groups

Next, the outstanding number of ordinary shares issued and fully paid at both the beginning (EQSTART) and the end (EQEND) of the financial period were collected. The UITF Abstract 10 also recommends that companies report their year end share price and this too was recorded where given (SPRICE) with Datastream used as alternative source when it was not. The mean year end share price was £4.63 (median £3.43), with share prices ranging from just 34p (Guinness Peat Group) up to £37.10 (Misys[8]).

[8] Unsurprisingly Misys undertook a 5 for 1 share split in September 1998

Based on the financial year end date, the prevailing three month treasury bill rate on that day was recorded (TBRATE) from Datastream as a proxy for the UK risk-free rate. Interest rates remained fairly flat over the sample period with just a small downward trend as the year progressed, thus there is little variation in this variable with all observations being within 1% of the mean interest rate of 7.22%.

Also from Datastream, the daily dividend yield on the preceding 365 calendar days was taken. The number of distinct observation was recorded (DYDAYS), usually 262 although this is occasionally less, falling to a minimum of 154 for the more recently floated companies. From the above observations the average dividend yield for the period was calculated (DYAVE1). This rose from zero for those companies not currently paying any dividends, to a maximum of 12.7% (Matthew Clark), with a mean of 3.29% (median of 3.13%).

Option valuations are particularly sensitive to dividend yields and yields in excess of 6-7% are probably not sustainable in the long term, hence an alternative dividend yield was also calculated (DYAVE2). This was taken to be the average of the dividend yield quoted (on Datastream) on 28th of each month over the four year period 1993-1997. Where a figure was not available the median industry dividend yield calculated on that day from the remainder of the sample was used as a proxy.

The mean of this new measure was very close to the first at 3.25%, but the maximum had reduced to just 7.83% with just 6 observations above 7% compared

with 22 for the first dividend measure (DYAVE1). Accordingly, the second measure (DYAVE2) was used throughout the analysis presented in Chapter Five and Chapter Six, although the use of the first measure (DYAVE1) does not materially affect the results.

Similarly two volatilities were collected for each company. The first (VOL1) is that quoted in the London Business School's (LBS) Risk Measurement Service for the fourth quarter of 1997. The LBS volatility calculation involves calculating monthly returns from which an annual volatility measure can be estimated. In general, five years of monthly returns are used although this can vary between one and five years depending on the availability of the data.

The LBS volatility measure was not immediately available in ten cases. Although very recent listings had been removed from the sample, the remaining ten most recently floated companies left in the sample had still not traded for a sufficiently long enough period for the LBS calculation to be made. In these cases, the volatility figure was taken from the relevant issue of the Risk Measurement Service in which a measure of volatility was given for the second time. For example, Halifax Plc was listed in May 1997, LBS first quoted a volatility for it in the second quarter of 1998, hence the value used in the data set was that quoted in third quarter of 1998. This reduced the potential bias of unrepresentative volatilities due to the effects of trading around the share flotation.

The second volatility measure (VOL2) is very closely related to the LBS measure but was calculated explicitly from returns data collected for each

company over four years. The Datastream return index value was collected, as for the dividend yield, on the 28th day of each month from January 1993 to December 1997 with an additional observation being made for December 1992. This allowed 48 monthly returns to be calculated over the period. The return in month i, (R_i) was calculated as the natural log of the return index in month i divided by the return index in month i-1. Again, where a figure was unavailable the median industry return was used. The standard deviation of the monthly return figures was calculated and then annualised to produce the volatility measure. Summary statistics for the two measures are shown below in Table 3.4

	Volatility Measure	
	VOL1 (LBS)	VOL2 (Returns Data)
25th percentile	21%	20%
50th percentile	25%	23%
75th percentile	31%	28%
95th percentile	54%	44%
Mean	28.3%	25.7%

Table 3.4: Volatility Measures

Table 3.4 shows little variation in the two measures except towards the 95th percentile. On average the second measure (VOL2) is 2.6% lower than the first. Table 3.5 shows the distribution of both volatility measures across the industry sectors. Again, with the exception of the Utilities sector where the mean and median volatilities calculated under the two method are extremely close, the volatility as calculated using the returns data tends to smaller than that reported by the LBS. However the pattern of volatility across the industry sectors is similar

under both measures, with mean volatility highest in the Service sector and lowest in the Utilities sector in both cases. Results presented in this thesis are all based on the second volatility measure (VOL2), although as with the alternative dividend yield measure, the results are not materially affected by the use of the first volatility measure (VOL1).

Industry Sector	VOL1 (LBS)		VOL2 (Returns Data)	
	Mean	Median	Mean	Median
Mineral Extraction	29.6%	26.5%	26.0%	22.5%
General Manufacturing	27.5%	26.0%	26.3%	25.0%
Consumer Goods	28.7%	23.0%	25.4%	21.6%
Services	30.1%	26.5%	27.0%	23.6%
Utilities	22.4%	22.0%	22.4%	22.5%
Financials	26.2%	24.0%	22.5%	21.1%

Table 3.5: Volatility By Industry Sector

The Datastream return index was also collected at the beginning and end of the financial year for each company in order to compute an annual log return figure (TSR), calculated in the same way as the monthly return figures described above. The market return, represented by the annual return on the FT-All Share Index, for the calendar year 1997 was 18.0%, this compares with a mean log return figure in the sample of 0.163, equivalent to annual return of 17.7%. There were however some major winners and losers during the year as Table 3.6 illustrates.

The annual return could only be computed for 499 of the sample companies, the remaining 11 had not been listed for a full twelve months at the time of their financial year end. The best performer over the period was Verity

Group with a log return figure of 1.489, equivalent to an annual rate of return of 343%. Meanwhile the worst performer was British Biotech, who reported a log return figure of -1.392, equivalent to an annual rate of return of -75%.

	Log Return = $Ln(R_i/R_{i-1})$
1st Percentile	-0.8335
5th Percentile	-0.3570
10th Percentile	-0.2195
25th Percentile	-0.0144
50th Percentile	0.1630
75th Percentile	0.3639
90th Percentile	0.5252
95th Percentile	0.6800
99th Percentile	0.9604
Mean	0.1627
Standard Deviation	0.3206

Table 3.6: Annual Returns Of Sample Companies

The final company specific variables to be collected were alternative size and performance measures taken from Datastream. These included the net adjusted earnings per share (Datastream item 211) over the accounting period (EPS), the total number of employees (item 219) in the firm (EMPLOYEE), the total capital employed (TOTALCAP) by the company at the financial year end and finally a sales figure (SALES) was recorded for each company. These variables are summarised in Table 3.7. Financial and property companies of course do not report sales figures, thus where this was unavailable the proxy of total income (item 948) was used or where this too was absent, for example banks, a net interest income figure (item 816) was substituted. The indicator variable (SALESIND) was included to show which of the three 'sales' figures was used.

Variable	Median	Mean	Standard Deviation
EPS (pence)	19.625	20.399	39.778
Employees (units)	4279	13057	23966
Total Capital Employed (£000)	319778	2128263	7577817
Sales (£000)	442221	1601229	4067490

Table 3.7: Size And Performance Characteristics Of Sample Companies

3.4.2 Director Specific Variables

Firstly, the leading executive at the financial year end in each company was identified (DIRECTOR). This was taken to be the CEO if such a role existed. Where no CEO existed the leading executive was taken to be either an executive chairman, the group managing director or other named individual implied as the leading executive in the company report and accounts.

The specific title given to the leading executive was also recorded (ROLE) and from this an additional variable (COMBINE) was constructed which was defined by whether or not the company had combined the roles of chairman and CEO. Companies were assumed to have combined the two roles when either the report had specifically indicated so or where the leading executive identified was a chairman. Section 4.9 of the Cadbury Report recommends that the roles of chairman and chief executive should be separate yet only 415 (81.4%) of the 510 companies seem to have done so.

Having identified the leading executive (hereafter referred to as the CEO), the number of months during the accounting period for which that individual was a director was recorded (DIRMTH). Similarly, the number of months during the

accounting period for which the named individual held the post of leading executive (ROLEMTH) was noted.

The vast majority (483 or 94.7%) of year end CEOs had served on the board for the full financial period although only 442 (86.7%) had served as CEO for the entire time. Thus of the 510 sample companies, 68 had appointed a new CEO during the year where 41 (60.3%) of the new appointments were already board members serving in an alternative capacity.

Direct cash compensation figures comprising, salary (SALARY), benefits in kind (BENEFITS) and annual or mid term bonuses (BONUS) along with any other additional payments (OTHER), but excluding pension contributions, were collected to give the total cash compensation for the year (TOTAL). The total of equivalent payments in the preceding financial year (TOTPY) was also included. Mean and median values for these figures are shown in Table 3.8.

The results indicate that at the mean CEOs received total cash compensation of £413,290 representing a pay increase of 17% over the previous year, while at the median the total figure rose by 21%. The main component of total cash compensation is still basic salary which constitutes 65.4% of the overall total at the mean. The other main significant component is the annual or mid term bonus figure, which represents a further 28.6%.

Variable	Mean	Median
Basic salary	£270,152	£240,000
Benefits	£19,930	£14,000
Annual or mid term bonus	£118,074	£68,764
Other payments	£4,947	£0
Total cash compensation	£413,290	£340,000
Total cash compensation in previous year	£353,231	£280,500

Table 3.8: Summary Of Direct Cash Compensation

The two remaining elements of bonus and 'other' between them account for only 6%. (Bonus - 4.8%, Other - 1.2%). Benefits typically included the cash value of the provision of a company car and membership of private medical insurance and life assurance schemes. On occasions though it also included items such as mobile telephones, magazine subscriptions and chauffeurs. Other payments generally represented one of extraordinary items, such as relocation expenses for a new CEO or compensation for changes to existing contracts.

Next, the total beneficial and non-beneficial shareholdings held by the CEO at the beginning and end of the year were taken. The mean number of shares beneficially held by the CEO at the end of their company's fiscal year was 2.7 million, although the distribution is severely skewed by some very large holdings. At the median the figure is just 126,936 shares. Only 19 CEOs had no beneficial holding in their own company at the year end date and the majority (58%) of these were newly appointed CEOs who perhaps had not yet had time to build up a sharestake.

The remaining data collected relates to the long term incentives held by the CEO and primarily concerns the option portfolio built up by the director. The non-option variables relate to the number of shares held in long term incentive plans other than in the form of options. The number of shares granted (TSTGRANT) under such schemes during the year was recorded along with the maximum possible allocation at the start (TSTSTART) and end (TSTEND) of the financial year.

The first two option variables (OPDATA, OPYE) determine whether or not the CEO held any options. If at no time during the year did the CEO hold any options than OPDATA was set to 'No', otherwise it is set to 'Yes'. Similarly if the CEO held options at the year end then OPYE is set to 'Yes'. Overall, 445 (87.3%) CEOs held options at some time during the year, with 439 (86.1%) of those continuing to hold options at the end of the year.

Options are usually granted at regular intervals, so that over time it is possible for directors to build up large stocks. Each individual grant of options is known as a tranche, within which all option characteristics are identical. As highlighted in Section 3.3, companies can choose to report either the average statistics for the entire option stock held by each director, or opt for complete disclosure and report information on each separate tranche held by the directors. Where the company opts for the former, the entire stock of options is treated as one large tranche, in either case, all information reported by the company is recorded.

For each CEO the level of disclosure was recorded (IORW), that is, whether full information was given for each individual tranche, or overall statistics based on the entire stock of options. Table 3.9 below shows that where the CEO did hold options at the year end, 82.5% of the respective companies (362) reported information on all individual tranches held by the director. A further 4.8% (21) report a mixture of weighted and individual tranche information. In these cases, companies had usually opted to report weighted average exercise prices, but had split the CEOs option holding into; (1) those options in the money and those out of the money; or (2) by those exercisable and those not yet exercisable; or alternatively (3) by the scheme under which the option was granted. By doing this it often become possible to identify individual tranches.

	Number of observations
Number of CEOs in sample	510
CEOs with options at sometime in the year	445 (87.3%)
CEOs with options at year end	435 (85.3%)
For CEOs with options at year end, the level of disclosure given was:	
All individual tranche data supplied	362 (82.5%)
Mixture of individual and average data supplied	21 (4.8%)
Only average data supplied	56 (12.8%)

Table 3.9: Incidence Of Option Holding And Disclosure Levels

Next, the specific option characteristics for each tranche of options held at the year end were recorded. These included the exercise price of the option (XPRICE), the date on which the option first becomes exercisable (EXFIRST), the date on which the option expires (EXLAST) and the date on which the option was

granted (GDATE). Where companies report overall statistics, the exercise price represents the weighted average exercise price of all option held, EXFIRST represents the first date any option within the portfolio can be exercised and EXLAST the date the final option expires.

Unfortunately companies were not consistent in the way they reported the above dates. Some gave the exact day, some the month, while others only specified the year. Thus the format of the date provided i.e. day, month or year was recorded (DFORMAT) and the exercise dates were set to the earliest possible day consistent with the information given. For example, if a company specified May 1999 as the expiry date for an option, EXLAST was set to 01/05/99. Similarly if only a year was specified the date is set to the first of January of that year.

Most options are granted under executive option schemes, however a small percentage are granted under employee wide save as you earn (SAYE) schemes, thus the scheme under which a particular tranche is granted is recorded (SCHEME). On average where a CEO held options at the year end, less than 2% of the total number of options held had been granted under SAYE schemes.

Based on the company year end date and the EXLAST date, the remaining life of the option was calculated (TMAT), representing the time to maturity of the option. Executive options when granted usually have a life of ten years whereas SAYE options tend to have a life of either three or five years. For the entire sample, the average remaining life of an option was 5.6 years, for executive

options this increased to 6.2 years. Executive options are usually required to be held for at least three years before they become exercisable, the closeness of this figure to 7 years then would seem to indicate that executive options are usually exercised fairly quickly after they first become exercisable. For savings related options the average remaining life of the option was 3.3 years

Since the publication of the Greenbury recommendations, most executive options are now issued at-the money, that is at an exercise price equal to the prevailing market share price at the date of issue. Savings related options however are usually granted at a 20% discount to the prevailing market price. The average year end share price was £4.63, this compared with the average exercise price of only £2.95, and still only £2.96 if just executive options are considered. Thus the majority of the outstanding options held by UK CEOs are deeply in the money reflecting the fact that the majority of the options had been held for a number of years over which time the company share price had appreciated.

Next the number (NUMBER) of options held in each tranche was recorded, obviously where companies report overall statistics, this represents the total number of options held by the CEO. For those directors who do hold options, the average number of options held was 633,132, (median of 262,332).

Finally with regard to the year end stock of options, the number of individual tranches held by the CEO (NTRANCHES) was calculated. This represented the number of tranches for which full information was available, thus for companies reporting only overall statistics or where no options at all were

held, this was set to zero. Where this variable was non-zero (362 companies), the average number of tranches held by CEOs was 3.69 with a maximum of 14 separate tranches held by Allan Leighton, the CEO at Asda.

The remaining variables relate to changes in the stock of options over the financial year. An indicator variable (CHANGE) was included which was set to 'Yes' if the director had exercised or been granted any options over the period, or if any of the options held at the beginning of the period had lapsed.

Options lapse when the expiry date is reached and the option has still not been exercised. This usually occurs when the share price has failed to climb above the exercise price at a time when the director wishes, or is able, to exercise the option. Directors of course are under no obligation to exercise options approaching their expiry date, even if they are in the money. Conversely, under certain circumstances directors may choose to exercise an option even if it is out-of the money and incur an immediate loss. Within the sample, 24 CEOs held a total of 3.6m options that lapsed during the year.

Where a change had taken place, i.e. a grant, exercise or lapse of options, all the option variables detailed above were recorded along with two additional variables. Firstly the date on which the change occurred (EDATE) and secondly the market price of the company's shares on that date (MKTPRICE).

The market price figure was usually only given explicitly where options had been exercised. This enabled the monetary value of exercised options to be

calculated as the market price minus the exercise price, multiplied by the number of options exercised. Overall, 147 CEOs exercised options during the year, resulting in an average realised gain of £502,175 (median of £180,905). Conversely, nearly half the sample (254 CEOs) received some form of option grant during the year with the average (median) value of £188,089 (£69,428).

A final indicator variable (MARKER) was created to determine the status of any recorded option at the year end. This was set to 'H' if the option was still held at the year end, 'E' if the option had been exercised during the year, 'G' if the option had been granted during the year and 'L' if the option had lapsed during the year.

Thus if a director had received a grant of options during the year which was still held at the year end, the individual tranche could appear twice in the data set, once with MARKER set to 'H', and again with MARKER set to 'G'. This however was not necessarily the case. It is possible that the company in question only reported average statistics, in this case the individual tranche would only appear once with a MARKER of 'G', while being included along with all other options held by the director in a single block tranche with MARKER set to 'H'.

3.5 Comparison With US Data

As a result of enhanced federal reporting requirements for fiscal years ending on or after 15 December 1992[9], US companies were required to increase

[9]SEC Release numbers 33-6962, 34-31327 and IC-19032 pertaining to Regulation S-K. The new regulations were published in the Federal Register 57, No 204 (1992): 48126-48159

their levels of disclosure with respect to share options granted to and held by the company directors. In particular, the relevant exercise price of options granted during the year had to be reported along with an estimated value of the award.

US companies have certain discretion on how to provide such estimates. In short, the SEC provided them with two basic alternatives. Firstly to assume that the share price rises at 5% and 10% per annum over the life of the option and report the two payoffs that would occur at the date the option expires. The second alternative is to report a figure based on the Black-Scholes formula. Initially companies were not required to disclose the inputs used to generate such valuations, for example, dividend yields, interest rates, etc. Indeed, companies were further allowed to discount the resulting Black-Scholes values by an undisclosed amount if they deemed it appropriate. However an amendment to the rules in November 1993 required companies to "describe the assumptions used relating to the expected volatility, risk-free rate of interest, dividend yield and time of exercise [and] any adjustments for non-transferability or risk of forfeiture"[10]

While the above alternatives do allow some variation in the reporting of option information, the resulting levels of disclosure do usually allow an independent Black-Scholes valuation of the current grant of options to be made. However, this is not the case for stock of share options already held by the director.

[10] Federal Securities Law Reports, December 15, 1993, p61892

In determining the stock of options held by directors at the financial year end companies must first report the number of options exercised during the year along with the monetary gain realised from the exercise. They are not required to disclose the exercise price of the options exercised, nor the market price of the shares on the date the option is exercised. Thus even if complete information is held on the stock of options held at the beginning of the year, it may still not be possible to identify which options have been exercised.

Finally, US companies are required to report the total number of unexercised options held by the director at the year, split between those that are currently exercisable and those that at the year end date remain unexercisable. In addition, again splitting the options into these two categories, they must report the end of year value of the stock of options calculated as the aggregate value of the difference between the exercise price and the year end share price. Because of this valuation method, only options that are in the money are considered in determining the year end value of the option stock.

This implies that American CEOs could hold vast numbers of options, worth considerable sums (based on Black-Scholes values), which would pass unnoticed if the exercise price were above the current stock price at the time of reporting. This reporting mechanism causes particular distortions when the options held are very close to the money. Option values that had appeared in previous statements can suddenly disappear from the balance sheet as a result of only a very small downward movement in the share price. This would incorrectly give the impression that the CEOs total holding of options had fallen. Conversely,

marginally out of the money options can be put back in the money by just a small increase in the share price giving the misguided impression that the CEO had received additional option grants.

These reporting guidelines mean that is virtually impossible to gather full information for all the individual tranches of options held by US directors. Hall and Liebman (1998) attempted to overcome this problem by recording CEO's option holdings over time from the moment they first held options using each years annual proxy statement to track any grants or exercises. However, because of the limited data on exercised options supplied by US companies, even this requires a number of assumptions to be made resulting in errors in the final stock of options held (see Hall and Liebman, 1998, p689). Thus even from a series of proxy statements let alone a single years reporting, it appears impossible to build a complete and accurate picture of the stock of options held by American CEOs.

This represents the main difference of this UK data to that available for US companies. Namely the ability to identify separately each and every tranche of options held by the director (where the UK company provides full information). This richer UK data allows the implications of the differing reporting mechanisms to be more closely investigated, an analysis of which is undertaken in Chapter Five.

3.6 Strengths And Weaknesses Of The Data

Although the data sample includes only 510 of approximately 1800 companies currently listed on the London Stock Exchange, it does represent over 97% of the UK stock market by market capitalisation and as such provides an accurate picture of the current state of executive remuneration in the UK.

The main strength of the data set is the rich source of option material collected. As explained above, it is vastly superior to that that could be constructed in the US. It is of course, only through the increased disclosure levels over recent years that such material has become available, as such, to the authors knowledge the completed data set represents the most comprehensive collection of option data currently available in the UK.

The structure of the data set also makes it a simple task to extend it to cover additional companies, or more importantly successive reporting periods. As the 1998 reporting season closes, information from new annual reports can easily be added to the data set to build up an impressive panel of option and executive compensation data.

Though comprehensive, the data set is not without it's weaknesses. Most of these stem from the varying levels of disclosure observed across the sample companies. Although the full disclosure of option data has vastly increased, many companies (approximately 20% in the sample) still opt to give a weighted average exercise price for the stock of options held at the year end. Companies that

disclose option information in this way usually only report an exercise window for the entire stock. That is, they give the first exercisable date as the date on which any of the options held can be first exercised and the expiry date as the date the very last option held expires. This means a precise valuation of the option stock is still not possible for one fifth of the sample. The impact of this reporting mechanism is explored in Chapter Five.

Even when companies do report information on individual tranches, some fail to provide the full information necessary to accurately price the option. The most common omission is the exact date the option expires, occasionally this is missing completely but more commonly it is only specified approximately. This creates the possibility of mispricing the option due to an error in estimating the remaining life of the option. As previously stated, the convention used was to assume an expiry date that is as early as possible but still consistent with the information provided by the company. In this way option values will be typically underestimated, since the value of an option is usually, but not necessarily, an increasing function of time (see Section 2.4.1)

However, the error is not likely to be significant. Consider a typical in-the-money option with a remaining life of 7 years, dividend yield of 3%, volatility of 30%, risk-free interest rate of 8%, an exercise price of £2 and an underlying share price of £3. This option has a Black-Scholes value of 140.43 pence. Where the expiry date is only given to the nearest month, there is potential to be a maximum of one month out in the estimate of the remaining life of the option. That is, the true remaining life of the option can be up to one month longer than that

estimated. However, using a life of 7.08 years (7 years, 1 month) the value of the above option would only increase to 140.59 pence.

When the expiry date is only given as a year, which occurred in less than 7% of the 1486 individual tranches valued, the time to maturity of the option is potentially underestimated by up to twelve months. However, the value of the above option still only rises to a maximum of 142.14 pence when the remaining life of the option is set to 8 years. As such, the lack of exact dates in some circumstances is unlikely to materially affect the results presented. Note, where no information at all is provided on the expiry date, in order to produce an option value, a remaining life of seven years is assumed for executive options and four years for savings related options.

A another limitation of the data is the treatment of long term incentive scheme holdings. Companies have only recently introduced such schemes and there is considerable heterogeneity between companies, both in terms of schemes adopted and the way in which they are reported. As such, only a very broad and rather superficial analysis of incentive schemes is undertaken here, the main focus of the data being the option holdings.

Finally, the Institute and Faculty of Actuaries recently issued new guidelines on the disclosure of pension benefits. The recommendations were only incorporated into the Listing Rules of the London Stock Exchange in respect of accounting periods ending on or after 1 July 1997. As such there has been a distinct change in the way pension benefits have been reported over the last two

years. Traditionally company pension contributions were included as part of a directors total remuneration, however under the above guidelines they are now treated separately and are excluded from that total.

The timing of this study covers this transition period and whilst the majority of companies have excluded pension contributions from both the current and previous years total remuneration, a number of companies, while providing a current year total remuneration figure that excludes pension contributions (or more precisely providing an inclusive total but with the level of pension contribution explicitly stated and hence deductible), they provide a previous year total that includes pension contributions. As a result the total of the previous years remuneration (TOTPY) will marginally overstate the true figure. However, given the size of pension contributions relative to salaries and bonus payouts and the small number of firms in question, the difference is again not considered material.

This chapter has detailed the construction of a data set made possible only because of the improved levels of disclosure observed since the publication of the Greenbury report's recommendations in 1995. The following chapter examines the nature and determinants of disclosure levels observed before such recommendations were widely accepted.

Chapter Four

The Disclosure of Directors' Share Option Information

4.1 Introduction

The focus of this chapter is on the disclosure of directors' share options in company reports in the period immediately surrounding the publication of the Greenbury report. An important issue in the corporate governance literature has been in placing a numerical value on directors' share options so that shareholders and other stakeholders, are able to understand the total value of executive compensation as well as the incentive structure faced by senior executives (see Conyon, Gregg and Machin, 1995).

Although suitable methods for approximating the value of share options exist (see Section 2.4.1), the relevant information necessary to do the calculation was typically not available in company accounts (see Main, Bruce and Buck, 1996). Against this background, the Greenbury report (1995) argued for full and complete information about all aspects of director share options to be disclosed in company accounts. Forker (1992) presented a model that considered the decision to disclose information about senior executive share options. This chapter addresses the same problem in light of the Greenbury recommendations.

The objectives are twofold. Firstly to cast light on the state of share option disclosure in a sample of UK companies at the time of the Greenbury report and secondly, to model the decision to disclose share option information as a function of the proprietary costs of disclosing that information (see Verrecchia, 1983). Here, the accounting policy choice literature and the agency costs associated with

revealing particular information inform the analysis (see Forker, 1992; Pierce-Brown & Steele, 1999).

The results indicate a high degree of information disclosure about director share options. This contrasts with earlier academic findings. The broad econometric models indicate that the quality of information disclosed about share options is a positive function of the presence of non-executive directors. This is evidence in favour of the monitoring function of non-executives. Also, there is evidence of a negative correlation between the quality of information disclosure and corporate size. This is consistent with a class of models that suggest that larger firms suffer propriety and political costs from information disclosure. For example, political costs may include reductions in profits due to regulation, adverse media reporting, or union rent seeking demands (see Pierce-Brown & Steele, 1999).

The remainder of this chapter is organised as follows. Section 4.2 considers the regulatory environment surrounding directors share options. Section 4.3 discusses the potential theoretical determinants of executive share option disclosure. As noted in Chapter Three (Section 3.1.1) the data used in this chapter is different from the main data set, hence Section 4.4 details the assembly of this data sample and the estimation strategy. In Section 4.5 the results are presented while finally, Section 4.6 offers some concluding remarks.

4.2 Directors' Share Options: Institutional Context

The cost to shareholders of directors' share options stem from two main sources. The first is the potential for equity dilution faced by incumbent shareholders from new issues of shares (Clark and Main, 1997). There is indeed evidence that many companies service executive share option schemes through the issue of new shares (i.e. through subscription). The alternative method, not resulting in equity dilution, is share purchase from the current pool of already issued equity (i.e. through acquisition). Egginton, Forker and Grout (1993) present evidence that shows that 79% of companies use the subscription method. Clark and Main (1997 p. 65) comment: "Given that current accounting practice does not require the expense of meeting executive share options through equity dilution to be reported as a charge against earnings or even as a footnote in the profit and loss account, the practice seems set to remain a common one".

The second cost is a need to value the share options received by directors in order to fully understand organisational incentive systems (Conyon, Gregg and Machin, 1995; Main, Bruce and Buck, 1996; Bruce and Buck, 1997). The Companies Act 1985 required that the emoluments of the highest paid director and chairman, where different, be reported[11]. The contribution of the value of options to overall remuneration is not a legal disclosure requirement although it clearly impacts on the behaviour of management by altering incentives[12]. The valuation of share options can be calculated (for instance using the Black - Scholes method) if certain information requirements are met. However, as Main, Bruce and Buck

[11] In addition, the total remuneration of the board is to be given and the numbers of directors within certain specified pay bands.

(1996) make clear, until 1995 this information had not been reported in sufficient detail in company accounts.

Forker (1992), and Egginton, Forker and Grout (1993) discussed the information requirements in order to appraise option schemes. Forker (1992) remarked "the value of options when they are granted represents the biggest component of the cost of options to shareholders". The valuation of the stock of options held by a director requires information on the number of options (N), the exercise prices (X), the remaining life of the options (T), the volatility of the underlying share (σ), the dividend yield (q) and risk-less rate of interest (r). While the last three variables can be readily determined from general stock market information, the first three can only be obtained from the company in question, either through direct contact with the company, or through their annual publications.

Main, Bruce and Buck (1996) note that this information has always been available from the Register of Directors' Interests, but collecting such information from this source is extremely costly to the investigator. The only real alternative source is from the information contained in the company accounts which was all too often incomplete. Accordingly, their analysis of share options (using data from the Register) focused on only 60 companies. The emphasis here however is different since it considers not the actual content of the information disclosed, but more the decision to reveal option information in the accounts (see Forker, 1992, Pierce-Brown and Steele, 1999).

[12] See chapters Five and Seven for more information on the incentive effects of options

The disclosure of directors' emoluments is primarily governed by the Companies Act (1985). In addition, information on share options must be given in compliance with the Yellow Book Listing Rules of the London Stock Exchange. Reviews of this are provided in Clark and Main (1997). Moreover, the revelation of information surrounding executive share options is influenced by the policy statements of institutions such as the Association of British Insurers[13] (ABI). The Greenbury report (1995) recommended full and complete disclosure of share option information in company accounts. This recommendation included a requirement that companies detail the performance criteria to which options were subject (see Section 3.3 for full requirements).

4.3 Modelling The Share Option Disclosure Decision

Verrecchia (1983) presented a discretionary disclosure model in which a manager of a risky asset can exercise a choice in the disclosure of information. Market participants / traders form rational expectations concerning the manager's motivation. The information released by the manager then represents a signal of the asset's fundamental value perturbed by noise. The manager chooses to release the information contingent upon the effect of its release on the assets' market price. The manager then, reveals or withholds information. If he reveals information the value of the asset is reduced by some cost (the cost of information disclosure). At the most basic level the cost is simply the cost of preparing and disseminating information to market participants / traders.[14]

[13] See Chapter Seven for a further discussion on ABI guidelines

[14] Other theoretical models of discretionary disclosure and accounting policy choice include: Wagenhofer (1990) and Verrecchia (1990).

However, Verrecchia (1983) invokes a wider notion of costs to include the cost associated with disclosing information that is proprietary in nature and so can be potentially damaging to the firm if disclosed. For instance, releasing unfavourable financial information about a firm would incur a proprietary cost (e.g. a bank may re-negotiate loan payments with terms that are unfavourable to the company). However, the release of genuinely favourable accounting information (such as increasing sales revenue or reduced costs of operations) may also have adverse consequences for the firm's prospects. For instance, this may take the form of rent seeking or opportunistic behaviour by trade unions[15], or it may serve to attract competitors into that market. The costs may also involve adverse media comment. The UK privatised utilities can attract severe media criticism if financial statistics are considered to be excessively favourable, prompting calls for stricter regulatory control.

The significance of a proprietary cost is that if it is withheld, then market traders are unsure whether it is withheld because (a) the news really is bad or (b) that the news is good but not good enough to out-weigh the proprietary cost associated with its release. The proprietary cost then, introduces noise into the system by making the interpretation of the withholding of information ambiguous. In short, non-disclosure of information can be associated with both 'good' and 'bad' news.

[15] Verrecchia (1983) cites the case of the Chrysler Corporation which on announcing that the firm's fortunes had improved prompted the United Auto Workers to accept fewer labour concessions.

To move to an empirical framework it is important to identify accounting and economic variables which co-vary with the (proprietary) costs of disclosure. Pierce-Brown and Steele (1999) review the voluminous literature relating to accounting policy choice. Also, Forker (1992) considers explicitly those factors which affect the costs of disclosing share option information. A description of the most relevant variables is detailed below.

4.3.1 Company Size

The size of a company is a potentially important predictor of information disclosure. Jensen and Meckling (1978) presented a model where organised pressure groups within an economy, lobby for regulators to transfer rents from large corporations to other parties. This may be thought of as rent seeking behaviour by outside parties. Watts and Zimmerman (1978) hypothesise that larger companies are more "politically visible". Accordingly, they will attract greater costs associated with political or regulatory control. Forker (1992) argues that firm size may proxy data collection costs and the threat of take-over. He argues that the adverse impact of poor disclosure on share prices increases the threat of take-over.

He contends that this effect is larger the lower is the market value of the firm. The prediction is that if the costs of disclosure increase with the size of a firm there will be a negative association between disclosure and company size. Forker (1992), in an analysis of 182 listed companies in 1987/8, found that company size is positively related to option disclosure. In a sub-sample of 85 small firms the predicted negative relation was observed but was not significant.

4.3.2 Board Structure

UK boards comprise of non-executive and executive directors. An important difference between them is their role and function on the board. Agency models typically predict that non-executive directors act as agents for shareholders by monitoring the executive management team. In the absence of this monitoring function (or other countervailing mechanisms such as the threat of take-over) the management team may have the opportunity as well as the incentive to behave opportunistically. They may pursue their own interests at the expense of shareholders (see Jensen, 1993). However, as noted by Nickell (1995) and Hart (1995), it is not clear that non-executive directors have sufficient incentives to fulfil their monitoring function effectively.

Non-executives typically have low financial stakes in the company; they may be executive directors at other companies and so are time constrained; the information they need to effectively evaluate the board may be derived from the chief executive officer (CEO); and ultimately their job position may be owed to the incumbent CEO. The combined effect of these considerations is to mitigate against the effectiveness of outside director monitoring. Empirical evidence relating to the effects of non-executive directors is reviewed by Conyon and Peck (1998b).

The study of CEO turnover in the United States by Weisbach (1988) found that CEOs were likely to be dismissed for poor corporate performance. Also, the

likelihood of dismissal for poor performance was greater the higher the proportion of non-executive (outside) directors there were on the board.[16]

Forker (1992) argued that disclosure of option information is greater the more non-executive directors are present. This is consistent with a positive monitoring effect by non-executives to the extent that such information revelation adds to shareholder interests and reduces opportunistic behaviour by the management team. However, his empirical results indicate that the proportion of non-executive directors is not in the predicted positive direction and is not significant.

4.3.3 Debt Structure

Pierce-Brown and Steele (1999) discuss the impact of restrictive debt covenants on the choice of accounting policy. They argue that the firm may endeavour to assure its financiers / bank about its credit standing and reduce the cost of servicing existing debt. This would imply that the company would choose income increasing accounting policies that maximise reported profit and equity and so reduced capital gearing. It has been suggested that debt holders, and banks in particular, perform an important monitoring role for shareholders (see Diamond, 1984).

Accordingly, debt can provide an important discipline function which may constrain managerial discretion. High levels of capital gearing may promote

[16] See also, the UK evidence on the CEO-performance-board structure relationship presented by Cosh and Hughes (1997) and Conyon (1997b).

management behaviour to pursue shareholder interests so as to avoid the increased probability of default. If revealing information about share options is an unfavourable signal of the firms prospects then proprietary costs are incurred. Disclosing such adverse information is less likely in firms with high debt to equity ratios. If, on the other hand, the revelation of such information acts as a favourable signal of managerial effort then, *ceteris paribus*, proprietary costs are reduced and a positive correlation may be expected between debt structure and information disclosure.

4.3.4 Corporate Performance

Companies with good corporate performance may be less likely to reveal information about their reward structures for senior executives for similar reasons as those given for corporate size. If good corporate performance makes companies politically visible then revealing option information may be useful to competitors (they may try to emulate the reward strategy in an attempt to achieve similar performance patterns at the expense of the original firm). Similarly, employees may also value the options from the disclosed information. Since the firm has an "ability to pay" afforded to it by good performance, employees may then engage in rent seeking activity (see Verrecchia, 1983).

4.3.5 Business Risk

Pierce-Brown and Steele (1999) argue that the volatility of earnings is believed to affect accounting policy choice. Specifically, more volatile companies are more likely to employ techniques that smooth earnings. They find, despite their prediction, that companies with higher betas are more likely to use creative

accounting techniques. In this context, the implication is that companies with high betas would be expected to be less likely to disclose option information.

4.3.6 Industry Effects

Finally, many authors have noted that there may be distinct industry effects in accounting policy choices (see Zmijewski and Hagerman, 1981, and Pierce-Brown and Steele, 1999). In the case of option disclosure it seems clear that some industries may be politically more visible than others. For instance, the consequences of the privatised utilities decision to reveal information about share options may differ from firms operating in say the electrical engineering sector. This analysis caters for these industry variations by incorporating industry specific effects into the model.

4.4 Data Assembly And Model Estimation

The 350 companies used in this analysis represented the UK FTSE 100 and FTSE Mid 250 companies in 1996. As highlighted in Section 3.1.1, this sample of companies (excluding the investment trusts) is effectively a subset of the main data sample, however, the data used here is from a different time period to that used in the main data set The main source of data was the company annual accounts for the years 1994 and 1995. The information on option disclosure comes from inspection of the annual reports (see below). Other data on company size, board structure, debt, corporate performance, risk, and industry effects comes from Datastream. There is a potential maximum of 350 companies for 2 years (700 cases). However, Datastream provides limited information on investment

trusts and hence these were excluded from much of the analysis. Also, a number of other companies were delisted during the period, for example, through take-over. These effects reduced the sample to 550 cases in the typical regression reported below.

4.4.1 The Econometric Model

The following Probit model is estimated where Φ is the standard cumulative normal with zero mean and unit variance:

$$Pr(y_i \neq 0 / x_i\beta) = \Phi(x_i\beta) \qquad (4.1)$$

The term $x_i\beta$ is the probit score, where x contains forcing variables and β is the population vector to be estimated by maximum likelihood methods. The term y is an indicator variable relating to the disclosure of option information (see below). A zero (0) indicates a negative outcome or failure, whereas as a one (1), represents a positive outcome or success. Firms are denoted over i. Specifically, the x matrix contains proxies for company size, board structure, debt structure, corporate performance, risk, and industry effects as defined below.

The indicator variable y can be defined in a number of ways to indicate success in option disclosure. The strategy is to estimate j separate probit equations (j = 1 - 7) representing different levels of disclosure quality (see Forker, 1992). Separate regressions are performed to allow unrestricted estimation of β.[17]

[17] Since $x_i\beta$ has a normal distribution, then interpreting the probit coefficients means dealing in the Z metric. Accordingly, marginal effects rather than the coefficient estimates are reported. The

The LHS variables

The quality of share option disclosure in annual accounts was classified according to the degree of information given about the number of share options (N), the exercise prices (X) and the vesting period (T). These classifications accord with Forker (1992) and can potentially provide sufficient information to value options as one moves from N to X to T. In addition, disclosure quality is also classified according to whether information was provided about the performance criteria to which options were subject (P).

Clearly, the quality of disclosure can vary according to N, X, T and P. For example, it may be that information on exercise prices is only given for some of the executive options. A finer classification would be that exercise prices are given on all share options. In the event, there was, in fact, very little variation in N and accordingly this could not be satisfactorily modelled. Therefore, the following LHS indicator variables are defined.

- LHS variables relating to X:
    - Y_1 = 1 if exercise prices are given for all options; 0 otherwise
    - Y_2 = 1 if exercise prices are given for some options; 0 otherwise
- LHS variables relating to T:
    - Y_3 = 1 if earliest exercise date is given for all options; 0 otherwise

transformation makes it possible to specify a change in the probability resulting from an infinitesimal change in a component of x.

- $Y_4 = 1$ if earliest exercise date is given for some options; 0 otherwise
- $Y_5 = 1$ if expiry date is given for all options; 0 otherwise
- $Y_6 = 1$ if expiry date is given for some options; 0 otherwise

- LHS variable relating to P:
  - $Y_7 = 1$ if the options are reported to be subject to some performance criteria; 0 otherwise

The RHS variables

The above discussion highlighted a number of economic and accounting variables which can potentially explain the cross sectional variation in the disclosure of directors' share option information. The following variables are thus selected with the Datastream item number or datatype shown in brackets:

- Size: The log of the market value of the enterprise in 1995 (MV).
- Board structure: The number of non-executive directors (243) and the total number of directors (242).
- Debt structure: The debt to equity ratio of the company (733).
- Corporate performance: Measured as return on capital employed (707).
- Risk: Represented by beta, the systematic risk of the company's ordinary shares (BETA).
- Industry effects: A set of indicator variables allocating companies to their FTSE industry group.

To filter out any idiosyncratic time fluctuations in the right hand side variables averages were taken over a number of years. Accordingly, the means of Datastream items 242, 243, 733, and 707 between 1990 and 1995 were evaluated.

4.5 Results

Descriptive statistics are presented in Table 4.1. These are provided for the complete sample. The pattern that emerges is generally one of a high degree of option disclosure. Some 83% of the companies in the sample disclose exercise prices for all options (Y_1), with 93% reporting exercise prices for at least some of the share options (Y_2).

	LHS Variable	Mean
Y_1	(All exercise prices)	0.8307
Y_2	(Some exercise prices)	0.9334
Y_3	(All earliest exercise dates)	0.6918
Y_4	(Some earliest exercise dates)	0.8379
Y_5	(All expiry dates)	0.6946
Y_6	(Some expiry dates)	0.8480
Y_7	(Performance criteria)	0.3140

Number of observations 691

Table 4.1: Analysis Of Share Option Disclosure

Information on the vesting period is slightly less well reported. Only 69% of companies gave the earliest exercise date for all options, whereas 83% give details for at least some of the options. An almost identical pattern is observed for the disclosure regarding the expiry date with 69% of companies revealing all expiry dates and 84% providing information on at least some of the expiry dates. Finally, the Greenbury report urged that companies disclose information about the performance criteria to which options were subject. The data indicates that only 31% of these companies gave information indicating that the options had any performance criteria attached to them which had to be satisfied before the options could be exercised.

The results can be contrasted with those in Egginton, Forker and Grout (1993) which relate to the disclosure of option information in the top 100 and bottom 100 listed companies in the times 1000 for the account year 1988 / 89. They found that about 73% of the top 100 companies reported minimum data on the number of share options in issue for directors (in this data set the figure is 98%). Furthermore, they document that only 5% of companies in the top 100 detail complete information on N, X and T (i.e. number of shares, the exercise price and the vesting period). For all participants here, the figure is 40%.

Variable	Observations	Mean	Standard deviations
Market value	662	2003.22	3597.17
log (market value)	662	6.84754	1.10534
Number of directors	588	10.2377	3.13513
Number of non-executives	584	4.59282	2.25678
Borrowing ratio	588	0.77752	2.28271
Return on capital employed	570	22.2315	35.5592
Beta	652	0.95247	0.22237

Table 4.2: Analysis Of Right Hand Side Variables

The means and standard deviations of the right hand side variables are provided in Table 4.2. The mean company market value is £2003m. The mean size of the board of directors is 10 individuals with an average of just under 5 non-executive directors representing an approximate 50% mix between inside and outside directors. The mean debt to equity ratio is 0.77 and the average return on capital employed is 22%. Finally, the mean estimate of beta (risk) is 0.95.

The econometric results are contained in Tables 4.3, 4.4 and 4.5. Table 4.3 relates to the determinants of exercise price disclosure (X), Table 4.4 to the vesting period (T) and Table 4.5 to the performance criteria (P). The primary results from Tables 4.3 and 4.4 are easy to summarise. First, after controlling for corporate governance, debt, company performance and risk considerations, there is a negative and statistically significant relationship between information disclosure about share options and log market value. This appears valid for most of the regressions.

	LHS variable = Y_1 (All exercise prices)	LHS variable = Y_2 (Some exercise prices)
Log (Market value)	-0.04819	-0.01985
	(0.01987)	(0.01425)
Number of directors (total)	-0.02992	-0.01641
	(0.01028)	(0.00664)
Number of non-executives	0.05659	0.02342
	(0.01383)	(0.00998)
Borrowing ratio	-0.00378	0.00901
	(0.00555)	(0.00423)
Return on capital employed	-0.00045	-0.00060
	(0.00045)	(0.00030)
Beta	0.25858	-0.11014
	(0.09074)	(0.06233)
Industry effects	Yes	Yes
Time effects	Yes	Yes
Observations	514	353
χ^2	99.40	70.37
Pseudo R^2	0.1859	0.2616
Observed P	0.8132	0.8810
Predicted P (at mean x)	0.8602	0.9471

White (1980) standard errors reported in parentheses

Table 4.3: Determinants Of Disclosure Of Exercise Prices

This is consistent with the hypotheses that large firms are less likely, *ceteris paribus*, to reveal information about share options due to proprietary costs. Revealing information about share options may impose proprietary costs on the company in the form of adverse media attention, provide valuable information to competitors about organisational reward strategies, or generate greater potential to attract regulatory or rent redistribution activities.

	LHS variable = Y_3 (All earliest exercise dates)	LHS variable = Y_4 (Some earliest exercise dates)	LHS variable = Y_5 (All expiry dates)	LHS variable = Y_6 (Some expiry dates)
Log (Market value)	-0.08456	-0.05480	-0.06727	-0.01566
	(0.02737)	(0.02053)	(0.02667)	(0.01874)
Number of directors (total)	-0.05564	-0.01680	-0.06775	-0.03928
	(0.01475)	(0.01038)	(0.01482)	(0.00984)
Number of non-executives	0.06066	0.03689	0.07075	0.04131
	(0.01938)	(0.01418)	(0.01951)	(0.01298)
Borrowing ratio	-0.03141	0.00560	-0.03712	0.00359
	(0.01496)	(0.00610)	(0.01880)	(0.00537)
Return on capital employed	-0.00114	-0.00083	-0.00106	-0.00027
	(0.00075)	(0.00055)	(0.00073)	(0.00038)
Beta	0.02473	-0.09670	0.07668	-0.13999
	(0.12528)	(0.09966)	(0.12543)	(0.08363)
Industry effects	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes
Observations	526	506	526	502
χ^2	136.58	100.54	131.30	107.51
Pseudo R^2	0.2283	0.2141	0.2178	0.2221
Observed P	0.6673	0.8024	0.6711	0.8127
Predicted P (at mean x)	0.7113	0.8549	0.7163	0.8738

White (1980) standard errors reported in parentheses

Table 4.4: Determinants Of Disclosure Of Vesting Period

In the case of Y_2 and Y_6 the relationship is negative and not significant. All models report marginal effects. Focusing on the decision to disclose exercise prices for all options (Y_1), the results indicate that a small increase in company size decreases the likelihood of disclosure by approximately ½%. Inspection of the log market value variable in Tables 4.3 and 4.4 indicates a broadly similar quantitative effect.

The results reported here contrast with those in Forker (1992). Whilst a negative correlation between option disclosure and company size was predicted, it was only established in a sub-sample of firms and was not significant. Pierce-Brown and Steele (1999 p. 11), however, report that larger companies, who face greater political costs, are more likely to use creative accounting techniques.

The corporate governance variables in the analysis, too, turn out to play an important role in shaping the option disclosure choice. The main attention is reserved for the impact of non-executive directors on disclosure. Generally, after controlling for company characteristics and industry fixed effects, this variable exhibits a significantly positive relationship with option information disclosure. For example, in Table 4.3 column 1, a small increase in the number of non-executives on the main board is associated with a 0.0566% increase in the likelihood of disclosing exercise price information for all share options. This result is consistent with the monitoring function of non-executive directors (see Weisbach, 1988 and Conyon, 1997a).

In contrast, the impact of increasing the total number of directors on the main board decreases the likelihood of disclosure (by about 0.0299% in most regressions). This may be because increasing the number of directors increases the proprietary costs of disclosure (e.g. greater political visibility etc.). As such it functions in a similar way to the corporate size variable and so the results appear coherent. The effect of corporate governance contrasts with the findings made by Forker (1992). He found that the proportion of non-executives had an (unexpected) negative effect on disclosure (although the result was not generally significant).

The effect of the debt variable is generally (but not always) negative. The effect of the borrowing ratio variable is less well determined than those variables reported above. The result is consistent with increased proprietary costs (such as increased likelihood of bank re-negotiation of loan terms) in high leveraged firms. The performance variable (the return on capital employed) attracts a negative sign in the disclosure regressions. This is consistent with increased political visibility and hence lower disclosure. Finally, the risk variable is not well determined. It is only sometimes significant and alternates sign. This is not consistent with the priors since one would expect less disclosure about options in high beta companies.

Table 4.5 considers explicitly the determinants of the disclosure of the performance criteria that options are subject to, typically this is growth in earnings per share or total shareholder return. Column 1 contains the size variable as a level, whereas column 2 introduces non-linearities by including the square of the

company size variable. The results in column 1 indicate that although there is a negative relationship between option performance criteria disclosure and company size the result is not significant.

	LHS variable = Y_7 (Performance criteria)	LHS variable = Y_7 (Performance criteria)
Log (Market value)	-0.01963	1.17860
	(0.02814)	(0.27321)
Log (Market value) squared		-0.08377
		(0.01913)
Number of directors (total)	0.02922	0.03717
	(0.01535)	(0.01531)
Number of non-executives	-0.04122	-0.04775
	(0.01976)	(0.01938)
Borrowing ratio	0.00142	0.01192
	(0.01077)	(0.00983)
Return on capital employed	-0.00010	0.00001
	(0.00066)	(0.00065)
Beta	-0.01667	-0.08157
	(0.12781)	(0.12706)
Industry effects	Yes	Yes
Time effect	Yes	Yes
Observations	538	538
χ^2	66.70	89.86
Pseudo R^2	0.1012	0.1285
Observed P	0.3680	0.3680
Predicted P (at mean x)	0.3545	0.3493

White (1980) standard errors reported in parentheses

Table 4.5: Determinants Of Disclosure Of Option Performance Criteria

The model in column 2 fits a concave relationship between disclosure and size. The results indicate a positive (significant) relationship between disclosure and size at low levels of company size. This may be a credibility effect where

disclosing the option performance criteria adds to firm value and is not outweighed by propriety costs. Beyond a local maximum, these benefits are outweighed by the costs and a significantly (negative) association is found. The concave correlation between accounting policy choice and company size has recently been considered by Pierce-Brown and Steele (1999).

Finally, it is worth commenting on the robustness of the findings. All models report standard errors that have a stationary covariance matrix. This adjustment was made using the White (1980) method. Also, the industry effects were always found to be important. For example, Table 4.5 (column 2) estimated the unconstrained model which includes industry specific effects. The constrained model (omitting these industry variables) was then also estimated.

The resulting Likelihood Ratio (LR) test[18] yielded a test statistic of 56.07 distributed as χ^2 (32). Clearly, industry effects are important, and the LR test rejects the null of non-inclusion of the industry effects. This implies that there are significant industry differences in the disclosure of option information. Overall, the model diagnostics are satisfactory. The χ^2 statistics for variable inclusion are always good, and the pseudo R^2 are within an acceptable range across all the models.

[18] Suppose that L_0 and L_1 are the likelihood values from the unconstrained and constrained models respectively. Then the LR statistic is calculated as $\chi^2 = -2(L_1 - L_0)$ with $d_0 - d_1$ degrees of freedom. The terms d_0 and d_1 are the model degrees of freedom.

4.6 Concluding Comments

This chapter has considered the information disclosed about directors' share options in a sample of UK companies in 1994 and 1995. The results add to the recent UK corporate governance literature (see Keasey, Thompson and Wright, 1997). The objectives were first to cast light on the state of share option disclosure in a sample of UK companies and second to model the decision to disclose share option information as a function of the proprietary costs of disclosing that information (see Verrecchia, 1983).

The main results indicate a high degree of information disclosure about director share options. Many firms now report sufficient information to value options (a matter dealt with in the subsequent chapters of this thesis). The current disclosure position contrasts with earlier academic findings (e.g. Forker, 1992). The main econometric models indicate two substantive results. First, information disclosed about share options is a positive function of the presence of non-executive directors. This is evidence in favour of the monitoring function of non-executives and adds to the growing evidence concerning the effects of board structure on firm performance.

Secondly, a negative correlation between option information disclosed and corporate size is isolated. This is consistent with a class of models that suggest that larger firms suffer propriety and political costs from information disclosure.

This chapter has considered the level of disclosure of share option information in a sample of companies in 1994/5. The subsequent annexing of the Greenbury recommendations to the Listing Rules of the London Stock Exchange, dramatically increased this level of disclosure and made it possible for the first time to accurately analysis and value the stock of share options held by UK corporate executives. The following chapter considers these issues, specifically the value and incentive effects of options and impact of varying disclosure mechanisms.

Chapter Five

Option Incentives & Reporting Style

5.1 Introduction

An important mechanism by which incentives are provided for executives is through their holding of share based compensation such as share options, ordinary equity, restricted stock or other such awards under long term incentive plans (LTIPs). Researchers using US data, including Murphy (1999) and Hall & Liebman (1998), have demonstrated that these elements of executive compensation are the dominant factors in driving the level of executive compensation and the pay-performance sensitivities in recent US corporate history.

In contrast, the provision of share options in the United Kingdom, and their contribution towards total annual compensation and executive incentives, is much less well understood. In part, this is explained by the historically poor disclosure requirements in the UK, highlighted in Chapter Four, whereby the necessary information to evaluate the overall compensation package was simply not available. This is no longer the case. With the publication and subsequent implementation of the Greenbury report (1995), and latterly the Hampel committee report (1998), there now exists sufficient information in annual reports to begin the task of interrogating the design of British CEO compensation contracts.

This chapter makes use of the fact that, as detailed in Chapter Three, the majority of large UK quoted companies provide considerable information on the share options held by executives. Indeed, for these companies the amount of

information disclosed about the entire stock of share options (as opposed to simply the current grant of options) is usually greater than the information currently supplied to researchers using US data. This level of UK information disclosure allows a number of innovative contributions to be made to the executive compensation literature.

Firstly, for the main data sample of 510 CEOs at UK quoted companies in the fiscal year 1997/8, the total value of compensation is determined using the adjusted Black-Scholes pricing formula to value awards of share option. For each CEO, the incentives arising from the entire stock of share options is then calculated. CEO incentives from holding options are calculated as the slope of the Black-Scholes function (the option delta) multiplied by the fraction of total outstanding options on common equity expressed as a percentage. This is a measure of how CEO option wealth varies for given changes in shareholder wealth[19].

Secondly, how the amount of information available regarding the inputs to the Black-Scholes function affects the valuation of executive pay and the calculation of the pay-performance term is considered. In the case of the United States, complete information is given on the current grant of options, but for prior grants, US companies only provide data on (1) the total number of options held, and (2) the total intrinsic value of the unexercised options. Even in the UK, companies can opt to provide a more concise form of disclosure whereby they

[19] This approach to measuring executive incentives has been used by Jensen and Murphy (1990b), Yermack (1995), Murphy (1999) and Conyon and Murphy (1999).

supply only the total number of outstanding options, the weighted average exercise price and the expiration date of the longest dated option.

However, where UK firms do provide full information, this richer UK data, which contains input information on both past and current grants, makes it possible to test whether there are any differences in the valuation of executive's share options and the pay-performance sensitivities, arising from the different disclosure methodologies. This can be done by imposing on the full information UK share option data the disclosure conditions that pertain to US companies and the UK firms opting for concise disclosure. It then becomes possible to identify any distortions that arise from the lack of complete information about the stock of options held by executives.

The rest of this chapter is organised as follows. The next section briefly recaps the method of valuing share options and deriving the pay-performance incentives from them. Section 5.3 describes the varying disclosure requirements in the UK and the US and the sources of the UK compensation data. In Section 5.4 empirical results are presented that show the effect of the different disclosure requirements on option valuation and pay-performance. Finally, Section 5.5 offers some concluding remarks.

5.2 The Provision Of Share Based Compensation

Prior to examining how different information disclosure levels impact on option valuations and incentives it is worth recapping the option valuation method

and how executive incentives that arise from share options are calculated.

5.2.1 Share Option Valuation

As described in Chapter Two the Black-Scholes pricing formula has become the generally accepted option pricing model and is used extensively by academics and practitioners alike. Unsurprisingly then it has become standard practice in the executive compensation literature to estimate the value of executive options using this formula, adjusted for continuously paid dividends. This convention is used here. The standard Black-Scholes equation (5.1) calculates the value (c) of a single European style call option:

$$c = Se^{-qT} N(d_1) - Xe^{-r\,T} N(d_2) \qquad (5.1)$$

where

$$d_1 = \{ \ln(S/X) + (r-q + \sigma^2/2)(T) \} / \{\sigma T^{1/2} \}$$

$$d_2 = \{ \ln(S/X) + (r-q - \sigma^2/2)(T) \} / \{\sigma T^{1/2} \}$$

The six inputs to the function are described in detail in Chapter Two (Section 2.4) but for completeness they are, the share price (S), the exercise or strike price (X), the time to maturity (T), the dividend yield (q), the risk free rate of interest (r) and the standard deviation of returns on the share (σ). N(.) is the cumulative probability distribution function for a standardised normal variable.

The terms S, q, r, and σ are all common to the firm whereas the inputs X and T vary within the company across different option tranches. Since executives can

hold many tranches of options, to accurately value the stock of share options held, each tranche needs to be valued separately and the sum taken. Note however, that to calculate the total annual pay for the fiscal year 1997/8 in the initial analysis below, it is only necessary to value the current grant of options.

There are potential drawbacks to using the Black-Scholes formula in calculating the value of an executive share option. These were discussed in Chapter Two but to recap the main causes for concern are as follows. The Black-Scholes value is, at best, a measure of the company's cost of granting the option and will typically overstate the value to the risk averse executive recipient. Also, executive share options are typically subject to forfeiture if the executive leaves the firm prior to vesting; this probability of forfeiture reduces the value of the option and thus implies that the Black-Scholes formula will again overstate the option's value.

Furthermore, the Black-Scholes formula determines the value of a European call which assumes that the option can only be exercised at the expiration date. Executive options however, can usually be exercised at any time in the options' life after an initial holding period has elapsed (usually three years). In this respect executive options more closely resemble American style options and as such the Black-Scholes formula would under value them. However, to some degree this latter effect is negated because executives tend to exercise options well before it is rational to do so which reduces the option value. Finally, UK executive options increasingly have performance conditions attached to them whereby the holder is

prevented from exercising the option if certain performance targets have not been met. This probability of forfeiture again reduces the value of the option and implies the Black-Scholes formula overstates the option's worth to the executive.

These issues question whether the Black-Scholes formula is wholly appropriate in valuing executive options. Almost all the bias however is in an upward direction and as such, the Black-Scholes values can be regarded as an upper bound on the value a director would place on an executive option. The most significant of the above issues is almost certainly the concept of CEO risk aversion and this topic is discussed more fully in Chapter Seven. However, as stated above it has become the accepted model in the compensation literature and is therefore used here.

5.2.2 Executive Incentives and Shareholder Wealth

The executive compensation literature treats CEO incentives as the change in executive rewards brought about by a change in company performance. In this context, it is customary to measure company performance as changes in shareholder wealth. Executive holdings of any form of equity based asset provides a direct linkage between executive and shareholder wealth. The aggregate executive incentives arising from all forms of equity claims can be evaluated by considering each type separately and then summing across the various elements (see Conyon & Murphy, 1999). This chapter initially considers the incentives arising from all holdings of equity based assets, but then focuses on the incentives derived from holding options.

Incentives arising from ordinary equity are measured as the percentage of ordinary equity held by the executive. If a CEO holds 5% of the common equity and shareholder wealth increases by £100, then the CEO receives £5 of that increase. This 5% is the "sharing rate" or "effective ownership" arising from a change in shareholder wealth that is translated into executive equity wealth.

Calculating the sharing rate / effective ownership is slightly different for share options. It is not simply the percentage of outstanding options on common equity since it is important to recognise that the change in the value of the share option is not one-for-one with the change in the share price as is clear from the Black-Scholes pricing formula

As reported in Chapter Two (Section 2.4.3), the change in the value of the option, resulting purely from a (small) change in the price of the underlying asset is termed the delta of the option (δ). It is equal to the derivative of the Black Scholes call option value with respect to share price. For a European call on a share paying dividends the delta is given as: $\delta = e^{-qT} N(d_1)$. The option delta varies between zero and one. Deep in the money options (that is where the share price is way in excess of the exercise price) have deltas that are close to unity whereas deep out of the money have deltas close to zero. Consequently, CEOs who only hold deep out of the money options will, independent of the fraction of options on outstanding equity held, have low pay-performance sensitivities. Again, since CEOs hold many tranches of options it is necessary to calculate a pay-performance / sharing rate term for each tranche separately and sum to get the total pay-performance sensitivity. Alternatively, this can be thought of as the

product of the share weighted option delta and the ratio of outstanding options on common equity expressed as a percentage.

5.3 Executive Compensation Disclosure

The precise disclosure requirements for UK companies are explained in detail in Chapter Three, Section 3.3. A summary however is provided below.

5.3.1 UK Share Option Disclosure

Current compensation disclosure requirements for directors are contained in the Greenbury (1995) report. In turn, the Greenbury rules are predicated on the expert opinion of the UK's Accounting Standards Board. The Accounting Standards Board's Urgent Issue Task Force (UITF) concluded in 1994 that it is not practicable or viable to specify a standard method for valuing share options. Instead full details of each individual director's entitlement are required in accordance with UITF Abstract 10 and its successors. The resulting information disclosure requirements for companies were given on page 67.

To provide an accurate Black-Scholes valuation of the complete stock of options held by the CEO, information on the time to maturity, the exercise price and the number of options is required for each and every tranche held. Companies that reveal information allowing this to be done are said to be providing full or complete information.

However, as noted in Chapter Three, the Greenbury (1995) report made provision for less than complete share option information disclosure in certain circumstances, and allowed companies to opt for a more concise form of disclosure. In short, this requires companies to provide (1) the total number of share options held, (2) the weighted average exercise price for the stock of unexercised options held and (3) the maturity date of the longest dated unexercised option. This concise form of disclosure thus creates the potential for a difference to arise between the 'true' value of the stock of options and the associated pay performance sensitivity, and those calculated under concise disclosure conditions. One aim of this chapter is thus to determine the magnitude and significance of such differences.

5.3.2 US Share Option Disclosure

The current disclosure requirements for US companies as defined by the SEC, are set out in detail in Chapter Three (Section 3.5). In short though, US have certain discretion in how they present executive option information. With regard to the current grant of options, companies can either assume that the company share price rises by 5% and 10% per annum over the life of the option and report the two payoffs that would occur at the date the option expires. Alternatively, they can report a figure based on the Black-Scholes valuation of the option.

With regard to the stock of options held by directors at the financial year end companies are required to report the total number of unexercised options held by the director at the year end, split between those that are currently exercisable and those that, at the year end date, remain unexercisable. In addition, again

splitting the options into these two categories, they must report the end of year intrinsic value of the stock of options, calculated as the aggregate value of the difference between the exercise price and the year end stock price. Because of this valuation method, only options that are in the money are considered in determining the year end value of the option stock.

These reporting guidelines mean that is virtually impossible to gather full information for all the individual tranches of options held by US directors, even by tracking option holdings through successive proxy statements (see Hall and Liebman, 1998). The limited data on exercised options supplied by US companies always necessitates a number of assumptions to be made about which options have been exercised resulting in errors in the estimates of the final stock of options held

In order to calculate the Black-Scholes option values from the US data, two variables must be determined. The exercise price and a time to maturity. Because no data at all is supplied on the latter variable, the assumption that all unexercised options have a remaining life of 7 years is generally made (e.g. Conyon & Murphy, 1999; Murphy, 1999). The exercise price can be estimated from the intrinsic value of the stock of options supplied. This intrinsic value is given by N times Max{(S-X),0}, where N is the number of options held, S is the year end share price and X the average exercise price. Since S and N are known and the intrinsic value, (Value) is supplied, the average exercise price of the unexercised options held at the year end can be calculated as;

$$X = S - Value/N \qquad (5.2)$$

5.3.3 Data Collection

The UK data used in this chapter is comprehensively described in Chapter Three. To briefly recap however, the sample consists of 510 of the largest UK companies by market capitalisation for the fiscal year 1997/8. These companies account for almost all (97%) of the market capitalisation of the entire UK stock market. For each company a CEO or equivalent most senior executive officer was identified and detailed information on their equity and option holdings collected. This made it possible to calculate the fraction of company equity owned by the CEO and the explicit pay-performance sensitivity derived from equity and option holdings.

5.4 Empirical Results

Table 5.1 provides details of compensation received by UK CEOs. Aggregate figures and those by company size bands are provided. Total cash pay is equal to the sum of salaries, realised short term bonuses, benefits and other cash compensation. Total annual pay represents total cash pay plus the grant-date value of share options and grant date value of any awards under LTIPs, the latter being discounted by 20% for performance contingencies.

Total annual pay for all companies has a mean (median) of £588,000 (£414,000). It is also positively correlated with firm size, median pay in companies with sales less than £250 million is £286,000 and is £811,000 for companies with sales in excess of £1,500 million. A qualitatively similar picture is observed for the total cash pay figure. Median cash pay in companies with sales

less than £250 million is £235 and is £558 in companies with sales in excess of £1,500 million. Median total cash pay represents 82% of total annual pay for all companies. The percentage of total annual pay accounted for by total cash remuneration falls as companies get larger. For companies with sales less than £250 million median cash pay as a percentage of total annual pay is 82% but for companies with sales in excess of £1,500 million it is only 69%. This implies larger firms are utilising option grants to a greater extent than the smaller firms.

	Number of Companies	Total Annual Pay (£000)		Total Cash Pay (£000)	
		Average	Median	Average	Median
All Companies	510	£588	£414	£413	£340
By Firm Sales (m)					
Less than £250	182	£434	£286	£294	£235
£250 to £500	89	£419	£345	£338	£287
£500 to £1,500	116	£602	£505	£430	£386
Above £1,500	123	£925	£811	£629	£558

Note: Sales for financial firms defined as net interest income (banks) and total income (insurance companies).

Table 5.1: Summary Statistics On CEO Pay By Company Size

Average and median shareholdings for UK CEOs (expressed as a percentage of outstanding shares) are presented in Table 5.2. These show that the mean stock ownership is 2.13% and the median is 0.05%. This implies that at the mean (median), the CEO receives 2.1% (0.05%) of any given increase in shareholder wealth through the increase in the value of their equity holding. CEO equity ownership is negatively correlated with firm size. Companies with sales of less than £250 million have mean (median) stock ownership of 4.1% (0.47%) whereas

companies with sales in excess of £1,500 million have mean (median) stock ownership of just 0.21% (0.01%). Thus firm size is undoubtedly a prime driver in the determination of the pay performance statistic.

	Number of Companies	Share Holdings (Effective Ownership %)		Option Holdings (Effective Ownership %)		Long Term Incentive Holdings (Effective Ownership %)		Total Pay to Performance Sensitivity (Effective Ownership %)	
		Average	Median	Average	Median	Average	Median	Average	Median
All Companies	510	2.13%	0.05%	0.18%	0.06%	0.02%	0.00%	2.34%	0.25%
By Firm Sales (m)									
Less than £250	182	4.07%	0.47%	0.29%	0.16%	0.02%	0.00%	4.38%	0.94%
£250 to £500	89	2.62%	0.14%	0.17%	0.09%	0.03%	0.00%	2.82%	0.36%
£500 to £1,500	116	0.76%	0.02%	0.12%	0.07%	0.03%	0.00%	0.91%	0.16%
Above £1,500	123	0.21%	0.01%	0.07%	0.02%	0.02%	0.00%	0.31%	0.05%

Note: Revenues for financial firms defined as net interest income (banks) and total income (insurance companies).

Table 5.2: Summary Statistics On CEO Share Stakes By Company Size

As illustrated above, holdings of unexercised share options also provide a direct link between CEO and shareholder wealth, because the value of the options held increases with increases in the stock price. Table 5.2 shows that the average UK CEO would receive 0.18% of any increase in shareholder wealth through the increase in the value of their options (median 0.06%). Again, CEO share option ownership is negatively correlated with firm size. Companies with sales of less than £250 million have mean (median) stock ownership of 0.29% (0.16%) whereas companies with sales in excess of £1,500 million have mean (median) stock ownership of 0.07% (0.02%).

The recent introduction of new long term incentive schemes also provides additional effective ownership stakes, although as Table 5.2 shows they are currently not very widespread in this data set, with the median equal to zero across all sales bands, however they are included here for completeness.

The final column of Table 5.2 shows the total pay-performance sensitivity. At the mean this is 2.34% and dominated by the CEO equity stake which represents 91.3% of the sensitivity. However, as company size increases, option holdings become an increasingly significant proportion. For companies with sales under £250 million, option holdings represent 6.7% of the total pay-performance whereas for companies with sales in excess of £1,500 million, option holdings represent 24.0% of the total pay-performance.

Having provided summary statistics for the complete data set, the implications of the US and concise UK styles of disclosure are now considered. Before formal results for this analysis are presented for the full data set however, a worked case example is provided to illustrate the methodology.

5.4.1 Worked Case Example

The results that follow demonstrate how for two companies, the estimates of the pay-performance sensitivity and the value of the stock of options are dependent on the underlying level of disclosure. Table 5.3a below provides the company specific variables for the two example companies, Headlam Plc and GWR Plc. These two companies are typical of those providing full information

and represent one from each of the two sub-divisions used later in this chapter, namely holders of only in the money options (Headlam Plc) and holders of at least some out of the money options (GWR Plc).

Company	Share Price	Dividend Yield	Risk-free Rate	Volatility	Number of Shares Outstanding
Headlam Plc	353.5p	2.36%	7.34%	20.9%	68,046,894
GWR Plc	178.5p	1.57%	7.25%	30.6%	109,043,880

Table 5.3a: Company Specific Variables

Each of the CEOs at these two companies have three tranches of options outstanding, the details of which are provided in Table 5.3b which also shows the individual option values and option deltas which can be calculated under full information disclosure.

Company	Tranche	Exercise Price (pence)	Time to Maturity (years)	Call Value (pence)	Call Delta	Number of options
Headlam Plc	1	132.80	7.59	219.82	0.8328	40438
	2	138.90	3.33	218.12	0.9235	12420
	3	311.50	6.38	123.16	0.7451	117000
GWR Plc	1	46.76	4.84	132.61	0.9238	325046
	2	135.00	3.26	71.11	0.8245	12789
	3	212.00	5.03	51.27	0.6415	1000000

Table 5.3b: Option Tranche Details For Headlam And GWR

From Table 5.3b the total value of options held and the option pay-performance sensitivity (PPS) can be calculated. The total option value is simply the sum over the three tranches of options of the product of the call value and the

number of options. The full option PPS is similarly the sum over the three tranches of options of the product of the call delta and the number of options, divided by the total number of shares outstanding in the company (multiplied by 100 for a percentage). That is, the full option PPS is defined as;

$$PPS = \frac{\sum_i \delta_i N_i}{M} \times 100\%$$

where δ_i is the delta of options in tranche i, N_i number of options held in that tranche and M the total number of issued company shares. The values for the full PPS are given in the first two rows of Table 5.3c

	Headlam Plc	GWR Plc
UK Full Information		
Total Option Value	**£260,072**	**£952,878**
Option PPS	**0.1944**	**0.8733**
US Restricted Information		
Total Intrinsic Value	£165,043	£433,779
Total Number of Options	169858	1337835
Average Exercise Price	256.34p	146.08p
Time to Maturity	7	7
Individual Option Price	152.74p	84.19p
Individual Option Delta	0.7902	0.7824
Total Option Value	**£259,448**	**£1,126,264**
Option PPS	**0.1973**	**0.9599**
UK Restricted Information		
Total Number of Options	169858	1337835
Average Exercise Price	256.34	171.12
Maximum Time to Maturity	7.59	5.03
Individual Option Price	155.15	65.16
Individual Option Delta	0.7808	0.7336
Total Option Value	**£263,527**	**£871,791**
Option PPS	**0.1949**	**0.9000**

Table 5.3c: PPS And Option Values For Headlam Plc And GWR Plc Under UK And US Disclosure Systems

Table 5.3c then displays how the equivalent figures are calculated under the alternative assumptions of US and UK restricted information. Looking at GWR Plc, the first step in calculating the figures under US regulations is to determine the total intrinsic value of the options. From tables 5.3a and 5.3b, it can be seen that only options in tranches 1 and 2 have any intrinsic value since for tranche 3 the current share price is lower than the exercise price.

Having determined the total intrinsic value of the options held, the average exercise price can then be calculated according to equation (5.2) on page 127. The individual option value and delta can then be calculated using the Black-Scholes formula and finally the total option value and option PPS determined by aggregating over the N options.

The calculation of the total option value and the option PPS under UK restricted information differs from the US calculation only in the estimate of the X and T variables which alter the individual call price and call delta. In the concise UK case, X is the average exercise price weighted by the number of options held, thus for GWR Plc, X is given by:

$$X = \frac{(46.76 \times 325046) + (135 \times 12789) + (212 \times 1000000)}{(325046 + 12789 + 1000000)}$$

$$X = 171.12$$

The time to maturity, (T) in this case is the maximum maturity length over the three tranches. Again for GWR this is given as Max (4.84, 3.26, 5.03) = 5.03.

Having established these variables the individual option value and delta and the total option value and PPS are calculated as in the US case. Thus under full information the option PPS for GWR is calculated to be 0.87, under US restricted information the figure is now estimated at 0.96 and under UK restricted information the estimate is 0.90.

Having demonstrated the relevant calculation for two example case companies, the same calculations are now made for the whole data set where appropriate. The results are presented in Tables 5.4 and 5.5 which report the share option pay-performance sensitivity and the value of the outstanding stock of share options by firm size. The important feature of these tables is the information assumptions used to calculate the pay-performance term and the value of the share options. Full information is defined as having information on all individual tranches of options held by the CEO. There are 439 companies where the CEO held share options at the year end. Of these, 362 (82%) companies report complete information on all share option tranches. The data analysis in Tables 5.4a and 5.5a is therefore based on these 362 companies.

In the case of Table 5.4a, restricted information relates to the US reporting system and is defined as using only the total number of unexercised options, their total intrinsic value (as defined in the previous section) and a maturity of 7 years, to compute the pay-performance sensitivities and option values. In the case Table 5.5a which relates to the concise UK reporting system, restricted information is defined as using the total number of unexercised options, a weighted average

exercise price and longest dated time to maturity (as defined in the previous section) to compute the pay-performance sensitivities and option values.

5.4.2 US Disclosure Results

In Table 5.4a, for the 362 companies, the mean CEO option pay-performance sensitivity is 0.231% under full information and 0.230% under US imposed restricted information. The final column in Table 5.4a indicates that the difference in option pay-performance sensitivity means is just 0.0006 and is not statistically significant. The pay-performance term calculated under US disclosure rules for the full sample is thus not significantly different from that calculated under full information.

The share option pay-performance sensitivity is negatively correlated with firm size. For firms with sales less than £250 million the full information mean (median) option pay-performance term is 0.39% (0.22%) and for firms with sales in excess of £1,500 million the mean option pay-performance term is 0.09% (0.03%). Again, the calculated differences in means between the full and restricted information cases are generally not statistically significant, although there is evidence that the PPS in the largest firms is overestimated under US reporting conditions. Figure 5.1 plots the distribution of pay-performance terms under complete and US imposed reporting rules.

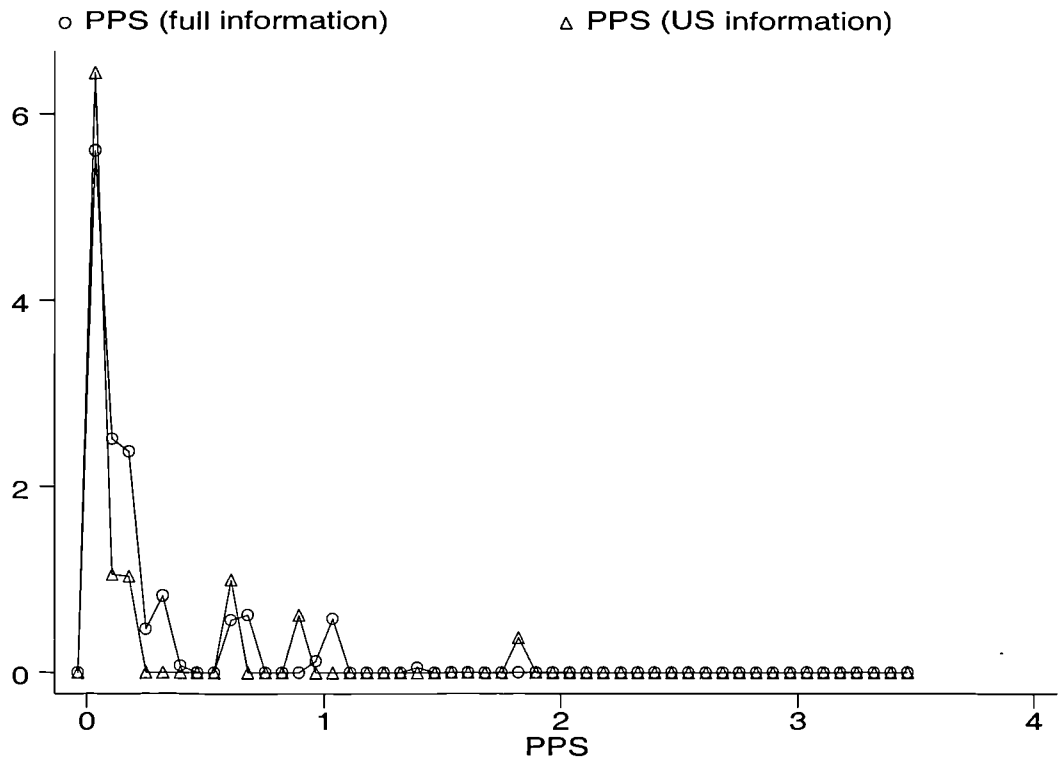

Figure 5.1: Share Option Pay-Performance Sensitivity Calculated Under Full And Restricted US Information

The lower half of Table 5.4a details the valuation of the stock of share options under the full and the US restricted information cases. The mean (median) value of the share options using complete information for all companies is £732K (£275K). The equivalent figure for the US restricted information case is £745K (£293K), representing a mean difference of just £12K which is not statistically significant. Again across all size bands the difference in valuing the share options according to the full or restricted information case is generally not significant. The data thus indicates that the valuation of the stock of share options, like the pay-performance sensitivity is not distorted by the limited information disclosure requirements under US regulations.

	No.	Share option Pay-Performance Sensitivity (%) (Full information)		Share option Pay-Performance Sensitivity (%) (US Restricted information)		Difference in means (t-statistic)
		Average	Median	Average	Median	
All Companies	362	0.2309	0.0954	0.2303	0.0996	0.0006 (0.39)
By Firm Sales (m)						
Less than £250	131	0.3910	0.2236	0.3882	0.2321	0.0028(0.75)
£250 to £500	63	0.2124	0.1065	0.2082	0.1041	0.0042(1.38)
£500 to £1,500	92	0.1331	0.0772	0.1357	0.0929	-0.0026(1.39)
Above £1,500	76	0.0888	0.0282	0.0910	0.0326	-0.0022(2.17)
	No.	Value of Stock of Share options (£000s) (Full information)		Value of Stock of Share options (£000s) (US Restricted information)		Difference in means (t-statistic)
All Companies	362	732.24	274.84	744.61	292.90	-12.37(1.65)
By Firm Sales (m)						
Less than £250	131	841.35	345.52	837.37	346.17	3.97(0.39)
£250 to £500	63	432.27	204.67	471.35	202.56	-39.07(1.15)
£500 to £1,500	92	480.88	229.66	506.14	268.63	-25.26(3.17)
Above £1,500	76	1097.13	324.72	1099.91	367.25	-2.78(0.31)

Table 5.4a: The Share Option Pay-Performance Sensitivity And Value Of Stock Of Share Options By Company Size: US Reporting System

This however, is not the whole story. It is not that there is no bias in the calculation of the above terms, but that there are two at work pulling in opposite directions, which, at least in this data set, seem to cancel each other out. This can be seen more clearly by dividing the 362 companies into those where the CEO only holds options that are in the money (232 companies) and those where at least some of the options that the CEO holds are out of the money (130 companies).

Table 5.4b repeats the same analysis as in Table 5.4a but for the 232 CEOs who hold only in the money options. The estimate of the option PPS under US

disclosure is now significantly lower than that calculated in the full disclosure case. This pattern is repeated across all sales bands, with the difference being significant in all but the £500m to £1,500m category. The total value of the stock of options however is still not generally significantly different under the two reporting mechanisms, although there is evidence that the value for the very largest firms is underestimated under US disclosure conditions.

The explanation for these results lies in the determination of Black-Scholes inputs. Because all the options being considered here are in the money, the aggregate intrinsic value represents all outstanding options and as such the estimate of the average exercise price is an accurate reflection of the true weighted average exercise price. For example, the analysis of Headlam Plc in Section 5.4.1 showed that all the options held by their CEO were in the money and the average exercise price calculated under US restricted information was equal to the weighted average exercise price calculated under UK restricted information.

With an accurate estimate of the average exercise price, the main source of error is now in the estimate of T, the remaining life of the option. The average T for the 735 option tranches held by the 232 CEOs who only hold in the money options is just 5.04 years. The US estimate of 7 years then is a considerable over estimate. Under normal circumstances an over estimate of the time to maturity would result in an over estimate of the value of the option. However, because these options are all well in the money, the existence of even moderate dividend yields, tends to reduce the impact of the increase in T. Indeed if the option is

sufficiently in the money and dividend yield sufficiently high, increasing T can actually reduce the value of the option.

The result is that error in the T term has little impact on the valuation of the option. However, it does significantly reduce the delta of the option and this is what drives the PPS term down for the US restricted information case in Table 5.4b while leaving the total value of the options unaffected.

	No.	Share option Pay-Performance Sensitivity (%) (Full information)		Share option Pay-Performance Sensitivity (%) (US Restricted information)		Difference in means (t-statistic)
		Average	Median	Average	Median	
All Companies	232	0.2486	0.1089	0.2413	0.1046	0.0074(4.32)
By Firm Sales (m)						
Less than £250	91	0.4090	0.2175	0.3964	0.2237	0.0126(3.42)
£250 to £500	44	0.2097	0.1078	0.2011	0.1013	0.0085(2.14)
£500 to £1,500	48	0.1657	0.0942	0.1635	0.0901	0.0022(1.09)
Above £1,500	49	0.0670	0.0164	0.0653	0.0158	0.0017(3.27)
	No.	Value of Stock of Share options (£000s) (Full information)		Value of Stock of Share options (£000s) (US Restricted information)		Difference in means (t-statistic)
All Companies	232	833.36	340.21	826.54	331.11	6.82(0.64)
By Firm Sales (m)						
Less than £250	91	890.09	343.49	865.61	332.80	24.48(1.95)
£250 to £500	44	482.11	215.13	523.56	207.80	-41.45(0.85)
£500 to £1,500	48	713.29	415.93	710.62	388.08	2.67(0.48)
Above £1,500	49	1161.02	511.18	1139.57	497.33	21.45(3.07)

Table 5.4b: The Share Option PPS And Value Of Stock Of Options By Company Size: US Reporting System For Only In The Money Options

The situation is different for CEOs who hold out of the money options. Table 5.4c shows the equivalent table but for the 130 CEOs who hold at least some out of the money options. The US disclosure estimates of the option PPS are now significantly higher for all companies and across all sales bands. Furthermore, the total value of the stock of options is also significantly overestimated for all companies and across all sales bands under the US restricted information case.

The variable driving the error in this case is the estimate of the exercise price. As can be seen in the case of GWR Plc, where some of the options held are out of the money, the estimate of the average exercise price is too low. For GWR, the US estimate of the average exercise price was £1.46 compared to an actual weighted average exercise price of £1.71. This is because all of the out of the money options are by default assumed to have an exercise price equal to the ruling share price, which by definition is lower, than the exercise price of the out of the money option.

The underestimate of the exercise price results in the overestimate of the option value and its delta. Again, the T is overestimated, the average time to maturity in this group of options is still only 5.56. However, because the options are out of the money, the overestimate of T further increases the estimate of the option value and its delta and adds to the distortion in the PPS and total option valuation.

	No.	Share option Pay-Performance Sensitivity (%) (Full information)		Share option Pay-Performance Sensitivity (%) (US Restricted information)		Difference in means (t-statistic)
		Average	Median	Average	Median	
All Companies	130	0.1994	0.0854	0.2108	0.0968	-0.0115(4.43)
By Firm Sales (m)						
Less than £250	40	0.3500	0.2479	0.3697	0.2527	-0.0197(2.68)
£250 to £500	19	0.2187	0.0886	0.2246	0.1148	-0.0059(1.94)
£500 to £1,500	44	0.0976	0.0737	0.1054	0.0929	-0.0078(2.52)
Above £1,500	27	0.1284	0.0410	0.1377	0.0507	-0.0093(4.32)

	No.	Value of Stock of Share options (£000s) (Full information)		Value of Stock of Share options (£000s) (US Restricted information)		Difference in means (t-statistic)
All Companies	130	551.80	209.06	598.40	258.95	-46.61(6.07)
By Firm Sales (m)						
Less than £250	40	730.47	370.41	773.14	357.39	-42.67(3.01)
£250 to £500	19	316.85	155.31	350.43	178.71	-33.58(4.41)
£500 to £1,500	44	227.33	157.98	283.06	223.63	-55.73(3.91)
Above £1,500	27	981.18	219.43	1027.92	277.86	-46.74(2.42)

Table 5.4c: The Share Option PPS And Value Of Stock Of Options By Company Size: US Reporting System For Some Out Of The Money Options

The above results show that recent estimates of US pay-performance sensitivities and total option values by imposing a fixed time to maturity of 7 years across all options may have produced accurate results, but more by luck than judgement. The relatively large overestimates of the PPS variable for the one third of CEOs who hold some out of the money options is almost perfectly counterbalanced by smaller underestimates for the remaining two thirds of CEOs who hold only in the money options. The same is true for the valuation of the total stock of options held with the small under estimates in the majority of cases, balancing the larger overestimates in the minority of cases.

This is of course unlikely to remain true indefinitely. In particular, markets have been steadily rising over recent years resulting in fewer options being out of the money. As soon as the stock markets experience a significant downward trend, the number of CEOs holding out of the money options will rise and the balance will be lost. The result will be that estimates of the PPS and the total value of the stock of options derived from US data will be overestimates of the true figures.

5.4.3 UK Concise Disclosure Results

Table 5.5a turns to the results relating to the alternative, concise level of disclosure available in the UK. The prior analysis is replicated but now imposing the condition that companies only reveal the average exercise price and longest dated time to maturity. As before, the mean CEO option pay-performance sensitivity is 0.23% under full information and now 0.22% under UK restricted information. The final column in Table 5.5a indicates that the difference in option pay-performance means is statistically significant for all companies and indeed the differences in the PPS term are significant across all the sales bands with the PPS under full information being consistently higher than that under restricted information. The differences in the share option pay-performance terms are also seen in Figure 5.2.

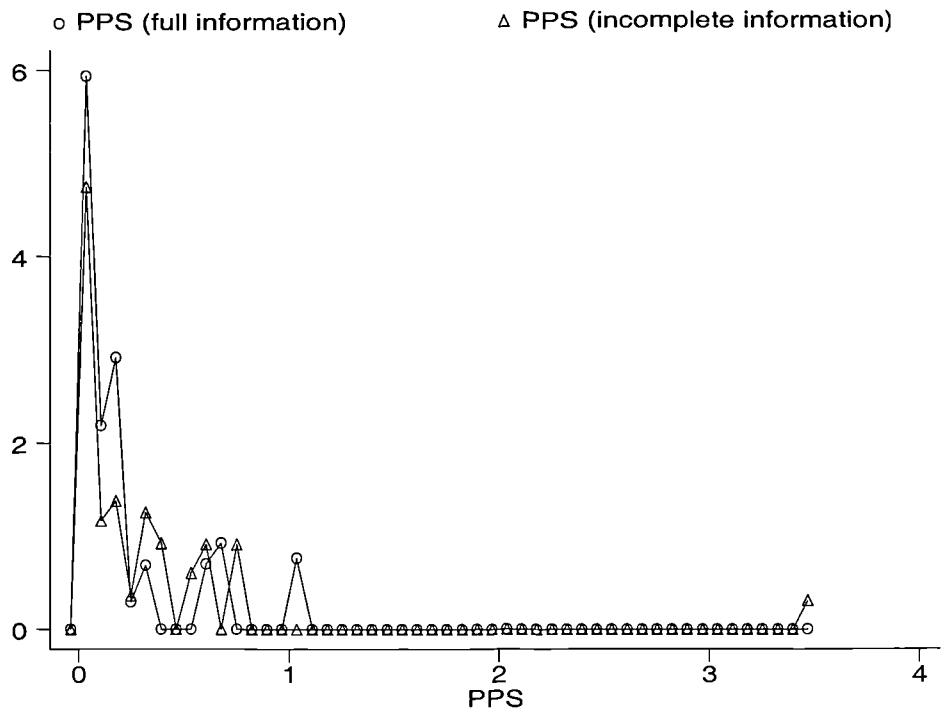

Figure 5.2: Share Option Pay-Performance Sensitivity Calculated Under Full And Restricted UK Information

Again the results show that independent of the method of disclosure, option pay-performance sensitivities are negatively correlated with firm size. The mean (median) PPS in the restricted information case falls from 0.38 (0.22) for firms with sales of less than £250 million to 0.09 (0.03) for firms with sales in excess of £1500 million.

The lower half of Table 5.5a details the valuation of the stock of share options under the full and restricted information cases. The mean (median) value of the share options using complete information for all companies is £732K (£275K). The equivalent figures for the restricted information case are £736K and £292K. In all size bands the difference in valuing the share options according to the full or restricted information case is small and insignificant. The data indicates

that the valuation of the stock of share options is not sensitive to using the concise level of disclosure.

	No.	Share option Pay-Performance Sensitivity (%) (Full information)		Share option Pay-Performance Sensitivity (%) (UK Restricted information)		Difference in means (t-statistic)
		Average	Median	Average	Median	
All Companies	362	0.2309	0.0954	0.2243	0.0944	0.0067(5.47)
By Firm Sales (m)						
Less than £250	131	0.3910	0.2236	0.3800	0.2236	0.0110(3.67)
£250 to £500	63	0.2124	0.1065	0.2046	0.0991	0.0078(3.43)
£500 to £1,500	92	0.1331	0.0772	0.1300	0.0785	0.0031(2.40)
Above £1,500	76	0.0888	0.0282	0.0862	0.0288	0.0026(3.73)
	No.	Value of Stock of Share options (£000s) (Full information)		Value of Stock of Share options (£000s) (UK Restricted information)		Difference in means (t-statistic)
All Companies	362	732.24	274.84	736.19	291.68	-3.94(0.86)
By Firm Sales (m)						
Less than £250	131	841.35	345.52	841.84	349.04	-0.49(0.05)
£250 to £500	63	432.27	204.67	444.92	202.56	-12.65(1.22)
£500 to £1,500	92	480.88	229.66	497.31	252.29	-16.43(2.39)
Above £1,500	76	1097.13	324.72	1084.69	328.84	12.44(1.63)

Table 5.5a: The Share Option Pay-Performance Sensitivity And Value Of Stock Of Share Options By Company Size: UK Reporting System

Overall, the imposition of UK restricted information on the entire data set, has resulted in significant distortions in the calculation of the pay-performance term but not in the valuation of the stock of share options. Just as in the US case, the companies are once again divided into those where the CEO holds only in the money options and those where the CEO holds some out of the money options.

	No.	Share option Pay-Performance Sensitivity (%) (Full information)		Share option Pay-Performance Sensitivity (%) (UK Restricted information)		Difference in means (t-statistic)
		Average	Median	Average	Median	
All Companies	232	0.2486	0.1089	0.2406	0.1051	0.0080(4.61)
By Firm Sales (m)						
Less than £250	91	0.4090	0.2175	0.3945	0.2133	0.0145(3.51)
£250 to £500	44	0.2097	0.1078	0.2027	0.0980	0.0069(3.75)
£500 to £1,500	48	0.1657	0.0942	0.1631	0.0865	0.0025(1.42)
Above £1,500	49	0.0670	0.0164	0.0648	0.0157	0.0022(3.96)
	No.	Value of Stock of Share options (£000s) (Full information)		Value of Stock of Share options (£000s) (UK Restricted information)		Difference in means (t-statistic)
All Companies	232	833.36	340.21	831.09	337.70	2.26(0.43)
By Firm Sales (m)						
Less than £250	91	890.09	343.49	883.77	334.37	6.31(0.64)
£250 to £500	44	482.11	215.13	492.38	209.09	-10.27(0.71)
£500 to £1,500	48	713.29	415.93	720.57	416.29	-7.28(0.85)
Above £1,500	49	1161.02	511.18	1145.67	499.27	15.35(2.15)

Table 5.5b: The Share Option PPS And Value Of Stock Of Options By Company Size: UK Reporting System For Only In The Money Options

The results for the in the money option holds are shown in Table 5.5b. They follow a similar pattern to those in Table 5.4b, that is the PPS is significantly under estimated in the restricted case whereas the differences in the valuation of the stock of options is small and again generally not significant. This is unsurprising since as in the US case, the mispricing is once again mainly due to the over estimate of T.

Finally, Table 5.5c shows the differences caused by the UK concise reporting system for the out of the money option holders. The results do show that for all firms the PPS is significantly underestimated, a pattern repeated across all

sales bands, although the difference is only significant in the two largest sales bands. Total option values are slightly over estimated, but again not significantly in most cases. This differs from the results in table 5.4c because in the UK case, the estimate of the average exercise price is accurate irrespective of whether the options are in or out of the money.

	No.	Share option Pay-Performance Sensitivity (%) (Full information)		Share option Pay-Performance Sensitivity (%) (UK Restricted information)		Difference in means (t-statistic)
		Average	Median	Average	Median	
All Companies	130	0.1994	0.0854	0.1950	0.0806	0.0043(3.08)
By Firm Sales (m)						
Less than £250	40	0.3500	0.2479	0.3469	0.2385	0.0030(1.19)
£250 to £500	19	0.2187	0.0886	0.2089	0.1005	0.0098(1.55)
£500 to £1,500	44	0.0976	0.0737	0.0939	0.0759	0.0037(1.98)
Above £1,500	27	0.1284	0.0410	0.1249	0.0425	0.0034(1.99)
	No.	Value of Stock of Share options (£000s) (Full information)		Value of Stock of Share options (£000s) (UK Restricted information)		Difference in means (t-statistic)
All Companies	130	551.80	209.06	566.82	220.43	-15.02(1.77)
By Firm Sales (m)						
Less than £250	40	730.47	370.41	746.44	367.61	-15.98(0.73)
£250 to £500	19	316.85	155.31	335.01	175.42	-18.16(3.24)
£500 to £1,500	44	227.33	157.98	253.75	178.03	-26.42(2.43)
Above £1,500	27	981.18	219.43	974.03	220.05	7.15(0.41)

Table 5.5c: The Share Option PPS And Value Of Stock Of Options By Company Size: UK Reporting System For Some Out Of The Money Options

Thus under restricted information in the UK, the PPS term is underestimated for the CEOs who hold only in the money options, just as it is under US disclosure conditions. However, unlike in the US, the PPS estimate of out of the money option holders are not overestimated and hence there is no cancelling out of the two mispricing effects. This explains why as a whole there are significant differences in the PPS term under UK restricted information conditions and not under US conditions.

5.5 Concluding Remarks

This chapter has considered the current levels of CEO share option holdings under in the UK. Using data on 510 CEOs for fiscal year 1997/8 it has demonstrated a number of features relating to the valuation and incentives arising from UK executive share options.

First, taking all companies together the US reporting system does not significantly affect the valuation of the stock of share options nor the estimated PPS. However, this is the result of two mispricing errors which work in opposite directions and currently cancel each other out. The PPS term is underestimated for holders of in the money options because of the errors in estimating the time to maturity of the options. However, the PPS term is significantly overestimated for the smaller number of CEOs who hold out of the money options, because of errors in the estimate of the average exercise price. A similar pattern is observed in the valuation of the stock of options held, although the distortions are of a smaller magnitude.

The results for the concise form of UK disclosure are somewhat different. The PPS term for the whole data set is now underestimated as a result of the restricted disclosure conditions. This is because the underestimate of the PPS term for the in the money option holders is no longer counterbalanced by an overestimate in the estimate for the out of the money holders. This is because, unlike in the US case, in this latter case there is no error in the estimate of the average exercise price.

To conclude, UK restricted information results create errors in the estimate of the PPS term mainly as a result of errors induced by inaccuracies in the time to maturity (T) variable. This error is likely to persist in the same direction, as long as the current concise disclosure convention is maintained. In contrast, the US restricted information results, currently produce no significant errors in the estimate of the PPS term, nor the valuation of the stock of options. However, this is unlikely to persist. In the event of a downturn in the market, or the increased use of premium options (see Chapter Seven), both of which will result in an increase in the number of out of the money option holders, estimates of the PPS and the value of the stock of options will become exaggerated.

Chapter Six

Corporate Tournaments & Executive Compensation

6.1 Introduction

As documented in Chapter Two, the empirical determination of executive pay has attracted considerable academic attention from economists (Conyon, Gregg and Machin, 1995; Hallock and Murphy, 1999; Jensen and Murphy, 1990b; Murphy, 1999). It has also emerged as an issue of crucial importance in the strategic management literature (Balkin and Gomez-Mejia, 1990; Finkelstein and Hambrick, 1988; Gomez-Mejia, Tosi and Hinkin, 1987). Traditionally, the main issues have involved identifying the hypothesised positive relationships between executive pay, company performance and firm size (see Murphy, 1999).

Another stream of research has centred on tournament theory. This predicts that executives will exert effort in order to be promoted to a better-paid job position. An important implication of this work is that the structure of compensation is central to the understanding of wage setting in the boardroom. Consequently, it is impossible to tell whether a particular CEO is over (or under) paid simply by relating CEO pay to measures of output and performance. Instead, it is important to look at the structure of the within company pay distribution and attempt to evaluate its incentive properties (Lazear, 1995).

Tournament models however, have received far less empirical investigation and none relate to the UK. The intention of this chapter is to test the predictions of tournament theory that have appeared in the literature for a sample of UK firms. The research is informed by tests carried out by Eriksson (1999), Lazear (1995), Main, O'Reilly and Wade (1993) and reviewed by Prendergast

(1999). In particular this chapter tests three tournament propositions. Firstly, do wages rise in a convex manner as one moves up the corporate hierarchy? Secondly, is the prize for becoming CEO increasing in the number of competitors for the job? Finally, is wider boardroom pay dispersion associated with higher company performance?

The UK evidence provides an evaluative benchmark by which to assess other international research on tournaments. For instance, although the UK and US governance systems are similar they are not identical. Important recent changes in corporate governance arrangements in the UK, ushered in since the Cadbury Committee (1992) report, mean that board structures are different between the two economies, for example UK company boards now usually do not combine the posts of CEO and chairman. This may have implications for the operation of corporate tournaments.

This chapter makes a number of contributions to the existing tournament literature. First, it presents UK evidence on the operation of tournaments. Second, it uses a measure of total compensation (i.e. cash remuneration plus stock based compensation) for each named executive on the company board. This overcomes a weakness of most UK compensation research that has typically focused only on the non-named job position of 'highest paid director'. Also prior empirical tournament research ignored the importance of stock-based executive pay and did not consider a Black-Scholes valuation of stock options in the compensation variable. Finally it also considers for the first time the within firm

distribution of the pay-performance sensitivity derived from holdings of share options.

The remainder of this chapter is organised as follows. The next section considers incentives and tournament theory and underpins the formulation of the subsequent empirical hypotheses. This is followed by the methods section, which outlines the sample and the data. The main results are presented in Section 6.4 while Section 6.5 considers the within firm distribution of the pay-performance sensitivity. The chapter closes with summary conclusions.

6.2 Incentives And Empirical Tests Of Tournament Theory

This section build on the work presented in Chapter Two and outlines some theories of compensation which inform the subsequent empirical work. The analysis is based on Milgrom and Roberts (1992) and Lazear (1995).

6.2.1 Linear Compensation Contracts

A key hypothesis in the empirical literature on the determination of directors' pay is the supposed positive association between compensation and company performance. The empirical work is typically motivated by agency considerations. As illustrated in Chapter Two, a simple agency model defines a risk neutral principal (shareholders) who seeks to design an optimal wage contract to motivate a risk averse agent (managers) in the presence of asymmetric information. To recap, company performance, denoted Π, depends on the manager's effort level a and. a chance random variable ε.

The model assumes that managerial effort is private information. The profit function is non-separable in a and ε and accordingly a contract which relates agent income, W, to effort, a, is not enforceable. Instead, one solution to the latent agency problem is to relate managerial compensation to profits (Lazear, 1995). This is often supposed to be a linear function of Π and so can be written as:

$$\Pi = f(a, \varepsilon)$$

$$W = a + b\Pi \qquad (6.1)$$

The model is characterised by a trade-off between incentives and insurance (see, Hart, 1995). To induce high effort the contract offered to the agent should specify high powered incentives (i.e. managerial compensation, W, should be sensitive to company performance, Π). Agency theory is concerned with finding the optimal trade-off between efficiency and risk-sharing.

Empirical models of executive compensation determination typically added a stochastic error term to equation (6.1) and used appropriate estimation techniques (i.e. panel fixed effects) to determine the size of b (see Murphy, 1985, p.22-25). Estimates of b have typically been found to be low or, indeed, difficult even to isolate (see Conyon, Gregg and Machin, 1995). This may be interpreted as low power of the underlying incentive contract. However, there are some other potential explanations of why it has been difficult to isolate a robust link between pay and performance, particularly in the UK. Firstly, it is not clear that the pay variable has been appropriately measured. For instance, Main et al (1996) stress

that most UK studies ignore the role of share options in the pay contract. When this is accounted for (using a Black-Scholes valuation method) the pay-performance correlation becomes quantitatively much stronger (Conyon and Murphy, 1999; Hall and Liebman, 1998).

Secondly, the unit of observation in these studies has been the 'highest paid director'. This may not correspond to the CEO and may lead to significant jumps in the pay time series. Also, the relationship of b to a formal economic model and hence interpretation is ambiguous. However, these points not withstanding there may be other reasons to suppose that pay and performance may not be correlated. One of those factors is the role played by tournament theory.

6.2.2 Tournament Theory And Incentives

Tournament models are premised on the notion that motivation is produced not by an absolute reward, but by compensation that is based on relative comparisons (Lazear, 1995). The managerial labour market is a good example: managers are often rewarded on the basis of being better than their peers, not necessarily for being good. An implication is that one cannot say whether a particular executive is "over-paid" simply by looking at individual performance (see Lazear, 1995; Lazear and Rosen, 1981; Rosen, 1986).

For simplicity consider a stripped down version of the Lazear-Rosen tournament model. A firm has two employees and two job slots (boss and worker). The two employees compete with one another, the loser gets the worker job while the winner becomes the boss. The overall prizes are fixed in advance

with the winner receiving W_1 and the loser W_2. The probability of winning the contest depends on the level of effort that each contestant exerts together with a random shock component. Denoting the individuals as j and k then:

$$q_j = \mu_j + a_j$$

$$q_k = \mu_k + a_k$$

where q_j and q_k are individual output; μ_j and μ_k is the effort levels of the respective individuals and a_j and a_k are the white noise chance factors. Dealing with the individual labour supply decision first, each individual wants to maximise their expected payoff. Looking first at employee j, the problem then is;

$$\text{Max } (\mu_j): \; PW_1 + (1 - P)W_2 - C(\mu_j)$$

where P is the probability of j winning and $C(\mu_j)$ is a convex cost of effort function, i.e. the monetary value associated with a particular level of effort. The first order condition for j is thus:

$$(W_1 - W_2)\partial P/\partial \mu_j - \partial C/\partial \mu_j = 0 \qquad (6.2)$$

There is a corresponding problem for employee k. Employee j wins the contest if he produces more output than employee k, that is j wins if $q_j > q_k$. The probability that j wins is therefore given by:

$$P = \text{prob}(q_j > q_k) = \text{prob}(a_k - a_j < \mu_j - \mu_k)$$

$$= \text{prob}(\mu_j - \mu_k > a_k - a_j) = G(\mu_j - \mu_k)$$

where G is the distribution function on the random variable $a_k - a_j$. Also, note that $\partial P/\partial \mu_j = \partial G(\mu_j - \mu_k)/\partial \mu_j = g(\mu_j - \mu_k)$. However, since individuals j and k are *ex ante* identical there is a symmetric Nash equilibrium where j and k choose the same effort level thus $\mu_j - \mu_k = 0$ and so equation (6.2) can be written:

$$(W_1 - W_2)g(0) = \partial C/\partial \mu_j \qquad (6.3)$$

Now consider the optimal wage chosen by the firm given the labour supply decision characterised by equation (6.3). Lazear (1995 p.30-31) demonstrates that the average wage necessary to attract employees to the firm and the optimal wage spread are given by:

$$(W_1 - W_2) / 2 = C(\mu)$$

$$(W_1 - W_2) = 1 / g(0)$$

Tournament models, together with equation (6.3), have some testable implications. First, an increase in the wage spread, $W_1 - W_2$, implies a higher equilibrium effort since $C(\mu)$ is convex. So a bigger rise in the pay gap will induce workers to compete harder for promotion. Furthermore, the absolute level of the prize does not affect effort, if both prizes rise by the same amount so the

prize differential remains unchanged then the effort level will also remain unchanged.

The intuition is that the value of winning is not only the prize at that level, but also the possibility to compete for larger prizes at higher levels. However, the higher up the organisational hierarchy the individual moves, the smaller the opportunity for promotion becomes since there are fewer and fewer positions to move into. One substitute for the loss of the chance to compete further is higher current compensation. In consequence, tournament models predict that compensation is an increasing function of organisational level (Lambert *et al.* 1993; Main *et al.* 1993). Indeed, Rosen (1986: p701) comments "The extra weight of rewards at the top is due to the no tomorrow aspects of the final stage of the game." This yields the following hypothesis.

Hypothesis 1: Tournament models predict a convex relationship between executive compensation and organisational level.

Second, tournament models predict that the tournament prize is increasing in the number of competitors (see Eriksson, 1999; Lambert *et al.* 1993; Main *et al.* 1993; O'Reilly *et al.* 1988; Prendergast, 1999). Each tournament participant implicitly gives up some of the expected salary associated with his marginal product or performance. This excess then becomes part of the overall tournament prize. As O'Reilly *et al.* (1988: 261) remark: "Given this fact, then it should follow that, in general, the more players in the tournament, the larger the prize should be. In an organisational context, this should mean that, after controlling for

other possible economic determinants of CEO compensation, the more vice presidents, the larger should be the observed gap between the CEO's salary and bonus and those of the vice presidents." This provides the second hypothesis.

Hypothesis 2: Tournament models predict that the tournament prize (gap) and the number of contestants are positively correlated.

Third, tournament models have implications for the effect of within company wage variation on corporate performance (Eriksson, 1999; Main *et al.* 1993). Theoretical tournament models argue that to induce effort by agents a relatively large prize (i.e. a gap or variation in wages) is required. If a large prize (wage gap) induces higher effort by executives then standard productivity models suggest that this should be reflected in higher outputs and performance. This suggests a positive relationship between company performance and wage spread or variation between tournament players. In line with prior research then, the following hypothesis is tested.

Hypothesis 3: Tournament models predict that corporate performance is positively correlated with executive wage dispersion.

However, since the tournament outcome depends simply on being better than the other contestants then winning can be achieved by either a) being more productive than a co-worker or b) undermining or sabotaging co-worker efforts. As Eriksson (1999) makes clear, the senior management of a firm often act as a

team performing highly interdependent work, and so paying executives in a tournament like fashion can lead to undesirable effects.

The problem arises because individuals are rewarded on how they do relative to others. Thus, they may be less likely to help others, or may even sabotage the efforts of co-workers engaging in so called "hawkish" behaviour. Lazear (1995: p36), for instance, concludes that: "Since the upper ranks of the organisation tend to be dominated by Hawks, it pays to sacrifice some effort in order to prevent these extremely competitive individuals from killing each other off." The implication is that pay compression can potentially reduce sabotage incentives, and so raises output and performance by making board members behave in a more co-operative manner. As Main *et al.* (1993) discuss, the effects of pay compression and pay dispersion in the boardroom are both theoretical propositions that require empirical testing.

A number of theoretical papers have demonstrated that tournaments possess properties that allow principals to ensure that agents expend the "correct" or optimal amount of effort. For instance, Prendergast (1998) shows that effort expended by tournament participants (the agents) is increasing in the size of the prize and in the efficiency of monitoring. See also Baker, Jensen and Murphy, 1988; Lazear, 1995; Lazear and Rosen, 1981 and Dye, 1984 for insights and limitations of tournaments.

Empirical research on tournament theory has been limited, although strong support for it has been found for it in a sporting setting. Ehrenberg and Bognanno

(1990) looking at professional golfers and Becker and Huselid (1992) looking at professional NASCAR drivers, both report results in favour of tournament theory. A further example is Fernie and Metcalf (1996), they undertook an empirical test based on the pay and performance of an unbalanced panel of 50 jockeys over a period of eight years. The transparency of not only the pay but more importantly the performance of the jockeys made the pay-performance link much easier to observe. Jockeys are usually paid a percentage of any winnings, and their opportunity to win, that is the number of rides they are offered, depends on their reputation and standing. Fernie and Metcalf conclude that the existence of this, almost "ideal" payment system does improve the level of effort and hence the performance of the riders when compared to other non-performance related compensation packages.

Empirical tests of tournament theory in a business context have also received comparatively little attention. Exceptions documented in Chapter Two, include Lambert, Larcker and Weigelt (1993), O'Reilly, Main and Crystal (1988) Main *et al.* (1993) using US data for the 1980s and Eriksson (1999) using Danish data for the 1990s. None of these studies consider a "total" executive compensation measure by calculating a Black-Scholes valuation of stock options grants (although Lambert *et al.* (1993) do use an approximate valuation procedure). The analysis below uses UK data for the late 1990s. It makes a methodological step forward by using a cash compensation measure and a variable that includes the valuation of current stock option grants.

The UK context also differs from the US in a number of important respects. First, the position of CEO and chairman are increasingly not combined in the UK (Conyon and Peck, 1998a) unlike in the US where the two roles are typically still held by a single individual. Second, boards in the UK tend to be smaller than in the US (Conyon and Peck 1998b). Third, the mix between inside (executive) and outside (non-executive) directors is approximately equal in the UK (Conyon and Peck, 1998a) whereas in the US, executives dominate the board. Given these international differences in board arrangements, which occur within essentially similar governance systems, it is important to evaluate whether the tournament process is empirically valid in a UK context.

6.3 Data And Measures

As noted in Chapter Three (Section 3.1.2), the sample of companies used in this chapter represents a subset of the main data set. The sections below describe this sample along with the specific variables used in the analysis.

6.3.1 Sample

The sample consists of 105 companies drawn from the 250 largest UK stock market companies in 1997-98. These companies account for 68% of the market value of all companies on the London Stock Exchange (at the selection date) and are distributed across the six main stock exchange sectors. A crucial data requirement in order to test tournament models is the pay information for all directors within a company. Such data has not been available to UK researchers until very recently. The recommendations of the Greenbury (1995) report and the

subsequent additions to the listing rules of the London Stock Exchange, requires UK listed companies to detail information on the pay of each named director separately. The available data is thus now sufficient to move beyond simple cash compensation measures and now allows an estimate of the value of stock options and other non-cash elements of pay to be included

The director compensation data is augmented by individual director data (for controls) on age and other cross board membership. Company level data, such as performance and size, was also added from Datastream. The final data set contains information on 1170 executive and non-executive directors. There are 552 executive (inside) directors and 618 non-executive (outside) directors confirming that boards of UK companies are approximately evenly split in their outsider-insider representation.

The average size of the company board is 11 (ranging from 6 to 22). Average shareholder return in the sample is 15%, whereas mean return on capital employed is approximately 27%. The empirical tests of tournament theory that follow are based on the 552 executives at 105 companies for the year 1997-98. However, a few observations in the regressions that follow are lost due to occasional missing data points. The average age of an executive in the data set is 52 years. Also, one out of every two executives holds at least one other off-board directorship.

6.3.2 Measures

Executive compensation: Two measures of compensation are used. The first is the total cash compensation received by an executive director as reported in the annual company accounts. This variable includes salary, bonus, and benefits where appropriate and is denoted *cash compensation*. This is the measure used widely in the executive compensation literature and that used by Eriksson (1999) and O'Reilly *et al.* (1988) to test tournament models.

The second measure includes the cash compensation measure noted above, but also includes the value of any options granted during the year along with any other non-cash elements of pay such as shares allocated under a long term incentive plan (LTIP). The grants of options are valued using the Black-Scholes (1973) pricing formula adjusted for continuous dividends (see Section 2.4.1). LTIP grants are valued at the year-end market price using a probability factor that the award will vest in full. The sum of all these components is called *total compensation* below. Prior research on tournament models, in a business context, typically do not focus on such a total compensation measure.

Performance (total shareholder return): Lambert *et al.* (1993) amongst others (see Murphy, 1999) argue that compensation and performance should be linked due to agency cost reasons. In the executive compensation equations corporate performance is measured as total shareholder return. This reflects share price appreciation plus the value of dividends on a continuously reinvested basis. Such market based measures have been widely used (e.g. Hambrick and Finkelstein, 1995; Jensen and Murphy, 1990b).

Size (total capital employed): Executive compensation equations universally control for measures of company size (e.g. Finkelstein and Hambrick, 1988; Jensen and Murphy, 1990b). This is measured as (log) total capital employed.

Age: Hill and Phan (1991) identify a number of human capital proxies as important for explaining executive pay. In the data, therefore, to proxy for experience, the age of the executive is included as disclosed in the annual report.

Multiple board membership: Executives can hold more than one board position. Booth and Deli (1996) argue that outside directorships may represent value increasing opportunities for the firm (for example, through exposure to different management styles). Controlling for these quality differences, superior reputation and ability of executives may be important. Conversely, Hallock (1997: p332) claims that CEOs on reciprocally interlocked boards may have "both the incentive and opportunity to raise each other's pay". In the data therefore, the control variable is defined as the number of board positions held by the executive at other UK listed companies.

Hierarchical level (job position): The discussion of tournament models has highlighted the importance of hierarchical level in explaining wage outcomes and incentives. Allocating job levels to executives is a difficult and fuzzy task in the UK. For instance, other than the CEO, there is no agreed seniority ranking of other executives on the board. A dummy variable equal to one for the job position of CEO and zero for all other non-CEO executives is included.

6.4 Analysis And Findings

Tournament theory (hypothesis 1) predicts a convex relationship between managerial compensation and hierarchical level. Focusing firstly on the raw (unconditional) executive compensation data.

	Median cash compensation	Mean [sd] cash compensation	Median total compensation	Mean total compensation [sd]
Chief executive officer (CEO)	522,000	592,653 [339935]	728,963	916,229 [767546]
Other executive directors	305,000	389,287 [288455]	438,121	564,328 [475791]

Notes:
Cash compensation includes salary, bonus and other benefits.
Total compensation is cash compensation plus the value of options and LTIP grants

Table 6.1: Executive Compensation In UK Corporate Boards 1997/8 (£)

The results presented in Table 6.1 indicate that CEOs in large UK companies receive median cash compensation equal to £522,000. Other executives receive median cash compensation of £305,000 implying that CEOs receive about 1.71 times other board members. In terms of total pay, CEOs receive £728,963 compared with £438,121 for other executives implying a similar order ratio of 1.66. The evidence thus appears consistent with hypothesis 1, with extra compensation weight placed on the most senior executive position.

The results of the multivariate regression analysis and a direct test of hypothesis 1, are presented in Table 6.2. The coefficient on the CEO indicator variable is positive and significant under both compensation measures, ranging from 0.46 to 0.48 indicating that CEOs receive a compensation premium. This

result is established, regardless of the measure of compensation and also after controlling for individual, firm and industry characteristics. The data is thus consistent with hypothesis 1.

	Log(cash compensation)	Log(total compensation)
Shareholder return	0.2581♣	0.4555♣
	(0.1209)	(0.1409)
log(total capital employed)	0.0974**	0.1197**
	(0.0233)	(0.0263)
Executive age	0.0163**	0.0070
	(0.0040)	(0.0048)
log(multiple board membership)	0.2143**	0.2422**
	(0.0552)	(0.0552)
CEO job position	0.4577**	0.4757**
	(0.0524)	(0.0524)
Observations	521	521
Industry dummies	Yes	Yes
Overall R^2	0.3151	0.2681

Notes:
♣ <p0.10; *p<0.05; **p<0.01. Robust standard errors reported in parentheses.
All regressions contain a constant.

Table 6.2: The Determination Of Executive Compensation

The other control variables are also of interest outside the direct area of tournament theory. The shareholder return variable is typically significant. Of more importance, however, is the difference between the shareholder return estimates for the two compensation measures. The estimated coefficient is quantitatively larger on the total compensation measure (0.46) compared to the cash pay measure (0.26). The compensation size elasticity is in region of 0.10 which is consistent with other non-UK based research (see Murphy, 1999). The

age variable is positively signed and significant for the narrower pay measure. Finally, the multiple board membership variable is also positive and significant under both pay measures.

Hypothesis 2 predicts that the prize for winning is increasing in the number of competitors. Two measures of the prize or gap are calculated. The first is the log of CEO cash pay minus the log of average cash compensation received by the executive team. The second wider measure, is the log of CEO total pay less the log of average total compensation received by the executive team. This is the procedure used by Eriksson (1999), Main *et al.* (1993) and O'Reilly *et al.* (1988).

	Log(CEO cash compensation) - log (average executive cash compensation)	Log(CEO total compensation) minus log(average executive total compensation)
Log (total capital employed)	0.0012 (0.0157)	-0.0141 (0.0209)
Number of directors in the executive team	0.0357** (0.0088)	0.0297* (0.0117)
Observations	104	104
Industry dummies	Yes	Yes

Notes:
♣ <p0.10; *p<0.05; **p<0.01. Standard errors reported in parentheses.
All regressions contain a constant.

Table 6.3: The Effect Of Tournament Contestants On The Tournament Prize

The results are contained in Table 6.3 and indicate that after controlling for company size and industry effects that there is a positive relationship between the size of the prize (gap) and the number of executives. Dependent upon the measure

of the tournament prize used, the addition of each executive raises the gap by either 3.0% or 3.6%. The evidence then is consistent with hypothesis 2, namely that more competitors are associated with an increased prize for becoming CEO.

To test hypothesis 3 the procedure followed by Main *et al.* (1993) and Eriksson (1999) to estimate the relationship between company performance and wage variation is used. The performance measures are return on assets and total shareholder return. The coefficient of variation of the board's executive compensation is also constructed (this too is in line with Main *et al.* 1993 and Eriksson, 1999). There are no proxies for the degree of inter-dependence of executive team members (as in Main *et al.* 1993 or Eriksson, 1999) thus instead the relationship between performance and wage variation is tested.

	Shareholder return	Return on assets
Coefficient of variation of executive team compensation	0.0876 (0.1231)	-16.3982 (14.6583)
Log(total capital employed)	0.0242 (0.0222)	-11.9144* (4.1671)
Observations	99	99
Industry dummies	Yes	Yes
Overall R^2	0.2175	0.2617

Notes:
♣<p0.10; *p<0.05; **p<0.01. Robust standard errors reported in parentheses.
Left hand side variables are shareholder return and return on assets separately
All equations contain a constant.

Table 6.4: Regression Of Shareholder And Asset Returns On Wage Variation Within The Executive Team

The performance determination results are given in Table 6.4. Each model contains, in addition to the compensation dispersion variable, a size control and

industry dummies (6 companies are omitted due to lack of data). The size variable attracts a negative and significant value in the return on assets equation. However, the results indicate that wage dispersion does not have a robust positive or negative effect on corporate performance.

6.4.1 Discussion Of Hypothesis Results

To date, this chapter has examined the determination of executive compensation in 105 leading UK companies. These results were predicated by the theory of tournaments and tested using two measures of pay reflecting both direct cash compensation and total compensation which includes cash and non-cash measures (i.e. the value of current share option grants and current long term incentive plan allocations).

The results are easily summarised and are broadly consistent with other studies. The first test was whether there is a convex relationship between executive compensation and hierarchical level and also whether the tournament prize varies positively with the number of competing participants. Tournament models predict these results and the empirical findings support them. Conditional on other factors, (company size, sector, executive age and board interlocks) obtaining the CEO job slot (or winning the tournament) commands around 47% pay premium relative to other executives. This result is slightly larger than in Eriksson (1999) where the change in reward from moving from vice president to CEO in Danish firms is found to be 37.2%.

Also consistent with tournament theory notions, the results show the addition of each executive raises the tournament prize gap by approximately 3%. The result is very similar to Main *et al.* (1993) who estimate a 3% effect and Eriksson (1999) who estimates a 2% effect. This is established for both for the cash compensation measure used in prior tournament research and the wider pay measure also used here. The quantitative impact of additional members of the executive team is similar for both gap measures. However, the results do contrast with O'Reilly *et al.* (1988: 270) who find that the greater the number of vice presidents the smaller the difference between CEO salary and that of the vice presidents. They argue that their evidence is "exactly opposite to the result predicted by tournament theory".

Finally, the impact of the within company executive pay distribution on corporate performance was tested. Previous US research has found that wider pay distributions imply higher equilibrium levels of effort and consequently higher performance. However, it is possible that this wider pay variation could encourage uncooperative behaviour. In line with some other recent research, the impact of wage variation on corporate performance was tested (see Eriksson, 1999; Lazear, 1995; O'Reilly *et al.* 1988). The results indicate that wage dispersion does not have a robust positive effect on corporate performance.

These results contrast with Main *et al.* (1993) who find a positive effect on the coefficient of variation on return on assets in US firms but no effects on shareholder return. Similarly, Eriksson (1999) finds that the coefficient of pay variation has a positive effect on a performance index in a sample of Danish firms.

The difference between the results and those found in the US and Denmark maybe attributable to a number of factors including the fact that the data does not have a measure of executive inter-dependence which prior studies have included. Clearly, future UK tournament research might focus on this measurement issue.

6.5 Distribution Of Within Firm Pay-Performance Sensitivity

The above analysis has considered the within company distribution of various compensation measures. The following section now focuses instead, on the incentives faced by executives. Just as tournament theory predicts a within firm variation in compensation, variation is also possible within the overall pay-performance sensitivity of company directors. Theory would predict that those at the top of the executive hierarchy would require greater pay-performance incentives since they lack the added incentive of further promotions.

Pay-performance sensitivities are derived from holdings of share options. As described in Chapter Five, incentives from holding options are calculated as the slope of the Black-Scholes function (the option delta) multiplied by the fraction of the total holding of outstanding options on common equity expressed as a percentage. The resulting statistic, the pay-performance sensitivity, provides a measure of how director option wealth varies for given changes in shareholder wealth (see Jensen and Murphy, 1990b)

Table 6.5 shows the median and mean pay-performance sensitivities in the 105 companies. At the median, the pay-performance sensitivity is nearly 2.3 times

as big for the CEO as it is for the other executive directors on the board, and 2.7 times at the mean.

	Median Pay-Performance Sensitivity	Mean [sd] Pay-Performance Sensitivity
Chief executive officer (CEO)	0.0167	0.0410 [0.0889]
Other executive directors	0.0073	0.0150 [0.0242]

Table 6.5: Pay-Performance Sensitivities In UK Corporate Boards 1997-98

These results are consistent with career concern ideas. Non-CEO executives require less direct incentive from compensation since they also have the added incentive of trying to achieve the top position. In contrast, CEOs have no incentive in terms of promotion and thus require larger incentives from pay.

The determinants of the pay-performance sensitivity are shown below. Controlling for size and industry effects, the coefficient of the CEO indicator variable is positive and significant showing that the CEOs have a pay-performance premium over other executive directors. The coefficient on total capital employed is negative indicating that larger firms have lower pay-performance sensitivities. This is consistent with the results presented in Chapter Five and is a consequence of CEOs in larger firms owning a smaller fraction of the total outstanding equity of their firm than CEOs in smaller firms.

	Pay-Performance Sensitivity
Chief Executive Office	0.02574**
	(0.0088)
log(total capital employed)	-0.0100**
	(0.0028)
Executive age	-0.0005
	(0.0025)
Executive age^2	0.000002
	(0.0002)
Observations	540
Industry dummies	Yes
Overall R^2	0.1498

Notes:
♣ <p0.10; *p<0.05; **p<0.01. Robust standard errors reported in parentheses. All regressions contain a constant.

Table 6.6: The Determination Of Director Pay-Performance Sensitivity

The standard regressions yield a coefficient on the age variable that is just negative and not significant even at the 10% level. Table 6.7 below however gives robust regression estimates. This regression performs an initial screening to eliminate outliers[20]. In this case age becomes a significant variable, with a positive coefficient, while age squared has a negative coefficient indicating a concave relationship between the pay-performance sensitivity and age.

[20] Robust regressions use Stata rreg function: This begins by estimating the regression, calculating Cook's D and excluding observations where D>1. It then works iteratively performing a regression, calculating weights based on absolute residuals and then regressing again using those weights until the changes in weights drop below the desired tolerance.

	Pay-Performance Sensitivity
Chief Executive Office	0.00453**
	(0.00132)
log(total capital employed)	-0.00267**
	(0.00050)
Executive age	0.00158*
	(0.00069)
Executive age^2	-0.00001*
	(0.00001)
Observations	540
Industry dummies	Yes

Notes:
♣ <p0.10; *p<0.05; **p<0.01. Standard errors reported in parentheses.
All regressions contain a constant.

Table 6.7: The Determination Of Director Pay-Performance Sensitivity - Robust Regressions

A possible explanation for this relationship is as follows. The option holding characteristics of the typical director can be split into three separate phases. Firstly, as the director proceeds up the executive ladder he receives additional and bigger grants of options, slowly building up a large stock of unexercised options. During this phase the pay-performance sensitivity is increasing. The next stage is when the limit recommended by the ABI is reached[21] During this stage the director can only receive further options when old options are exercised or lapsed, the result is that the pay-performance sensitivities stabilise. The final stage is as the director approaches retirement. Executive options lapse when a director leaves the company, thus as the director approaches this watershed he begins to unwind his holding of options, exercising more

[21] See Chapter Seven for more details on the ABI option limits

options than are granted. The result is that the pay-performance sensitivity begins to decline.

6.6 Conclusions

Overall, this chapter has moved beyond the standard empirical linear pay-performance model (see Hallock and Murphy, 1999) by testing some of the notions predicted by tournament theory. The established weak pay-performance relationship has encouraged commentators to seek alternative theoretical explanations of executive pay outcomes (see for example Gomez-Mejia and Wiseman, 1997). The results derived from tournament theory predictions are largely consistent with the empirical work cited, and despite continuing differences between international corporate governance systems it is arguable whether this should be a surprising outcome. As Kaplan (1999) notes, different governance systems generate similar outcomes when they are located within competitive market economies (see also Conyon and Schwalbach, 1999). The results provide further non-US evidence that incentives generated by tournament mechanisms may be important for the operation of European managerial labour markets.

However, at the micro-economic level, it seems that a richer understanding of the top pay setting process should take account of the myriad potential factors that can influence within company incentives and compensation outcomes. Gomez-Mejia and Wiseman (1997) review the rich variety of such explanations. A further strategic management implication of the research may be that linking

executive pay to measures of corporate performance (although this appears to be important) may not be the only mechanism to generate management incentives. The evidence presented on the existence of tournaments in the UK context indicates that the structure of pay between board members (tournament participants) can also be important for executive motivation and a consideration in UK boardroom pay setting processes.

The final section considered the within firm variation of pay-performance sensitivities. The results indicate that CEOs do have a pay-performance premium over other executive directors which is consistent with tournament theory. It also demonstrated how and why pay-performance sensitivities are seen to decline as executives approach retirement.

The pay-performance sensitivities used in this and previous chapters have been calculated from directors holdings of share options by applying the Black-Scholes pricing formula. Although, this is widely accepted practice and used extensively by other researchers (e.g. Murphy 1999; Hall & Liebman, 1998) such valuations are built on a number of underlying assumptions which in the context of executive options may not be valid. The following chapter considers more fully the incentives provided by options, initially in a Black-Scholes context. It then considers the effect of relaxing the fundamental assumption of the Black-Scholes formula that the option risk can be hedged.

Chapter Seven

Option Incentives & Risk Aversion

7.1 Introduction

As Chapter Five highlighted, executive options have become an increasingly significant factor in the remuneration and incentivising of executive directors. Managerial incentives as a whole can no longer be fully understood without a solid understanding of the nature and valuation of these instruments.

Since their introduction in the early 1980's, annual grants of options have soared. As illustrated in Chapter Three, now more than 85% of UK CEOs hold options and the mean value of current option grants is equivalent to over 40% of the total cash compensation. In the US, the increase has been even more dramatic, with the value of the average CEO option grant (Black-Scholes values, inflation adjusted 1994 dollars) increasing from $155,000 to $1,200,000 between 1980 and 1994 (Hall and Liebman, 1998). More than 90% of all US CEOs currently hold share options and annual option grants are now often larger on average than salary and bonus combined.

The aim of this chapter is to develop a deeper understanding of options as incentive tools and to address some of the short comings of current valuation methods. More specifically, the chapter focuses on two particular issues.

Firstly, the chapter explains the rationale behind the adoption of executive options. Options provide a much more efficient means of creating incentives than equity. This property is demonstrated through the leverage effect of options, the implication is, however, that companies should increase the number of options

that they are currently granting. This policy is explored in light of current UK best practice with respect to the Association of British Insurers guidelines. These guidelines effective limit the number of options a company can issue to their directors and consequently, limit the incentives produced.

The second problem addressed is that of CEO risk aversion. Option values based on the Black-Scholes pricing formula assume the option risk can be hedged, and hence ignored. This is not the case for CEOs or indeed any other company director. As a result, risk averse CEOs will place lower values on executive options than those supplied by the Black-Scholes formula. More importantly, the subsequent delta of the option will also be lower under a risk averse valuation and this has important consequences for the provision of CEO incentives.

The remainder of this chapter is organised as follows. The next section develops the rationale for using share options as incentive tools and explains the leverage effect of options. Section 7.3 considers the implications of the ABI guidelines while Section 7.4 accounts for the effects of risk aversion amongst CEOs. Section 7.5 makes some recommendations to improve current best practices while final conclusions are drawn in section 7.6.

7.2 The Rationale For Options

This section seeks to provide an explanation for the use of options as the preferred tool for providing executive incentives. It is once again premised on the

principal agent results that were presented in Chapter Two and which are further discussed below.

7.2.1 Aligning the Agent

Chapter Two illustrated the agency problems faced by large modern day corporations and described two methods for alleviating them. One alternative is to adopt behaviour based contracts and attempt to improve monitoring such that the actions of the CEO can be fully observed. Unfortunately, monitoring is typically a blunt and ineffective solution to the agency problem. There are an innumerable actions a CEO can take many of which are highly complex. Shareholders typically do not know what *ex ante* actions maximise firm value and even if they did, verifying actions *ex post* is extremely difficult.

Furthermore, in practice, monitoring is done on behalf of the principals (shareholders) by the board as a whole, in particular by the non-executive directors. This creates its own principal-agent problem. Who monitors the monitors? There is no more reason to believe the board will act in the shareholders' best interests in monitoring the CEO and other executives, than there is to believe the executives themselves are acting in the best interests of shareholders. The result is, that even the best monitoring is unlikely to solve or even substantially reduce the agency problem in large companies.

The alternative solution is to adopt outcome based contracts and attempt to align the interests of the CEO with that of the shareholders. The most direct way of reducing agency problems through this means, is through so called, 'high-

powered' incentive schemes. That is, by tying a large proportion of CEO pay directly to shareholder wealth.

This, unfortunately, is easier said than done. The sheer size of large modern companies makes it difficult for CEOs to own any significant proportion of the firm's equity. Even a wealthy CEO with a personal fortune of £10 million say, could only purchase less than half of one percent of the average firm in the main sample[22]. Thus they can never become owners themselves in any real sense, yet they must be incentivised in such a way as to think and behave as if they were.

If significant direct equity ownership is not possible, then options provide a means of building up the 'effective' ownership stake (see Chapter Five). It is precisely this, that boards have been attempting to do over the past twenty years. As vast holdings of options build up over successive years the effective ownership stake increases and the CEOs will be faced by a much stronger link between pay and performance.

7.2.2 Pay And Performance

Chapter Five estimated the current pay to performance links in the UK from equity and option holdings. Virtually all past studies have found that the elasticity of CEO cash compensation with respect to firm value to be within the range 0.1 - 0.15 (Rosen, 1992). Hall and Liebman (1998), estimated an elasticity of 0.24 for the late 1980s and early 1990s which although slightly higher than previous estimates, still suggests a small relationship between CEO cash pay and

firm performance. An elasticity of 0.24 implies that an increase in shareholder wealth of 10% during the year would increase a CEO's salary and bonus payments by 2.4%. Table 5.1 (page 129) reported the mean total cash pay of CEOs in this data set to be £413,000, thus a 2.4% increase is equivalent to just £9,912.

Based on the mean total PPS for all the CEOs reported in Chapter Five of 2.34% (see Table 5.2, page 130) and a mean company value of £2233 million, the same 10% increase in shareholder wealth would increase the value of the mean CEO's total stock of shares, options and other long term incentive stakes by £5.23 million. That is, while a 10% increase in firm value would increase the mean CEO's cash compensation by £9,912, indirectly the CEO would receive an additional £5.23 million through the increase in the value of their shares and options, more than 500 times the increase from cash compensation.

The fact that equity and share options represent over 99% of the pay-performance relationship suggests that the annual change in salary and bonus can all but be ignored. CEOs may give disproportionate weight to annual changes in salary and bonus, partly because they perceive these elements as more tangible and also because higher direct cash compensation is seen to represent greater status and power. However, CEOs who fully appreciate their overall compensation package will realise that it is their equity and share option holdings that hold the key to realising substantial gains from improvements in the company performance.

[22] Based on the market value of the 510 companies at the end of their fiscal periods

One of the most widely cited estimates of the pay-performance link is Jensen and Murphy (1990b). They reported that total CEO wealth changed by only $3.25 cents for every $1,000 change in shareholder value and concluded that CEOs are essentially paid like bureaucrats. Hall and Liebman's (1998) estimate of this measure of sensitivity showed that it had essentially doubled between 1980 and 1994, indeed adjusting for size, the sensitivity had increased four fold. However, while this may represent a substantial increase in sensitivity, reporting changes in CEO wealth of $3.25 or even $7.5 and $10, misrepresents the pay to performance link, implying a small and insignificant relationship.

The point is that firm values do not change by a thousand pounds, not even by tens of thousands of pounds, but by hundreds of thousands, indeed millions. For example, the mean standard deviation of annual firm returns in the main UK data sample was 25.6%[23]. The mean market value of the firms at there fiscal year end was £2233 million. Based on these figures, a one standard deviation increase in firm value represents an increase of £572 million in shareholder wealth.

Even based on the Jensen and Murphy sensitivity of $3.25 per $1000, such an increase would generate an additional return for the CEO of £1.86 million. Based on the PPS reported here, the CEO would gain an additional £13.38 million. The point is that while swings in CEO wealth may be small in comparison to changes in firm value, they are large in absolute monetary terms.

[23] Based on the second volatility measure VOL2, see Chapter Three for full description.

7.2.3 Creating Incentives Without Options

In theory boards could use changes in direct pay, salary and bonus, to motivate managers. However, unless there are dramatic changes in the way that boards operate, it is unlikely that salary and bonus can ever become an effective tool for creating the type of high powered incentives that result from executive share option holdings.

The main problem is that high powered incentives require large swings in their payouts, both on the upside and the downside. Unfortunately, in the case of salary and bonus, swings in any direction are resisted. On the upside, very large bonuses are resisted by what Jensen and Murphy (1990a,b) call implicit regulation. Executive pay is undoubtedly a politically sensitive topic. Large salary increases or bonuses tend to attract the attention of the media and the public and invite criticism, even if the size of the bonuses are small in comparison to the total increases in shareholder wealth.

A perfect example is the case of Cedric Brown, the CEO of British Gas Plc in 1995. Following readjustments in the company's remuneration policy towards its top executives, it was widely reported that British Gas had increased the salary of its CEO by over 70% to £475,000 per year. Not only did Mr Brown's remuneration become the focus of attention at the company's 1995 annual general meeting which attracted over 4500 shareholders, but Mr Brown was forced to defend his salary before a House of Commons employment committee. Share option gains, while still inviting some criticism, seem to be less controversial.

Sam Chisholm of British Sky Broadcasting last year realised over £6 million through exercising some of his options with almost no public or media reaction.

On the downside, large decreases in salary or bonuses are naturally resisted by CEOs. Board members are typically quite friendly with the CEO and find it difficult and awkward to impose large decreases in compensation. Moreover, compensation consultants can be fired for giving unwelcome advice or more likely may find it difficult to recruit new clients if they obtain a reputation for austere pay packages within management circles. As such, they may be reluctant to push for large decreases in executive pay.

Furthermore, many of the non-executives sitting on today's remuneration committees are themselves executive directors at other companies. While it may not be the case that executives from a pair of listed companies advise directly on each other's pay, the significance of this situation should not be underestimated. Such individuals, when they sit on remuneration committees are setting, if only indirectly, the going rate for top managerial personnel, which in turn will be a factor in the determination of their own remuneration. Finally, as is demonstrated later in this chapter, CEOs actually lose money from holding options if, as a result of poor company performance, the share price falls. It is hard to imagine[24] any board inflicting a negative bonus, which would be the analogous move, on a CEO in today's boardrooms.

[24] Though not impossible, there is one instance (LucasVarity) within the main data set where the remuneration committee claims negative bonuses will be imposed for poor performance.

It is therefore unlikely that salary and bonus will ever provide the type of high-powered incentives that come automatically from equity based assets such as ordinary shares and options.

7.2.4 Share Options And Incentives

The initial analysis has argued that equity-based pay has become and is likely to remain the primary driver of pay to performance. The question then becomes which provides the better incentive, equity or options? To answer this, the incentives provided by options must be properly understood, something that is clearly not the case for a large number of executives, the boards that grant the options or even the policy makers establishing the corporate guidelines and best practices.

One of the most confusing features about executive share options is their downside risk. It is commonly argued that call options only have upside potential whilst equity provides the opportunity for both positive and negative returns. This is of course not the case, indeed, it can be argued that options have a greater downside risk than shares.

The view that share options have limited downside risk stems from the fact that if the share price falls below the exercise price the holder is under no obligation to exercise the option an incur and immediate loss. Instead he can allow the option to lapse and make a zero gain. While this is true, it misses the point. That is, that when the options were granted they had value, just as equity

itself has value. As the price of the share falls, the value of an option on that share also falls and the CEO 'loses' money.

This can be made clearer with an illustration. The typical share option grant is made at the money (i.e. the exercise price is set equal to the share price on the day of issue) and has a duration of 10 years. Based on the main data set of 510 companies, the mean values of the relevant Black-Scholes variables are as follows; a dividend rate of 3.25%, a volatility of 26% and a share price of £4. Assuming a risk-free rate of 8%, these values would price a ten year, at the money option at £1.41 and yield an option delta of 0.61.

If a company wishes to transfer a wealth equivalent of £100,000 to its CEO, it can do this either by granting him 25,000 shares (with a value of £4 each) or 71,117 at the money options (with a value of £1.41 each). Table 7.1 shows the value of both the equity holding and the option holding at the end of the first year under various year end share prices. If the share price has risen then the CEO can make a larger gain from holding the options than from holding the equity. However, he can lose far more when the share price falls. A fall in the share price to £2 would wipe out half of the CEOs wealth if he held it in equity, but wipes out over three quarters of it, if the same wealth had been held in options.

In this respect CEOs can and do lose as well as gain from having options and in both cases the change in wealth can be greater than that from equity alone. The key is simple, for the same *ex ante* value transfer to the CEO, a company can give a greater number of share options than shares, because each option is worth

less than each share. For at the money options a company can give about three times as many options as shares for the same *ex ante* value transfer to the CEO.

Year End	Equity		Options	
Share Price	Value	CEO Return	Value	CEO Return
£2.00	£50,000	-50.0%	£22,908	-77.1%
£2.50	£62,500	-37.5%	£38,227	-61.8%
£3.00	£75,000	-25.0%	£56,099	-43.6%
£3.50	£87,500	-12.5%	£75,887	-24.1%
£4.00	£100,000	0.0%	£97,163	-2.8%
£4.50	£112,500	+12.5%	£119,504	+19.5%
£5.00	£125,000	+25.0%	£142,695	+42.7%

Table 7.1: Value of Equity and Options Under Increasing Share Price

The larger number of options more than offsets the lower sensitivity per option relative to shares, as denoted by the option delta. Granting options at the money with a delta that is 0.62 means the total sensitivity of options is about 1.7 times higher than that provided by equity. This is the leverage effect of share options as a compensation tool. The same *ex ante* transfer of options has more sensitivity than the equivalent value of shares.

By extension, the same *ex ante* transfer of out of the money, or premium, options has greater sensitivity than at the money options. An option with an exercise price that is 50% above the share price is worth approximately a quarter of one share, which implies that a company can give about four options for every share. Each of these out of the money options has a delta of about a half which

means the total sensitivity of such an out of the money grant would be twice as large as that of equity. Out of the money options can thus provide even greater sensitivity than at the money options for the same transfer value of wealth.

Another example will illustrate this leverage effect more clearly. The benchmark transfer to the CEO is still £100,000. With a share price of £4, this can be done as before by granting 25,000 shares. If the share price increases by £1 the value of the CEO's equity increases by £25,000. Consider again granting an equivalent value of at money options i.e. X = £4, instead. As can been seen in Table 7.2, this implies granting the CEO 71,117 options, each with a delta of 0.61. When the value of one share rises by £1 the CEO's wealth now increases by £43,092, approximately 1.7 times the increase in wealth from that of holding equity.

Exercise Price	Value of One Option	Delta	Number of Options Equivalent to £100,000	Increase in CEO wealth from £1 increase in share price
£0.00[25]	£4.00	1.00	25,000	£25,000
£2.00	£2.04	0.698	49,136	£34,313
£3.00	£1.69	0.657	59,201	£38,911
£4.00	£1.41	0.606	71,117	£43,092
£5.00	£1.18	0.552	84,973	£46,872
£6.00	£0.99	0.498	100,903	£50,300
£7.00	£0.84	0.449	119,068	£53,427
£20.00	£0.15	0.120	660,689	£79,412
£50.00	£0.01	0.013	7,936,932	£106,779

Table 7.2: Total Pay-Performance Sensitivities for Varying Exercise Prices

[25] This row represents equity directly and not strictly an option at X=0.

The gain to a CEO from holding out of the money options is even higher. If the exercise price is set at £6, representing 150% of the current share price, then the CEO can now be granted 100,903 options, each with a delta of 0.50. A £1 increase in the share price now leads to an overall increase in the CEOs wealth of £50,300, over twice that from equity.

The same basic logic applies to downward movements in the share price although the leverage effect of options is slightly smaller in the downward direction since option deltas fall as the share price falls. The key conclusion is still that, for the same value transfer to the CEO, options have greater pay to performance sensitivity both for upward and downward movements, than shares and out of the money options have greater sensitivity than at the money options. This relationship is depicted graphically in Figure 7.1 where the incentive represents the increase in the value of a bundle of options, initially worth £100,000, from an increase of £1 in the share price.

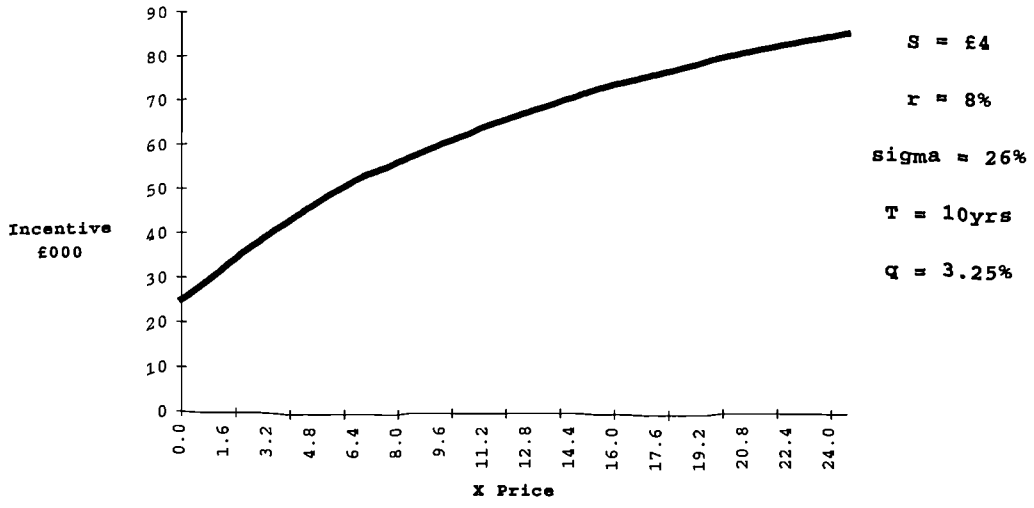

Figure 7.1: The Leverage Effect Of Share Options

7.3 Leverage And The Association Of British Insurers

Thus far this chapter has considered how companies could potentially increase the pay-performance sensitivity by providing directors with increased numbers of premium options. However, in the UK, companies are limited under Association of British Insurers (ABI) guidelines in the number of options they may allocate to executives. This section now documents some of the empirical effects of this rule in terms of how it impacts on the calculated option pay-performance term.

7.3.1 The ABI Guidelines

In addition to the regulatory framework for disclosure explained in Chapter Three, UK companies are effectively constrained by the number of share options that they are permitted to issue. The ABI guidelines (1995,1994) indicate that the total value of options held by a director should not exceed four times the pay of that executive. "The total market value of all options granted to any one participant under any discretionary/executive scheme involving the issue of shares should not exceed four times (4X) the participant's total annual remuneration (see paragraph 4.2 of the Guidance Notes). Options having a market value of up to a further 4X remuneration may be granted in the form of super-options" ABI (1995). In practice the total market value is calculated as the aggregate face value of the options, i.e. the sum over all tranches, of the exercise price times the number of options per tranche.

7.3.2 The Empirical Consequences Of The ABI Rules

The above restriction was tested among the 510 companies constituting the main data set as described in Chapter Three. For each CEO the aggregate face value, as defined above, of their total option holding is calculated. In effect, this is the amount the CEO has to pay in order to buy his option portfolio. This aggregate figure is then divided by total cash compensation. If the ABI constraint is binding this ratio will be less than four. Table 7.3 details this variable by size of enterprise.

	Ratio of Face Value of Share options to Total Cash Remuneration By Firm Sales (millions)				
Percentile	*All Companies*	*Less than £250*	*£250 to £500*	*£500 to £1,500*	*Above £1,500*
5th Percentile	0.12	0.36	0.07	0.11	0.05
10th Percentile	0.49	0.67	0.42	0.34	0.42
25th Percentile	1.46	1.72	1.18	1.37	1.58
50th Percentile	2.52	2.64	1.87	2.25	2.86
75th Percentile	3.91	3.91	3.04	3.80	4.32
90th Percentile	6.27	5.91	5.59	5.21	9.13
95th Percentile	9.73	8.74	8.98	7.41	11.85
Average	3.65	4.33	3.35	2.82	3.80

Table 7.3: Ratio Of Face Value Of Share Options To Remuneration By Firm Sales

The results indicate that the "four times" rule is in fact a binding constraint for the median company in all size bands. Also, except for firms with less than £250 million in sales revenue the average of this ratio is also less than 4 and is only 4.3 in this smallest sales band. Indeed even at the 75th percentile, the four-times rule is adhered to taking all the companies together, and in three of the four

size bands when by splitting by company sales. The implication of this is that most companies are complying with the ABI limit in restricting the number of options that they issue. As will be seen below, this has implications for the provision of share option incentives.

The leverage effect of share options can also be evaluated empirically using the share option data described in Chapter Three. Table 7.4 examines this effect for the 510 companies in the main UK data set. Row 1 details the original stock of equity shares held by the 510 CEOs. The mean (median) pay-performance sensitivity is 2.13% (0.05%). If the share price at the end of 5 years is the same as the beginning of period share price then the CEO would receive £366,000 if the shares were exchanged for cash. If the end of period share price is 200% of the opening period share price (i.e. the share price doubles) then the CEO would receive £732,000.

Row 2 considers exchanging the CEOs equity holdings for an equivalent value of 5 year share options with an exercise price equal to 100% of the beginning period stock price (i.e. issuing at-the-money share options). The mean (median) pay-performance sensitivity is now 2.16% (0.08%) i.e. an increase relative to that from holding equity. If the share price at the end of the period is unchanged then the median CEO now receives no payout. In this case though a rise of 200% in the share price yields a total cash payout of £1,425,000 for the CEO, nearly double that received from holding equity (ignoring dividend payments).

	Pay-Performance Sensitivity (%)		Median Cash Payout after 5 years from a Final Stock Price Determined as a Percentage of Opening Stock Price (£000)			
	Average	Median	100%	150%	200%	250%
Original Stock of Equity Shares	2.135%	0.053%	£366	£549	£732	£915
Exercise price as % of Stock price						
100%	2.161%	0.079%	£0	£712	£1,425	£2,137
120%	2.436%	0.090%	£0	£577	£1,540	£2,502
140%	2.696%	0.102%	£0	£243	£1,458	£2,673
160%	2.941%	0.109%	£0	£0	£1,411	£3,174
180%	3.170%	0.118%	£0	£0	£995	£3,344
200%	3.384%	0.126%	£0	£0	£0	£3,313

Table 7.4: Share Option Leverage Effects, Pay-Performance Sensitivities, and CEO Compensation Payouts.

Rows 3 to 7 consider the issuing of premium options. By illustration consider a premium option issued with an exercise price of 160% of the current share price. In this case the mean (median) pay performance term is 2.94% (0.11%). The payoff in this case is zero when the stock price is increased by only 100% or 150%. With performance at 200% of the original stock price, then the payoff reaches £1,411,000.

In general Table 7.4 illustrates the following. First, the pay performance sensitivity increases in line with the exercise price of the option being granted. In this respect premium options are (a) preferred to incentives from holding equity and (b) preferred relative to issuing at the money options. That is premium options deliver better share option incentives. Second, the level of performance

necessary to trigger any payout is increasing in the level of the premium, as is the rate of increase in the payoff once it has been triggered. In this way, premium options have intrinsic performance criteria built in and remove the need for additional performance criteria such as earnings per share growth targets, to be attached.

Given the way the aggregate value of options is calculated, i.e. the sum over all tranches of the exercise price times the number of options per tranche, if the ABI guideline is to be adhered to then the higher the option price at the date of grant, the smaller the number of options that can be granted. Exactly the opposite of that proposed above. Increasing the exercise price of course also reduces the delta of each option, thus if companies continue to abide by the ABI guideline, granting out of the money options would result in the CEO being granted fewer options, each with a smaller sensitivity and consequently having a lower total PPS.

Indeed, to maximise the PPS while abiding by the four times rule, companies should instead grant deep in the money options, this would enable large numbers to be granted. The Greenbury recommendations of course now preclude the granting of discounted options, the minimum price at which options can be granted is the current share price and this is what is observed in practice.

Summarising to date, this chapter has illustrated the leverage effect from share options in the data. It has shown that the pay-performance sensitivity increases by about 60% as one moves from an at the money option to a premium option whose exercise price is set at twice the at the money option. It has also

demonstrated that premium options imply larger payouts for good performance but no payouts for average or minimal stock price appreciation. Remuneration committees of company boards that want to increase the sensitivity of executive reward plans can do so by (a) transferring the same *ex ante* value of stock to share options for the executive and (b) considering issuing these as out of the money options rather than at the money options.

Secondly, UK regulations impose a "four times" remuneration constraint on the award of executive options. This constraint is adhered to by the majority of CEOs in the data. Effectively, this places a practical limit on the number of options that can be awarded. Furthermore, because the value of the option is taken to be the exercise price, the higher this exercise price is set, the lower the number of options granted must be in order to remain within the four times limit. The implication is that for companies wishing to grant large numbers of options they would have to issue them at the minimum acceptable exercise price (i.e. at the money options). *Since the pay-performance sensitivity is increasing in the* exercise price, accordingly, the "four time" rule blunts UK executive incentives.

7.4 Risk Averse CEOs

A lifting of the four times rule is thus in the interests of shareholders, it would enable companies to grant greater numbers of out of the money options which would increase the pay to performance sensitivity of the CEOs and other executive directors. If this step is taken (as seems likely under current reforms), the problem becomes where to set the exercise price? For a given cost to the

company, is there an optimal, realistic exercise price that companies should choose in order to maximise the pay to performance sensitivity?

It is important to fully appreciate the nature of the problem. The analysis here does not seek to determine the optimal value or cost to the company of the option grant, that is should the company grant options at a cost to itself of £100000, £200000 or £300000? Instead, the problem addressed is, for some predetermined fixed cost to the company, what is the optimal exercise price of the option grant. As far as the company is concerned, the optimal exercise price is one that maximises shareholder wealth. For the principal agent model presented in Chapter Two, if costs are fixed, this occurs when the effort of the agent is maximised. The only assumption here is that effort is maximised when the incentives are maximised. Such an assumption is supported by Kahn and Sherer (1990) who demonstrated that managers with high sensitivities to bonus payments tended to have higher subsequent evaluations.

With a current share price of £4, granting options at £6 with a life of ten years seems fairly reasonable. The CEO only has to achieve growth rates of 10% and the option will move into the money within 5 years. However, the pay to performance sensitivity can theoretically be increased still further, by granting the options at £7 instead of £6. From Table 7.2 this would increase the sensitivity by another £3000. But why stop there? Issuing deep out of the money options with an exercise price of £20, increases the pay to performance incentive to £80,000 and with an exercise price of £50, it jumps to well over £100,000.

Indeed, for the average company, the further out of the money the option goes, the greater the total sensitivity will be for a given value transfer to the CEO. However, while most CEOs would probably be confident of achieving a 50% rise in their share price over ten years, very few would be willing to gamble on the kind of rises required to make the latter options have any intrinsic value. The answer lies in the risk aversion of the CEOs.

Black-Scholes valuations are based on a risk neutral framework stemming from the fact that the holder of an option can hedge away all the risk. This is of course not the case for the CEO. He is precluded from hedging the risk of holding the option and therefore a risk neutral valuation is not appropriate. The value he places on the option will thus depend on how risk averse he is.

It therefore becomes necessary to value the option from the perspective of a risk averse CEO. This can be done in a general sense but the following analysis considers results based on a typical UK CEO. From Chapter Two, the typical CEO[26] holds approximately 105,000 equity shares, (call this Q) holds 320,000 options (N) that are approximately £1.50 in the money (let X_1 denote the exercise price of these options. Although the options currently held by CEOs typically have 7 years left to run, to ease the analysis assume that all existing options, like a newly issued options will expire in 10 years. The values for volatility, dividend yield and share price are as used above, namely 26%, 3.25% and £4 respectively. Finally assume the same CEO has a personal safe wealth of £3 million.

[26] Figures represent median values from the data set

Suppose a company wants to reward its executive at a cost to itself of £100,000. The question then is how should the company transfer this wealth to the CEO in order to maximise the incentive of the director to pursue the goal of increasing shareholder wealth?

The company can largely hedge the risk of the options it writes. Thus the Black-Scholes valuations are a reasonable approximation of the cost of the options to the company. Therefore, still working the options depicted in Table 7.1, if the company chooses to set the exercise price of the options it issues at £4, it can grant 70,922 options to the CEO. If it increases the option exercise price to £6, it can issue 101,010 options for the same cost. Let X_2 denote the exercise price of the new options the company chooses to issue and P the number of options issued.

To value the options from the CEOs point of view requires some assumptions about his utility preferences. The following analysis explores the case where the CEO has a power utility function (U), although of course it can be extended to any utility preference framework that is deemed suitable. The utility from a given level of wealth W, is thus given as;

$$\mathrm{U}(W) = \frac{W^{1-\gamma}}{1-\gamma}$$

where gamma is the coefficient of Relative Risk Aversion:

$$\gamma = -\frac{\mathrm{U}''}{\mathrm{U}'}W$$

The mechanism used to determine the value the CEO places on the options is based on that used by Murphy (1999)[27]. The idea is to determine how many of a particular option the CEO needs to receive before he is indifferent between receiving that bundle of options and £100,000 cash. This is done as follows.

If the CEO receives the £100,000 as cash, his personal safe wealth (C) now stands at £3.1 million. The expected utility of the CEOs wealth is then calculated at the end of the ten years. The safe wealth is assumed to earn the risk-less rate (8%) over the period. The remaining elements that determine the CEOs total wealth, his equity, old options and newly granted options (of which there are none at present, i.e. P=0) are all dependent on the final company share price. If the final share price is equal to S_{10} then the final level of wealth is given by:

$$W = C(1+r)^{10} + Q \times S_{10} + N \times \max\left(0,\ (S_{10} - X_1)\right) + P \times \max\left(0,\ (S_{10} - X_2)\right)$$

Assuming the share price has a log normal distribution it is possible to estimate the share price in ten years, this enables the final level of wealth to be calculated and hence the total utility estimated.

It is of course the expected utility that is of interest and thus it is the distribution of the final share price and not the expected final share price that is critical. The expected utility can be estimated by creating a discrete

[27] My thanks to Kevin Murphy for supplying the algorithm for pricing options in this manner.

approximation to the distribution of the final share price, which is the approach taken below.

Assuming the share price follows a geometric Brownian motion process then its rate of return can be described as;

$$\frac{dS}{S} = \mu dt + \sigma dz$$

where

μ = the instantaneous expected rate of return

σ = the instantaneous standard deviation of the rate of return

dt = a small increment in time

dz = a Wiener process

In this case the returns to the share R_t defined as ln (S_t/S_{t-1}), are normally distributed with a mean and standard deviation as follows:

$$R_t \sim N\left(\ln(S_0) + \left(\mu - \frac{\sigma^2}{2}\right)t, \sigma^2 t\right)$$

where

S_0 is the share price at time zero.

The approximation to the normal is made by dividing the distribution into 12000 separate bands. This is done for the standard normal distribution by taking

bands from -6 to +6 through increments of 0.001. The probability associated with each band is calculated by reference to standard normal tables. Finally a share price is allocated to each band equal to the median share price over the increment.

This generates 12000 final share prices each with an individual probability of occurring. The expected utility can then be calculated as:

$$E[U] = \sum p_i U(W_i)$$

where p_i (i =1 to 12000) is the probability of share price S_i occurring and W_i is the final level of wealth calculated from a final share price of S_i.

This gives the amount of utility the CEO receives from being granted £100,000 cash and no new options. The analysis is now repeated assuming that instead of receiving the cash, the CEO receives P options, each with an exercise price of X_2. That is, his safe wealth is once again £3m and P is now non-zero.

The value of P, the number of options granted to the CEO, is then adjusted until the two utilities, that from having options and that from having no options are equal. This P represents the number of options that the CEO values as equivalent to having the £100,000 in cash. Accordingly the value of each individual option can be determined as £100,000/P.

The final step is to determine the incentive effect from holding P options. This is given by the number of options multiplied by the delta of the option. The delta represents the derivative of the call value with respect to a change in share price. Usually this term is immediately available from the Black-Scholes pricing formula, however in this case the delta has to be approximated as;

$$\delta \approx \frac{\Delta c}{\Delta S}$$

Thus having determined the number and price of options that equalises the utilities, the price of the options is recalculated for a small increase in the initial share price ΔS. The resulting change in the option value can then be used to estimate the delta of the option. Having determined the overall incentive effects of the option package, the whole process can then be repeated for a different exercise price and the new incentive calculated.

7.4.1 Utility Results

In addition to the variables relating to the option characteristics and the CEOs general level of wealth, there are two further inputs to determine before the simulation can be run. They are the levels of risk aversion of the CEO and the market in general. The risk aversion of the CEO is determined by the Relative Risk Aversion (RRA) coefficient. The higher the value of RRA the more risk averse the individual is. The risk aversion of the market in general is represented by the market risk premium, again the higher the market premium, the more risk averse the market.

As a simple example, assume both the market and the CEO are risk neutral, the RRA becomes zero as does the market premium. In this case the utility model produces values equivalent to the Black-Scholes option values, as one would expect.

Typical estimates of the RRA place it about 2 (Friend & Blume, 1975), while historical estimates of the equity premium place it at about 8%. Unfortunately, research has shown that these two figures seem theoretically inconsistent with each other. Mehra and Prescott (1985) were the first to identify this paradox which in light of their paper has come to be known as the "Equity Premium Puzzle". A thorough analysis of the problem is provided by Kocherlakota (1996) and Siegel and Thaler (1997), while Freeman and Davidson (1999) provide a UK perspective. In short however, the problem is that observed market premia imply levels of RRA well in excess of the observed values of 2, indeed the implied figure is much nearer 20 than 2.

Needless to say, it is not within the scope of this thesis to address this paradox, suffice to say applying a market premium of 8% while using a RRA of 2 is not appropriate. Instead, to produce a balanced framework, once the RRA is set, the market premium is estimated, by setting it to a value such that the utility model prices a deep in the money option (exercise price just above zero) at a Black-Scholes price. This represents an upper limit on the value of the market premium, since any premium above this would result in the utility model calculating a risk averse price higher than the Black-Scholes risk neutral price for some option. This method will of course slightly over estimate the risk premium,

but will provide a significantly better estimate of the market premium consistent with a particular level of RRA than will the historical estimate.

The results based on the typical CEO figures detailed above are illustrated in Table 7.5. The figures in this table assume the CEO has a RRA of 2. Based on the procedure outlined above, this is reflected in a market premium of 4.46%. As expected the risk averse values are lower than those provided by the Black-Scholes formula. The important feature however is that the risk averse values decrease more quickly than the Black-Scholes values as the exercise price of the option is increased. For an exercise price of £1, the risk averse value represents 99% of the Black-Scholes value. However, for an exercise price of £13 this has fallen to 50% and at an exercise price of £22, the risk averse valuation is now just 11% of the Black-Scholes value.

Exercise Price	Black-Scholes Value	Black-Scholes Delta	Risk Averse Value	Risk Averse Delta	Total Incentive Black-Scholes	Total Incentive Risk Averse
1.00	2.444	0.720	2.423	0.555	29449	22720
4.00	1.406	0.606	1.271	0.466	43092	33160
7.00	0.840	0.449	0.650	0.322	53427	38348
10.00	0.529	0.325	0.337	0.211	61407	39839
13.00	0.349	0.237	0.175	0.137	67874	39189
16.00	0.239	0.175	0.088	0.088	73304	36893
19.00	0.169	0.132	0.039	0.056	77985	32991
22.00	0.122	0.100	0.013	0.033	82097	26737

Table 7.5: Analysis of Black-Scholes and Utility Based Option Values and Incentives

A similar pattern is observed across the option deltas. Again, deltas calculated under the utility framework are always less than those supplied by the Black-Scholes formula. Furthermore, as the exercise price of the option increases the risk averse delta falls from 77% of the Black Scholes delta (X=1) to 33% of the Black-Scholes delta (X=22). It is this rapid decline in the option delta that is of crucial importance in the provision of CEO incentives.

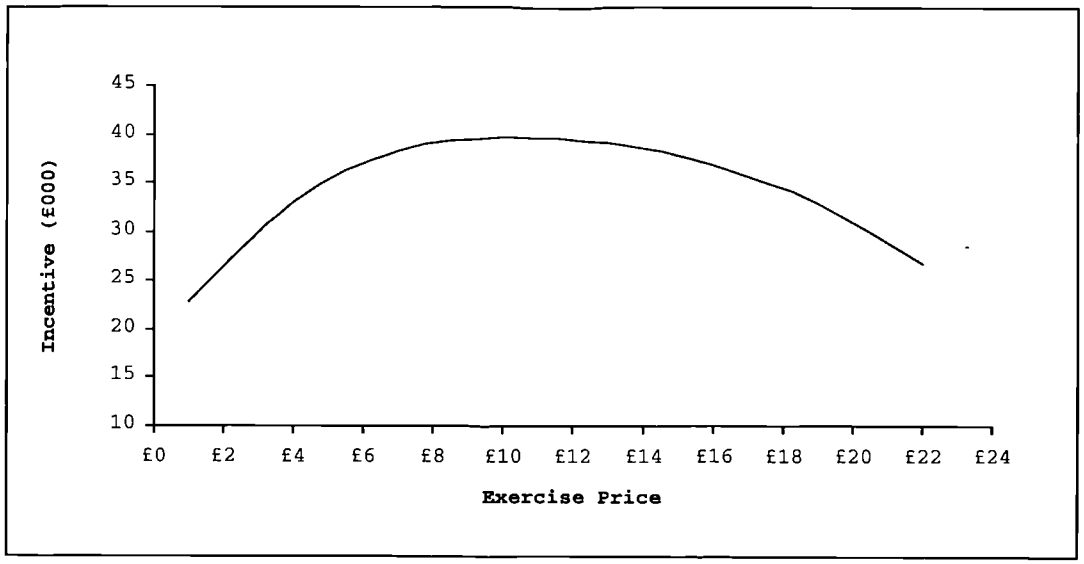

Figure 7.2: Total Incentive Based On Utility Valuation (RRA=2, Market Premium = 4.46%)

The final two columns of Table 7.5 show the total incentive (represented as the increase in the value of the options from a £1 increase in the share price) derived from an option grant costing the company £100,000. The Black-Scholes total incentive, replicates the result depicted in Figure 7.1. Here the further the options are granted out of the money, the increased number of options that can be granted more than off sets the fall in the option delta resulting in a greater total incentive. This is not the case in the utility model. The figures in the final column

are graphed in Figure 7.2 and clearly show that the total incentive is no longer an increasing function in the exercise price.

In this case, the risk averse CEO places very little value on deep out of the money options. The result is that as the exercise price increases, the drop in the delta is no longer offset by the increased number of options that can be granted and the total incentive falls. Based on the above figure, CEO incentives would be maximised by granting options with an exercise price of about £10.5. With an initial share price of £4, an annual growth rate of 15%, which is certainly an achievable target, would put the option into the money in approximately 7 years, well inside the 10 year life of the option.

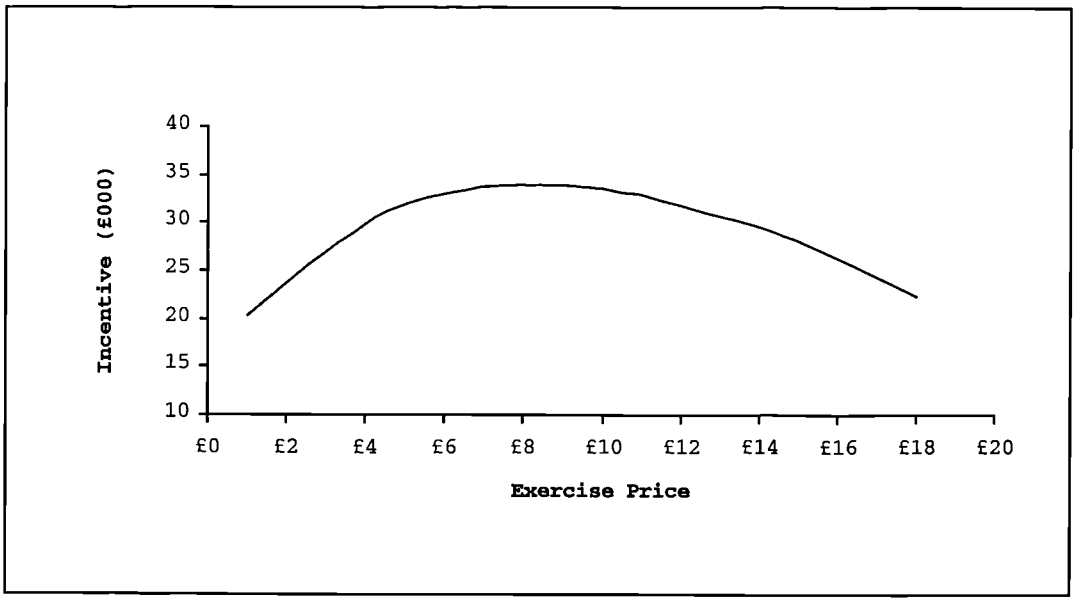

Figure 7.3: Total Incentive Based On Utility Valuation (RRA=3, Market Premium = 6.87%)

Choosing a RRA of 3 instead of 2 produces similar results. In this case, the market premium is estimated at 6.87% and the resulting incentives are graphed

in Figure 7.3. Again, the total incentive is seen to be concave, this time reaching a peak at about £8.1. That is, as the CEO becomes more risk averse, the optimum exercise price reduces.

It could of course be argued that CEOs may be more risk averse than the market in general since they are investing their labour as well as their wealth in the company. In this case, the market premium is set at 4.46%, a level consistent with a RRA of 2, while the RRA of the CEO is raised to 3. These results are graphed in Figure 7.4. Once again the same concave relationship is observed, with the maximum incentive now achieved at a much lower exercise price of just £5.6.

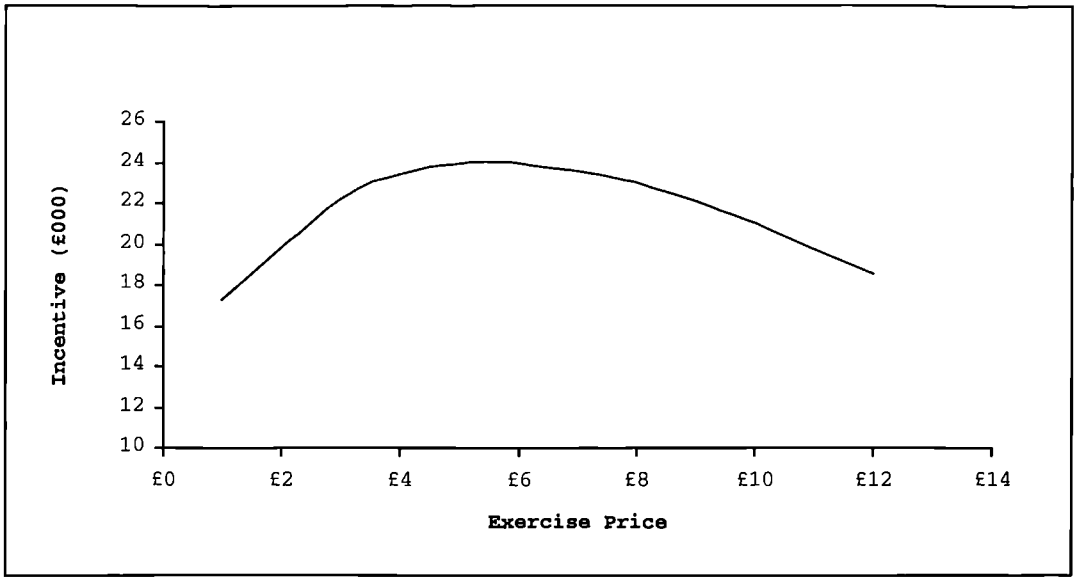

Figure 7.4: Total Incentive Based On Utility Valuation (RRA=3, Market Premium = 4.46%)

The results presented here suggest that if remuneration committees continue the trend of issuing ten-year options, than granting premium options with an exercise price set at between twice and three times the current share price will

optimise the incentives faced by executives. The results are reasonably robust to changes in the underlying variables. For example, increasing the safe wealth of the CEO to £5 million in the initial analysis yields an optimum exercise price of £11.1 compared to £10.5 for a safe wealth of £3 million. Increasing the safe wealth still further to £10 million results in an optimum exercise price of £13.2. Alternatively, doubling the CEOs holding of equity in the initial analysis (i.e. safe wealth of £3 million) to 210,000 shares only results in an increase of £0.1 in the optimum exercise price.

7.5 Creating Better Incentives

This final section draws together the results of the chapter to date and makes some recommendations to improve the current best practices in the UK. The previous analysis has clearly shown how options can be used to increase the incentives faced by the CEO to maximise shareholder wealth. For this to work however, CEOs must be fully aware of the size of their option holdings and how these derivatives are valued.

There seems to be little evidence of this in practice. Indeed, in some cases, it seems that CEOs have no idea how much their options are worth. More importantly, they do not understand how much their option packages change with changes in the value of their companies.

Hall (1998) suggests that in an attempt to 'educate' the CEOs, boards should adopt a formal practice of valuing their executive's options each quarter.

He proposes this quarterly 'scoring' could be coupled with a straightforward sensitivity analysis, which shows the executive how much his or her option package changes with various changes, upwards and downwards, in the company's share price. This scoring system would provide clear benefits in terms of making the incentives work,

Of course making CEOs fully aware of the value of their equity and option holdings and how closely they are linked to company performance will unavoidably give rise to a new conflict. The goal of any incentive-based pay is to align the incentives of managers with the goals of owners. Such alignment often conflicts with the preferences of risk averse CEOs. A good incentive contract will generally have the feature that the CEO will want to shed some of the company's risk. There is no escaping the problem that high-powered incentives put some CEO wealth at risk, which is undesirable for risk-averse CEOs who want their portfolios to be better diversified.

Ofek and Yermack (1997) argue that CEOs can, and do, hedge some of their risk by selling their shares and exercising their options. This is of course counter-productive to the goal of equity-based pay. Thus CEOs must be encouraged or forced to hold on to their equity and options.

7.5.1 Vesting Periods

In light of the above problem Hall (1998) proposes increasing the vesting periods of options in an attempt to prolong the period options are held for. This however is a double-edged sword. While it may force CEOs to retain their options

for longer, it would reduce their effectiveness as incentive tools. Consider again the standard at the money option.

Time to maturity	Value of One Option	Delta	Number of Options Equivalent to £100,000	Total Pay to Performance Sensitivity
4	£1.00	0.645	100,000	£64,500
6	£1.20	0.640	83,333	£53,333
8	£1.32	0.626	75,758	£47,424
10	£1.41	0.606	70,922	£42,979
12	£1.45	0.583	68,966	£40,207
14	£1.48	0.558	67,751	£37,805
16	£1.48	0.532	67,659	£35,995

Table 7.6: Sensitivity of Options With Respect to Time

The analysis is based on the Black-Scholes valuations but an equivalent pattern emerges under the utility pricing method detailed in Section 7.4. Table 7.6 illustrates that increasing the time to maturity of this option increases its value but reduces its delta and consequently the net incentive produced for a fixed value grant of options declines as the time to maturity increases. While this will not always be the case since it is possible for the delta to rise as the time to maturity increases, (see Figure 2.3, page 50) it is the likely scenario in the majority of cases. Consequently, simply increasing the life span or vesting period of executive options is not conducive to increasing the pay to performance sensitivity.

A second alternative is to establish guidelines or goals for the minimum overall numbers of shares and share options that CEOs must hold. Many

companies have established ownership guidelines in recent years, for example, many CEOs are expected to hold shares that are valued at four or five times their salary and bonus. However target share ownership alone is not enough, since it can encourage CEOs to exercise their share options and use the profits to buy shares to meet such targets. This essentially deleverages their position in the company, which reduces the alignment of their incentives with those of shareholders. The policy implication of this is obvious, ownership guidelines should include share options as well as shares and be structured so that options become the preferred asset for CEOs to hold. Furthermore, guidelines should stress that such targets are minimum requirements, with no upper limit being placed on CEO equity and option ownership.

7.5.2 Indexed Options

The analysis to date has supported the policy of granting options with a fixed exercise price set above the current market share price. Indexed options can provide similar advantages. Because the (expected) exercise price is higher than the current share price, indexed options are leveraged in a similar way to premium options. Therefore, greater incentives can be provided for the same transfer of wealth than issuing standard at the money options. However, they have the obvious advantage that CEOs are not rewarded or punished for overall movements in the share market.

On the downside though, with indexed options it does become possible for executives to receive a payout from a negative share price performance. For indexed options to have value, the company's share price only has to outperform

the group of companies that the exercise price is indexed to. If the index falls 10%, the CEO will be rewarded for any performance better than that - even a negative return of say 5%. It is of course a questionable point as to whether executives should ever be rewarded - in addition to their salary and any bonus payments, for achieving negative absolute growth, even if that growth represents a relatively good performance. The shareholders themselves have made a real lose and perhaps in these circumstances the CEO should not be seen to be making additional gains. A simple remedy to this would be to set the market price at the date of issue as a minimum, below which the exercise price is not allowed to fall.

Given the above, premium and indexed options are likely to be popular with both shareholders and the public. With premium options, it is clear that CEOs have to substantially raise the share price before they receive any payoff. With indexed options, CEOs only make a profit if their company's share price performance beats the comparator group the exercise price is linked to. Both types of options make it more difficult for the CEO to make any gains unless the company has performed well, in a sense both have implicit performance criteria attached that need to be met before the options can be exercised.

7.6 Conclusions

The chapter began by illustrating the leverage effect of options and demonstrating how the ABI "four times" guideline impacts on the provision of incentives in the UK. This constraint is adhered to by the majority of CEOs in the data effectively placing a practical limit on the number of options that can be

awarded. Furthermore, because the value of the option is taken to be the exercise price, the higher this exercise price is set, the lower the number of options granted must be in order to remain within the four times limit. The implication is that for companies wishing to grant large numbers of options they would have to issue them at the minimum acceptable exercise price (i.e. at the money options). The analysis showed that the pay-performance sensitivity derived from the Black-Scholes formula were increasing in the exercise price and according, the "four time" rule blunts UK executive incentives.

Secondly, the chapter addressed the issue of risk aversion amongst CEOs. The results demonstrated that for a typical CEO, relaxing the inappropriate assumption that option risk can be hedged has important consequences in the provision of incentives. Incentives are no longer an increasing function in the option grant exercise price, instead there is an optimal and economically sensible exercise price for companies to set to maximise the immediate incentive created for their CEO. This optimal exercise price is negatively correlated with the level of risk aversion of the CEO.

Finally, the chapter made some recommendations for remuneration committees to consider in the granting of further options. While the explosion in CEO share option awards during the past 15 years has had the desired effect of creating a stronger link between CEO pay and firm performance, there are still a variety of ways in which current compensation practices can be improved. In particular, both premium options and indexed options have significant advantages over the current practice of issuing only at the money options. Indeed, given the

leverage benefits of premium and indexed options together with their appeal to shareholders, their almost complete absence as a compensation tool for top executives is puzzling.

In addition, incentives would be improved significantly if boards adopted the practice of valuing or 'scoring' the CEO's option packages on a regular basis. Pay to performance incentives are undermined to the extent that the executives they are meant to motivate do not understand them. Finally shortening share option vesting periods while creating ownership guidelines that recommend minimum holdings of equity and in particular options, represent two straightforward ways of increasing the pay to performance sensitivity and sustaining such increases into the future.

Chapter Eight

Conclusions

8.1 Summary Of Findings

The main objective of this thesis has been to shed light on the extent and the purpose of the large option portfolios typically held by the CEOs of large UK publicly quoted companies. The data necessary to do this has only become available in the last few years since the implementation of the recommendations made in the Greenbury report in 1995. The general level of option disclosure now available in the UK is unparalleled both historically in this country and to that currently available in the United States.

Chapter Two provided the theoretical foundations for the thesis by reviewing the principal-agent model and basic option theory. It further reviewed the relevant literature and identified the gaps in current research that this thesis addresses.

Chapter Three detailed the construction of the main data set of 510 of the largest UK quoted companies, representing 97% of the London Stock Market at the date the sample was taken. The unique feature of the main data set is, as mentioned above, the richness of the option information obtained. It enables, for the first time, a full examination of the complete compensation packages that are currently being offered to the UK's leading executives.

Chapter Four considered the information disclosed about directors share options in a sample of UK companies in 1994 and 1995. The results presented here add to the recent UK corporate governance literature. The chapter first provided a benchmark for the level of share option disclosure in UK companies

prior to the introduction and acceptance of the Greenbury recommendations. It demonstrated that even at this time, for a majority of companies there was sufficient information to value directors' options, a result which contrasts with earlier academic findings (e.g. Forker, 1992).

Secondly, it modelled the decision to disclose share option information as a function of the proprietary costs of disclosing the information. Two substantive results were established here. Firstly, that the level of information disclosed about share options is a positive function of the presence of non-executive directors. This is evidence in favour of the monitoring function of non-executives and adds to the growing evidence concerning the effects of board structure on firm performance. Secondly, it documented a negative correlation between option information disclosed and corporate size. This is consistent with earlier findings that suggest that larger firms suffer propriety and political costs from information disclosure.

Chapter Five considered the provision of share options in the UK. Using the main data set it demonstrated a number of key features relating to the valuation and incentives arising from share options. It highlighted the differing levels of the disclosure of option information in the UK and the US. It demonstrated that when looking at all companies together, neither the US nor the concise UK reporting system economically affected the valuation of the stock of share options or the calculated option pay-performance parameter. However, it goes on to demonstrate that with regard to US disclosure, there are in fact two areas of mispricing, both of which are significant in their own right, but opposite directions, which at this

moment in time happen to cancel each other out. The mispricing with respect to the restricted information provided in the UK is less marked, and although there is significant mispricing of out of the money options, there is no reason to suggest that the level of the bias should change in the future.

Chapter Six moved beyond the standard empirical linear pay-performance models and considered the notions predicted by tournament theory. Past inability to establish any significant pay-performance relationship encouraged some commentators to seek alternative theoretical explanations of executive pay outcomes. This chapter tested three distinct hypothesis associated with tournament theory predictions. The empirical findings were consistent with tournament theory in that they did find both a convex relationship between executive compensation and organisational level and that the tournament prize (gap) and the number of contestants are positively correlated. However, little evidence was found in support of hypothesis three that corporate performance is positively correlated with executive wage dispersion. The results however provide further non-US evidence that incentives generated by tournament mechanisms may be important for the operation of European managerial labour markets.

The final section considered the within firm variation of pay-performance sensitivities. The results indicate that CEOs do have a pay-performance premium over other executive directors which is consistent with tournament theory. It also demonstrated how and why pay-performance sensitivities are seen to decline as executives approach retirement.

Chapter Seven demonstrated the leverage effect of options and the implications of the UK regulation that imposes a "four times" remuneration constraint on the award of executive options. This constraint is adhered to by the majority of CEOs in the data. The analysis showed that the pay-performance sensitivity could be increased by granting greater numbers of executive options and as such the ABI four-times limit blunts UK executive incentives.

Having established that companies can increase the pay-performance sensitivity by granting out of the money options, Chapter Seven then attempted to determine exactly how far out of the money options should be granted. Results based on the standard Black-Scholes option pricing formula implied that the final incentive could be increased indefinitely by granting the options further and further out of the money. Black-Scholes valuations however, although predominately used in the literature are not perfectly applicable to executive options. The inability of executives to hedge their option holdings means the risk neutral Black-Scholes valuations over state the value of the options to the risk averse executives, a result that is exaggerated for high risk, deep out of the money options.

The utility model approach to valuing the options, demonstrated that there is in fact an optimal exercise price at which to maximise the incentive of the executive. Based on a 'typical' CEO it demonstrated how premium options, with a realistic and achievable exercise price can be optimal.

Finally Chapter Seven concluded by making a number of policy

recommendations to improve the provision of incentives in UK firms. Specifically, the ABI four times limit should be replaced with guidelines on minimum target equity and option holdings for CEOs and executive directors. Secondly, premium and indexed options should be issued in place of the currently issued at the money options. Finally, the time to maturity of options should be reduced to increase their sensitivity.

8.2 Conclusions

This thesis has made several new contributions to the executive compensation literature. Many of the advances are a direct result of the utilisation of previously unavailable data. The increased levels of disclosure in modern day remuneration reports have provided the opportunity to fully investigate the state and impact of executive option holdings in the UK. The results presented here demonstrate how options are now an important element in almost every executive remuneration package. While their use has already begun to strengthen the pay to performance link in the UK, this thesis has also illustrated on a theoretical level how options could be better used to further align the goals of managers and shareholders. Indexed and premium options are undoubtedly the remuneration tools of the future, it will be interesting to see how quickly their use becomes the norm rather than the exception.

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Appendix

Appendix One: Full List of Companies in Main Data Set.

	Company		Company
1	*Abbey National*	52	*Berisford*
2	*Abbot Group*	53	*Berkeley Group*
3	*Abbott Mead Vickers*	54	*Bespak*
4	*Aberdeen Asset Management*	55	*BG*
5	*Admiral*	56	*BICC*
6	*Aea Technology*	57	*Bilton*
7	*Aegis Group*	58	*Black (Peter)*
8	*Aggregate Industries*	59	*Blue Circle*
9	*Airtours*	60	*BOC*
10	*Albright & Wilson*	61	*Body Shop Intl.*
11	*Alfred McAlpine*	62	*Bodycote*
12	*Allders*	63	*Booker*
13	*Allen*	64	*Boots*
14	*Alliance & Leicester*	65	*Bowthorpe*
15	*Alliance Unichem*	66	*Boxmore Intl.*
16	*Allied Domecq*	67	*BP*
17	*Alpha Airports*	68	*BPB*
18	*Amec*	69	*BPP Holdings*
19	*Amey*	70	*Bradford Pr.*
20	*Amvescap*	71	*Brake Brothers*
21	*Andrews Sykes*	72	*Brammer*
22	*Ange.Undwrt.Tst.*	73	*Britannic Assurance*
23	*Anglian Group*	74	*Britax International*
24	*Anglian Water*	75	*British Aerospace*
25	*Anite Group*	76	*British Airways*
26	*Antofagasta Hdg.*	77	*British Biotech*
27	*API Group*	78	*British Energy*
28	*Argos*	79	*British Land Company*
29	*Arjo Wiggins Appleton*	80	*British Polythene Industries*
30	*Arriva*	81	*British Sky Broadcasting Group*
31	*Ascot*	82	*British Steel*
32	*Asda*	83	*British Telecom*
33	*Ashtead Group*	84	*British Vita*
34	*Associated British Foods*	85	*British-Borneo Pet. Syn.*
35	*Associated British Ports*	86	*Brixton Estate*
36	*Astec (BSR)*	87	*Brown (N) Group*
37	*Atkins WS*	88	*Bryant Group*
38	*Avis Europe*	89	*BTG*
39	*Avon Rubber*	90	*BTP*
40	*BAA*	91	*BTR*
41	*Baird (William)*	92	*Bulmer (Hp)*
42	*Bank of Scotland*	93	*Bunzl*
43	*Barclays*	94	*Burford Holdings*
44	*Barratt Developments*	95	*Burmah Castrol*
45	*Bass*	96	*Burton Group*
46	*BAT*	97	*Business Post*
47	*BBA*	98	*Cable & Wireless*
48	*Beazer Group*	99	*Cadbury Schweppes*
49	*Bellway*	100	*Cairn Energy*
50	*Bemrose Corporation*	101	*Caledonia Investments*
51	*Benchmark Group*	102	*Cap.&Regl.Pr.*

Appendix One - Cont.

103 Cap.Shop.Cents.
104 Capita Group
105 Capital Radio
106 Caradon
107 Carlton Communication
108 Carpetright
109 Cattles
110 Celltech
111 Centrica
112 Charter
113 Chelsfield
114 Chiroscience Group
115 Christie's International
116 Chrysalis Group
117 City Centre Restaurants
118 Close Brothers
119 Cls Holdings
120 CMG
121 Coats Viyella
122 Cobham
123 Colt Telecom
124 Commercial Union
125 Community Hospitals
126 Compass Group
127 Cookson
128 Cordiant Comms.Gp.
129 Corporate Services Group
130 Courtaulds
131 Courtaulds Text.
132 Courts
133 Cox Insurance
134 Croda Intl.
135 CRT
136 Daejan Holdings
137 Daily Mail'A'
138 Dairy Crest
139 Danka Business Systems
140 Davis Service Group
141 De La Rue
142 Delphi
143 Delta
144 Dennis Group
145 Derwent Valley
146 Devro
147 Dewhirst Group
148 DFS Furniture Co.
149 Diageo
150 Diagonal
151 Dialog Corporation
152 Dixons Group
153 Domestic & General
154 Dorling Kinder.
155 Druid
156 Edin.Fund Mgrs.Group
157 Eidos
158 Eis Group
159 Electrocomponents
160 Elementis
161 Ellis & Everard
162 Emap
163 EMI Group
164 Eng.China Clays
165 Enterprise Inns
166 Enterprise Oil
167 Euromoney Pubs.
168 Eurotherm
169 Eurotunnel Units
170 Evans of Leeds
171 Expro Intl.
172 Fairey Group
173 Fenner
174 Fi Group
175 Fibernet Group
176 Field Group
177 Filtronic
178 Fine Art Developments
179 Finelist
180 First Choice Hols.
181 First Group
182 First Leisure
183 First Technology
184 Firth Rixson
185 FKI
186 Flextech
187 Forth Ports
188 Freepages Gp.
189 Friends Ivory & Sime
190 Frogmore Estates
191 Gallaher Group
192 Games Workshop
193 GEC
194 Geest
195 General Accident
196 General Cable
197 George Wimpey
198 Gerrard
199 GKN
200 GlaxoWellcome
201 Glynwed
202 Go-Ahead Group
203 Goode Durrant
204 Graham Group

Appendix One - Cont.

205 Granada Group
206 Grantchester Holdings
207 GRE
208 Great Portland Estates
209 Great Universal Stores
210 Greenalls Gp.
211 Greene King
212 Greggs
213 Greycoat
214 Guinness Peat Gp.
215 GWR Group
216 Halifax
217 Halma
218 Hambro Countrywide
219 Hammerson
220 Hanson
221 Hardy Oil & Gas
222 Harveys Furnishings
223 Hays
224 Hazlewood Foods
225 Headlam
226 Henlys
227 Hepworth
228 Hewden Stuart
229 Heywood Williams
230 Highland Distillers
231 Hillsdown
232 Hiscox
233 Hogg Robinson
234 House of Fraser
235 HSBC
236 Hunting
237 Hyder
238 IBC Group
239 Ibstock
240 Iceland Group
241 ICI
242 IMI
243 Imperial Tobacco
244 Inchcape
245 Independent Insurance Group
246 Inspec
247 Intermediate Capital Group
248 Jardine Lloyd Thompson Group
249 Jarvis
250 Jarvis Hotels
251 JBA
252 JJB Sports
253 Johnson Matthey
254 Johnson Service Group
255 Johnston Press
256 Kalon
257 Kingfisher
258 Kwik-Fit Hdg.
259 Ladbroke Group
260 Laing (John)
261 Laird Group
262 Land Securities
263 Laporte
264 Lasmo
265 Ldn.&Manc.Gp.
266 Ldn.Mer.Secs.
267 Legal & General
268 Lex Service
269 Liberty Intl.
270 LIMIT
271 Lloyds TSB
272 Logica
273 London Bridge Software
274 London Clubs International
275 London Forfaiting
276 London Intl.Gp.
277 London Scottish Bank
278 Lonrho
279 Low & Bonar
280 LucasVarity
281 Luminar
282 Lynx
283 M&G Group
284 Macfarlane Group
285 Maiden
286 Man (E D & F) Group
287 Manchester Utd.
288 Mansfield Brew.
289 Marks & Spencer
290 Marley
291 Marshalls
292 Marston Thompson
293 Matthew Clark
294 Matthews(Bernard)
295 Mayflower Corporation
296 McBride
297 McCarthy & Stone
298 McKechnie
299 Mdis
300 Medeva
301 Meggitt
302 Menzies (John)
303 Mepc
304 Mersey Docks & Harbour Company
305 Meyer
306 MFI Furniture

Appendix One - Cont.

307 *Micro Focus Gp.*
308 *Millennium & Copthorne Hotels*
309 *Minerva*
310 *Mirror Gp.*
311 *Misys*
312 *Mitie*
313 *Monument Oil & Gas*
314 *More Group*
315 *Morgan Crucible*
316 *Morrison Construction*
317 *Morrison(Wm)Spmkts.*
318 *Moss Bros.Gp.*
319 *Mowlem (John)*
320 *MSB International*
321 *Mucklow(A.&J)Gp.*
322 *National Express*
323 *National Grid*
324 *National Power*
325 *NatWest*
326 *Nestor Healthcare*
327 *Next*
328 *Nfc*
329 *Northern Foods*
330 *Northern Leisure*
331 *Nycomed Amersham*
332 *Ocean Group*
333 *Orange*
334 *Oxford Insts.*
335 *P&O*
336 *Paragon Group*
337 *Parity*
338 *Partco*
339 *Pearson*
340 *Peel Holdings*
341 *Pentland Group*
342 *Perkins Foods*
343 *Perpetual*
344 *Persimmon*
345 *Photo-Me Intl.*
346 *Photobition*
347 *PIC International*
348 *Pilkington*
349 *Pillar Property*
350 *Pizzaexpress*
351 *Polypipe*
352 *Ports. & Sunderland Newspapers*
353 *Powell Duffryn*
354 *Powergen*
355 *Premier Farnell*
356 *Premier Oil*
357 *Provident Financial*
358 *Prudential Corporation*
359 *Psion*
360 *Racal Electronic*
361 *Railtrack*
362 *Ramco Energy*
363 *Rank Group*
364 *Rathbones*
365 *Reckitt & Colman*
366 *Redrow Gp.*
367 *Reed International*
368 *Regent Inns*
369 *Renishaw*
370 *Renold*
371 *Rentokil*
372 *Reuters*
373 *Rexam*
374 *Rio Tinto*
375 *RJB Mining*
376 *RM*
377 *RMC*
378 *Robert Wsm.Drs.*
379 *Rolls-Royce*
380 *Rotork*
381 *Royal & Sun Alliance*
382 *Royal Bank of Scotland*
383 *RPC Group*
384 *Rubicon Gp.*
385 *Rugby Group*
386 *Rutland Trust*
387 *Safeway*
388 *Sage Group(The)*
389 *Sainsbury (J)*
390 *Salvesen(Chris.)*
391 *Scapa Group*
392 *Scholl*
393 *Schroders*
394 *Scot.Radio Hdg.*
395 *Scotia Holdings*
396 *Scottish & Newcastle*
397 *Scottish Hydro-Electric*
398 *Scottish Media*
399 *Scottish Power*
400 *Sears*
401 *Securicor*
402 *Sedgwick Group*
403 *Select Appointments*
404 *Sema Group*
405 *Senior Engr.*
406 *Serco*
407 *Seton Healthcare Group*
408 *Severn Trent*

Appendix One - Cont.

409 *Shaftesbury*
410 *Shanks & Mcewan*
411 *Shell*
412 *Shire Pharmaceuticals Group*
413 *Siebe*
414 *SIG*
415 *Signet Group*
416 *Singer & Friedlander Group*
417 *Skillsgroup*
418 *Skyepharma*
419 *Slough Estates*
420 *Smith & Nephew*
421 *Smith (David S)*
422 *Smith(WH)Group*
423 *SmithKline Beecham*
424 *Smiths Industries*
425 *Somerfield*
426 *South Staffordshire Water*
427 *South West Water*
428 *Southern Electric*
429 *Southern Newspapers*
430 *Spirax Sarco*
431 *St Ives*
432 *St James's Place Capital*
433 *Stagecoach*
434 *Stakis*
435 *Standard Chartered*
436 *Stanley Leisure*
437 *Storehouse*
438 *Streamline Holdings*
439 *Sun Life & Provincial*
440 *T&S Stores*
441 *Tarmac*
442 *Tate & Lyle*
443 *Taylor Nelson AGB*
444 *Taylor Woodrow*
445 *Tbi*
446 *Telewest*
447 *Tempus Group*
448 *Tesco*
449 *Thames Water*
450 *The Electronics Boutique*
451 *Thistle Hotels*
452 *Thorn*
453 *Thorntons*
454 *TI Group*
455 *Tibbett & Britten*
456 *Tilbury Douglas*
457 *TLG*
458 *Tomkins*
459 *Trafficmaster*
460 *Transport Development Group*
461 *Travis Perkins*
462 *Triad Group*
463 *Trinity*
464 *TT Group*
465 *Ultra Electronics*
466 *Unigate*
467 *Unilever*
468 *United Assurance*
469 *United Biscuits*
470 *United News & Media*
471 *United Utilities*
472 *Vardon*
473 *Vaux Group*
474 *Verity Group*
475 *Versailles Group*
476 *Vickers*
477 *Victrex*
478 *Viridian Group*
479 *Vitec Group*
480 *Vodafone*
481 *Volex Group*
482 *Vosper Thncft.*
483 *Waddington*
484 *Wagon Industrial Holdings*
485 *Wassall*
486 *Waste Management International*
487 *Waste Recycling*
488 *Wates City of London*
489 *Watson & Philip*
490 *Weir Group*
491 *Wellington Underwriting*
492 *Wembley Gp.*
493 *Wessex Water*
494 *Westbury*
495 *Wetherspoon (Jd)*
496 *Whatman*
497 *Whitbread*
498 *Wickes*
499 *Williams*
500 *Willis Corroon Group*
501 *Wilson Bowden*
502 *Wilson Connolly*
503 *Wolseley*
504 *Wolv.&Dudley*
505 *WPP Group*
506 *Wstm.Hlth.Care*
507 *Yates Brothers Wine Lodge*
508 *Yorkshire Water*
509 *Yule Catto*
510 *Zeneca*

Appendix Two: Variables in Main Data Set

Variable	Description
BENEFITS	Benefits in kind received during the year
BENEND	Beneficial share holding at end of year
BENSTART	Beneficial share holding at beginning of year
BONUS	Bonus received during year
CHANGE	Change in the directors option holding during the year (Yes or No)
COMBINE	1 = Roles of CEO and Chairman combined, 0 = Roles of CEO and Chairman separate
COMPANY	Company Name
DFORMAT	Format of dates reported D=Exact Day, M=Month, Y=Year
DIRECTOR	Name of leading executive
DIRMTH	Number of months during the year for which named executive was a director
DSCODE	Datastream code of company
DYAVE1	Average dividend yield over financial year (Datastream DY)
DYAVE2	Average dividend yield over 4 years (Datastream DY)
DYDAYS	Number of dividend observations during year
EDATE	Event Date for changes in holding i.e date options were exercised, granted, or lapsed
EMPLOYEE	Total number of employees (Datastream 219)
EPS	Earnings per share - net adjusted (Datastream 211)
EQEND	Number of shares in issue at end of financial year
EQST	Number of shares in issue at beginning of financial year
EXFIRST	First day or which options can be exercised
EXLAST	Last day on which options can be exercised
GDATE	Grant Date - date options were initially granted
ICODE1	1-digit FTSE industrial classification code.
ICODE3	3-digit FTSE industrial classification code.
IORW	I= Individual tranche exercise price, W=Weighted average exercise price
ITYPE	Description of industry of company
MARKER	H=Holding at year end, G=Granted in year, E=Exercised in year, L=Lapsed in year
MKTPRICE	Market price of shares on option event day where applicable

Appendix Two - Cont.

MV	Market value on 15/7/98
NBENEND	Non-beneficial share holding at end of year
NBENSTART	Non-beneficial share holding at beginning of year
NTRANCHES	Number of individual tranches held by director
NUMBER	Number of options in particular tranche
OPDATA	YES = Options were either held at the start or at the end of the year, NO - otherwise
OPYE	YES = Options are held at the end of the year, NO - otherwise
OTHER	Other payments (e.g. compensation, cash pension supplements, etc.)
ROLE	Executive Title (e.g. CEO, Chairman, MD)
ROLEMTH	Number of months during the year for which named executive held stated role
SALARY	Basic salary received during the year
SALES	Total sales figure (or equivalent)
SALESIND	Indicator for appropriate sales figure: S=Sales, TI= Total Income, NII=Net Interest Income
SCHEME	Scheme under which options granted : E=Executive, S=SAYE, SAR=Stock appreciation rights
SEDOL	Sedol number of company
SPRICE	Share price at financial year end from annual report
TBRATE	Treasury bill rate on financial year end date
TMAT	Remaining length (in years) of option tranche
TOTAL	Total direct compensation (=Salary+Benefits+Bonus+Other)
TOTALCAP	Total Capital Employed (Datastream 322)
TOTPY	Total direct compensation in previous year
TSR	TSR during year (=log [return index at end/return index at start])
TSTEND	Number of shares held under LTIP at end of year
TSTGRANT	Number of shares granted under LTIPs during year
TSTSTART	Number of shares held under LTIP at beginning of year
VOL1	Volatility of company - taken from LBS Risk Management
VOL2	Volatility of company – calculated from 4 years of returns data
XPRICE	Exercise price of options
YREND	Financial year end date