An Investigation into Optimal Stock Option Compensation

A thesis presented in fulfillment of the requirements for the degree of Doctor Philosophy in Finance at Massey University

Eugene Chang Fu Lai

2010

ABSTRACT

Throughout twentieth century, it has become increasingly common for executives to be remunerated with stock options, contracts which allow the recipient to buy company stock at a predetermined price, thus giving the incentive to maximize the stock price in order to increase the value of the stock option contract. Not only has stock option compensation become increasingly prevalent to executives at most major listed companies, but also to employees at all levels of the firm, both big and small. However, along with the growth in popularity, stock option compensation also became a topic of contention, not only among the general public, but among lobbyists, legislators and academics.

This thesis aims to provide a better understanding of stock option compensation practice, with a particular emphasis on the United States, where stock option compensation is most prevalent. The thesis is divided into three chapters: the first chapter deals with establishing a foundational understanding of stock option practice and possible drivers through investigating the literature on the history of stock option compensation practice in the US. The second chapter develops a holistic theoretical model of an optimal stock option compensation package to possibly explain some practice currently considered as excessive. Then lastly, the third chapter empirically tests the validity of possible drivers of executive stock option policy in recent times in an attempt to identify whether current practice is optimal or not.

The first chapter is primarily a literature review, covering a series of events over the history of stock option compensation in the US, ranging from its early beginnings in the early twentieth century until the present day. Included in the coverage of

significant events are: legislation impacting tax benefits for corporate and for recipients; “landmark” events such as the first case of “broad-based” option compensation resulting in companies following a standard business practice; trends in the stock market; academic theory of the development of agency theory which supports the use of tools such as equity based compensation, and the development of major option valuation models; the possible impact of accounting standards; and the possibly impact of major bankruptcies or unethical behavior directly or indirectly tied to executive stock option compensation.

The second chapter follows with a theoretical approach to understanding stock option compensation trends by analyzing the major benefits and costs associated with stock options. The model developed differs to most other existing optimization models as it does not focus on one set of benefits or factors, rather a more holistic approach is taken. Using a holistic approach, this model also helps explain how levels of compensation that are considered excessive under an optimisation model based only incentive benefits, can actually be optimal for the firm once other costs and benefits are incorporated.

The model also aims to provide an alternative explanation to the managerial power hypothesis to explain why the buoyancy of the market may be positively correlated with compensation levels. This is explained by the impact of the buoyancy of the market on the likelihood of stock option exercise, and the costs and benefits either unconditional, partially conditional or conditional on options being exercised. In addition, smaller companies are also found to benefit from stock options more than larger firms due to some of the unconditional benefits, in particular, the ability to

attract higher quality talent which can also help small firms fulfil untapped potential. Lastly, the model also provides useful insight into the appropriateness of using of foregone option premiums as the economic opportunity cost of granting stock options.

The third chapter aims to empirically test the impact of several factors brought up in Chapter One that may help explain changes in compensation that occurred at the turn of the century. These major factors analyzed are: 1) the bull market prior to and the bear market following the market crash of 2000, 2) changes in accounting standards for equity based compensation, and 3) possible public perception of corruption following several major bankruptcies associated with poor ethics in 2002.

Mixed evidence is found regarding the impact of market cycles. These findings include cycles to be linked to granting options out-of-the-money, a general inverse relationship with the levels of stock option compensation with the buoyancy of the market, expected for companies managing incentives, and finally there are indications companies ceased granting options based on poor company stock price performance prior to 2001.

Other findings indicate the possible influence of accounting standards on economic decisions as well as the broad impact of events surrounding 2001-2, even though they have no economic impact. On the one hand, decreases in stock option compensation levels is shown to be linked to accounting decisions, however, there is insufficient evidence to support the argument that firm-wide decision making to cease granting stock options completely was based on accounting decisions.

ACKNOWLEDGEMENTS

I would firstly like to thank Professor Martin Young for accepting me as a student, for his patience throughout the years, his support when I doubted myself and guidance in helping point me in the right direction.

To Fong Mee Chin, thank you for assisting me in acquiring the ExecuComp database and accessing price data from CRSP. To my sister Serena Lai, thank you for helping collect data for me, and for proof reading.

Thanks to my colleagues, friends and family for their kind words of encouragement, and for understanding whenever the thesis became a higher priority than time with them over the years.

To my wife Jenny, thank you for your patience and understanding throughout our first year of marriage. To my mother, for your regular phone calls to check up on me.

Lastly, I would like to thank Professor Chin Diew Lai, who as a father helped support me in so many ways, and as an academic was always there for me to discuss the most minor of details, whether at home or in the office. I don't think I would have been able to do this without your support throughout the years. Although this experience has been difficult at times, through it we have been brought closer together, and for that I am grateful.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter I: INTRODUCTION

Since the late twentieth century, it become increasingly common for executives to be granted company stock options as part of their compensation package, thus linking a portion of executive's remuneration to the performance of the company's stock price. Performance based pay such as stock options, restricted stock and bonuses (based on short-term and long-term targets) on top of an executive's base salary, were a key component to how executive pay would typically differ from the average worker on a wage or salary. This difference in compensation structure drove executive pay rates up at a much higher rate than the average "blue collar" worker, which in many cases was attributable to the growth in popularity of stock option compensation, especially in the United States, where executive pay rates were higher than any other country in the world. However, the popular use of stock option compensation was not only constrained to executives, it later became common practice within some companies for stock options to be granted to employees at all levels of companies irrespective of size. However, as options gained increased popularity, and slowly gained more media attention throughout the late 1980s, stock option compensation also became, and still is, a topic of contention, not only among the general public, but also among lobbyists, legislators and academics.

Traditionally, academic advocates of stock options have regarded them as a vital component to a company's overall corporate governance framework. Alongside a strong board of directors, internal audit, internal controls, and other forms of remuneration, stock options help ensure accountability of an employee's actions and provide the proper incentives to align the interests of employee and the stockholder, thus reducing or eliminating the principal-agent problem (see for example Jensen & Meckling, 1976).

Other advocates stress the benefits of options to attract and retain employees at both the executive and lower levels. Some lobbyists campaigning against accounting standard changes in the 1990s even argued that stock options were a major contributor to the thriving US economy at the time, and if accounting standards were changed, it would impact stock option usage, and possibly hinder the future growth of the economy. Although these views seem extreme, there is anecdotal evidence to support

the argument of the success of major technology companies having depended on stock option compensation in early stages of the company's life cycle, including companies such as Intel and Apple. Due to the unprecedented amount of support for stock options, the Financial Accounting Standards Board eventually relaxed their position on compulsory expensing until the matter was reviewed in 2002.

Protagonists against stock option compensation generally argue that options are granted excessively due to the false perception of them being cheap as there is no cash outlay involved, and until the accounting standards changes in 2004, stock option compensation was not "recognized" on most company's financial statements. Several academics have supported this line of reasoning, contending that many corporations have failed to understand the economic opportunity cost involved with granting stock options, as well as arguing why options can be an inefficient tool to lower agency costs.

There is also general disagreement regarding issues of executive compensation fairness and the role that stock options have in creating excessive compensation packages. During the bullish market of the 1990s, it was also suggested that executives were benefiting from the state of the up market, as much of the value their option exercises could be due to the buoyant market instead of value they added. Whether or not this is due to some executives having influence over their own compensation package or not is also an issue of contention among academics. Options are also indirectly associated with the widening pay gap between executives and lower level employees, which is of interest to the general public. However, because options are not exclusive to executives, they are not solely responsible for the widening pay gap. From the early 1990s, there were incidences such as that of Microsoft, where software companies with broad-based option compensation gained notoriety for narrowing the gap by making thousands of employees millionaires.

From late 2001 to 2002 there were several incidences which would seem to support the view of significant unethical behavior in executive compensation. The prime example was Enron which went bankrupt due to fraudulent acts of its executives, which some observers have perceived to have been incentivized by equity based compensation. This view was reinforced on a wider scale in 2006, when hundreds of companies were

discovered to have backdated their stock option exercise prices so that they were granted in-the-money, yet taking advantage of tax and accounting policy reserved for at-the-money and out-of-the-money options. Then in 2008, in the midst of the financial credit crisis, stock option compensation once again came under scrutiny as a possible reason behind the greed that led to the bankruptcy or bailout of financial giants such as Lehman Brothers, Bear Sterns and Merrill Lynch.

Although rarely the topic of "breaking news", executive compensation has been of continued interest to the general public through the media, as most people query how executives command such high levels of compensation, particularly as the pay gap has widened. This leads to a key question central to this thesis, have companies been granting too many options?

This thesis is aimed at better understanding the rationale behind trends in stock option compensation at both the executive level, and the "broad-based" employee level. Although a key area of interest is whether an executive is worth what they are paid, it is not the objective of this thesis to necessarily answer this question. Nor, is it the goal of this thesis to explain the role of options in the collapse of companies such as Enron or Lehman Brothers. While important, this latter issue deals with the much larger problem of corporate governance, which stock options only play a partial role in.

Instead, a holistic view of the costs and benefits of options will be taken throughout the thesis, where the optimal level of option compensation is not restricted to the optimal level of incentive pay. By gaining a better understanding of other factors which may affect option compensation policy, it is hoped that rational explanations can be found for companies to grant seemingly excessive levels of incentive pay in the form of stock options.

In order to accomplish this, this thesis is comprised of three interrelated chapters investigating the history of stock option compensation practice, the development of a theoretical model of optimal stock option compensation packages, and empirical testing of possible drivers of executive stock option policy.

In the first chapter: *A history of stock option compensation in the US*, a basic overview of the development of stock option compensation is established. As aforementioned, the widespread manifestation of stock option compensation became apparent in recent times, however the origins of their usage go much further back. Starting from the earliest records of the 20th century until the present, the chapter begins by tracking major events that may have influenced the widespread usage of stock options, and ends covering more recent events which may have contributed to the observed reduced usage of stock options.

Included in the coverage of history are events ranging from tax benefits arising from the first court case allowing options to be expensed for tax purposes, to "landmark" events such as the first case of "broad-based" option compensation which many companies followed, to trends in the stock market, to academic theory of the development of major option valuation models, and the possible impact of these models on accounting standards, in addition to other issues. This chapter is primarily a literature review, which provides anecdotal evidence regarding events or factors which may have impacted on stock option compensation policy and trends.

The latter chapters develop more objective evidence in order to establish the extent to which many of the factors identified in the first chapter may impact on stock option compensation policy.

The second chapter takes a theoretical approach to understanding stock option compensation trends by analyzing the major benefits and costs associated with stock options. It develops an optimization model that differs from most other optimization models as it does not focus on one set of benefits or factors, rather a more holistic approach is taken. It is also generic enough to apply to a firm with mostly executives or to a firm compensating employees across all levels of the firm or to small high growth companies which may receive some benefits that others do not.

Because there is little theoretical rationale regarding the relationship between option costs and benefits and accounting standards and corporate corruption, these factors serve no major role in the model. Of particular interest, however, is the possible impact

of the market, which may increase or decrease the "moneyness" of options, that is, the likelihood of stock option exercise. Expanding on some of the benefits introduced in the first chapter, the second chapter reviews the recent academic literature regarding both executive and broad-based stock option compensation. These factors include benefits relating to attracting and sorting talent, retention of employees, lower finance issuance costs, cash conservation, tax and improved capital structure. With a clearer understanding of these different costs and benefits, the relationship between "moneyness" and these benefits becomes clearer. As a result each of these benefits is divided into one of three categories with regards to the relationship with "moneyness": unconditional, partially conditional, and conditional benefits, which also correspond to when the benefits are incurred (at grant, throughout lifetime, upon exercise).

By analyzing the benefits offered by a firm, this allows a framework to be established to compare the difference between a firm with and without options. Whereas using empirical data or any retrospective analysis based on the current price already reflects the majority of benefits from stock options, the model disaggregates *what would have been* and the *incremental benefits* from stock options. Such a framework provides a new perspective to the nature of the economic opportunity cost as well as costs relating to dilution of value. The framework also provides insight to perceived value, with the implication that the market is not strong-form efficient, and that employees have inside information regarding value adding benefits or decisions which will cause them to have a different valuation of the firm to that of an outsider.

Finally, through the use of sensitivity analysis, the model is used to clarify the relationship between moneyness and opportunity cost of foregone revenues, moneyness and dilution, minimum required unconditional benefits and grant sizes with and without tax, the impact of moneyness on unconditional benefits, the impact of moneyness and conditional benefits, and finally required unconditional benefits (also used as a proxy for incentive and selection benefits) and conditional benefits.

The third chapter tests the anecdotal evidence brought up in Chapter One concerning the major events impacting stock option compensation since near the beginning of the twenty first century that may have led to the much decreased level of stock option compensation grants. Of primary focus are: 1) the impact of the bull market prior to

and the bear market following the market crash of 2000, 2) changes in accounting standards for equity based compensation, and 3) the impact of several major bankruptcies associated with poor ethics and the resulting Sarbanes Oxley legislation.

Several hypotheses are developed for the model presented in the chapter. Firstly, it is hypothesized that the influence of the market is to impact the firm's option granting, because out of the three factors, it has the strongest theoretical support. However, the circumstances surrounding the choice of accounting transition methodology meant that firms which did not believe in traditional efficient market theory could possibly be identified. So depending on the type of accounting policy chosen, some firms were hypothesized to change their stock option compensation policy, whereas others would not. Lastly, corporate fraud was hypothesized to have no impact on the firm.

Utilising data from Execucomp for 870 executives from 397 S&P 500 companies who had worked for at least 8 years, as well as handpicked information regarding voluntary adoption of recent accounting standards, regression analysis was conducted to gain a better understanding which of these variables was related to recent decreases in stock option compensation. In addition, further analysis was conducted to analyse firms which had not only decreased granting options, but had completely ceased using them at all levels.

Chapter II: A HISTORY OF STOCK OPTION COMPENSATION IN THE US

2.1 INTRODUCTION

In recent times, stock option compensation has become a popular issue. Stories surrounding the topic have varied in nature, including both the good and bad. In the early 90s options gained a positive reputation for the ability to reward employees, with stories such as the account of an estimated two thousand Microsoft employees (Fox, 1997) who became millionaires through their stock options. However, more recently, options have received a more negative standing, particularly amidst the large corporate scandals of 2002 and the bankruptcy and bailout of major financial corporations in 2007-2008. Some observers have attributed blame to excessive stock options for providing major incentives to executives to either embellish the accounting results or take excessive risk that led to the collapse of the companies involved.

These scandals led to pressures for reforms throughout the accounting industry as an effort to prevent any further debacles. So by late 2002, the International Accounting Standards Board (IASB) released an exposure draft for *International Financial Reporting Standards 2 Share-based Payment* (IFRS 2), which was finalized on February 19th 2004. Shortly afterwards on March 31st 2004, the Financial Accounting Standards Board (FASB) released the exposure draft of the American equivalent: a revision of the existing FASB Statement 123. The final standard was released approximately six months later in October after all the submissions had been heard and accounted for.

However, even before the FASB released the exposure draft, legislation was being proposed in an attempt to delay the revision and implementation of Statement 123. Most of these proposals were rejected, and though a Bill with potential was passed, it never reached the Senate. Eventually, petitions concerning pressures for companies to comply with the Sarbanes Oxley Act led the FASB to delay the final version until December 15th 2004. The compliance dates for listed companies were also extended to June 15th 2005, 6 months after the original proposed date of December 15th 2004. The revision of these accounting standards relating to option compensation saw the overdue replacement of thirty-two year old accounting standards which companies still had the choice of using, after an unsuccessful attempt to replace them in 1995.

When changes to accounting for *equity based compensation* were originally proposed in June 1993, there was even greater opposition than what was found for the 2005 changes. Never had a proposed change in accounting raised so much controversy before. The level of controversy that arose is perhaps indicative of how influential stock options had become in the US economy (at that time) and the possible role that accounting standards had in helping fuel stock option grants in the US to the estimated hundreds of billions of dollars they are worth today. The key incentive that the old accounting standards provided was through the outdated valuation method of "intrinsic value", calculated by the exercise price less the underlying stock price (with a minimum value of zero). This allowed companies to construct stock option packages which could escape recognition in financial statements, as long as stock options were granted at an exercise price lower than the share price when the options were granted. The proposed standards, however, defined fair value more meticulously, which required modern option valuation models that accounted for a wider set of variables than just the exercise price and price of underlying asset at date of grant, thus preventing any opportunity for stock option plans to exploit the deficiency of the old standard. But with the amount of opposition to these proposed standards, the FASB struggled to implement their original proposition to replace the old standards. So after more than two years from the Exposure draft, the FASB issued Statement of Financial Accounting Standards No. 123. Instead of requiring compulsory recognition of stock option expense, this final version only strongly recommended recognition, allowing companies to only have to disclose stock option details under the footnotes of financial statements.

Even with these changes in accounting, the use of stock options is unlikely to diminish as a form of compensation. Accounting standards are but one of a few factors which may have influenced the widespread popularity and usage of employee stock options over the years. Contrary to what a few industry articles may have suggested, employee stock options have a history which reaches much further back than the 1990s or 1980s. To better understand how the possible impact these accounting changes may have had, it is important to understand some of the history of stock options and how they have developed. To do this requires more than just identifying levels of stock option usage. To properly understand how employee stock options have developed there is a need to

consider the culmination of intertwining factors which have affected their usage including tax law, accounting treatment, option valuation, the state of the stock market, legislation, and innovations with regards to their usage and their features. By knowing what issues have troubled or helped options in the past, it will be clearer what the future may hold.

2.2 DISCUSSION

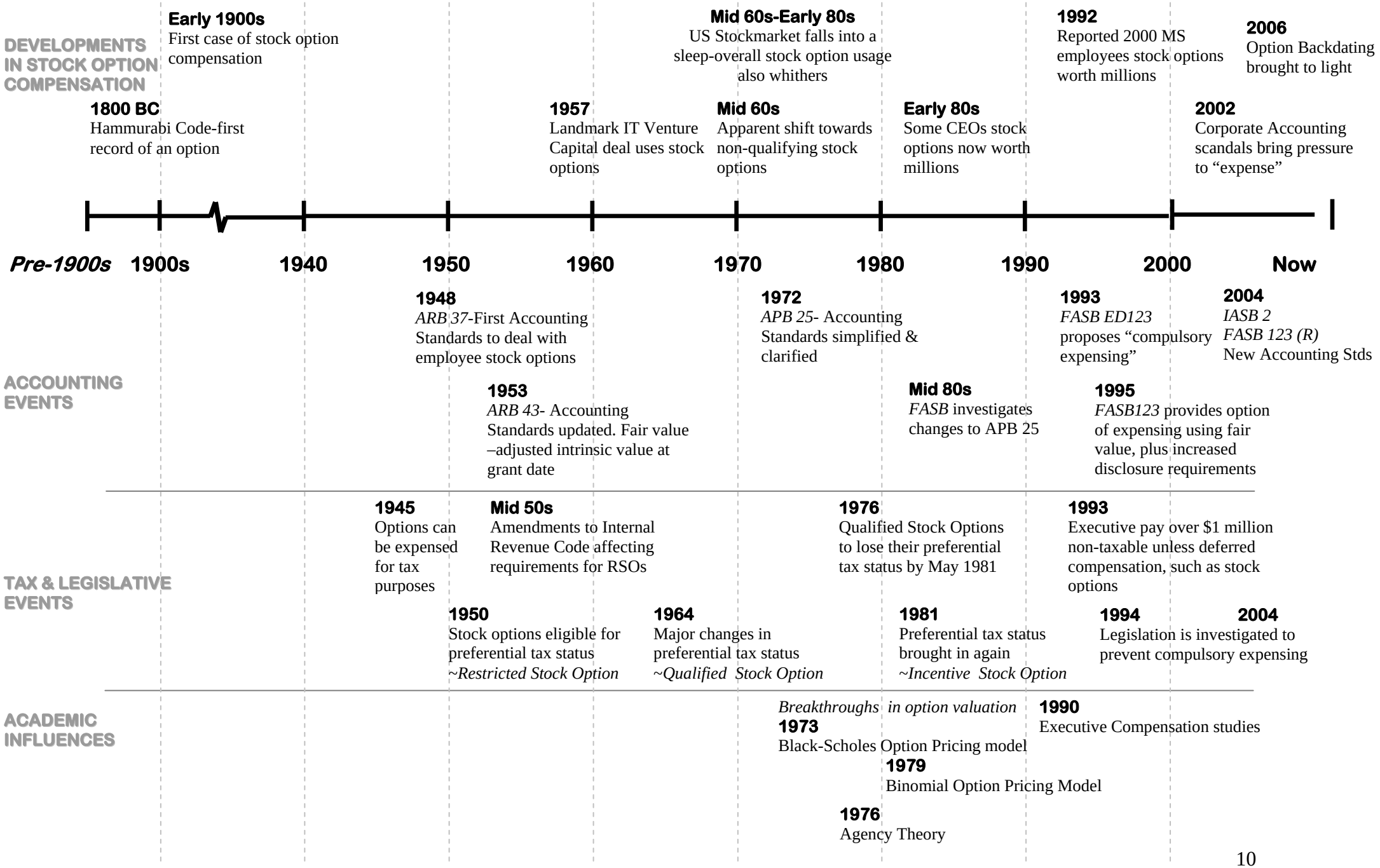
2.2.1 Options prior to the 20th Century: A brief background

The exact origin of a "contractual option" is unclear, but Dunbar (2000) suggests that the Code of Hammurabi is the earliest record of an options contract. Though not explicit, within the Code it was compulsory for loan underwriters to underwrite *deep out-of-the-money* call options (interest rate caps) to hedge their borrowers from extreme interest rate hikes for each period. However, the influence of this code is questionable, as it was only rediscovered in 1902 (Dunbar, 2000), and would not be well known outside archaeologists and historians. Perhaps of greater influence on the origin of the stock option was Aristotle's (350BC, translated 2000) story about the Greek philosopher and mathematician Thales of Miletus who negotiated a contract on the rights to olive presses. In doing so, Thales essentially replicated a long position in a call option, thus limiting losses to the initial premium paid for the derivative, while the possible profits were almost unlimited depending on how plentiful the olive harvest was.

The actual impact of these events is unknown. However by the 17th century, it is known that amidst the irrational markets of Tulip trading, options were being utilized by tulip growers and retailers to hedge themselves of the risk associated with tulip defects. Over time options were applied to many other commodities, and by the turn of the 20th century stock options were introduced on the London Stock Exchange, (Luckock, 2000) where they were traded "over the counter".

Figure 2.1: Timeline of Major Events in Employee Stock Option History shows the majority of events related directly or indirectly to the development of stock option compensation started in the early 20th century.

Figure 2.1: Timeline of Major Events in Employee Stock Option History



2.2.2 Employee Stock Options: 20th Century

In order to better understand the nature of stock option compensation, it is useful to understand how stock options and other derivatives typically work. Stock options and other typical financial derivatives, essentially replicate changes in the value of an underlying asset at a fraction of the cost of the underlying asset itself. As a derivative replicates the changes in value (price) of an underlying asset at a fraction of the cost, derivatives are an efficient tool to hedge or speculate with. Typically, many derivatives markets depend on these two contrasting parties in order to operate, as derivatives merely allow hedgers to transfer their risk to speculators at a cost. The speculator's gain will be the hedger's loss, or vice versa. Employee stock options however, operate differently. There is no external capital market where underwriters sell the option contracts to those wanting to replicate the cashflows of the underlying stock. The underwriter (employer) simply issues options to the recipient (employee). In addition, if the stock price goes up, unlike a traded option, both parties will benefit as the underwriter wants to maximise the stock price, and the employee will receive greater pay. Though there is ingenuity behind the idea of employee stock option, in its early days it seems that few organizations appreciated the concept. In fact, the first cases of stock option compensation were reported in the beginning of the 20th century, but there is no clear evidence of wider recognition until at least 1923[1]. For two decades stock options had not attracted much attention, and without a trigger, stock options continued to lack attention for another two decades.

2.2.2.1 1945: Taxable Stock Option Compensation

A major category of events which influenced the usage of stock option compensation, were changes in tax and legislation. A summary of the major tax changes are recorded in Table 2.1: Significant Stock Option related tax changes. In 1945, an important precedent was made by the supreme courts, which clarified the definition of compensation with regards to tax providing an incentive for companies to use stock options as a means of compensation. In the case, **Commissioner of Internal Revenue v Smith**, the Supreme Court found in favour of the petitioner, Western Cooperage Company, who had expensed stock options granted to an employee upon exercise of the options. This ruling made it

[1] U.S. Supreme Court COMMISSIONER v. LoBUE, 351 U.S. 243 (1956) 351 U.S. 243 makes reference to treasury practice since 1923 of measuring compensation to employees given stock options by the difference between the option price and the market value of the shares at the time the option is exercised.

possible for a firm to expense "the difference between the market value and the option price of the stock as compensation for personal services of the employee, taxable as income in the years when he received the stock (*exercised the options*), under 22 (a) of the Revenue Act of 1938, c. 289, 52 Stat. 447, and 22 (a) of the Internal Revenue Code, 26 U. S.C. 22 (1), 26 U.S.C.Z. Int. Rev. Code, 22(a)." The result was that the president of Western Cooperage was granted Hawley stock options in 1934 through the board of Hawley's acquirer, Western Cooperage, as compensation for his contribution to the reorganization of Hawley Pulp & Paper. In 1938, Western became entitled to a number of Hawley's stocks, and in 1939, the president of Western exercised the options granted to him. Western then expensed the market value that was in excess of the "strike" value of the stock options.

Table 2.1: Significant Stock Option related tax changes

Date	Tax Effect	Event	Impact on Stock Options
1945	**Corporate**	Supreme Court Ruling allowing realized value of stock options to be expensed for tax purposes	This created an incentive for more firms to use options for their tax purposes.
1950	**Personal**	Creation of "Restricted Stock Options", statutory option eligible for preferential tax treatment.	Creation of tax loophole, only 25% tax on long-term capital gains, but up to 91% on personal income. But this eliminates any corporate tax benefit
1964	**Personal**	"Restricted Stock Option" replaced with "Qualified Stock Options"	Stricter qualifications made statutory options less attractive.
1969	**Personal**	Alternative Minimum Tax to limit tax deductible items	Reduced tax benefits of statutory options
1976	**Personal**	Qualified Stock Options to lose their favourable tax treatment by 1981.	Eliminated the incentive to issue statutory options.
1981	**Personal**	Economic Recovery tax act 1981 reintroduces a statutory stock option, Incentive Stock Option	Similar to previous restrictions, except major change limiting grants to value of $100,000
1993	**Corporate**	Congress add section 162 (m) to the tax code, making any regular income expense to executives above $1 million, non-tax deductible.	Encouraged companies to limit salary to $1 million, and then use equity based compensation as additional

Initially lower courts had ruled that the company compensated the employee with company stock rather than the stock options. It was argued that stock was granted at discount through the options as a tool to give bargain purchase, not as a form of

compensation. But the Supreme Court overruled this, as that reasoning was found invalid in the case. At the date of the option grant, no discount could be provided (the exercise price was greater than the current stock price), so at grant the recipient was not entitled to a "bargain purchase". The options could only provide a discount if the stock price exceeded the current share price, which in turn provided an incentive for those involved in reorganizing Hawley to make positive changes which would then reflect in the company's share price. Because of the Supreme Court's interpretation and power, a precedent was set so that companies could treat option compensation as part of gross income under the Revenue Act and Internal Revenue Code, thus allowing companies to deduct the realized value of exercised employee stock options as an expense for tax purposes. This resulted in creating a tax incentive for companies to utilize employee options, which contributed to an increased level of activity in stock option grants.

2.2.2.2 The First Accounting Standards for option compensation: ARB 37

Just as tax changes had an impact on the utilization of employee stock options, so did financial accounting standards. Table 2.2 provides a summary of accounting standards relating to stock option compensation, while Tables 2.3 and 2.4 provide practical examples of the impact of each of the different accounting standards. In November 1948 the first authoritative guidance on accounting for stock option compensation in the US was established in *Accounting Research Bulletin No 37*: *Accounting for Compensation in the form of stock options* (ARB 37). Several years earlier the *Securities Exchange Commission* (SEC) decided to delegate its accounting standard setting power to an accounting based committee, which at the time was the *Committee on Accounting Procedures*, who then authored ARB 37 (Nordquist & Ellingson, 1997). Later the *Accounting Principals Board* (APB) replaced them, which was subsequently followed by the *Financial Accounting Standards Board* (FASB). Both of the boards issued further financial accounting standards regarding the use of stock options.

Table 2.2: Accounting Standard changes affecting Employee Stock Options

Date	Standards	Rationale	Impact on Stock Options
1948	**ARB 37**	The popularity of stock options was slowly growing, and this was the first set of standards to recognize the need to expense	Stock options now had to show up as an expense in the financial statements. Although there is a flaw in how/when expense is calculated
1953	**ARB 43**	ARB 37 had a number of shortfalls, namely in how stock compensation is measured	Stock option expense date changed, and adjustments allowed to account for restrictions.
1972	**APB 25**	ARB 43 lacked detail, thus leaving small holes or inadequacies, particularly in how to deal with new innovations in stock option plan designs.	Stock option expense simplified to excess over the exercise price at date of grant, pending option has no variable factors.
1995	**FASB 123**	APB no. 25 had a major flaw which allowed ordinary stock options to be expensed for nothing. Originally the FASB wanted to expense options using a "fair value" instead of the intrinsic value, but instead leaves it optional.	A new definition of fair value is given, but it is not enforced, its use pends on a company's decision to do so. Increased disclosure requirements.
2000	**FASB Int 44**	Due to APB no. 25 not being completely replaced, there were several areas which were not covered for those who chose not to use "fair values".	Clarified some areas APB 25 did not cover, leaving less room for manipulation.
2002	**FASB 148**	It was not known when APB 25 would be replaced, so details which were not made clear in the statement were clarified.	Provides alternatives to transition for those considering taking up FASB 123
2004	**IASB 2**	Partially in response to the corporate accounting scandals of 2002.	Compulsory to expense options using fair value (applicable to companies in Countries belonging to IASB)
2004	**FASB 123 (R)**	As very few companies chose to recognise expense using fair value, this made it compulsory to do so.	Compulsory to expense all options using fair value. (Applicable to the US)

ARB-Accounting Research Bulletin

APB-Accounting Principles Board

FASB-Financial Accounting Standards Board

IASB-International Accounting Standards Board

Table 2.3: Summary of impact on Earnings and Balance sheet for in-the money options

Accounting Standard	Impact Timing	Impact on Earnings	Impact on Balance Sheet	Impact on Cashflow
ARB 37	*Grant*			
	Exercise	$2,000 expense	$2000 paid capital $600 cash (saved)	$600 tax shield
ARB 43 / APB 25	*Grant**	$200 expense	$200 Accrued Expense	
	Exercise		$600 cash (saved)	$600 tax shield
FASB 123	*Grant**	$200 expense Footnote disclosure: * diluted EPS *Option attributes	$200 Equity	
	Exercise		$600 cash (saved)	$600 tax shield
FASB 123 (R)	*Grant**	$300 expense	$200 Equity	
	Exercise		$600 cash (saved)	$600 tax shield

Table 2.4: Summary of impact on Earnings and Balance sheet for at-the-money options

Accounting Standard	Impact Timing	Impact on Earnings	Impact on Balance Sheet	Impact on Cashflow
ARB 37	*Grant*			
	Exercise	$2,000 expense	$2000 paid capital $600 cash (saved)	$600 tax shield
ARB 43 / APB 25	*Grant**	$0 expense	$0 accrued expense	
	Exercise		$600 cash (saved)	$600 tax shield
FASB 123	*Grant**	$0 expense Footnote disclosure: * diluted EPS *Option attributes		
	Exercise		$600 cash (saved)	$600 tax shield
FASB 123 (R)	*Grant**	$300 expense	$300 Equity	
	Exercise		$600 cash (saved)	$600 tax shield

Tables 2.3 & 2.4 assume:

Grant* timing refers to the date of grant, and every year after until vesting period

Option "fair value" at grant: $1,500 (intrinsic value of in-the money option being $1,000)

Exercise value of $2,000.

Option life-time: 7 years, vesting period: 2 years, therefore time until vesting period: 5 years

A major difficulty that standard setters had been confronted with regarding stock options was the matter of valuation, since in the late 1940s no generally accepted option valuation models had been developed to calculate option premiums i.e. the expected worth of the option. It was not until several decades later that any such models were conceived. With this constraint, it was difficult to accurately or appropriately determine what the value of the stock option was at the date of grant, so “fair value” was instead determined at the date of exercise. Fair value was defined as the *market value excess above the exercise price,* producing results equivalent to the compensation expense that would be reported for tax purposes. Unfortunately, as will be explained later, taking a retrospective approach like this was not consistent with financial accounting principles. According to Nordquist et al (1997) the Bulletin also fell short in outlining criteria to prove stock options had been issued for compensation purposes, and not primarily to increase employee ownership or to raise capital. In years to come there were a number of tax and legislative changes that instigated changes in accounting standards, and the deficiencies of this early standard were later rectified.

2.2.2.3 Creation of Statutory options: the Restricted Stock Option (1950)

Shortly after the 1945 US Supreme court ruling which entitled stock option compensation to be a tax deductible expense, legislation was implemented which sought to encourage particular stock option usage. The Revenue Act of 1950 established Section 130A of the Internal Revenue code (I.R.C.), which created a class of options called "restricted stock options". This distinction of statutory and non-statutory options served to encourage particular option attributes through a provision of preferential tax treatment. To qualify for statutory option status, options needed to possess particular attributes. If one requirement was not met, the option would be considered non-statutory, and would have failed to gain any preferential tax treatment for the recipient.

The main appeal of the preferential tax status statutory stock options applied to the employees receiving the option, rather than to the firm. Up until this point, any recipients would be charged income tax based upon the intrinsic value at the date of exercise (Park & Smith, 2004). In 1950, many well paid executives in the US would have been taxed at the highest marginal tax rate of 91%, which often required liquidation of shares in order to pay the income tax from exercised options. Restricted stock options, however, would have two benefits: firstly, income tax would not be incurred until the sale of the

underlying shares; which entitled them to the second benefit of long-term capital gains tax status. During this period of time of the 1950s the tax differential (refer to Figure 2.2*)* was at its peak, with long-term capital gains at 25%, less than a third of the highest marginal tax rate of over 90%.

Figure 2.2: Graph of Long-term capital gains and Highest marginal tax differential

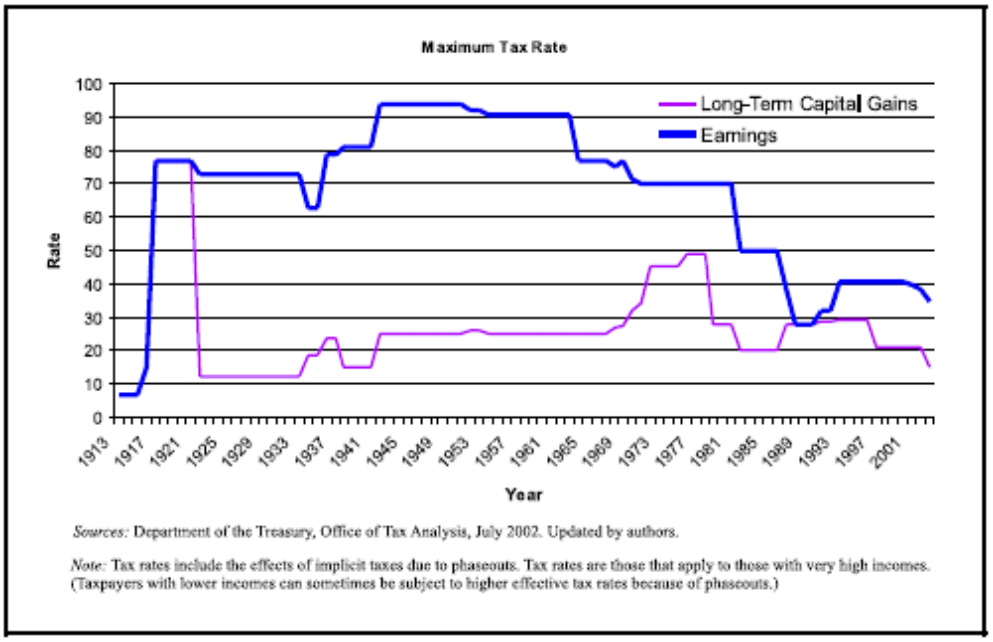


Figure reference: http://www.taxpolicycenter.org/publications/template.cfm?PubID=1000588

To qualify as a restricted option the strike price had to be at least 85% of the share's fair market value, exercise must have been during the recipient's employment or within three months of termination, the underlying shares could not have been sold within two years of the original option grant and must have been held for at least six months; and finally these options could not be granted to anyone who directly or indirectly owned more than 10% of the voting power of the firm. For the companies granting these special options, there was an opportunity cost. For employees to qualify for this preferential tax status, the company granting options would lose the right to expense options for tax purposes, however non-statutory options could still claim this benefit.

With this legislative change, option grants reportedly experienced a considerable increase in issuance due to the ability to shelter income, rather than any realization of any other advantage inherent in them (Park et al, 2004). Because of this, employee stock options were granted primarily to those in higher income tax brackets, typically leaving lower

level employees without any options. Overall compensation packages probably did not change much, but salaries which exceeded higher tax thresholds such as the highest of 91%, would have lowered and substituted salaries with stock options, even though income from the stock option was, despite the uncertainty of the income from stock options. If we consider the case of an employee earning a $100,000 salary, if the top $10,000 of that was taxed at a rate of 91% marginal tax would only receive $900 after tax of that portion of income. A risk neutral employee would certainly substitute $10,000 worth of secure salary for $10,000 of uncertain stock option based compensation, as after-tax, they are substituting $900 worth of secure income for $7,500 (long-term capital gains tax of 25%). Even a quite risk averse employee would have likely to have been happy to substitute $10,000 worth of salary for $10,000 worth of options. In order for the options to be worth less than the certain salary, options would need to be less than one eighth of the original expected value, or more specifically less than $1200 at exercise, in order for the after tax amount to be less than $900. But for risk averse employees on a lower marginal tax rate, there would have been less incentive to want to take this risk, as the difference between the tax rate on their certain salary was likely to be closer to the long-term capital gains rate on stock option compensation.

2.2.2.4 ARB 43, Chapter 13, Section B

With the considerable increase of activity in option grants due to I.R.C section 130A and shortfalls of ARB 37, a revised accounting bulletin was issued five years after the original in January 1953. Later that year further changes were made as part of a larger project to cancel and replace of Bulletins 1-42 (except the terminology bulletins), which then made ARB 43, Chapter 13 (Compensation), Section B-*Compensation involved in stock option and purchase plans*, the relevant standard for stock option accounting.

The most significant changes in the Bulletin were 1) the clarification of what constituted options compensation usage, and more importantly 2) the change of date for determining the fair value (the intrinsic value ~ *exercise price less strike price* adjusted for any restrictions, eg lack of transferability) from the exercise date to the grant date (Nordquist et al, 1997).

In addition to compensation, it was also pointed out that stock options could be granted for several purposes, the two main alternatives being to raise capital and to induce greater

ownership of the corporation's stock among its employees. Under this newer bulletin, if "the inducements are not larger per share than would be reasonably required in an offer of shares to all shareholders for the purpose of raising an equivalent amount of capital, no compensation need be presumed to be involved." (APB, 1953)

The significance of this change in date was quite important with respect to the matching principle in accounting. By expensing according to the exercise date, this ignored the fact that the compensation expense related to revenues generated years earlier, and that the compensation may have been for several years work. By calculating the intrinsic value at the grant date, and then amortizing (until the end of the vesting period), there is a matching between expenses incurred and revenues generated for the given periods.

Though the matching principle was addressed, this bulletin introduced another problem. Another flaw was created when the bulletin sought to recognize that employee stock options can be more restrictive than normal stock options due to certain clauses within the contracts. So, the bulletin allowed flexibility to adjust for these constraints. But because no details were provided on how to do this, valuation was left open to manipulation.

2.2.2.5 Revisions to the Internal Revenue Code: Mid 1950s

The following year in 1954, the entire US Internal Revenue Code went under revision and section 130A was replaced with section 421. Aside from an aesthetic number change, there was a relaxation of requirements regarding eligibility to receive a restricted stock option. Before no employee owning more than 10 percent of the firm's voting power could be a recipient, but with the new section recipients could be entitled to restricted stock options on the condition that the strike price was at least 110 percent of the share value at the grant date and the option expired within five years (IRC 421 (d)(1)(C) (1954)). In years to come there were further slight alterations and modifications, with the main changes being: an extension to six months for the interval allowed between termination and exercise of options; automatic exercise of shares when acquired as a result of someone's death; and clarity provided with regard to situations involving parent-subsidiary corporations and variable priced options (Park et al, 2004).

2.2.2.6 Venture Capital and Stock Options

In an innovative and landmark venture capital deal in 1957, stock options were utilized in such a way that has indirectly become a contributing factor to the development of the technology industry in the United States today. The need for the venture capital deal arose from eight young scientists, who were disappointed working for Nobel Prize winning physicist William Shockley at Shockley semiconductors. They desired to resign, but still wanted to work altogether. As it was unlikely they all would be able to find work together at another company, it was suggested they investigate the option of working for themselves. However the semiconductor industry had very high establishment costs, which meant they required a lot of financing (Harvard Business School alumni, 1997).

At the time, it was rare to invest at the initial idea stage of a project, let alone an expensive and "little-known" industry such as semiconductors. However an investment banker named Arthur Rock eventually became involved and sought financing for the project. After being rejected by thirty-five companies, he finally secured $1.5 million for the eight to be able to start up their own semiconductor company. A condition of the deal was that their financiers, Fairchild Camera & Instrument, had the option to buy it back for $3 million within 8 years. Fortunately for Fairchild, the investment paid off, and today Fairchild semiconductors is still a leading global supplier of semiconductor products (Harvard Business School alumni, 1997; Fox, 1997).

Unfortunately within several years, many top engineers left Fairchild semiconductors, including the original eight founders. Because management was unwilling to issue any stock options to anyone below the executive level, many employees sought to maximise their earning potential, by either starting up their own companies or by working for companies which offered a better stock and options package. Among the last to leave of the original eight were Gordon Moore and Robert Noyce, who upon their departure formed Intel, with the help of Arthur Rock, who had originally sourced the financing for Fairchild Semiconductors. Following his initial landmark deal, Arthur Rock also became involved in the establishment of several famous technology companies, including Teledyne, Scientific Data Systems and Apple Computers, of which, Intel and Apple are well reputed for their broad-based option programs.

The impact of these influential companies set a benchmark for other technology companies, that in order to attract and retain employees, companies needed to share the company's wealth with its employees, which could easily be done through options. This seems to have lowered the barriers to entry into the technology industry, making it easier to start up companies for those previously unable to afford the high salaries of their competitors. As a result of lower barriers to entry, the technology industry in the United States became more competitive, which led to a greater need for innovation and creativity. So indirectly, stock options had become like a fuel for the growth in technology company start ups, which eventually had a big influence on Silicon Valley, and the entire technology industry in the United States.

2.2.2.7 Reconsiderations for the statutory option: The replacement of the Restricted Stock Option

With such a significant increase in stock option plans, Senator Albert Gore Sr began to put pressure on congress to re-examine the preferential tax status of statutory options (Fox, 1997). Around this time stock option programs had spread to approximately two-thirds of all listed corporations (Wettling, 1968). Though congress saw this increase was somewhat desirable due to the benefits of stock options in their ability to attract, retain and motivate executives, and that they were good for the economy, the preferential tax status Restricted Stock Options possessed had allowed option compensation to be abused for tax purposes. Rather than eliminate any preferential tax status found with Restricted Stock Options, Congress decided to merely replace the Restricted Stock Option. So under the 1964 Tax Revenue Act, Qualified Stock Options became the new statutory option, thus changing section 422 of the Internal Revenue Code. This new category of options made it much more difficult to gain the preferential tax status restricted options had afforded.

At the time many professionals in the compensation industry thought this would end the popularity of options (Crystal, 1968). On a superficial level, Qualified Stock Options merely tightened existing conditions. The minimum holding period increased from two to three years; the maximum gap between employment and the exercise date was reverted back to three months; grants were only available if recipients would have less than 5% ownership of firm's voting shares following the grant, wiping out the eligibility to grant options to employees with more than 10% ownership; and finally the strike price of the

option could not be less than the share's price or fair value when granted (formerly it could be 85% of the share price). The implication of this last requirement would impact the relevance of accounting for qualified stock options, as under the accounting regulations, qualified stock options are not worth anything as they are issued out-of-the-money, thus they have no intrinsic value at the date of grant. From a certain perspective, qualified stock options encouraged firms to grant stock options that would go unseen on the profit and loss statements.

In addition to the aforementioned stricter requirements, several new requirements were introduced. Under section 422 (b) (1) of the Internal Revenue Code, shareholder approval of a company's stock option plan was required 12 months prior to the adoption of the plan. This plan was to detail the aggregate number of shares which may be issued under options and establish which classes of employees were eligible for options. Options under the plan had to be granted within ten years, (b)(2) and exercised within five years of being granted (b)(3), thus placing a maximum life on any option program of fifteen years.

Qualified Stock Options also had an odd clause concerning the exercise of options. No options could be exercised if there were other Qualified Stock Options granted previous to which had not yet been exercised. So if some old options were "underwater", meaning they were currently worthless if exercised now, but newer options had a lower exercise price below the current stock price, the grantee could not exercise the newer options now and wait for the possibility that the older option might be worth something later should prices increase. Fortunately the remaining restricted options granted prior to the issue of this legislation were exempt from this requirement. For restricted stock options issued prior to 1964, restricted stock options could be exercised in any order, and a participant holding a newer Qualified Stock Option could exercise it first.

Though statutory options with preferential tax treatment were now more difficult and troublesome to grant, this did not result in options "dying" as some industry experts forecasted. Though statutory options became less popular due to less appeal with tightened requirements, it seems non-statutory options "gained popularity since the 1964 Revenue Act imposed additional restrictions on statutory plans (Wettling, 1968). Non-statutory stock options not only provided more freedom in plan design, non-statutory

options also allowed firms to claim the tax deduction privileges which statutory stock options had disallowed. To add to the popularity of switching to non-statutory options, in 1965 the highest marginal income tax dropped from 91% down to 70% making statutory options less appealing.

Around this period of time, the US stock market began to stagnate, and as the value of stock options depend on the underlying stock price of the company; the expected value of options fell. So regular stock option compensation lost its appeal as the stock market continued to stagnate for over a decade. Although activity in stock option compensation may have dwindled during this time, several important factors developed, which led to even greater usage in the long term. The main areas of change were related to accounting, tax legislation, and advances in academia.

2.2.2.8 The Alternative Minimum Tax: 1969

Before the turn of the decade, another Tax Reform Act would affect the tax status of stock option holding individuals, who at the time were in the upper-income bracket. In 1969, an alternative minimum tax (AMT) law was created to ensure individuals would be limited in claiming particular tax deductions, such as long-term capital gains tax afforded through statutory stock option programs. At first this involved an add-on tax of 10%, but later the rate increased, and a taxpayer earning above a certain income would only need to be under the AMT system if the tentative AMT exceeded what would have been required the regular tax system plus any add-on tax. After numerous revisions, individuals even today are required to keep records to be able to calculate both their regular and alternative minimum tax (Internal Revenue Service, n.d.).

The initial introduction of the AMT did not have much impact, but over time it impacted on recipients of statutory stock options, who received exemption from regular taxes through their options. Rather than not having to pay capital gains tax until the sale of the underlying stock, an alternative minimum tax was required following exercise of the stock option. However this alternative minimum would act as a tax credit towards any capital gains tax owed in the future, so as not to double tax the recipient. The trouble with the tax being required earlier was that statutory stock recipients might not have had the cash available to cover their tax burden until the exercise of their options several years later. So a slight conflict was created between the alternative minimum tax and the goal

of increased ownership through statutory stock options. As time progressed, AMT would affect more, with the threshold not being adjusted for inflation.

This problem became greater as the AMT affected more and more people. Unfortunately, the tax which was originally aimed at the higher economic echelon of society began to affect an increasing number of people, as inflation had not been accounted for in the threshold, and as broad-based stock option plans grew in popularity.

2.2.2.9 Unofficial Accounting changes: 1971

In March 1971, the Accounting Principles Board issued an unofficial accounting interpretation of Accounting Research Bulletin no 43, chapter 13b. (p9633, APB Accounting Principles, 1973). This interpretation was rather brief, which can be attributed to the Accounting Principles Board "considering the broad question of accounting of all stock option and stock compensation plans (including how to measure and when to record compensation) with the objective of issuing an Opinion on the subject." In relation to accounting standards, there were no significant changes made, the less obvious significance of this interpretation was the recognition of innovations and changes in practice of some stock option compensation plans. The focus of the interpretation was on how to deal with a recent innovation in stock option plans which granted benefits (cash or stock with no initial investment required) to the value of the option, often referred to as "phantom" stock plans.

The origin of phantom stock plans seems to have originated from difficulties in financing the purchase of underlying stock. Wettling (1968) commented that a major oil company found that 90 percent of their participants had disposed at least part of their option stock, because of financing difficulties. Though this case may not be representative of most firms, it at least suggests that upon exercise, many employees had trouble financing the purchase of options they were entitled to. Phantom stock meant they could receive stock up to the intrinsic value of the options granted.

2.2.2.10 Accounting Principles Board Opinion No. 25

In 1972, the Accounting Principles Board (APB) established an opinion on the broader matter of all stock and stock compensation plans in *Accounting Principles Board*

Opinion no. 25: Accounting for Stock Issued to Employees (APB 25). The most significant impacts of this statement were, the resolution of a flaw in ARB 43, 13(b) which allowed for adjustments in option valuation, treatment of option grants with variable terms, and a change in tax treatment.

The solution to the flaw in ARB 43 was simple, valuation was merely simplified to the intrinsic value of the option, with no room for adjustment of any restrictions. Calculation of intrinsic was typically made at the date of grant, but option grants with variable terms where the grant size and exercise price were unknown at grant, meant grants would only be recognized on the date the size of grant or exercise price was set.

For companies which had not made adjustments for restrictions, nor issued options with variable terms, the main concern was a new section on how to account for tax. On exercise of non-statutory options, a company could claim tax deductions for the intrinsic value of the options, the same amount employees would need to. Though the company may receive tax benefits years after the option was granted, APB 25 would only allow a company to record a maximum tax benefit equivalent to the amount of stock option compensation expense in financial statements that year. Any remaining tax benefits would then be credited to equity under a paid-in capital account, where it would have ended up anyway, but under retained earnings. The obvious impact of this is that after-tax accounting profits would not be as high if not all the tax benefits could not be claimed, particularly if granted stock options show up as an expense on the financial statements.

Some other details APB 25 accounted for were clarification of what constituted a non-compensation related stock option plan, treatment of re-priced or renewed stock options with extended exercise dates, transferal of a stock option, cash settlement. Though this opinion was the most robust to date, there were still a number of details it had not anticipated, and two decades later these would be recognized.

It is interesting to note that three out of the eighteen board members (Mr A.J. Bows, Mr O. Gellein, and Mr N.T. Halvorson) dissented the approval of this Opinion, and nearly all the reasons for dissension would later be exposed in the future as flaws. Mr A.J. Bows dissented on the basis of: 1) the Opinion being inequitable, as grants under some plans

can escape recognition though they have great potential value in the hands of their recipients, and 2) because of variable accounting. The first point refers to any non-statutory plans which grant options with the exercise price above the current price, and all statutory plans which must do so in order to qualify; such plans will escape recognition as expenses on financial statements. Variable accounting occurs in this opinion when options have a variable element unknown at the date of grant, so instead of having a fixed expense based on the date of grant, this may change depending on the market values at the end of each period, the inequity of this being that these market values are not truly representative of the compensation when granted to the employee. Mr O. Gellein agreed with Mr Bow regarding the suitability of what is now known as variable accounting. He also pointed out that the measure of fair value in the opinion was inappropriate. He suggested fair value be measured on the basis of the value of a call on the company's stock at the time it is awarded. Unfortunately, though option valuation models existed, none had yet proven to be practical and easily applicable, though in the near future this was to change. Finally, Mr N.T. Halvorson's believed APB Opinion 25 was premature; apparently research was being conducted at the time to clarify some issues surrounding abuses in accounting for stock compensation.

Variable accounting had possibly become an impediment to the widespread use of options with performance clauses, as any conditions such as performance clauses consists of a variable option. Because of this, most plans are simple, plain fixed award options, which may allow employees to be rewarded for reasons other than their performance, such as the whole stock market doing well.

2.2.2.11 Academia's influence: Option Valuation and Agency Theory

In the 1970s there were a number of academic advances in the area of valuation models which would assist in the development of stock option usage, and from the theoretical side, equity based compensation was seen as helpful to solve the principle agent problem, also known as agency theory.

Table 2.5: Significant Academic Contributions affecting Stock Option Compensation

Date	Publication Subject	Nature of Impact
1973	Black Scholes / Merton model	Option Valuation Model
1976	Agency Theory	Employee Compensation
1979	Binomial Option pricing model	Option Valuation Model
1990	Executive Compensation Study	Employee Compensation

Some seminal publications from the aforementioned areas are in Table 2.5: Significant Academic Contributions affecting Stock Option Compensation.

2.2.2.12 The Black-Scholes Option Pricing Model

In 1973, Fischer Black, Myron Scholes and Robert Merton's Nobel award winning work on option valuation was published. Throughout the 1960s there was much development in relation to option pricing, which ultimately lead to the development of the Black-Scholes model. However, as mentioned earlier, no *practical* model had been developed to value options. Several models which had been developed, including Sprenkle (1961); Samuelson's (1965); and Samuelson & Merton (1969)) which depended on unknown parameters such as the expected return of the stock, appropriate discount rates, or the shape of a utility function for the average investor. The Black-Scholes model, however, could work using the exercise price at the grant date, time till maturity, compounded risk free rate, the current price of the underlying stock and its expected volatility.

Black-Scholes avoided the unknown parameters which other models needed, by realizing options could be priced based on a riskless arbitrage portfolio consisting of a position in the underlying asset with a specific number of hedge positions in a call or put option, which when priced correctly should provide a return equivalent to the riskless asset. Because this portfolio was riskless, discount rates did not need to be calculated, utility functions were unnecessary, and the expected return of the stock was implicitly accounted for through stochastic calculus and the assumption of log-normal distribution of prices.

Utilizing the relationship of the particular variables found in each of these assets (the underlying stock, time until maturity, short-term interest rate), and integrating stochastic calculus, Black-Scholes constructed an option valuation model based on such a portfolio. With the end result being the formula:

$$C = SN(d_1) - Ee^{-r_c T} N(d_2)$$

C= Call premium (price paid for a call option)

S= Underlying Stock price

E= Exercise Price

r_c = continuously compounded risk-free rate

T = Time to maturity

$N(d_1)$, $N(d_2)$ = cumulative normal probabilities

$$d_1 = \frac{\ln(S/E) + (r_c + \sigma^2/2)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

σ^2 = annualised variance of the continuously compounded return on the stock

Like any theory, the original Black-Scholes model had a number of conditions and constraints. Firstly, the options had to be European, referring to options which can only be exercised upon maturity. The stock pays no dividends or other distributions. The short-term interest rate is known and it is constant through time, and the underlying stock follows a random walk in continuous time with a variance rate proportionally to the square of the stock price. So the distribution of the possible stock prices at the end of any finite interval is log-normal, and the variance rate of the return on the stock is constant. Lastly, related more to the construction to the portfolio: there are no transaction costs in buying or selling in the stock or the option; it is possible to borrow any fraction of the price of a security to buy it or to hold it, at the short term interest rate; and lastly there are no penalties to short selling (Black et al, 1973).

Valuation models such as the Black-Scholes model paved the way for options to become more standardized. Without a practical pricing mechanism, using options for the purpose of hedging or speculating was limited and restrictive. But later that year, the Chicago board options exchange was established (Luckock, 2000). Options no longer had to be

customized over-the-counter goods, priced through negotiation, with customized conditions and clauses. With the establishment of an exchange, the option market became more liquid, and fairer with pricing no longer depending on Over the Counter bargaining skills, but according to the use of a proper valuation model.

2.2.2.13 Agency Theory

In the 1970s Jensen et al (1976) developed Agency theory, which supported the utilization of tools such as equity based compensation to remunerate executives. The basic principle of agency theory, or the principal-agent problem, is the existence of a misalignment between the principal and the agent due to each party having different interests. There are numerous ways to attempt to ensure that the principal will avoid actions and decisions harmful to the owners, however, many of these mechanisms, such as monitoring and additional controls can be costly. Equity based compensation can be an efficient way to align goals, as higher ownership makes executives or employees (the agents) more likely to act in the best interests of the principal (the shareholders) because they share a common factor which affects their wealth. In addition, equity based compensation has low agency costs, if the agent's performance is not in line with the principal's goal of wealth maximization, this will be reflected in the stock price, and therefore the stock option.

2.2.2.14 The Binomial Option Pricing model

Though the Black Scholes model provided an avenue to practically value options, it was based on a combination of constrictive assumptions, in addition to conceptually difficult stochastic calculus. In 1979, Cox, Ross, & Rubinstein developed a derivation of the Black Scholes model using some simpler mathematics. Apparently Merton suggested using a discrete mathematical model to price options, and out of his suggestion the Binomial Option Pricing model was developed. The rationale for such thinking lies in the fact that discrete mathematical models converge to continuous time models as the increments of time become smaller. So a binomial option pricing model should be a good replicate for a continuous time model. The simple binomial model is based on the premise stock prices either move up or down within a given period, more complicated trinomial and multi-nomial models can allow for more possibilities, but the simple binomial produces a simple lattice probability tree, with the inclusion of discount factor at the risk free rate because of the Black-Scholes arbitrage portfolio. In essence, it is a

translation of the Black-Scholes model from continuous time mathematics to discrete mathematics. However, by working in discrete increments, it allows for much more flexibility so many of the limiting assumptions of the Black Scholes model could be ignored. With adjustments the binomial model can cater for European and American options, changing volatility, changing interest rates, and dividend payments and/or distributions. Its versatility and ease of use would make it much more practical to use, though possibly more cumbersome to calculate.

2.2.2.15 1970s Tax changes

Towards the end of the 1970s the highest marginal tax rate dropped to 70%, and capital gains increased to approximately 50%, thus considerably reducing the benefits of having stock options with preferential tax status, thus bringing the significance of the preferential tax status into question. By 1976, legislation in the form of another Tax Reform Act, would lead to Qualified Stock Options losing all their privileged tax status by May 1981 (Kim, 1990).

2.2.2.16 1981 Reintroduction of Statutory options: The Incentive Stock Option

About a year after the Tax Reform Act commissioned the end of statutory stock options, a new statutory stock option was proposed, the Incentive Stock Option (ISO). Unfortunately it was initially rejected, but a few months after May 1981 when the last Qualified Stock Options lost their preferential tax status, the 1981 Economic Recovery Tax Act brought back statutory stock options, through ISOs. As can be seen from Table 2.6: Comparison of Statutory Stock Options, this statutory option possessed characteristics quite closely resembling its predecessors, the Qualified Stock Option and Restricted Stock Option. The minimum holding period changed back to two years from three years, unless the shares were transferred, which would then make it one year; employees with more than 10% ownership were entitled to be qualified if the strike price was at least 110% of the current stock price, and not exercisable five years after being granted. All other options could now be exercised within 10 years instead of the restrictive 5 years under the qualified stock option requirements. A completely new restriction, which was perhaps aimed to discourage large grants, was that only $100,000 worth of options per year were eligible to qualify for the Incentive Stock Option status.

Table 2.6: Comparison of Statutory Stock Options

Attributes	Restricted Stock Options	Qualified Stock Options	Incentive Stock Options	Non-statutory Options
Time Period	1950-1964	1964-1981	1981 -	n/a
Exercise Price	At least 85% of fair market value	Must exceed 100% fair market value	110%	No restrictions
Exercise period	During employment or within 3 months (later 6) of termination			No restrictions
Minimum Holding Period	2 year holding period	3 year holding period	2 year holding period	No restrictions
Ownership	Must not hold 10% or more	Less than 5% following grant	Must not hold 10% or more	No restrictions
Stock option plan	N/A	Shareholder approval required 12 months prior to adoption		
Other exercise conditions	N/A	Exercise of options only possible if previous QSOs already exercised		
Maximum Grant			$100,000	No restrictions

2.2.2.17 1980s Recovery of the US Stock Market

In the 1980s the stock market started to become more buoyant, and in doing so option grants became worth substantial amounts of money. By the 1980s, CEOs such as Disney's Michael Eisner and Toys "R" Us CEO Charles Lazarus began to attract headline attention for receiving considerable option windfalls, which totaled tens of millions of dollars (Greengard, 1999).

In addition, as a result of options allowing many entrepreneurs to get their technology companies started up during the 1960s and 1970s, many would eventually list on the stock market during the 1980s. A year of particular note was 1986, when a number of notable technology companies listed, including: Oracale, Sun Microsystems, Silicon Graphics, Adobe Systems, Informix, and Microsoft. It was rumored, Microsoft already

had sufficient cash to internally finance projects, but wanted to list in order for employees to exercise their large amounts of options.

To help explain why executives with stock options prior to the 1960s had not become as rich as those in the 1980s, it is useful to consider the changes which had occurred in the past two decades. When the US stock market and economy began to go through economic uncertainty in the late 1960s and 1970s, options became a less attractive form of compensation, as most options derive value from the underlying share price going up through the success of the company. Kim (1990) suggests in order to provide the same overall expected compensation, the size of option grants had to be increased to help counter the low expected value of the options. But as the markets buoyant again, these options became quite valuable, and in combination with the large grants provided much higher overall compensation. Though expected values of options may have just recovered to levels similar to prior to the 1960s, once the precedent of these larger option grants and overall compensation packages had been made, it would have been hard for companies to try and go back to option grants of prior levels.

2.2.2.18 1980s Accounting Reconsiderations

With a resurgence of option compensation activity, and a number of advances in option valuation since 1972, pressure would arise in 1984 from the AICPA and seven of the big 8 Public Accounting firms, urging the FASB to put Incentive Stock Options plans on its agenda (Evans, 2003), particularly to deal with the accounting flaw of APB 25 which allowed companies with particular plans to escape recognizing option compensation. The board agreed to confront this issue and in 1985 this project started through the due process procedure. This carried on until 1988, when due to the lack of consensus, it was decided to defer the matter until it could be determined whether to consider options as liabilities or equity as part of a larger project (Evans, 2003).

2.2.2.19 Modern Executive Compensation

In 1990 Jensen and Murphy published a seminal paper examining the compensation packages of executives. The paper implicitly supported the use of stock options, by stating that the pay-performance sensitivity for CEOS and executives in the US was too low, and that pay packages should have a higher sensitivity to the success of the

company. Stock options could efficiently do this, as they are more highly leveraged than other equity related compensation. Unfortunately the research was based on data up until 1986, so the research did not reflect the high levels of growth in equity compensation from 1986 onwards, which may bring into question the applicability and relevance of Jensen & Murphy's conclusions to the 1990s.

Traditionally paying employees or executives "better" equated to paying them more, but this thinking was changing. Towards the early 1990s better employee compensation began to focus on how employees were compensated. In industry this type of thinking was labeled by some as the "new pay", or pay for performance. Though most companies already had some form of bonus system as incentives for certain behaviors and actions, Jensen and Murphy's findings indicated not many had a performance pay system which adequately awarded good performance, or possibly penalized poor performance.

Throughout the late 80s it had become apparent through the media that some CEOs were becoming wealthy from their options. But in 1992, the media would publicise a significant case of broad based employee stock option recipients becoming wealthy, helping trigger the popularity of broad based employee stock option plans, making employees at all levels throughout an organization rich. In that year, an analyst estimated 2,200 of Microsoft's 11,000 employees had options worth at least $1 million, which led to widespread news coverage (Fox, 1997). So along with more companies awarding their executives with larger option grants, slowly the growth of option plans also expanded to broad based plans where lower level managers and employees would also benefit.

Another contributing factor to the executive stock options compensation growth was Congress' creation of section 162(m) of the tax code in 1993, which prevented companies from taking a tax deduction for the fixed salaries of over $1 million a year for the CEO and the top 4 executives, however, performance based pay was exempt from this tax condition. For stock options, this mainly meant that they should be granted out-of-the-money, so as not to reward executives prematurely, otherwise any in-the-money options would also be treated the same as cash. Given that employee stock options granted at-the money or out-of the-money also meant that they would escape being recorded as an accounting expense, from an accounting perspective, employee stock options were the cheapest form of performance pay to use.

2.2.2.20 FASB 123

In June of the same year, the FASB released the exposure draft of Statement of Financial Accounting Standards (SFAS) 123 “Accounting for stock based compensation”. Finally, years after pressures in the 1980s and earlier, the accounting flaws of APB 25 were expected to be resolved, “fair value” would be redefined, and practical valuation models existed to help do this. As part of the process of formulating the final statement, the public, particularly key affected parties, had the opportunity to provide feedback on the proposed changes. The FASB received more than 1700 comment letters, went through 6 days of public hearings, and unsurprisingly the majority of this feedback regarding this exposure draft was negative. The major fears came from those in the IT industry. They had relied on stock option usage to attract top talent they could not afford with conventional compensation plans, and it was feared implementation of these standards would either destroy profitability of high tech firms through accounting profits, or through discouraging companies to utilize stock option compensation to attract the quality employees which had made these companies rich. In addition there was also frustration over the proposed valuation model, the Black Scholes model was too complicated, and considered inappropriate. Employee stock options have a number of characteristics that are different to their counterpart, the stock option, which the Black Scholes is primarily designed for. Employee Stock Options have much longer lives than normal stock options, which was a prime matter of concern mainly because of the assumptions of constant volatility and constant risk free rate. But even with a more flexible model like the Binomial Option pricing model, there are huge limitations to forecasting out so far for interest rates and expected volatility.

The lobbying campaign against the proposed accounting standard was considered very aggressive, with mainstream business lobbies, Silicon Valley lobbies and accountants pressuring Congress, the SEC, and the FASB to deny the passing of the proposed standard. Eventually in 1994 a non-binding resolution from Congress condemned the proposal 88 to 9. According to Arthur Levitt, chairman of the SEC at the time, Congress and the business community feared stock option expensing would ruin company earnings, and impact on company share prices, forcing companies to change their employee stock option policies, and lose their ability to attract and retain staff, which ultimately would impact on the US economy as a whole (Public Broadcasting Service, n.d.)

Since the 1940s, the accounting industry in the US had been left to govern itself, it had maintained independent standard setting power, with no outside influence from the SEC. However, the controversy over the issue of stock option compensation effectively changed this independent status from outsiders when Arthur Levitt, Chairman of the SEC strongly advised the FASB to change their status on FASB 123. So in 1995, the FASB succumbed to the many political pressures and released the accounting standards regarding stock compensation with a loosened stance. The recognition of stock option expense using recommended "fair value" methods would be voluntary, however, companies choosing not to recognise stock option expense using “fair value” would instead need to disclose information regarding “fair value” in company footnotes.

Fair value in FASB 123 was defined as estimates using an option-pricing model which at the grant date can account for the exercise price and expected life of the option, the current price of the underlying stock and its expected volatility, expected dividends on the stock (except as provided in paragraphs 32 and 33 of FASB 123), and the risk free interest rate for the expected term of the option (determinable by a zero coupon US government issues with a remaining date equal to the expected life of the options). For non-public entities unable to estimate expected stock price volatility, a minimum value model ($C = S - Ee^{-r_c T}$) which used all the other aforementioned variables was to be used. It is interesting to note, however, that prior to June 2002 only 2 companies listed on the S & P 500 elected to expense their stock option compensation using the fair value methodology suggested by the FASB, the remainder continued to use APB 25 (Baker, 2004).

It should be noted that not all stock options were to be valued according to the “fair value” method suggested. Over the decades, stock option innovations had occurred, producing several non-traditional stock options, most of which had features which made them difficult to value. So a similar variable accounting treatment to that given in APB 25 existed in SFAS 123. With the choice to continue to use APB 25, there was little or no accounting incentive to use such non-traditional stock options.

This introduces an important topic of whether accounting should affect value or not, as the companies will still be doing the same thing, and generating the same cash flows. Although theoretically, there is not much to support this premise, industry practice seems to indicate that many companies believe the earnings figures will make a significant difference. In a study by Hall & Murphy (2000), they found in 1998, 94% of grants to CEOS in the S&P 500 were at-the-money, the minimal amount to hide stock option compensation from being recognized.

Around this time, the internet was being introduced to everyday consumers, and commercial applications were being developed. Like the development of the television and radio, much speculation surrounded the possible opportunities in the early stages of the recent technological development of the internet. But the commercial applications would be more widespread, and the internet began to revolutionise the way many traditional companies did business. New economy stocks and cheaper internet trading would help lead to an irrational stock market, with most stocks associated with the internet being overvalued. This bullish market would impact on options in two ways, there was a large increase of entrepreneurs wanting to enter into the industry, and options in internet-related companies became worth vast amounts more than options in traditional companies.

These two factors led to the expanded use of broad-based stock option plans. Most of these new technology start-up companies depended on stock options to attract talent which could otherwise not be afforded. Many employees from traditional companies left for positions with higher potential remuneration and responsibility, and more graduates sought to get into these types of companies. Businesses needed not only to consider the ramifications of the internet with relation to corporate strategy and operations, but also needed to consider traditional Human Resource Management practices they used, as their new counterparts were winning potential and current employees with stock option plans.

In April 2000, there was a major recorrection of pricing in the US stock market, which saw the end of the irrational bull market. As the end of the surging market effected the potential value of employee stock options, the level of stock option grants diminished to lower levels, being replaced with greater certainty in the form of a higher base pay.

Nonetheless, stock options had broken more ground as being fundamental to the total compensation package for any type of company in order to compete with each other.

2.2.2.21 FASB Interpretation No 44

In March 2000, FASB issued FASB Interpretation No.44 of APB Opinion 25: Accounting for Certain Transactions involving Stock Compensation. Originally it was hoped that FASB Statement No. 123 would supersede Opinion 25, but eventually Opinion 25 still had some standing, and certain issues within Opinion 25 which were not dealt with clearly in FASB 123, were addressed within this interpretation. Questions remained about the application of opinion 25 in a number of different circumstances. In particular this included the matters of: (a) the definition of *employee* for purposes of applying opinion 25; (b) the criteria for determining whether a plan qualifies as a non-compensatory plan, (c) the accounting consequence of various modifications to the terms of a previously fixed stock option or award, and (d) the accounting for an exchange of stock compensation awards in a business combination. The interpretation also dealt with share repurchase (and tax withholding) features, and issues related to grant date, deferred tax assets, and cash bonus plan linked to a stock compensation award. It did not, however, address any issues related to the application of the fair value method in 123.

The year 2002 saw a number of the large corporate accounting scandals. The most prominent among these was Enron, a former energy trading company which had become the 6th largest company in the US according to Fortune magazine (based on revenue). Enron, at the time, was the largest company to ever declare CH 11 bankruptcy, and the reasons lying behind this and other cases were unethical accounting. The main accounting problems related to the operational earnings and expenses, though some have argued stock option compensation as a factor, as millions of dollars of options were exercised, but none of this was easily visible from the accounts. Though millions of dollars of compensation may seem minor amidst billions of dollars of other transactions, executives with large stock option grants had a large incentive to use creative accounting to disguise the value of the company, the more successful the company appeared to be, the higher the share price would go and the richer they would become. Though all of the large companies involved in these accounting scandals had executives who had large stock option holdings, there were also hundreds of other companies with executives who

held large stock option grants that have not been involved in accounting scandals. What is common among these firms though, has been the matter of corporate governance.

As an act of good faith to investors, Coca Cola decided to be the third company listed on the S & P 500 to voluntarily expense stock option compensation using the recommended valuation model in SFAS 123. Shortly after, around 200 other companies listed in the S&P 500 soon followed in Coca Cola's footsteps (Baker, 2004).

2.2.2.22 Major Reforms in Accounting Standards: FASB and IASB drafts

With the corporate accounting scandals of 2002, pressure was on the accounting industry to undergo reform, and employee stock option compensation was a prime candidate to be reformed. So investigation soon began for the International Accounting Standards Board (IASB) and FASB to develop Exposure Drafts to be finalized as accounting standards.

Because these issues had already been in the process of consideration, by November 2002, the IASB released its exposure draft for International Financial Reporting Standards 2 (IFRS 2) Share-based Payment. Not surprisingly, there was a lot of resemblance between this and the requirements of FASB 123, with a few advancements. In that same month, the FASB issued an *Invitation to Comment, Accounting for stock-based compensation: A comparison of FASB Statement No. 123.*

Around this time, the FASB had been developing alternative transition criteria for those considering moving towards voluntary expensing, and in December 2002 *Statement of FASB No 148 Accounting for stock-based compensation-transition* and disclosure: An amendment of FASB Statement No. 123 was introduced. Prior to this, companies that wanted to expense stock option grants according to FASB 123 could only amortise expense options granted after the date of transition to this accounting method. So existing options which had already been granted as compensation were not recognised on financial statements, meaning total compensation was not recognised from transition. However gradually, each year with new stock option grants, the compensation expense would finally reflect all the existing stock options which had been granted. Unfortunately prior to all grants being accounted for in financial statements, there was the appearance of stock option expense increasing every year, thus creating an undesirable “ramp up effect”. Not only would this increase be misleading, there were also concerns about the

lack of consistency and comparability in reported results caused by that transition method.

SFAS 148 was a response to these concerns arising from the transition method prescribed by Statement 123 and financial statement users' concerns. So FASB 148 provided two alternative transition methods to the original prospective method for those who voluntarily expensed stock options, and after December 15th 2003 these were the only two methods companies could choose from.

The first of the two alternatives was the *modified prospective method*, which *recognised* stock based employee compensation cost from the beginning of the fiscal year in which the recognition provisions were first applied as if the fair value based accounting method in FASB 148 had been used to account for all employee awards granted, modified, or settled in fiscal years beginning after December 15, 1994. The second was the *retroactive restatement method*, which required *restating* all periods presented to reflect stock-based compensation cost under the fair value based accounting method in FASB 148 for all employee awards granted, modified, or settled in fiscal years beginning after December 15, 1994.

Both of these methods would have the same impact on the income statement, so the decision to choose one method over the other primarily depended on the impact on the balance sheet.

Industry observers commented that the preferred method was probably the current *prospective method*, as it had a less significant impact on earnings than the other methods and it was the easiest method to implement. However any firms which wanted to adopt the *prospective method* needed to have done so prior to December 15 2003, after which point, the transition method would no longer be permitted.

2.2.2.23 Opposition to accounting standards: 2003

Prior to the release of the FASB Exposure Draft, several sets of legislation had been proposed in Congress which would limit the accounting standards before implementation. Firstly, Senator Barbara Boxer proposed the "*Broad-based stock option plan transparency Act*" primarily aimed at delaying the implementation of stock option

accounting rules for three years so the Department of Commerce could conduct research on the impact such accounting standards would have on broad-based options. However, this quickly faced a lot of opposition and failed to progress much further.

Shortly after however, Senator Boxer with three others sponsored the S.1890 Stock Option Accounting Reform Act, a compromise of her previously proposed act and the Financial Accounting Standards which were yet to be finalized. This bill aimed to protect those parties which had the most to lose, smaller high growth companies, recently listed companies, and companies with broad-based stock option plans. Nonpublic companies with revenues and market capitalization both less than $25 million each would be exempt from expensing, and could keep that status for up to 3 years after an IPO. All other companies would only have to expense the top five executives.

The Bill also sought for the SEC not to accept any financial accounting standards until standards incorporated a mechanism to reconcile the differences between value at grant and at expiry or exercise, in addition to waiting for more rigorous research to be conducted on the impacts of compulsory option expensing.

2.2.2.24 Microsoft announces it will stop issuing stock options

On July 6th 2003, Microsoft made an announcement that it will no longer grant stock options to its employees, instead it will use another form of equity compensation, restricted stock. With the end of the rapid growth seen in the stock market, and Microsoft's stock price having fallen to lower levels, many employees held "underwater options" which were worth nothing, that is, options with exercise prices far above the current stock price. By offering restricted stock, employees would always receive some compensation. From a simple payoff perspective, it would be the same as granting options with an exercise price of zero, as they were being granted actual stock, with a few restrictions with regards to selling. Because recipients would own stock, they were entitled to dividends, as they didn't need to exercise anything. But restricted stock is unregistered with the SEC, meaning it can't be traded on the market, this only allows a private transaction to occur, which the granting company has entitlement to.

Denny Wong (2003) comments that there is debate whether the lowered leverage from

restricted stock provides enough motivation to employees. So until the benefits of such a program are made clearer, there may not be as many companies following Microsoft.

2.2.2.25 FASB Exposure Draft

Shortly after, March 31st, the FASB released its exposure draft for the updated FASB Statement 123. Unsurprisingly there are similarities between it and the original 1993 exposure draft. However there were a few enhancements. With the previous complaints about the use of the Black Scholes model, the draft of the new standard was supportive of more flexible lattice models. In addition, the calculation of volatility, a vital factor to option valuation models, is more tightly defined calculation, as before any method was acceptable. Greater guidance is also given in the areas of classifying an award or as a liability, and attributing compensation cost to reporting periods. Overall, in an aim to have international convergence of accounting standards, the exposure draft was quite close to the IFRS 2 except for treatment of income tax effects, and options with certain modifications.

The House of Representatives then passed the Stock Option Accounting Reform bill on July 20th, 2004. However, the NCEO reported that the chairman of the Senate banking committee was firmly opposed to it, subsequently hearings were not even held for it, and so it did not eventually impact on the release and implementation of the revised SFAS 123.

But, as companies had to comply with the Sarbanes-Oxley Act due towards the end of 2004, many petitioned the FASB to delay the implementation of FASB 123 until a later date, as to alleviate some of the pressures already being faced to go through so many changes under Sarbanes-Oxley. So on October 13th, the FASB decided to delay the effective date for public companies by six months to the 15th June 2005, and then on October 19th it was decided to keep the 15th December 2005 for non-public entities (Financial Accounting Standards Board, 2004).

When the finalised version of the revised SFAS 123 was released on December 15th 2004, few amendments had been made from the exposure draft. One of the main differences was the reversal of the FASBs preference towards lattice based valuation models, instead taking an indifference towards lattice based or Black-Scholes model. In

addition there were other minor differences to provide greater clarification to areas of concern, to cover possible flaws to be exposed and to ensure greater consistency in reporting.

2.2.2.26 Stock Option Backdating

Prior to the enactment of the Sarbanes Oxley Act 2002, corporations could grant stock options and decide on the exercise price within 30 Days of granting, which has now been changed to 3 days. This practice, would allow firms to choose exercise prices lower than the share price on the actual grant date, thus effectively granting them in-the-money. This act in itself is not illegal, however, it becomes illegal when companies disclose to the SEC, the public and the government that options to had been granted at-the money in order to be eligible for certain accounting and tax benefits, but actually granting options in-the money.

In early 2006, the Wall Street Journal produced a series of articles focusing on the practice of stock option backdating by, and later that year was awarded the Pulitzer prize for their service to the community. Shortly afterwards the SEC began to conduct their own investigations into option backdating, with over 150 firms in the S&P 500. As a result, many executives were either dismissed or voluntarily stepped down from their positions.

2.2.2.27 Global Credit Crunch and possible government reform

In 2007-2008, several major financial corporations collapsed due to excessive risk exposure, including investment banks Merrill Lynch, Bear Sterns, and Lehman Brothers, insurance firm AIG, and the government sponsored Federal National Mortgage Association (Fannie Mae). Of particular concern was the amount of exposure the investment banks had in Collateralised Debt Offerings (CDOs) based on subprime mortgages which the firms, which ultimately led to their demise.

On the one hand, stock ownership should prevent such events that lead to the downfall of a company, but on the other hand, some observers have questioned the role of stock ownership with regards to providing the incentives for executives to take excessive risk. Bebchuk, Cohen & Spamann (2010) investigated directly into compensation at Bear Sterns and Lehman Brothers and found an explanation as to why stock based

compensation, such as stock options, did not provide a disincentive to put the firm at risk. They found that although executives stock portfolios at the time did suffer as a consequence of the collapse of their employers, most executives over time had "cashed" out through bonuses and selling stock. So much so, that the majority of their personal wealth was not tied to company stock in the year's leading up to the collapse of Bear Sterns and Lehman Brothers.

Cheng, Hong & Scheinkman (2009) take a broader perspective, investigating the possibly links between compensation and risk-taking at finance firms during the period of 1992-2008. Although their overall findings a relationship between compensation and risk-taking, they acknowledge that this should perhaps not be the case given the incentives executives have as owners. They find that compensation and risk taking are highly related to have higher ownership by institutional investors, who tend to be more short term focused and have some influence over firm direction.

Erkens, Hung & Matos (2009) produce similar findings in their international study of financial firms surrounding the period of 2007-2008. Institutional ownership is found to be directly linked to greater risk taking prior to the crisis, as well as being related to greater losses during the crisis. The authors go further in their analysis of compensation, identifying a linkage between annual bonuses (as opposed to long-term stock based compensation such as options) with company losses and greater risk taking.

Given the indirect role that investment banks played in the events which eventually led to the massive amount of mortgage defaults, which ultimately led to the credit crisis and resulting recession, US Congress's House committee on Oversight and government reform has sought to investigate the possible causes for these events. Following the bankruptcy of Lehman brothers, chief executive Richard Fuld was asked to face this committee. The focus of the hearing was regarding executive compensation, and if it was fair that the CEO had earned over $480 million in compensation over eight years (though worth less now) given that he led the firm into bankruptcy? The Chairman, Henry Waxman, effectively concluded that he believed that executive compensation was excessive, and not truly conditional on the performance of the firm. Around this time period, former Federal Reserve chairman, Alan Greenspan faced the same committee to attempt to identify why he had not developed more regulative measures to prevent the

events that had come about, as well as questioning the Federal Reserve's reactions to the crisis. Greenspan conceded that his free-market ideology was partially flawed, leading to financial institutions not protecting shareholders and investments as well as he would have expected.

It is also important to acknowledge, that due to the severity of the credit crisis and recession, the government chose to bailout some major US companies, such as General Motors and several financial institutions including the aforementioned AIG and Fannie Mae, which were considered "too big to let fail". Given this vested interest, President Barrack Obama was seen to be quite critical of executive compensation, however, his focus was on companies that the government had bailed out. Given the critical stance that the committee and the president seemed to have, it is possible that legislation for stock based compensation for executives will come under further review.

2.3 CONCLUSION

Throughout the past century, stock option compensation in the United States has grown from nothing to being received by millions of executives and employees throughout the country. This growth seems to have been initially spurred on by short term factors, such as tax advantages or incentives for companies and for individuals and accounting flaws, rather than any benefits related to the characteristics of an option. However, over time some groups realized some of the benefits of using options, which related to the characteristics of options themselves. Namely, options have the ability to attract high calibre employees through the incentive of participating in the company's success, and assisting in cash flow. Over time, as the tax advantages which helped increase stock option usage increase disappeared, stock options did not see much drop. Rather there was a switch to stock options which did not have such benefits.

Although stock option usage peaked shortly after the turn of the century, it is difficult to tell if this was a short-term reaction to accounting reforms, bearish stock market, prominent users such as Microsoft reducing stock option usage, or due to the negative association with stock options after major corporate accounting scandals. Given the numerous events over the past decade, it will be interesting to see if there will be a decrease of traditional stock options and an increase in non-traditional stock option plans or perhaps other forms of compensation in the long-run.

From history, it seems unlikely stock option compensation will “die” as suggested by some industry articles written during the announcement of accounting changes, however, its level of usage in the late 1990s may have been excessive, and it may not recover to those levels. In addition, previously there may have been a mixture of firms using stock option compensation because of their fundamental benefits, and other firms using options as a tool to “manage earnings. However, in light of the corporate accounting scandals of 2002 and changes in accounting standards, firms which had been using options as a tool to “manage earnings”, may reduce their dependence on stock options. Regardless of this, options still have a place in executive and broadbased compensation packages.

Chapter III: AN INVESTIGATION INTO THE IMPACT OF "MONEYNESS" ON THE COSTS AND BENEFITS OF OPTION COMPENSATION

3.1. INTRODUCTION

From the previous chapter it was seen that executive stock option compensation has had its peaks and troughs, with the peaks of compensation in the 1990s attracting considerable interest from both the public and academics, as stock option compensation drove up pay rates. Although many people naturally question these pay rates as being excessive, there are others who advocate them because of the belief that how one gets paid is more important than what they get paid. In other words, it is the compensation packages behind high pay which is supported. As if the employee did not perform, pay would have been much lower.

As mentioned earlier, the origins of early academic support for general equity based compensation stems from the seminal paper (Jensen et al, 1976) on contracting and agency theory. However, it was not until Haugen & Senbet (1981) that the specific role of options as a tool to reduce agency costs was investigated. Their findings illustrate the importance of the convex payoffs from call options, which make them more effective than shares when reducing managerial perquisite consumption. Thus showing that options can definitely have a distinct role in an executive compensation package while other equity based compensation need not.

In spite of all this, it was not until the seminal work of Jensen & Murphy (1990a & b) on executive compensation, that a solid argument for the case of using equity based tools such as options was presented. Firstly, Jensen & Murphy (1990a) pointed out how far executive compensation had fallen since the 1940s on an inflation adjusted basis, and how the average ownership of executives had dropped since that time. Secondly, their work on pay-performance sensitivity (1990b) following on from Jensen et al (1976), solidified the case of using equity compensation to motivate executives to do what is in the best interest of shareholders. Their empirical work suggested that executives were not being paid appropriately, and their results suggested that there was ample room for executives to be paid more effectively.

The premise of Jensen & Murphy's (1990b) work is conceptually sound, as it suggested that high pay could be justifiable if executives were paid on the basis of performance. Though they emphasized the need to increase equity compensation to accomplish this (1990a & b), they noted cash still has a place due to equity still being susceptible to a number of factors outside of an executive's control. However, though equity compensation increased throughout the 1990s, it would seem that this advice was not that well heeded, as there were a number of record payouts amounting to hundreds of millions to executives (much of which was attributable to stock options) during the bull market of the 1990s. Though there may have only been a small number of extreme instances, these cases brought into question whether executives were really worth what they were getting paid, or whether they were just beneficiaries of good luck.

In light of these large payouts, and the spread of stock option usage to non-executive employees, much debate has surrounded the traditional alignment incentive benefits that equity was said to possess. Throughout the years a number of hypotheses have been formed including the optimal contracting hypothesis, managerial power hypothesis (Bebchuk, Fried & Walker, 2002), and perceived cost hypothesis (Murphy, 2002), with the second hypothesis applying only to executive compensation.

Although there is no clear consensus, there nevertheless appears to be considerable support for the premise that many executives are being compensated excessively with stock options. This has led a number of researchers to look beyond stock options being used as an incentive alignment tool, and unravel differing aspects of these complex instruments. These include numerous HR related benefits, such as attracting, sorting and retaining staff, as well as indirect benefits relating to a range of finance related issues, such as corporate governance, project selection, financing and tax issues.

With options issuance having such a widespread impact on a firm through all these different means, should it matter that, in isolation, they might not be the best tool to accomplish any one goal? This question is comparable to whether or not a firm should employ the candidate who has the highest grades in his or her field, or a candidate who has done well in several fields. Most of the time, there is a need for a versatile tool such as an option, just as a team will have a number of versatile personnel, in addition to some extremely good at their specialty. However, depending on the project, there may be more

or less of a need for a versatile employee, just as there may be more or less of a need for options depending on the circumstances.

If stock option levels are determined on the basis of their overall benefit to the firm, the firm may grant more options than if they were purely granted as incentive tools. Thus, executives may sometimes be overcompensated. However, the firm and its shareholders can still ultimately be better off in other ways due to the benefits from other properties of options. Because, just as the recipient may benefit from luck, the firm may also benefit from luck through alternative benefits it gains from the increased likelihood of options being exercised.

This chapter contributes to the literature in several ways. Firstly, by incorporating the impact an employee can have on a firm, a "what-if" framework is established to better understand the *incremental* benefits and costs from granting stock options. Secondly, the paper clarifies the nature and magnitude of the opportunity costs from dilution of value. Thirdly, as a result of this framework above, foregone revenues from option premiums is shown not to be the best measure for opportunity cost. Fourthly, this paper strengthens the argument for smaller firms with potential for growth to use options. Fifthly, the basis for a holistic optimisation model has been developed that incorporates a wide range of benefits and costs. Lastly, this chapter recognises the different nature of the major costs and benefits of stock options in relation to the moneyness of the options, and uses sensitivity analysis to help illustrate how these different types of benefits may impact on finding the optimal solution. However, it should be noted that although a framework for established the net benefits of options under different conditions is found, exact optimal solutions under different conditions are not identified this chapter.

The remainder of the chapter is structured as follows: in Section two, the major benefits portrayed in the literature are discussed, which will be followed by a brief discussion of costs in Section three. In Section four, many of the benefits and costs covered in section three are incorporated into a model. Section five then implements the model through scenario analysis to measure the relationships between the differing costs and benefits and grant or value size and the state of the market, a proxy for "moneyness".

3.2 BENEFITS

3.2.1 Incentive benefits

As aforementioned, Jensen & Meckling (1976) argued the need for greater incentive alignment in order to reduce agency costs. Strictly speaking this may cover a wide range of incentive issues, but as Nagaoka (2005) points out, the literature surrounding options and incentive alignment can be divided into two parts, *incentive* and *selection* benefits. In the context of *incentives* in labour economics, where workers are assumed to be effort averse, incentive benefits are thus required to motivate employees to work harder to fulfil their potential ability (Lazear, 1995). Whereas, when this chapter refers to *selection* benefits, it primarily refers to the investment selection benefits from the motivation to allocate more funds to value adding investments.

Though many academics discussed the agency theory implication of utilizing equity based compensation, it was the work of Jensen & Murphy (1990b) that solidified a framework to analyse the incentive benefits. Their work set out the importance of *pay-performance sensitivity*, that is the ratio between a dollar change in executive wealth for every dollar change in company wealth. Which, for the case of stock options, this is merely measured by the option delta multiplied by the number of options divided by the number of company shares on issue. The higher the ratio, the greater the incentive for an executive to push up the stock price, with the theoretical optimal ratio being one, implying a CEO or executive is the sole owner of the firm.

As the option delta is important in estimating the incentive benefit when stock options are concerned, it is important to understand how the option delta changes. As Carter, Lynch & Zechman (2002) point out, options that are out-of-the-money have less incentive power than those in-the-money, thus some firms choose to grant *repriceable* options to readjust the incentive benefits of options, to cover the event of options going deep out-of-the-money. Johnson & Tian (2000) also contribute by pointing out, that although out-of-the-money options on a one-to-one basis may have a lower delta, on a dollar for dollar value basis, premium options are superior at issue. However traditional options granted at-the-money may become superior in the future if the stock price decreases.

3.2.2 Investment "Selection" benefits

The convex payoff offered by options not only offers incentives to increase the share price, but also incentives to make certain types of investment decisions, including more efficient use of free cash flows, higher investing in R&D, and making riskier investments.

With regards to optimal levels of investment, Broussard, Buchenroth & Pilotte (2004) investigate the impact of equity compensation in light of the free cash flow theory, which suggests agency costs of free cash flow will be reduced through higher levels of pay-performance sensitivity (PPS), leading executives to invest free cash flows at an optimal level, eliminating either under investing due to a lack of effort to search out fruitful projects, or overinvesting free cash flow, thus leading to exacerbating the severity of financial constraints. Their analysis of the incentive effects on investment of free cash flow, focusing on CEO incentives (stock and stock options) support the hypothesis that equity based incentives alleviate the agency costs of free cash flow, reducing overinvestment, and helping reduce underinvestment of free cash flows.

With regards to aligning incentives for project selection or capital budgeting decision making, several authors have made arguments for options over other equity based compensation. Nohel & Todd (2005) consider the scenario where an executive's investment strategy is being hindered by career concerns that job loss will be the result of a poor investment decision, thus causing the executive to avoid some riskier positive NPV projects which have a lot of downside. In this case, the authors found that options were a superior tool compared to other equity based compensation to motivate executives to select riskier projects.

Bryan, Hwang, & Lilien (2000) also came up with similar findings. They chose to research the mix of the major types of stock compensation, stock options and restricted stock awards. Using seven hypotheses, they use seven possible determinants to suggest an optimal level of use of stock options. Included in these determinants are variables relating to investment opportunity, monitoring difficulty, managerial ownership, agency cost of debt, time horizon, liquidity constraint, tax cost, and cost of reported low earnings. Because of the similarities between the two types of awards, the hypothesized relationships are the same between all of the determinants, except investment

opportunity. This is due to the incentives from the convex payoff of options, as opposed to the linear payoff with restricted stock, which is not as conducive for managers to select risky value adding projects. Their empirical findings provide evidence for this, which would explain why companies with more high growth opportunities are more likely to choose stock options over restricted stock awards.

Ryan & Wiggins (2002) researched the impact of compensation on a company's research and development (R&D) expenditure, as R&D is a major long term driver of innovation, product development and long term growth. They found further supporting evidence for compensation packages that include stock options increasing R&D expenditure, as they provide a stronger incentive for growth, whereas restricted stock actually has the opposite effect, with lower R&D expenditure.

Though not directly mentioned in the mainstream literature thus far, options help contribute to a positive working environment conducive to value adding activity. As mentioned, stock option usage helps encourage innovation through increased R&D expenditure, and a side effect of riskier investment decision making is that workers are not put off submitting risky ideas that would otherwise never be considered. Though this impact on organizational culture is not easily measured, it may be more crucial to the company than executives merely selecting projects better. As Arnold & Hatzopoulos (2000, p10-11) mention, "it is widely acknowledged (e.g. King, 1975; and Emmanuel, Otley & Merchant, 1990) that the main obstacle to value creation is (i) the lack of an environment which encourages idea generation and (ii) enthusiastic project sponsorship ....". This also helps to explain the wide use of broad-based compensation, particularly at *new economy* firms (e.g. internet based companies) which are mainly based on intangible assets.

3.2.2.1 Alternative stock option incentive tools

It is worth noting that most executives and employees are granted basic "vanilla" options, whereas there are a number of non-traditional "exotic" options also available for companies to use. Some of the major alternatives and their corresponding incentive benefits will be briefly discussed.

Johnson & Tian (2000) nicely summarise the characteristics of non-traditional executive stock option plans, including premium options, performance, repricable, purchased options, reload, and index options. Five of which create stronger incentives than traditional options to increase stock price as well as return volatility. Of these, the index option comes out as the best alternative to provide an incentive to maximize stock price and return volatility, however it is also the alternative which would have the least value, thus requiring more options to be underwritten than other types of options in order to satisfy the recipient. The greater number of options required poses a problem to the firm as it increases the level of dilution if the shares are exercised.

3.2.3 Attracts higher quality talent

Although anecdotal evidence has long existed to suggest that stock options can be used to attract higher quality talent, Hellman & Puri (2002) find supporting empirical evidence of this in the case of small start up firms. Their finding show that small firms backed by venture capitalists are twice as likely to use stock options as another start-ups. The reasons for this stem from venture capitalists trying to secure the longevity of the firm and minimize risk by gearing HR policies towards professionalization, in addition to possibly replacing the CEO with an external hire. An implication of these findings also suggests that smaller firms in particular may have a greater need to utilize stock options for their survival, much more so than larger firms.

3.2.4 Talent sorting benefits

Arya & Mittendorf (2005) argue that in addition to a variety of factors suggested by others, options are a simple tool to hinder an executive attempting to extract rents by overstating their worth. They solidify this argument by developing a theoretical model which shows that a manager has the incentive to be more honest in declaring his or her capability, as their pay is put on the line. The implication of this work, is that stock options can be utilised by a firm when hiring new employees to assist filtering out the best applicants.

3.2.5 Retention

In Oyer & Schaefer's (2005) research of reasons why firms granted options which had few incentives, they showed that options were a good tool to retain employees. Amidst a buoyant labour market, where an employee may switch to an employer with better pay,

where a company has the choice of paying spot wages and/or stock options, to help retain talent. Except for cases where employees are very risk averse and pessimistic, Oyer & Schaefer's model was able to theoretically explain option grant levels for the majority of firms in their sample.

However Fee & Hadlock (2003) find that retention effects, are not necessarily as strong when applied to CEOs. In their study of executive headhunting, they found little evidence to support the ability of stock options and restricted stock to reduce the likelihood of an executive "jumping" ship.

Rather than researching the usefulness of traditional options, Carter, Lynch & Luann (2004) investigated the use of repricing options on retention of staff. As an option out-of-the-money has little value to an employee, intuitively there will be less retention benefit from an out-of-the-money option than an option in-the-money. The results of Carter et al (2004) research helps support this, as well as help justify why companies reprice options. They found employee turnover at firms with underwater options was significantly lower at the firms which decided to reprice, than those who decided not to.

Although the above findings are mixed, there does seem to sufficient supporting evidence to suggest that using options to compensate employees are likely to help retain employees, at least at the lower levels of the organisation. However, this does not suggest that options can act as a deterrent to other firms.

3.2.6 Cash conservation benefits

A number of authors, such as Yermack (1995) hypothesized that firms with liquidity problems utilized stock options as a substitute for cash, thus minimizing cashflow concerns. So for smaller firms starting up, they are able to offer an overall competitive compensation package, as long as they are willing to sacrifice some of the ownership. However, as Hall & Murphy (2000) point out, for executives, options have been found to be more often used as a form of "add-on", rather than a substitute for cash to maintain current levels of compensation. Although it could still be argued that firms wishing to increase levels of compensation can conserve cash by utilizing options.

However, the evidence for cash conservation is mixed. Core & Guay (2001) find greater use of employee options in firms with financial constraints. However, Ittner, Lambert & Larker (2003) find that among *new economy* firms, companies with greater cash flows actually use options more extensively.

3.2.7 Financing issuance cost savings

Upon stock option exercise, a firm receives significant amounts of cashflow from executives or employees buying stock from the firm. For a larger firm, these cashflows may be of little use and used for repurchasing shares, but as Hollan & Elder (2006) point out, for a smaller firm these savings can be an alternative form of financing. In addition, for a small firm, the cost of raising capital is higher than for a larger firm, particularly when raising smaller amounts. This view is supported by Lee, Lochhead, Ritter & Zhao (1996), who found that smaller issues of less than US $10 million have an average issuance cost of over 16%, whereas those of over US $500 million had an average issuance cost of 3.15% (including abnormal returns at the announcement of an offering). By utilizing options to help raise funds, the only issuance costs incurred are those relating to the increasing compensation to employees.

3.2.8 Tax benefits and capital structure

As of 1995, a change in the US tax code 162(m) made performance based compensation such as options (as long as they were not granted in-the-money) more attractive to use than a fixed base salary. The ruling in the tax code meant that every dollar above a base salary over $1,000,000 was no longer tax deductible. Only compensation that would encourage performance pay would be considered tax-deductible. Although not all firms capped base salaries to below $1,000,000, many firms did so, and option compensation continued to increase following this date.

Cipriano, Collins, & Hribar (2001) conduct a study on non-qualified[2] stock options to see the impact of taxes on cash flows for major users. Their investigations suggest that the tax benefit can be economically significant, citing that on average for the top 100

[2] Non-qualified refers to the lack of eligibility for preferential tax treatment for the employee. Qualified, or incentive stock options however are able to give the recipient particular tax benefits, however the firm is then no longer able to claim the exercised value of the option as a taxable expense.

NASDAQ firms in the fiscal year of 2000, over 45% of operating cash flow was due to tax benefits.

Amidst the concerns of option expensing with FASB 123 being revised, Ciccotello, Grant, & Grant (2004) sought to investigate the cashflow effects of employee stock options. They point out that nonqualified stock option exercises actually increase operating cash flows because they are tax-deductible expenses and because of the current accounting treatment of these taxes. In addition, companies will receive financing cash flows upon exercise, and may or may not use these cash flows to repurchase shares. In their analysis of NASDAQ 100 and S&P 100 firms from 1999-2001, they found the cashflow impact to be much greater for NASDAQ 100 companies proportionally, reflective of S&P 100 stocks having larger operating cashflows. NASDAQ 100 companies also had a higher volatility in tax savings, and were less likely to buyback shares.

A major benefit of utilizing stock option compensation for a company is the indirect impact on cash flows through possible tax savings when companies choose to use Non-qualified Stock Options (NSOs) to compensate executives. Graham, Lang & Shackelford (2004) examine the matter of non-debt tax shields, and capital structure, with an emphasis on corporate marginal tax rates after inclusion of expected stock option exercises. They compared NASDAQ 100 and S&P 100 firms, and their findings show marginal tax rates on average will drop significantly for a NASDAQ firm (from 31% to 5%), whereas a firm in the S&P 500 will see little difference, which can usually be attributable to the average level of earnings being lower for a firm on the NASDAQ.

Because of the possible tax shields created by NSOs, Kahle & Shastri (2005) investigate the possible impact of this on capital structure. Using the Execucomp database, they estimate the tax benefits of stock options from option exercises. They find companies with large tax shields from stock options tend to have lower long term leverage, lower DPS, and higher profitability than firms without tax benefits due to option exercise. These firms also have more options outstanding and more options exercised. They also find that firms which chose to issue equity were more likely to have had tax benefits from options than those which had issued debt. In addition, the larger the option tax benefits, the larger the dollar amount of equity likely to have been issued.

3.3. COSTS

When considering the costs of stock options it is important to distinguish the value of a stock option to an employee, and the cost to the company. Although this section is focused on the cost to the company, the ultimate cost will be affected by the value of a stock option to an employee, as it will determine how many options a firm needs to grant.

In a simple world, where employees are risk-neutral, an employee would value a stock option in the same manner that a firm may, that is based on an option valuation model, such as the Black Scholes model. However, as Muelbroek (2001) and Hall & Murphy (2002) point out, executives will discount options depending on how diversified they may be. Unlike an investor who is able to diversify risk freely, an executive will usually have the majority of their wealth locked up in company shares or other forms of company equity. Because of this discount, companies granting options may have to grant a significantly higher amount of options to an undiversified executive than they would have to if they were being granted to a diversified executive. Making undiversified employees, costlier to the firm

3.3.1 Dilution costs

If stock options are exercised, a company typically issues new stock, which thus dilutes the holdings of current stock holders. Martin & Thomas (2005) investigate the stock market reaction to stock option proposals which could potentially lead to higher levels of dilution, by conducting an event study surrounding the announcement dates using data from the Investor Responsibility Centre, in conjunction with CRSP. They also investigate the response of board of directors to shareholder opposition to stock option plans. Although several studies had found in the past, that executive option compensation plans were usually positively received, Martin et al (2005) find plans from 98-99 with potential to highly dilute company shareholdings have significantly negative cumulative abnormal returns in the 3-day surrounding the proxy date. Thus suggesting that proposed levels of grants were so high, that any benefits would be nullified by the level of dilution experienced by stock holders.

3.3.2 Repurchases

When firms wish to reverse the dilution effect, they will often buy back shares. Fenn & Liang (2001) produce findings that support the hypothesis that buybacks are linked to

managerial stock incentives, because the alternative of dividend payouts do not benefit stock option holders. The study also shows that management stock options are linked to lower dividend payouts and higher likelihood of repurchases. Kahle (2002) finds similar results, but goes further to investigate the reactions from the market. Whereas buybacks in the past were formerly considered a positive signal that the company has favourable future prospects, the market seems to have recognized the increase of buyback activity has been to do with the increase of non-managerial stock option compensation, and have not reacted as positively than if it had been otherwise.

Bens, Nagar, Skinner, & Wong (2003) suggest firms issuing employee stock options utilize share buybacks as a means of earnings management, particularly that of the Diluted EPS, a measure which incorporates in-the-money stock options at the time of financial reporting into the number of shares, which may not eventually be exercised by the time they are vested. When examining the level of stock repurchases, they seem to increase when the dilutive effect of outstanding employee stock options increases, and when earnings are below the level required to achieve the desired rate of EPS growth. So there seems to be more evidence to link these decisions to the diluted EPS, than there is to the basic EPS, as the repurchases don't seem to be connected with actual ESO exercises. However, Larker (2003) critiques Bens et al (2003) conclusions, on the basis of their assumptions of a historical EPS growth target, neglecting the expected impact of repurchases on earnings (due to opportunity cost of not investing), and their lack of alternative explanations.

3.3.3 Reduced or wrong incentives

Tian (2004) finds that excessive stock option compensation can actually reduce incentives, rather than increase them. Under Tian's model, option compensation policy must take into consideration the value of the recipient's total wealth as this determines the "critical threshold", which if exceeded, will produce counterproductive results. Carpenter (2000) also finds suggestive evidence that options may possibly lead to counter-intuitive results with respect to increasing risk. Rather than encouraging executives to take on riskier value adding projects, Carpenter finds that some risk averse executives may attempt to reduce risk in order to minimize risk associated with their pay.

However, in light of the credit crisis, several authors have suggested that stock option compensation may lead to excessive risk taking. Balachandran, Kogut, and Harnal (2010) find that in the case of financial institutions, stock based compensation, such as stock options, is linked to a higher probability of default. The authors confine their findings to the finance industry, firstly, because of the high leveraged nature of the industry; and secondly, there is less incentive to worry about bankruptcy for firms considered too big to fail, due to the likelihood of a government bailout to avoid systemic risk.

3.3.4 Accounting costs and earnings management

Although accrual accounting figures should not affect finance decision making, nor increase cost, they still may play a role directly or indirectly in the use of stock options. Murphy (2002) hypothesizes that a major reason behind the widespread use of options is attributable to the low perceived cost involved. Particularly as under accounting standards, at-the-money options could effectively be valued as nothing (because they have no intrinsic value) essentially escaping financial statements, aside from footnote disclosure (which includes more advanced valuations).

Such a focus on accounting figures brings about cause for concern for "earnings management", a practice of manipulating accounting information in order to improve the appearance of earnings. The ultimate ramifications of a company falsifying accounting information can lead to companies such as Enron falling into bankruptcy.

Jensen (2005) points out that although stock options may not cause corporate corruption, in the midst of corrupt corruption, stock options can exacerbate the problem. Jensen compares stock options in a firm with overvalued equity, to a heroin substance, which causes the firm to depend on earnings management; otherwise it will suffer dire consequences.

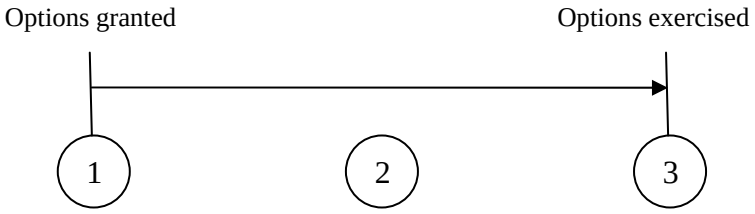
3.3.5 Economic Opportunity cost

As several authors have noted, particularly Murphy (2002), economic opportunity cost is a major factor which decision makers may not have incorporated into costs, as it does not impact on cashflows or accounting. However, when it comes to decision making, it is important to incorporate the economic opportunity cost to evaluate whether the decision is truly better for the firm or not.

3.3.6 Summary of Costs and Benefits

As can be seen from Table 3.1: Summary of costs and benefits, in conjunction with Figure 3.1: The timing of costs and benefits, it is easier to understand the nature of option costs and benefits by grouping the differing costs and benefits according to similar characteristics. Due to the contingent nature of the value of options, many of the benefits of using options are also conditional on the moneyness of options. For this reason, it is easier to understand the differing impact of some of the benefits by categorizing them into one of three different types: unconditional, partially conditional, and conditional.

Figure 3.1: The timing of costs and benefits



Unconditional benefits are incurred upon *granting* options (timing 1 as shown in Table 3.1 and in Figure 3.1), and are independent of whether or not the options are exercised or not. These benefits include cash savings, talent gauge (reduced risk of hiring employees unlikely to deliver value), and signalling benefits. Aside from the benefits of gauging talent, most of the unconditional benefits are comparable to fixed costs, which are known with certainty.

In general partially conditional benefits are those which exist for the duration of the lifetime of the option (shown as timing 2 in the Table 3.1 and Figure 3.1), or in the case of retention, the vesting period of the option. These also include incentive and selection benefits. The exception to this is the possible benefit to attract talent, a benefit which is effectively incurred at the same time as unconditional benefits, when options are granted. The strength of all of these benefits may vary throughout the lifetime of the option, depending on the moneyness of the option. As they occur throughout the lifetime of the option, none of them actually depend on options being exercised. The possible benefits from this are non-linear with respect to the selection and incentive benefits, however, the other benefits are constrained.

Table 3.1: Summary of characteristics of Costs and Benefits

Benefit/Cost	***Controllable factors***		**Is Moneyness important?**	**Timing**	**Drivers**	***Relevant to which employees?***
	s_t	X_t				
Incentive	Max	Max	Part	2	Low ownership	Those able to contribute high value to firm
Attracting	Max	Min	Part	1	Firm Profitability Hi-growth prospects	All
Selection	Max	Max	Part	2	Conservativeness of investments	Those in position to make important value making decisions
Sorting	Max	Max	No	1	Mainly beneficial with new employees Asymmetric info	All
Liquidity	Max	Min	No	1	Lack of cash / risky / Smaller firm Hi-growth prospects	All
Financing	Max	(Max) Min	Yes	3	High issuance costs Hi-growth prospects	All
Retention	Max	Min	Yes	2	High costs involved with rehiring	All
Tax	Max	Min P_t	Yes	3	Tax rates Existing tax shields	Executives
Opportunity cost	Min	Max		1		
Dilution	Min	Max		3		

Lastly, conditional benefits of options are considered to be those which are only incurred when and *if* options are exercised. These are taxes, capital structure benefits and financing benefits. The possible magnitude of the tax benefit is unlimited due to the linear relationship with the intrinsic value of the options upon exercise, however, the latter two have their limits, as they are a product of probabilities and benefits provided if options are exercised.

Just as benefits can be categorised according to their contingent nature, costs can also be divided into two similar categories: unconditional, and conditional. Economic opportunity cost is considered an unconditional cost as it remains the same regardless of whether the option is exercised. Secondly, the major costs of dilution (or repurchases) are conditional on the moneyness of the option.

Given that the bulk of the benefits are related to the moneyness of the firm's stock options, it is theoretically not surprising for there to be a significant relationship between the buoyancy of the market and the usage of stock option compensation. This leaves firms which have major benefits from sorting talent and liquidity to be the most likely stable users of stock options.

3.4. THE MODEL

A similar framework to Arya et al (2005) is followed in establishing a foundation for the model. However, enhancements will be made to incorporate many of the aforementioned costs and benefits, advancing the model beyond its original purpose to gauge talent.

The model firstly assumes that a firm seeks to maximize its value. Beginning with the firm's value, represented by market capitalization; currently N_tP_t, where P_t is the stock price at time t, and N_t is the number of shares at time t, which is considered to be the present time. Firstly, the value (market capitalization) of a firm in the future at time t+1, which can be described as:

$$N_tP_{t+1} = N_tP_t + \phi_t + \omega_{t+1} \tag{3.1}$$

Assuming that there are no changes in the number of shares throughout the period t, N_t must be constant for the period. The future changes in the company's share price at time t +1 are attributed to either: (i) ϕ_t representing expected change based on current elements contributing to company's future expected success or failure, thus a proxy for the profitability of the firm at time t; or (ii) ω_{t+1}, random elements outside of anyone's control (including market factors and unique firm risk) for the period t until t+1.

As a proxy for profitability, ϕ_t, can also be considered a proxy for opportunity for improvement and/or proxy for need of talent. For example, a company making continual losses is in much greater need of talented future management to turn it around than a successful company seeking to replace staff. Unlike the other components, ϕ_{t+1} is a constant during period *t*. Because of this, it is independent of all the other variables in the model, and is based on all current information and decisions thus far.

The term ω_{t+1} represents unexpected fluctuations attributable to either market risk or unique firm risk. In general, ω_{t+1} can be compared to the risk of the firm, however, as will be seen later when the impact of an employee to the firm is considered, some of the firm's unique risk will not be included within ω_{t+1}, but in another variable instead.

For a reader familiar with the random walk model with drift: $S_t = S_{t-1} + \alpha + \varepsilon_t$, one will notice the resemblance between this and the model above. Instead of price in the random walk model, market capitalization is used, and equivalent to the α drift component, there is the ϕ_0 component, as well as ε_t comparable to ω_t. However, as will be revealed later, this model does not strictly correspond to the random walk model with drift, as the impact of an employee is considered separately from firm profitability.

3.4.1 The introduction of an employee

If the firm wishes to hire a new employee, regardless of their rank in the company, they contribute some value to the company, referred to as θ_t, marginal value changes attributable to a change in the manager's current ability, efforts, and/or decision making criteria. At this point, the model advances from the Arya et al (2004) model, as employee contribution to the company is divided into two parts: 1) incremental "sustainable" value, which will also be referred to as Θ_t; and 2) dependent "employee" value, which will be referred to as υ_t, which represents value added that relies on the employee, and is independent of ϕ. Practically, *sustainable incremental value added* refers to any incremental increases in value attributable to superior decision making, such as project selection, policy implementation or development of intellectual property (e.g. idea for a new product), etc. which will have a semi-permanent "footprint" on the firm. Other value

added by an employee however, is considered somewhat temporary as it is related to the individual's personal attributes, knowledge or experience, e.g. he is effective at motivating other workers. So if the employee were to leave, this value would be lost. Although there is some overlap between attributes which contribute to both sustainable and temporary value (e.g. teacher could use knowledge and experience to help students year by year, and/or write a book), this possible overlap is dealt with in the model by the following

$$\theta_t = \upsilon_t + \Theta_t \tag{3.2}$$

The variable θ_t is slightly more complicated than other variables thus far, due to its relationship with other variables. From the firm's perspective, the actual value that will be added by an employee is somewhat uncertain, particularly when there is incomplete information. Let us consider the actual value added, θ_t be a function of the employee's perceived potential to add value, θ_t^E However, an employee may not actually produce θ_t^E value depending on motivation for the employee. More detail regarding these incentives will be mentioned later in the chapter.

On top of the value created by an employee, there may be possible side benefits, depending on the form of compensation. In particular, compensation packages that include options will have a number of benefits, which will temporarily be referred to as $B_{t,}$ until further expansion of these different benefits.

With regards to value added to the firm, it will be assumed that all value to be added by current employees are not going to change value of the firm on their own accord, so that the impact of a new employee on a firm can be observed in isolation. Consequently the new formula for the value of the firm sees the addition of value added by employee plus any B_t side benefits less the cost of employing him/her, C_t.

As a side note, the following equation (3.3) is generalized, meant mainly for conceptual purposes, and will be expanded and developed throughout this section.

$$N_t P_{t+1} = N_t P_t + \phi_t + \theta_{t+1} + B_{t+1} - C_{t+1} + \omega_{t+1} \tag{3.3}$$

So although C_t is subtracted as if it were a simple dollar cost, it is not necessarily that simple to calculate. These costs, as well as a number of other benefits not covered in the general equation below, will be expanded on later also.

Strictly speaking ϕ_t is independent of θ_{t+1}, as it represents expected value added independent of who is not employed by the firm at time = 0. However for future periods of ϕ_{t+1}, an employee is able to contribute Θ_{t+1}, "sustainable value" through project selection or policy implementation. In addition, ϕ_{t+1} is susceptible to unexpected changes, ε_t, to investments within the year. This gives us:

$$\phi_{t+1} = \phi_t + \Theta_t + \varepsilon_{t+1} \tag{3.4}$$

Θ_t is also indirectly related to ω_t due to the general risk and return relationship. As Θ_t represents changes in expected returns, these value adding decisions or investments will usually be associated with increased levels of market risk. However, there is only a general positive linear relationship, and thus can not be written explicitly. This is due to the selection of positive NPV projects, which provide excess returns above the expected risk adjusted return. Finally, it will be assumed that the firm does not pay dividends, so that any increases in value will be fully reflected in the stock price.

When attempting to reconcile this new model of future firm value to the random walk model, the main difference is that the random ε_t element is categorized into two different sources, $\theta_0 + \omega_t \theta$, contribute to the random components, with θ_0 also relating to how the long term expected return may change in the future. A more complicated model could be constructed by incorporating the CAPM into the calculation of ϕ_0 on the basis of the current expected market return, as well as splitting ω_t into changes in the market return, and unique firm risk.

3.4.2 Employee Compensation

An employee is compensated with a combination of base salary, b_t, and basic equity based compensation. The equity based compensation will be in the form of s_t number of traditional stock options with exercise price of X_t. This results in the manager's total compensation being:

$$b_t + s_t \max\left[P_{t+1} - X_t, 0\right] \tag{3.5}$$

or $$b_t + s_t \max\left[P_t + \frac{\phi_t + \theta_{t+1} + B_{t+1} - C_{t+1} + \omega_{t+1}}{N_t} - X_t, 0\right]$$

Aside from b_t, the salary, calculating the costs, C_t of compensating the manager is not as simple as calculating the value to the recipients. Stock options do not require any cash to be paid out; rather the company underwrites new shares, thus diluting the holdings of existing shareholders. In addition, a company bears the economic opportunity cost of not having underwritten stock options and sold them on the market instead of granting them.

3.4.2.1 Dilution costs

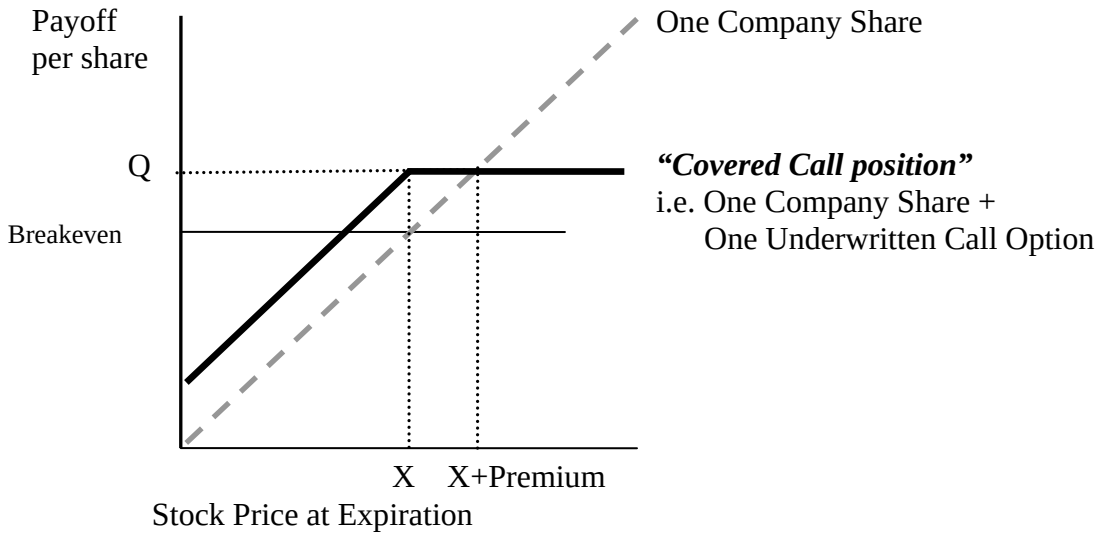
Whereas the majority of optimisation models focus on economic opportunity cost, this model will focus on the costs resulting from dilution due to the increased number of shares resulting from options being exercised. The reasons for this emphasis on dilution costs instead of economic opportunity costs will become clearer in the latter half of the section relating to the cost of employee compensation.

Typically many authors have focused on the impact of an increased number of shares on the *diluted EPS* (Earnings per share), particularly as this measure was required as part of footnote disclosure for stock option expense. However, it is important to understand that *diluted EPS* is not the same as *dilution of value*. Dilution of earnings implicitly only considers the impact of dilution on financial performance by adjusting the EPS calculation (Earnings divided by number of shares) by the new number of shares if options are exercised. Dilution of value however also considers the possible financial impact of additional capital to the firm, additional capital which may help increase earnings in the future. From this point onwards, when the cost of dilution is discussed in this chapter, it will refer to the costs attributable to the dilution of value as opposed to diluted EPS, as the primary goal of the firm is to maximise firm value not to maximise profit.

To help illustrate the dilution costs or loss in value due to dilution normally involved in underwriting stock options, simple payoff graphs are used. In Figure 3.2: Payoff for a normal investor's "covered call" strategy, payoffs for a strategy comparable to a firm granting stock options can be seen. A "*covered call*" strategy refers to an investor who holds a long position in the underlying asset and has a short position (i.e. underwritten to

sell) stock options. The grey dashed line represents the payoff if the company did not issue any options at all (the payoff for holding a share), and the bolded black line with a kink in it represents the payoffs for a covered call position, i.e. selling one stock option for every company share held.

Figure 3.2: Payoff for a normal investor's "Covered call" strategy

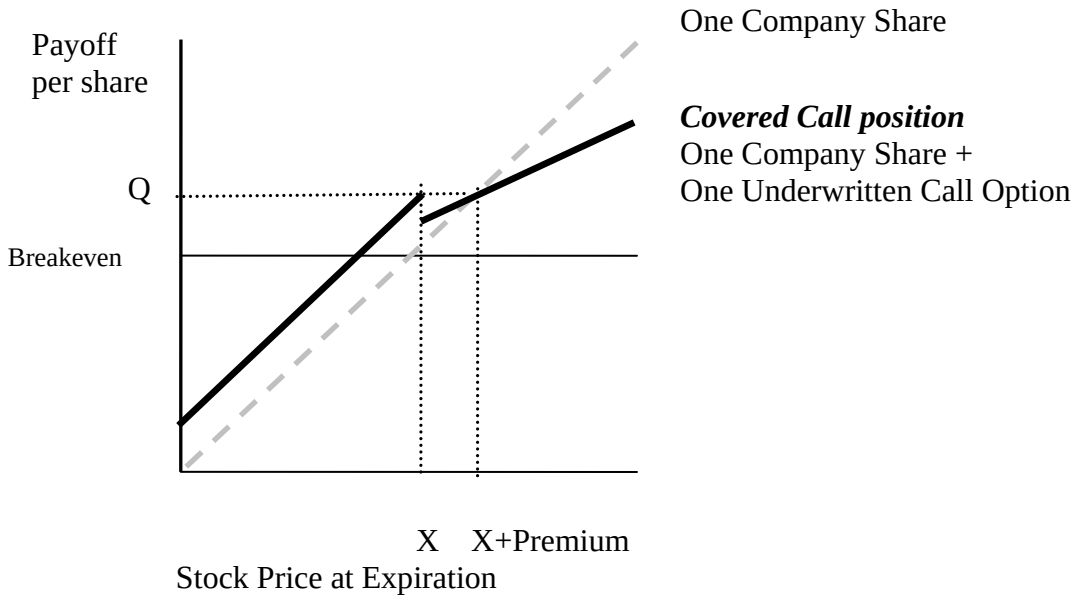


From Figure 3.2, it can be seen that *the covered call position,* represented by the black line, provides a better payoff than the company without options (i.e. one company share), represented by the grey dotted line, for all prices below the stock price *X+Premium*, where *X* is the exercise price, and *Premium* refers to the premium paid for the option. If the prices exceeds this price (exercise price plus option premium), then the company would have been better off not to have granted options at all.

According to Chance (1998) this strategy of underwriting stock options when an investor holds the underlying asset is used when the underwriter is content with locking in current wealth, and/or is expecting the company to experience a downward shift in the future. Although it may be reasonable for a speculator to do this, it is not for a firm, as it is contrary to the main goal of the firm which is to maximise stockholder value. This thus brings into question whether the economic opportunity cost or "next best alternative" to compensate employees with stock options is to sell options. The only logical reason would seem to be that there are benefits not stated here, which change the probabilities of outcomes for the better.

As mentioned earlier in the chapter, stock option compensation does not require any cash outlay; so a company is in the unique position of being able to just create new shares, with the only cost being diluting the value of its current stockholders' holding. As can be seen below in Figure 3.3: Simple Payoff for a Company's "Covered call" strategy, the dilution of value leads to a significant impact on the payoff for the company. For prices above *X*, the payoff graph changes not only in gradient, but also in location, with a sudden drop. This sudden drop in payoff per share is attributable to the firm suddenly creating new shares after options are exercised. As there is only a marginal increase in market capitalisation, and a sudden increase of shares, this causes a sudden drop, as the price of a firm is equal to the value or market capitalisation of the company divided by the number of shares on issue. The change in gradient is also attributable to dilution, as any previous increase in value per shares will be less due to there being more shares.

Figure 3.3: Simple Payoff for a Company's "Covered call" strategy



The magnitude of this drop and how much the gradient will decrease by will depend on the level of dilution. In this scenario, one option is being issued for every existing stock unit. So upon exercise there will be double the quantity of stock as there was originally. This is an extreme scenario and the cost of dilution is not typically this high.

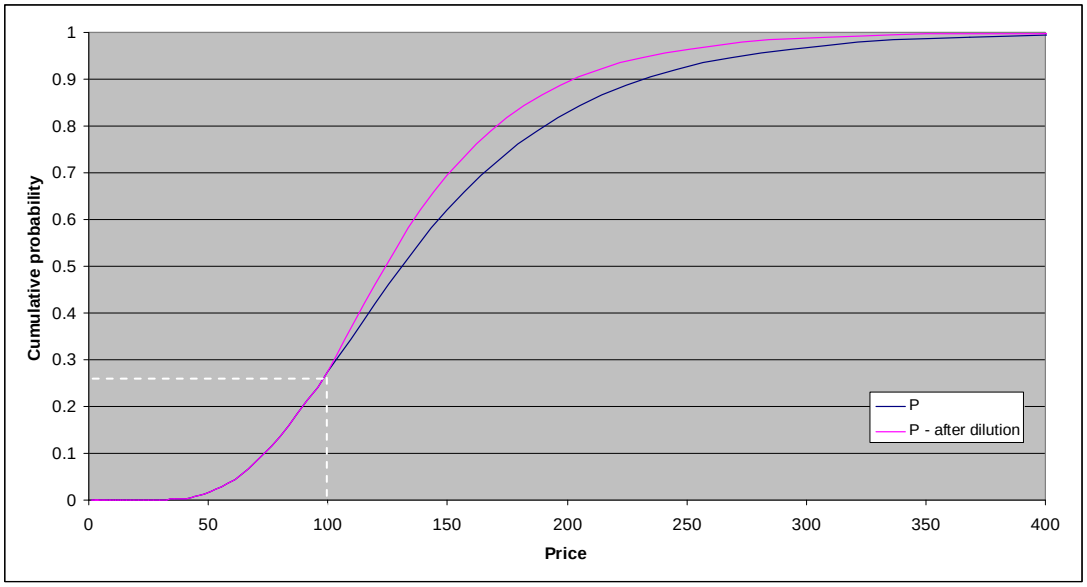
Computationally, the impact of dilution from the model above can be described as follows:

If $X_{t+1} \leq P_{t+1}$, then:

$$P_{t+1}^{after\ Dilution} = \frac{s_t(Premium_t + X_{t+1}) + N_t P_{t+1}}{s_t + N_t} \tag{3.6}$$

This is graphically depicted in Figure 3.4 below, with the divergence of the two curves where the price is greater than the exercise price of $100. The higher the price, the greater the divergence between the price before and after dilution, which is represented by the increased horizontal gap between the curves.

Figure 3.4: Price after dilution



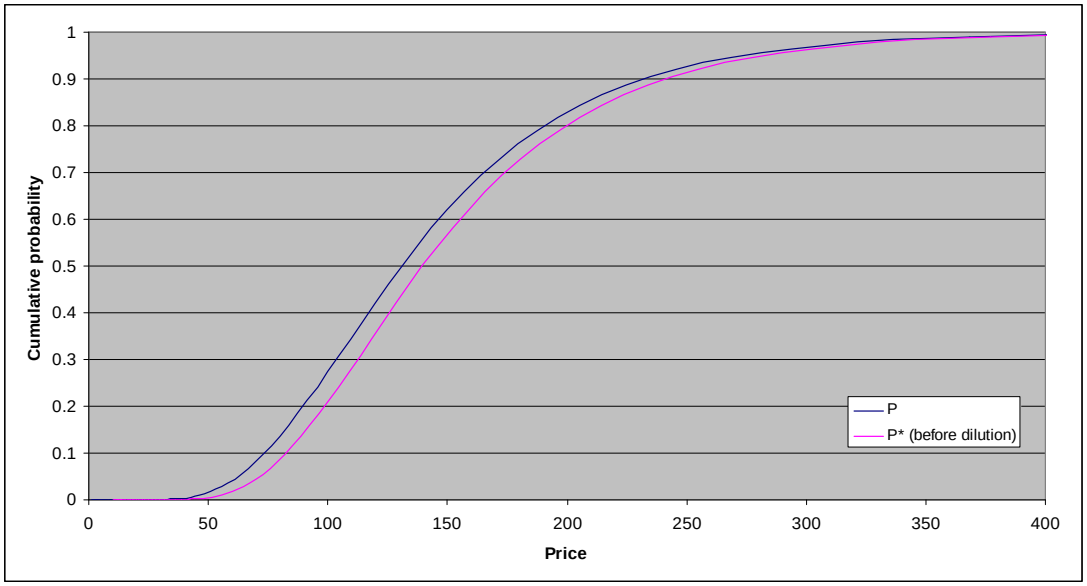
However, this simplified model is only appropriate when making a basic comparison of how much better off a firm is by granting options. But the simplified model assumes that the savings in premiums have been kept separate from firm value. Whereas in reality, the savings benefit directly affects P_{t+1}. However, these benefits will be incorporated along with others, later on.

The actual impact of dilution should be:

$$P_{t+1}^{after\ dilution} = \frac{s_t X_{t+1} + N_t P_{t+1}^{*}}{s_t + N_t} \tag{3.7}$$

Where P^*_{t+1} represents price boosted up from $Premium_t$ savings, in addition to other benefits from utilising stock options. It is important to note that in general $P^*_{t+1} > P_{t+1}$, with the price distribution for P^*_{t+1} most likely dominating the distribution for P_{t+1}. A graphical example of this is displayed below, where every outcome for any given probability the outcome of *P** is superior to *P*. This premise is empirically backed by Defusco, Johnson, & Zorn (1990), who found supporting evidence that there is a positive reaction in share price when an executive stock option plan is approved. The implications of this are that extra value is expected to be created by the implementation of compensating employees with stock options.

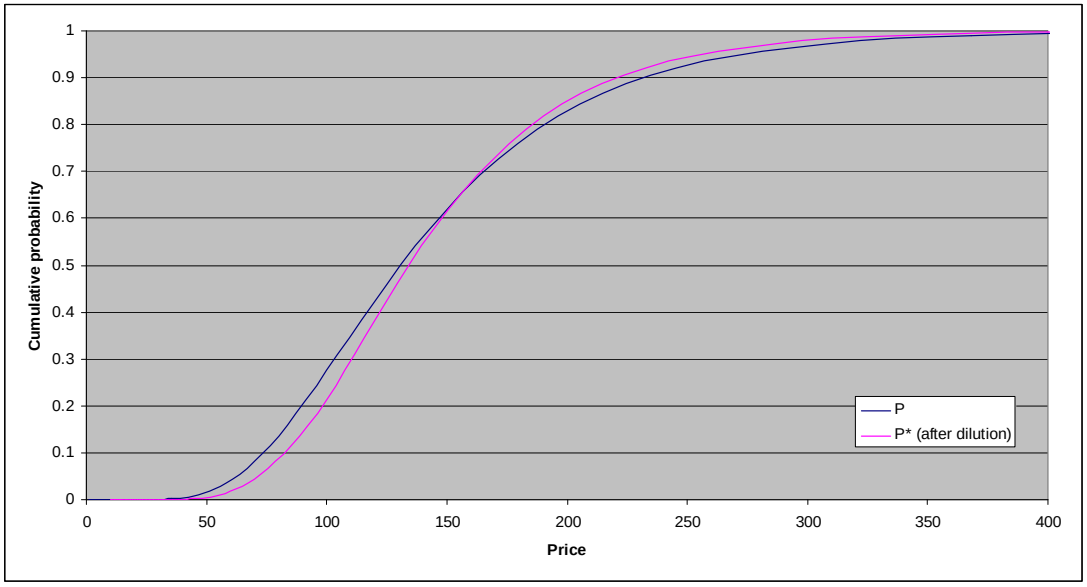
Figure 3.5: P* - the price of a company with option benefits incorporated into it



It is important to have this understanding, as it will help in analysing the incremental costs and benefits of using stock options in several cases. In the case of the dilution effect, it may be easy to confine it to the difference between P^*_{t+1} and $P^{After\ Dilution}_{t+1}$. However, if the incremental benefits of using options are to be compared, the ultimate outcome of using options, $P^{After\ Dilution}_{t+1}$ should be compared with the outcome associated with not using options, P_{t+1}. So if $P^{After\ Dilution}_{t+1}$ is larger than P_{t+1}, then essentially there are no dilution costs. Figure 3.6 below illustrates this comparison between the price distribution without any options with the price distribution (after dilution) with option benefits incorporated. In the particular scenario below, the company will be better off

with options up until approximately $150, which has a likelihood of over 60%. After this point, the cost of dilution brings the share price to a point lower than it would have otherwise been without options.

Figure 3.6: P* after dilution



3.4.2.1.1 Minimising dilution

When minimising dilution of earnings, the firm simply needs to minimise the introduction of new shares. However, when minimising dilution of value, it is more complicated, with the solution to the problem relying on disaggregating equation (3.7) and understanding the relationship between the variables s_t , X_t, and P^*_{t+1}. Beginning with the relationship between s_t and X_t, it is important to remember that these variables are constrained by the value of options component shown in equation (3.5), with the assumption that total compensation remains constant. If X_t increases, this lowers the value of $Premium_t^{X_t}$ (premium that is based on the exercise price X_t), thus s_t will have to increase, so there is a positive relationship between the two variables.

With regards to exercise, a higher X_t will require a higher P^*_{t+1} in order to be exercised. However, this is a broad generalisation, with an implicit assumption that an increased X_t will positively affect the price distribution of P^*_{t+1} enough. But in general, it is fair to assume that all three variables s_t , X_t, and P^*_{t+1} are positively correlated. If these

assumptions are correct, then dilution of value will be minimised by maximising X_t which will increase s_t and P^*_{t+1}, as long as the numerator ($s_t X_t + N_t P^*_{t+1}$) in equation (3.7) increases at a faster rate than the denominator ($s_t + N_t$).

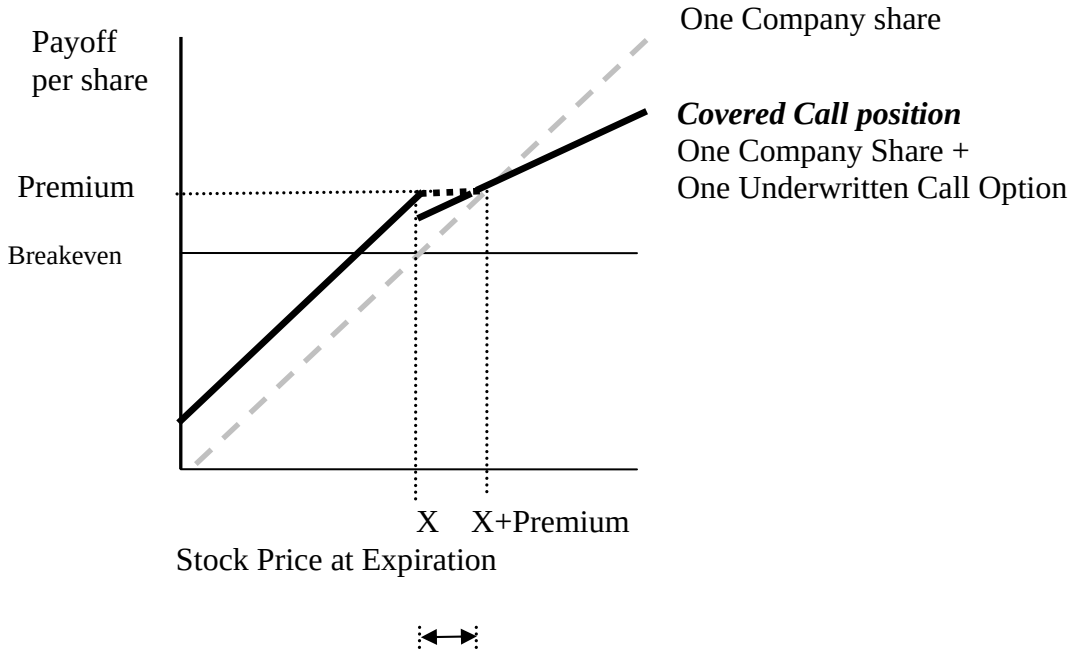
So although restricted stock (simplistically equivalent to an option with exercise price of $0) minimises the dilution of earnings, out-of the money options are likely to be required to minimise the dilution of value.

3.4.2.2 Share repurchases

However, it should be noted, that for any stock option exercise above *X*, but less than *X* + *Premium*, the firm would have been better off (issuing) purchasing shares on the open market, rather than issuing new shares. Though if the firm wished, it could effectively do the same thing by choosing to utilise cash it saved plus the funds it received from executives to purchase the newly issued stock, to repurchase stock on the open market. Or for some firms, they may just choose to use the funds received from executives to purchase the newly issued stock to repurchase stock on the open market, as they may not have really saved $Q, as it may not have substituted any existing pay.

However, the decision to repurchase shares still ultimately depends on the same fundamental factors of a firm deciding how to allocate cash. If the firm has few investment opportunities, it is more efficient to repurchase shares, whereas if a firm has ample investment opportunities available, it is best to retain the funds for reinvestment into the firm.

Figure 3.7: General Payoff for a Company's "Covered call" strategy with the choice to repurchase shares



For the remainder of the paper it will be assumed that a firm has ample investment opportunities, and will thus consider the costs of granting options, as the dilution cost.

3.4.2.3 Economic Opportunity cost of granting stock options

Many academics argue that economic opportunity cost is ignored by decision makers, and because of this, costs are underestimated, thus leading to excessive use of stock option compensation. However, there are several points that indicate that opportunity cost may be lower than often suggested.

Firstly, when discussing the opportunity cost of stock options, it is not uncommon to find opportunity cost defined as the foregone *revenues* which could have been generated through premiums, if the company had underwritten options to be sold to investors. e.g. Muelbrook (2001), Hall & Murphy (2000), Murphy (2002). However, as pointed out by Ferraro & Taylor (2005), it is important to remember that opportunity cost not only includes the cost of foregoing revenues/benefits, but it also includes the benefits of avoiding costs, a matter which they found approximately 80% of economics professors and PhD students overlook. This is possibly due to opportunity cost often being

discussed in a retrospective sense, but as will be seen, the foregone costs involved in merely selling options are complicated by its contingent nature. In addition, there are two other important points regarding the calculation of economic opportunity cost that is not generally recognised in the literature.

3.4.2.3.1 Foregone revenues from option premiums are lower than the value of employee options granted

As mentioned earlier in the discussion about dilution, it is important to distinguish the difference between P^*_{t+1} and P_{t+1}. As previously discussed, $P^*_{t+1} > P_{t+1}$ due to the benefits of granting stock options. One of the major differences incurred is the increased marginal value added by an employee, as a company using stock options provides better incentive benefits to fulfil his/her potential. So, if foregone revenues from option premiums are to be calculated, they should be calculated on the basis of P_{t+1} (assuming the employee had no incentive to have added value) not on the basis of P^*_{t+1}. From here onward, $Premium_t$ denotes a premium calculated on the basis of P_{t+1} (i.e., without any added value from the employee due to no incentive) whereas $Premium^*_t$ denotes a premium calculated on the basis of P^*_{t+1}.

Consider a company that underwrites options that it will sell for $50,000. For simplicity, let it be assumed that there are only two states for the options, being in-the-money ($100) and out-of-the-money ($60), which have the corresponding likelihoods of 55% and 45% for each event respectively.

In the case of a company granting $50,000 worth of options to an employee for compensation purposes, it is done so partially to provide the incentive to maximise the stock price, so it would not be surprising for the probability of being in-the-money being higher than the 55% when there is no incentive. Let the probability of being in-the-money when the employee is given incentives be 60%, and the probability of being out-of-the-money, 40%.

This change in the probability of outcomes, makes the latter company much more attractive, as the moneyness of the option increases by 5%, which leads to an increase in the option premium for this option (*Premium**). The second option will be worth more than the first (*Premium*).

In terms of formula, if $\theta_t^* > \theta_t$, then P_t with incentives will be greater than without. So the incentive effects and added value from alternative benefits impact on the price probability distribution which affects the expected net dilution of value. Perhaps more importantly, the greater implication of $\theta_t^* > \theta_t$ is relates to $Premium_t^* > Premium_t$. As mentioned earlier, the economic opportunity cost of revenues foregone has been calculated on the basis of $Premium_t^*$, either as a result of mistake or difficulty to calculate $Premium_t$. Consequently, analysis using this measure of economic opportunity cost has overestimated opportunity cost.

3.4.2.3.2 Forgone costs as well as revenues

Unlike many investments, there are no fixed costs involved with stock options. Costs are only incurred if options are exercised, so if the stock price lies below the exercise price upon expiry of the options, no options need to be granted, as the recipient would have no discount to take advantage of. These costs being, the same dilution costs mentioned before.

Now that the costs involved in selling options have been analysed, namely dilution costs, it should be considered what happens when the economic opportunity cost of selling options is subtracted from the costs of granting stock options to employees. Which leads to the question, what are the costs to a company of granting options to employees? Unsurprisingly, the nature of the costs is the same, a company granting options will merely create new stock if options are exercised. Now, it may be easy to conclude, that since the foregone costs of underwriting stock options are dilution costs, and a firm granting options also faces the cost of dilution, that the costs are the same. Hence, dilution costs should be nullified once the benefit of the avoided cost (associated with opportunity foregone) is added to the cost. However, due to the contingent nature of

stock option costs and the likelihood of exercise not being the same for a stock option granted as compensation and one merely being sold to an investor, the dilution costs are not actually equal.

This difference in dilution costs can be illustrated, by using the information from the earlier example. For simplicity, let it be assumed that the firm currently has 10,000 stock issued, and the firm will grant 2,000 options worth $25 each, making a total grant $50,000 worth of options to employees. This will be compared to foregoing the opportunity to underwrite $50,000 worth of options (without the benefit of employee incentives). As mentioned in the previous section, the option premiums foregone will be worth less than the $25 options granted to employees, let it be assumed that the foregone option premiums will be $20, thus requiring 2,500 options to have been underwritten. As the benefits and revenues are the same, the only difference in the net benefit of these two scenarios must come from the difference in the cost of dilution.

Regardless of whether the options expire in-the-money or out-of-the-money, the company has benefits or foregone revenues of $50,000. Only, if the options expire in-the-money at $100, does the firm bear the cost of dilution. Given the difference in probabilities of options expiring in-the-money (55% for underwriting stock options and 60% for granting employee stock options), the expected cost of dilution associated with granting options and underwriting options is most likely to be different. The cost of dilution itself will also be different, as 500 (2500 less 2000) more new stock would need to issued if stock options were underwritten than if they had been granted to employees. Assuming that the exercise price for the option was $80, the cost of dilution associated with granting options would be $33,333.33, and cost of dilution associated with underwriting options would be $40,000. This results in the expected cost of dilution for granting options as $20,000 and $22,000 for underwriting options.

So the net benefit of granting options to employees would be $30,000 ($50,000 - $20,000), and the profit associated with the foregone opportunity of underwriting stock options is $28,000 ($50,000-$22,000), so the economic profit (profits minus opportunity cost) in this simplified example would be $2,000.

3.4.2.3.3 The after-tax revenues foregone

Even though it has been shown that the revenues foregone should be lower than normally calculated, there is another important reason why revenues may have been calculated at a higher level than they should have. Any revenues foregone, would have been taxable, whereas granting stock options to employees is a tax deductible expense, as long as the options are "nonqualified" stock options. This is the case for most executive options and broadbased plans, unless such plans grant government qualified "incentive stock options". Companies granting "incentive stock options" surrender the right to corporate tax expense deductions so that employees can benefit from long-term tax rates. Ignoring that foregone revenues would be lower than assumed, a simple illustration will show that it is preferable to use options to save costs rather than to gain extra revenue, as is shown in the following example:

A firm currently earns cash revenues of $200,000, and has costs of $100,000, thus earning $100,000, which after tax at 30% equates to $70,000. If options were sold to generate extra revenues of $50,000, and those funds were then used to hire an extra employee who is paid $50,000, then after tax profit would remain at $70,000. However, if the employee were willing to accept $50,000 worth of options, then profit would be $50,000 and after tax profit would be $35,000, however as options are not a cash expense, the operating cash flows after tax would be $85,000.

	Selling options	**Granting options**
Profits before tax	$100,000	$100,000
Plus option revenues	$50,000	-
Less: expenses (options)	$50,000	$50,000
Net profit before tax	$100,000	$50,000
Less 30% tax	$30,000	$15,000
Profit	$70,000	$35,000
Add: noncash expenses (options)		$50,000
Net operating cash flows	$70,000	$85,000

So by using options to save costs rather than earn extra revenues, the firm would have saved an extra $15,000, i.e. 30% of $50,000. It should be remembered that it is the after tax opportunity cost of forgone revenues that is of concern, i.e. O (1-T), where T is the tax rate. This is rather than just the Option Premium based on the Black-Scholes value of stock options of what the options could have been sold to investors.

It is also important to remember, that if options were sold to generate revenues and then these revenues were used to compensate executives, then according to section 162 (m) of the tax code, no salary above $1,000,000 receives a tax deduction. Therefore the opportunity cost could be O (1-2T), as the company would in a sense be double-taxed, once from earning revenues, and secondly by spending these monies on non-tax deductible expenses. However, a company could instead choose to use the funds to pay a cash bonus which would qualify for a tax deduction.

Taking into account all of the aforementioned factors, it is easy to see that the real opportunity cost is less than others have deemed it to be. Instead of merely considering foregone revenues, $s_t Premium_t^*$, opportunity cost should be concerned with the after tax foregone revenues (assuming no incentive effects etc from granting options) less associated dilution costs $s_t Premium_t(1-T)$ – dilution costs. Unfortunately, this modelling makes it difficult to conduct more detailed empirical analysis, as there are complications with regards to estimating how the distribution of future prices will change due to the incentive effect from employees granted stock options. This makes it particularly difficult to analyse retrospectively, as one would need to suggest what would have happened to the company if the stock options were not given as incentives.

Modelling based on future events is more practical, as it is simpler to develop models of a company with and without option benefits. The next section will cover the benefits which will be included in the model, and how they will be incorporated into a company. This will then provide a basis to observe option granting under different conditions to possibly identify optimal stock option usage in order to maximizing firm value.

3.4.3 Benefits

Before the benefits associated with granting stock options can be fully understood, it is important to establish a framework to understand the utility of the firm and recipient. Firstly, it will be assumed that both shareholders and manager are risk neutral. With the firm's (shareholder's) utility being:

$$\left[N_t P_t + \phi_i + \theta_t + \omega_t\right]\left[\frac{N_t}{N_t + \max\left[\left(P_{t+1} - x_t\right)\frac{s_0}{P_{t+1}-x_t}, 0\right]}\right] \tag{3.7}$$

and the employee's utility being:

$$b_t + k_i \cdot s_t \max\left[P_{t+1} + \frac{\phi_i + \theta_t + \omega_t}{N_t} - x_t, 0\right] - e_t \tag{3.8}$$

Because the employee has contingent remuneration paid out in the future, the manager will discount the contingent portion of their pay, represented by a present value interest factor, k_t. Because it is assumed that the manager is risk neutral, k_t will simply be discounted at the risk free rate. The term e_t represents employee effort, which is related to the θ_t output generated.

3.4.3.1 Incentive benefits

The primary reasoning behind most firms using options is the incentive benefit they provide. An underlying assumption in personnel economics is that a worker is effort averse. Thus exerting extra effort causes negative utility, so a worker will attempt to contribute minimum effort while attempting to maximize pay. In the case of fixed pay, there is no incentive for an employee to exert effort, as pay stays the same regardless of effort, so the employee will produce the least effort possible. However, there is an incentive to produce a minimal level of effort, $\upsilon_t^{\min}$ [3], or else they will lose their position.

On the positive side, employees can be given the incentive to work harder by linking their remuneration to their output. Option contracts do this as their value is derived by the ultimate measure of output for an executive or employee holding a position where they are able to substantially influence the value of the firm. So for a low level employee whose θ_t^E may be relatively low, there is less incentive for holding options than their

[3] θ_t ,θ_t^E , & θ_t^F will refer to employee value added in excess of $\theta_t^{\min}$, as $\theta_t^{\min}$ will be incorporated into ϕ_t.

would be for a higher level executive or employee(s) able to more directly contribute to company value. The level of effort an employee is expected to exert, will be determined by the point at which equation (3.8) will be maximized.

As mentioned earlier, the level of effort determines the output. However, the relationship is not directly linear, typically effort averseness follows a quadratic relationship with value added (Cadenillas, Cvitanic & Zapatero, 2004), as seen in the equation (3.9) below.

$$\upsilon_t = \max\left(\xi_t \sqrt{e_t}, \upsilon_t^E\right) \tag{3.9}$$

So each unit of extra effort produces less output, until a point where an employee is no longer able to exert anymore effort, which is also the maximum value he or she believes they can add to the firm. If the maximum level of effort is exerted, the employee will produce his or her full potential output, θ_t^E. In theory, this level of incentives will not be maximised until the employee owns 100% of the firm. The level of ξ is reflective of the employee's level of productivity, in addition to the opportunities to add value to the firm. So an employee may have a higher level of ξ than with another company depending on unfulfilled potential in the company.

Intuitively, the nature of this function and its components can be clarified with an example. A new firm may have some problems which a relatively experienced employee should be able to fix with ease, whereas an inexperienced employee would only be able to solve the problem with great difficulty, even if he or she is a fast learner. So even though an employee in general may not be more productive, if the employee has opportunities to fix "simple" problems, then his or her level of ξ will be higher. When considering what level of effort to exert, it is also implicitly assumed that any employee searches out the simplest problems to solve first, thus minimizing effort while maximizing output. So as the simpler problems disappear, the employee will need to exert more effort to maintain previous levels of achievement. Lastly, as the level of ξ depends on the opportunities available to the employee, the level of ξ should decrease with the time left until expiration.

When choosing to decide the level of effort to exert, it can be shown [4] that the solution to the optimal level of effort the employee will choose to exert is:

$$\left(\frac{\sum \Pr_{P_{t+1}}(k_t s_t \xi_t)}{(2N_t)} \right)^2 \tag{3.10}$$

based on the summation of the probabilities over all possible price levels at time $(t+1)$. On the condition that $P_{t+1} > X_t$ at the optimal level, if not, the employee has no incentive to exert any effort above the minimal effort required for him or her to stay with the firm. In this case, unless the base pay exceeds the employee's opportunity cost, the employee may consider departing the firm. If a more advanced model were to be developed, it would be recognized that opportunities to add value are related to time, so ξ would be negatively related to time left until expiration or vesting.

3.4.3.2 Investment Selection benefits

For a firm which does not adequately reward risk taking, employees may prefer to develop or choose to invest in inferior NPV projects with less downside risk, so as to minimize the negative utility associated with losing a job. So although a project may provide higher returns, the excess returns (with respect to current project earnings), Θ_t, may be insufficient to motivate an employee to select or develop the project.

Stock options assist in eliminating this problem due to the high leverage, rewarding an employee to such an extent that the upside incentive more than exceeds the disutility of being dismissed. This leads to an employee taking more risk as long as the upside reward outweighs the downside utility of being dismissed in the case that things go wrong.

[4] If the utility function U is differentiated with respect to e_t, the optimal level of effort to maximize utility can be found when the first derivative of utility equals zero.

$$U = b_t + k_t s_t \max\left[P_t + \frac{\phi_t + \xi_t \sqrt{e_t} + \omega_t}{N_t} - X_t, 0 \right] - e_t$$

$$\frac{\partial U}{\partial e_t} = \frac{k_t s_t \cdot \xi_t}{2N_t \sqrt{e_t}} - 1 = 0 \Rightarrow e_t = \left(\frac{k_t s_t \cdot \xi_t}{2N} \right)^2$$

The extent to how much more risk an employee will take on may be constrained to the riskiness of projects available, internal controls regarding project selection policy or operational risk, as well as the ability of the employee to influence project selection. In the long term employees at the executive level will also be able to influence risk by developing a more aggressive overall strategy for the firm.

As there are clearly a number of complicated issues surrounding project selection and strategy which go beyond this chapter, the decision to change the volatility of the firm is simplified by primarily considering the employee's disutility from the negative outcome of a risky project.

Let us model the expected disutility of being dismissed, f_t , as a function of the probability of the project causing the firm to "significantly under perform", u_t, and the associated costs to the employee for being dismissed, d_t.

$$f_t = u_t d_t \tag{3.11}$$

This then gives us *expected employee utility* of:

$$b_t + \sum pr_{P_{t+1}} \cdot k_t \cdot s_t \max\left[P_t + \frac{\phi_t + \theta_t + \omega_t}{N_t} - x_t, 0 \right] - e_t - f_t \tag{3.12}$$

The optimal level of risk that the employee will take on will maximize his or her utility. The solution to this is quite complex and beyond the scope of this chapter. The main reasons behind the complications are due to risk affecting the probability distribution of P_{t+1} that much of the utility equation is dependent on, which in itself is affected by the level of effort, which will be determined by the outcomes and aforementioned probability distribution.

Although a solution to this component of the model is not specified, this should not undermine the importance to the model in reality. It is important to note, that this factor may be undervalued in this model due to complications of adequately modelling the impact of these types of decisions can have on the firm. Ultimately, at the executive

level, these types of decisions are crucial to a firm's ultimate success, as there is almost unlimited upside benefit, whereas effort incentives have their limits.

3.4.3.3 Attracting better talent

A primary factor of attracting better talent is to provide a more attractive compensation package than another firm. However, for a cash constrained firm, this may be difficult to afford due to a prospective employers opportunity cost, particularly in a highly competitive market for highly skilled workers leading to higher pay scales. When evaluating their compensation packages, it will be assumed that managers have similar beliefs surrounding ϕ_t^E and ω_t^E the probability distribution of ω_t^E, thus leaving the only difference in evaluating their compensation packages relating to the perception of their own talent, θ_t^E. So the candidate's decision to accept a position will ultimately be determined by their θ_t^E. If the utility of the pay offer does not exceed an opportunity cost of π_t^E, then a candidate will simply choose to work for another firm. In the circumstances where candidates may be replacing an employee who was dismissed, prospective employees will demand a package that at least matches what was offered to the dismissed employee, π^{PREV}.

For a larger company that has less growth opportunities and existing staff with a great deal of wealth of experience and ability, there are limitations to the extra value that the executive can contribute to the firm. Whereas for a smaller firm, with inexperienced staff and a product or service at an early stage in its lifecycle or in need to adapt to new technologies or environment, without experienced staff, the firm's growth opportunities will be severely limited. This matter of unleashed potential is partially represented by the term ϕ_{t+1} as a general proxy for opportunity for improvement. If a firm is undervalued or undergoing difficulties, then ϕ_{t+1} is much lower than a ϕ_{t+1}^{Target}. This is partially comparable to an undervalued firm, where the firm's expected return is much lower than the required rate of return calculated from CAPM. In general, the greater the difference between ϕ_t and ϕ_{t+1}^{Target}, the greater the need for talent to deliver value θ_t^F.

Smaller cash constrained firms with a lot of potential, can face a "chicken or the egg" scenario when it comes to unleashed potential. In order to become successful, a firm

needs to employ persons of a certain calibre to help implement the firm's strategy. However, most firms can not afford to pay the rates required by such persons, as they need some level of success to generate enough cashflow. Options provide a solution, as they attract better talent by basing pay on the potential success that they can unleash. Although the dilution costs may be vast, if they do not utilize stock options to employee higher calibre talent, the firm will not be worth much anyway.

In essence, in many industries good talent is a barrier to firms succeeding, particularly for smaller firms. As a side note, it is interesting to consider the impact on competition for employees in industries where good talent is a barrier to entry. Options effectively lower this barrier, as they are a "cheaper" alternative currency to allow more companies to enter into the industry who could not otherwise afford it. As the supply of good talent is scarce, this increased competition for good talent is likely to result in increases in pay. This provides additional reasoning for executive pay increases over time at a faster rate than other positions, as the shortage for talent for many companies at the executive level is likely to be scarcer and in more demand than other positions.

3.4.3.4: Sorting benefits

As mentioned, the greater talent a firm seeks, the higher pay they will be required to pay. However, as with any investment, a firm bears a risk that the initial investment may not produce adequate payoffs. When wanting to hire a manager, the owners will attempt to select a manager with the best ability to add value to the firm. However due to imperfect and private information they are unable to ascertain which candidates are likely to add the most value to their company. So the company may bear the risk of possibly hiring a candidate, attempting to extract rents in excess of what he or she is really worth, and/or potentially worth in the case of an able candidate choosing not to maximize effort. The firm's perceptions of its own future prospects, influence of external factors, and expectations of value that will be added by their new employee, shall be represented by ϕ_t^F, ω_t^F, and θ_t^F respectively. For sake of simplicity it will be assumed that the firm's perceptions of the firm's future prospects and influence of external factors are the same as the candidate's (i.e. $\phi_t^E = \phi_t^F$ and $\omega_t^E = \omega_t^F$). This assumption should not be too unreasonable, as these factors are based on publicly available information, whereas precise information about the true ability of candidate's is private information.

In a scenario where a firm is seeking an employee who will bring in θ_t^F value, a firm may seek to design a compensation package with total value of π_t^F. In the extreme scenario, where a package solely consists of a cash salary b_t of value π_t^F, any candidates with a $\pi_t^E \leq \pi_t^F$ would be happy to apply for and accept a position should it be offered to them. The results of which would see them have extracted rents of $\pi_i^F - \pi_t^E$ leaving the firm at an economic loss.

However, if the firm incorporates elements contingent on the candidate's potential talent then this will help sort out candidates whose ability are not up to the company's expectations. At the other end of the compensation package spectrum, prospective employees could be offered an options package, which only has an expected value of π_t^F if $\theta_t = \theta_t^F$. This will help sort out candidates who have lower θ_t^E to offer, as their expected pay will be below their opportunity cost π_t^E due to the option package depending on the performance of the company. So any employee with $\pi_t^E < \pi_t^F$, will prefer to look elsewhere for work. This can be illustrated by the following simplified example:

A firm has 1,000,000 stock units priced at $60 each and a firm wishes to hire someone who will add at least $2,000,000 to the firm. If no one is hired, the firm is expected to deal with the problems facing the company; the firm will suffer a drop of $1 in share price. Let us assume, that $\pi_t = 0.5\theta_t$, then a firm will construct an overall package with expected value of $1,000,000. Such a package will be based on the expectation of a $1,000,000 increase attributable to employee added value. In addition to expected increase in the value of the firm, assuming the risk free rate is 0%, thus disregarding the discount rate. This information gives us the following equation

1,000,000 P_{t+1} = 60,000,000 + θ_t - 1,000,000

According to these requirements, E[P_{t+1}] = $61, so if an at-the-money stock options package were constructed for an employee worth $1,000,000 based on the expected value of P_{t+1} based on the assumption of $2,000,000 of value added to the company.

$\$1{,}000{,}000 = b_t + s_0 \, \mathrm{E}[P_{t+1} - X_t]$

Therefore based on an employee expecting \$1,000,000 for the \$2,000,000 added value they can bring to the company:

$$s_0 = \frac{1{,}000{,}000 - b_t}{E[61-60]} = 1{,}000{,}000 - b_t .$$

As mentioned earlier, it is possible for an employee not able to contribute \$2,000,000 to possibly take up the position, thus extracting excess rents, and leaving the company short of value. However, under this extreme scenario, it can be shown that as long as $b_t \le 0.5\pi_t$ no one except someone who believes they can deliver at least a \$2,000,000 increase in value will accept the job.

$$\text{Total compensation} \ge \pi_t \equiv 0.5\theta_t$$

$$\text{Total compensation} = b_t + s_0 \max\left[P_{t+1} - X_t, 0\right]$$

$$\text{Total compensation} = b_t + (1{,}000{,}000 - b_t)\max\left[P_{t+1} - 1 + \frac{\theta_t}{1{,}000{,}000} - X_t, 0\right]$$

Therefore

$$b_t + (1{,}000{,}000 - b_t)\max\left[P_{t+1} - 1 + \frac{\theta_t}{1{,}000{,}000} - X_t, 0\right] \ge 0.5\theta_t$$

Because of the Max function, the minimum relevant θ_t is 1,000,000, for all values less than this, $P_{t+1} - X_t$ is negative so the Max function will equal zero. If it is assumed this value and incorporate this into the model, it simplifies the equation to the following:

$$b_t \ge 0.5\theta_t \equiv 500000$$

As a worker whose θ_t is less than 1,000,000 will only receive b_t, they will only earn excess rents if b_t is greater than \$500,000. In addition, any worker with a θ_t greater than \$2,000,000 would not be interested in taking the position.

However, firms still bear the risk of employing overconfident candidates whose perceptions of the value they have to offer is actually beyond their means at this point in time (i.e. $\theta_t^E < \theta_t$).

In situations where candidates may have differing beliefs regarding the company's current profitability, or the direction and magnitude of market factors in the near future, it can either work for or against the company. For example, if there are perceptions of a bull market, leading towards beliefs of positive bias, then an optimistic candidate's beliefs concerning ω_{t+1}^E may make them more willing to accept pay than a pessimistic candidate, even though the optimistic client has a lesser ability to add value than the pessimistic, θ_t. The greater the discrepancies between the candidate beliefs, the more difficult it may be to sort by negotiating packages with greater portion of contingency pay.

Even in the midst of differing beliefs, options in general will have greater benefit for a firm facing financial difficulty, or a firm in the midst of a downmarket. In these circumstances, there is more downside for the employee if they do not have the talent, so it is more important that they can generate the value they claim, else they will be a better offer elsewhere.

On the other hand, in the midst of a buoyant stock market, a company may be able to attract more employees more easily with stock options by taking advantage of their positive sentiment towards expected values. However, it will become more difficult to sort out which employees have the most talent, and which are attempting to extract excess rents from the firm. One means for the firm to attempt to solve this problem utilizing options is to increase the exercise price, X_t, as a higher exercise price will also act to sort employee ability.

Thus far the exercise price component available to the firm to enhance contracts has been ignored. Similar to situations where a firm is expecting the price to go down without an employee making changes, a higher exercise price serves as a better filter to help sort the best talent.

3.4.3.4.1 Do undiversified employees value options less than their market value?

Normally it is argued that an option is worth less to an undiversified employee than an investor, because an employee will discount options granted to them due to their inability to diversify. But few researchers have recognized the θ_t component that has been introduced in this thesis. An employee, particularly an executive, may value a stock at a higher price than an outsider would, because he or she has inside information about the firm, and more importantly is able to influence the value of the firm. Though an undiversified employee will still discount options, the degree to which they are discounted is not going to be as much as suggested by authors thus far, due to this difference in perceived stock value.

This becomes quite apparent for firms that use options as a sorting tool. For a firm with several prospective employees, it could get prospective employees to "bid" for the position by negotiating less options (due to their higher perceived value), with the employee bidding the lowest number of options also being the employee with the highest perceived value of the option. Thus using options to extract information about what employees are really worth, as well as possibly sorting out the top prospective employee.

3.4.3.4.2 Reduced risk of employee rent extraction

As mentioned earlier, when a firm hires a new employee, they take a certain amount of risk due to a lack of information concerning the employee's true ability. However, the culmination of sorting and incentive benefits reduces this risk as any employee with lower ability is filtered out. If the decision to hire an employee were compared to investing in a project, this is equivalent to lowering the risk of an investment. Although normally there is a reduction in returns associated with a reduction of risk, due to the other benefits from stock options, there may not even be a reduction in returns.

3.4.3.5 Retention benefits

Aside from losing employees who have proven their worth, a firm needs to go through the "risky" process of rehiring, training, as well as possibly suffering from short-term loss in productivity due to the learning curve or lack of specific company experience at the firm. The sum of these costs will be referred to as ρ_t.

Options can help reduce the likelihood of turnover as they do not payout until the end of a period; an employee has the incentive to at least stay on until their options are exercisable. However, if the options have a low chance of being exercised, i.e. options are out-of-the-money, an employee may choose to leave prior to the vesting date, as the options will have little value anyway. For the sake of simplicity, it will be assumed that there is a probability q_t^b that an employee will stay until t+1 associated with employee salary, b_t in relation to the employee's opportunity cost, δ_t^E. Likewise, there is a probability of employee retention if options are granted, q_t^s, which is based on the ratio of expected payout from options and the employee's opportunity cost. There is also the constraint: $q_t^b < q_t^s$. This means the expected cost of turnover is:

$$\rho_t \left[1 - \left[\frac{b_t}{\delta_t^E} q_t^b + \frac{E\left[s_t \max\left[P_{t+1}^* - X_t, 0 \right] \right]}{\delta_t^E} q_t^s \right] \right] \tag{3.13}$$

There are several points that can be observed from this model of retention. The lower E [P_{t+1}] is over time, the higher the likelihood that the employee will choose to leave. The higher X_t is set at the time of grant, the higher the likelihood that options will be worth nothing. It may be possible for an employee to want to stay even if their pay has dropped substantially, as the employee may be extracting excess rents from the firm, so the pay still may exceed the employee's opportunity cost.

To calculate the *incremental* benefits of using options, the expected costs if options are not used needs to be found. Consider an employee paid only a salary, the employee is not being overpaid, so $b_t = \delta_t^E$, thus the initial expected retention costs are:

$$\rho_t \left[1 - q_t^b \right] \tag{3.14}$$

So the *expected* net benefit from using options, simplifies to:

$$\rho_t \left[\frac{b_t - \delta_t^E}{\delta_t^E} q_t^b + \frac{E\left[s_t \max\left[P_{t+1}^* - X_t, 0 \right] \right]}{\delta_t^E} q_t^s \right] \tag{3.15}$$

And the *actual* net benefit:

$$y\rho_t \tag{3.16}$$

where y equals the number of staff retained, calculated as the difference between the expected number of employees to leave and actual number of employees who left. If the options go deep out-of-the-money, then the actual number of employees who leave the firm may exceed the number retained if nothing is done. This is one of the reasons why some firms may reprice options in order to help bring back the retention benefits with options. Otherwise, some firms may try to issue more options the following year to compensate for some of the loss in value. Though, the level of option compensation would also be influenced by the loss of incentives.

However the model will not incorporate re-evaluations of the value of incentives and retention benefits throughout the lifetime of the option, in order to keep the model simplistic. Thus, only one grant of options per period will be considered, with no overlap with other option grants. Even within these constraints, the framework provided in the model would still be suitable to help determine an optimal level of compensation as long as incremental benefits accounted for the change in values that occurred during the period.

3.4.3.6 Liquidity benefits

As aforementioned, smaller firms tend to have liquidity constraints, and options can enable them to hire employees they could not otherwise afford. For firms not as cash constrained as the smaller firms mentioned, they may still save cash by substituting cash salary with options. In which case, a firm can use the cash savings, λ_t and reinvest it into the company at a minimum rate of the company's weighted average cost of capital, $WACC_t$. However, a firm would be expected to earn a rate slightly higher than $WACC_t$, otherwise projects would barely be adding value. For the moment, the rate of return will be referred to as r_t. In addition, the cash savings will not always equate to the value of the options component, as the firm may use options to pay more than they would or could have with cash.

Just as for the case with a firm which is likely to repurchase stock, there is the possibility, a firm with limited investment opportunities may choose not to reinvest these savings,

but instead to use these funds for other purposes, such as repurchasing stock. For the remainder of the paper it will be assumed that a firm has investment opportunities at rate r_t to reinvest in perpetually, thus the benefit from improved cashflow will ultimately be the present value generated from foregone projects:

$$\frac{\lambda_t(1+r_i)^n}{\left(1+WACC_t\right)^n} \tag{3.17}$$

3.4.3.7 Financing benefits

For a smaller firm with investment opportunities, the costs of raising capital (F_t) can increase the overall cost of financing, on average issuance costs for less than $10 million are over 16% (Lee et al, 1996). However, it can reduce the need to access external financing by utilizing options, as upon exercise, the company will receive s_tX_t from recipients purchasing new company stock at $\$X_t$. For a firm with $r_t > WACC_t + F_t$ already financing projects through external financing, they will benefit from a savings of

$$s_tX_tF_t \tag{3.18}$$

from not having to pay issuance costs. Otherwise for the firm not getting external financing, it can benefit by the excess return on the cost of capital, the basic equivalent to the NPV:

$$\frac{(s_tX_t)(1+r_i)^n}{\left(1+WACC_t\right)^{n+1}} \tag{3.19}$$

However, the expected benefit will be less due to contingent nature of the benefit relying on the option being exercised in-the-money.

3.4.3.8 Corporate tax benefits

In the US, non-qualified stock options are considered a tax deductible expense, based on the value of options exercised and the condition that $X_t > P_t$. For simplicity, it will be assumed that the corporate tax rate is fixed. Incorporating all of the relevant cash benefits and costs mentioned thus far, a firm granting options gain an extra benefit of tax savings will benefit by:

$$Tks_t \cdot \max\left[P_t + \frac{\phi_t + \theta_{t+1} + y\rho_{t+1} + \left(\lambda_t\left(1+WACC\right) + s_t X_t\right)/(1+WACC)^{n+1} + \omega_t}{N_t} - X_t, 0 \right]$$

(3.20)

If this is added to the firm's expected utility (prior to dilution), it results in the below:

$$[N_t + Tks_t]\left[P_t + \phi_t + \theta_{t+1} + \rho_t \left[\frac{b_t - \delta_t^E}{\delta_t^E} q_t^b + \frac{E\left[s_t \max\left[P_{t+1}^* - X_t, 0 \right] \right]}{\delta_t^E} q_t^s \right] / N_t + \frac{\left(\lambda_t (1+WACC_t)(1+r_i)^n\right)}{(1+WACC_t)^{n+1} N_t} + \omega_t / N_t \right]$$
$$-Tks_t \min\left(P_{t+1}, X_t\right).$$

(3.21)

If dilution is incorporated into the equation, a stockholder's utility on a per stock basis will be:

$$\frac{\left[N_t + Tks_t\right]\left(P_t + \left(\phi_t + \theta_{t+1} + \rho_t \left[\frac{b_t - \delta_t^E}{\delta_t^E} q_t^b + \frac{E\left[s_t \max\left[P_{t+1}^* - X_t, 0 \right] \right]}{\delta_t^E} q_t^s \right]_t + \frac{\left(\lambda_t (1+WACC_t)(1+r_i)^n\right)}{(1+WACC_t)^{n+1}} + \omega_{t+1} \right) / N_t \right)}{N_t + \frac{s_t}{P_{t+1} - X_i} \max\left[P_{t+1} - X_t, 0\right]}$$
$$- \frac{Tks_t \min\left[P_{t+1}, X_t\right] + \frac{s_0 X_t}{P_{i+1} - X_t} \max\left[P_{t+1} - X_t, 0\right]}{N_t + \frac{s_t}{P_{t+1} - X_i} \max\left[P_{t+1} - X_t, 0\right]}$$

(3.22)

In the case of $X_t < P_t$ there will be no tax benefits, and the stockholder's utility on a per stock basis will then be:

$$\frac{N_t\left(P_t + \left(\phi_t + \theta_{t+1} + \rho_t \left[\frac{b_t - \delta_t^E}{\delta_t^E} q_t^b + \frac{E\left[s_t \max\left[P_{t+1}^* - X_t, 0 \right] \right]}{\delta_t^E} q_t^s \right]_t + \frac{\left(\lambda_t (1+WACC_t) + s_t X_t\right)(1+r_i)^n}{(1+WACC_t)^{n+1}} + \omega_{t+1} \right) / N_t \right)}{N_t + \frac{s_t}{P_{t+1} - X_i} \max\left[P_{t+1} - X_t, 0\right]}$$

(3.22a)

Whereas prior to incorporating tax benefits, the model's main benefits somewhat focused on maximising long-term sustainable benefits, with the introduction of taxes, portions of short term benefits such as a temporary upmarket (ω_t) are implicitly "locked" in via taxes. So tax benefits reward the firm for any factors which may contribute to value,

whether long term or short term, in the firm's control or not. This, however, may conflict with incentives for employees.

The better the firm's current future prospects ϕ_0, the greater expected tax shield benefits will be, as unlike θ_{t+1} or ω_{t+1}, ϕ_t is constant. Thus, this makes tax shield benefits even more appealing to some firms than other benefits associated with stock options due to greater certainty associated with taxes. Interestingly enough, taxes provide an incentive for a firm to bet on itself to do well, without any upfront costs (at the moment economic opportunity cost will be ignored). Even if the firm have the misfortune of doing poorly and no options are exercised, it is still in the same position as it was before, whereas the firm loses nothing from having bet on itself, as all costs are contingent.

Intuitively, it is not surprising that once the tax benefits of options are incorporated, the optimal number of options will be much greater than if only the sorting and incentive benefits of options were considered. This is because the tax benefit effectively amplifies any existing benefits, however, costs have not changed. The optimal solution will lead the firm to extract more benefits until the dilution and economic costs counter such benefits. This may help explain why many critics feel that option grants are excessive, as they have mainly been focusing on the incentive benefits which firms usually use to justify their usage.

There are also possible medium term benefits which may be a by-product of tax shields provided by stock options. For firms wanting to reduce their reliance on debt due to possible long run financial distress costs with higher gearing, stock option grants afford companies to do so without losing the tax shield generated by interest expense. For firms with few investment opportunities and wanting to quickly reduce debt, they may also choose to use proceeds from newly purchased shares to repurchase debt. Due to the difficulties of measuring these benefits, and added complications, these particular benefits will be left out of the model in this chapter.

3.5 SENSITIVITY ANALYSIS

By utilising the framework set forth in this paper, the significance and impact of certain costs and benefits can be tested through scenario analysis. The ultimate goal to see how

options can be used to optimise value added, by understanding the relationship between particular types of benefits and costs with other factors. Utilising a binomial framework, the possible future value of a firm *without* the benefits of stock options is initially established. Then other elements are incorporated in order to model the same company *with* selected benefits from granting stock options to employees. By modelling the same company, the marginal costs and benefits of stock options can be clarified by comparing the two scenarios.

3.5.1 Opportunity cost: Relationship between dilution and foregone revenues

Earlier in the chapter, the logic of a firm underwriting stock options as a form of revenue generation was queried, as it was comparable to the strategy of a “covered call", a strategy used when the underwriter believes that there is a downward shift in the market. Given that a typical company’s price distribution has positive expected returns and is thus opposite to the ideal circumstances for a covered call strategy, the profitability of underwriting stock options is brought into question. The results below are based on a firm underwriting at-the-money options with a life of five years. It is also assumed the firm currently has 100,000 stock units priced at $100 each, a 0.20 standard deviation of returns, and the risk-free rate is 5%. In order to simplify the model, possible returns from reinvesting option revenues were ignored, in addition to any tax implications from earning revenues from options, as well as the consideration for a firm to buyback shares.

As can be observed from Figure 3.8, option revenues are positively linearly correlated with the number of options underwritten. However, the marginal (dilution) cost of underwriting options decreases with each extra option granted. As can be seen in the figure below, a firm underwriting a relatively low number of options would be expected to make a small loss, however, once more than approximately 28,400 options are granted then a firm would expect to make a profit from this strategy.

As firms will have different numbers of shares currently issued, it is perhaps more relevant to consider the cost of dilution as a function of the percentage of new shares being underwritten with respect to total number of shares if options are exercised. This is shown in Figure 3.9 below, which measures the number of options granted as a percentage of the new number of shares. When considering the breakeven point of 28,400 options mentioned above in these terms, this converts to a percentage of over

22% of the company [28,400/(100,000 + 28,400)] if the options were exercised, which would obviously have major repercussions on any major stockholders. Given that the covered call strategy is not profitable unless these unrealistic amounts are being dealt with, the suitability of underwriting stock options as the firm's next best alternative foregone, i.e. opportunity cost, comes into question.

Figure 3.8: Foregone option revenues and dilution vs. grant level

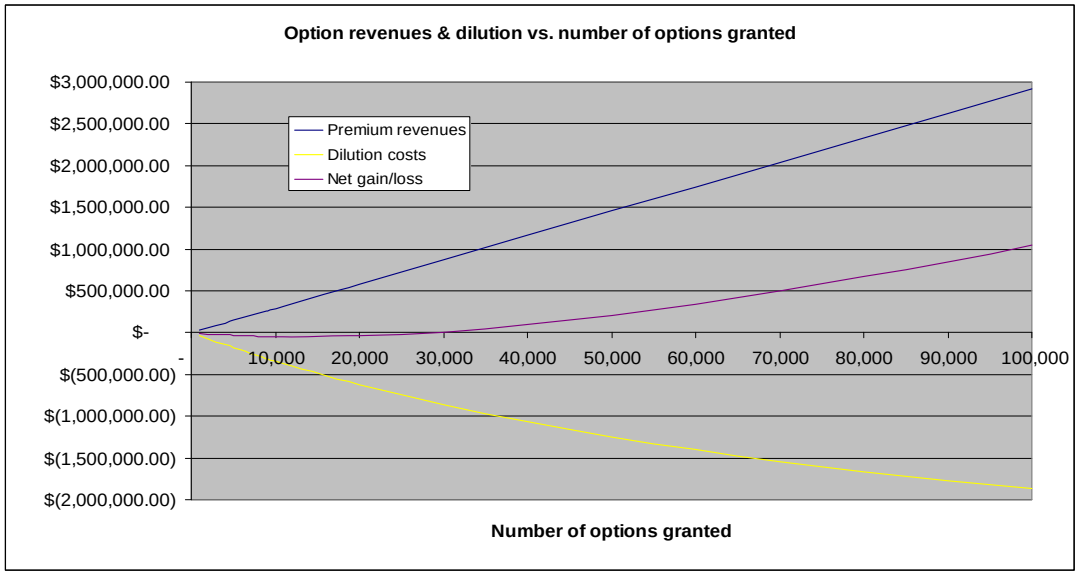
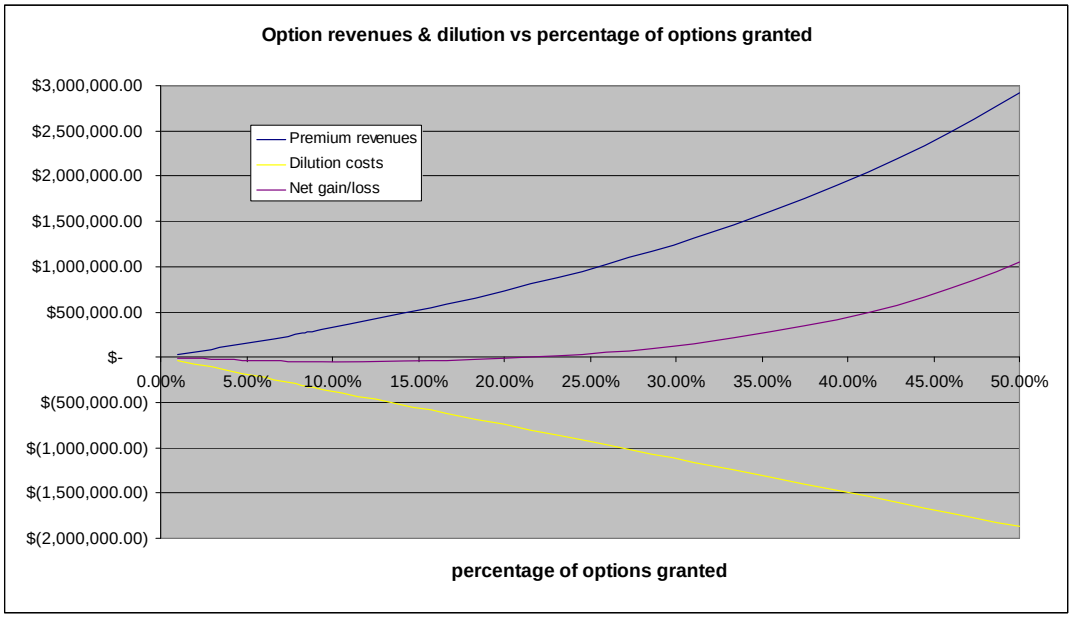


Figure 3.9:Foregone option revenues and dilution vs percentage of options granted



3.5.1.1 Adjusting for other variables

Given that certain assumptions may be unrealistic or overly simplified, model variables were adjusted to observe the impact on the breakeven point. Firstly, upon changing the number of shares, there was no change as long as the number of options was changed on the same scale. Thus, Figure 3.9 is a more appropriate figure to describe the relationship as it is based on a function of the ratio between the number of options and number of shares if options are exercised. When incorporating the revenues from reinvesting option premium revenues, the breakeven point is lowered, but the impact of these additional revenues is nominal**.** Neither increasing nor decreasing the standard deviation of returns has any significant impact on the breakeven point. Although lowering the lifetime of the option lowered the breakeven point, this would not be representative of the majority of firms, which typically grant stock options lasting for ten years. Lastly, if after-tax revenues are considered instead of before-tax revenues, this would increase the breakeven point.

One alternative not tested, however, is the incorporation of a buyback or share repurchase. As mentioned earlier, at certain prices and under certain conditions a firm may reduce some dilution costs by repurchasing stock. However, this has not been incorporated into the analysis in this chapter.

3.5.1.2 The case against underwriting options as opportunity cost

The findings above display the importance of dilution costs, which have been underestimated in the past. Not only do the incorporation of foregone dilution costs lower the overall opportunity cost from underwriting stock options, the costs are so large, that under realistic conditions (i.e. option grants that would compose less than 23% of stock), a firm would not even be expected to make a profit from underwriting stock options. Given the expected loss associated with underwriting stock options, it is therefore questionable whether there is any relevant opportunity cost of granting stock options to employees. So the next best alternative to underwriting stock options would be to retain the status quo, an action which has no foregone costs or benefits, therefore having an opportunity cost of zero. That said, the status quo is incorporated into dilution costs, so as long as the expected benefits from options after dilution are better than the status quo, then granting employee stock options should be seen as worthwhile. Based on these

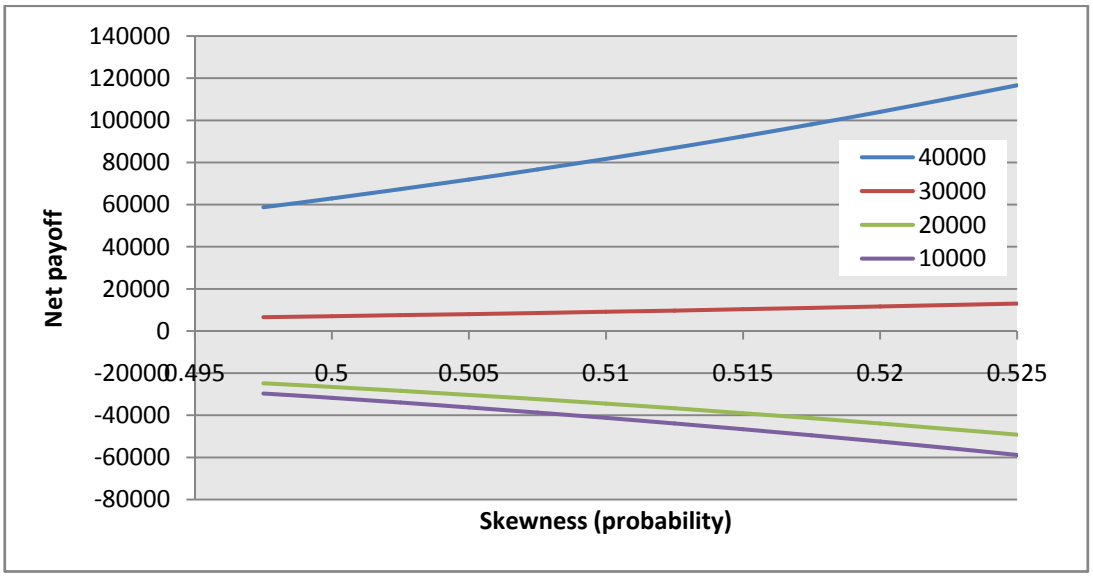
findings, the next section will only focus on scenarios with stock option grant levels lower than 23% of the company, thus simplifying the model to only deal with dilution costs and not foregone revenues and costs from underwriting stock options.

3.5.1.3 Moneyness and dilution

A bullish or bearish market can be synthesised in the model by changing the probabilities used in the binomial model. Although not completely representative, it should serve as a reasonable proxy to test the sensitivity of dilution to a shift in the market. Due to the simplicity of the manipulation only affecting probabilities and not outcomes, when sensitivity analysis is conducted to find the breakeven point, it is found to be at the same level as before regardless of the change in the level of skewness. In addition, this analysis assumes risk neutral employees, as risk averse employees would require higher compensation in a bear market.

In the Figure 3.10 below, the relationship between payoffs for underwriting options and moneyness (represented by the higher probabilities) is shown. As mentioned above, option grants at the breakeven point of around 28,400 is insensitive to moneyness. However, for grants greater than this level (which were argued to be unrealistic) moneyness improves the net payoff for the strategy, whereas for grants below 28,400, the net payoff for this strategy instead worsens.

Figure 3.10: Moneyness and dilution for different grants



This may seem slightly counterintuitive, as the price distribution for a bull-market should be superior to that for a bear-market. Although a bullish market will provide superior results to a bearish market, the dilution effect is related to how the firm value after options are exercised compares to the firm without. Below in Figure 3.11 such a comparison can be observed for a firm granting 10,000 options. The extreme scenarios below show a bearish market, where the firm only has approximately a 50% chance of exercising options, compared to an approximate 70% chance in a bullish market. Figure 3.11 below helps to illustrate why moneyness can increase expected dilution costs, as the gap between the firm with and without options in the bullish market has widened more than the gap between the firm with and without options in the bearish market.

Intuitively, this increase can be explained because dilution is a *conditional* cost, it is positively related to moneyness, as the probability of dilution increases. As a bull market increases "moneyness", expected costs of dilution increase due to an increased likelihood of dilution of value.

Figure 3.11: Cumulative distribution for dilution under different market states

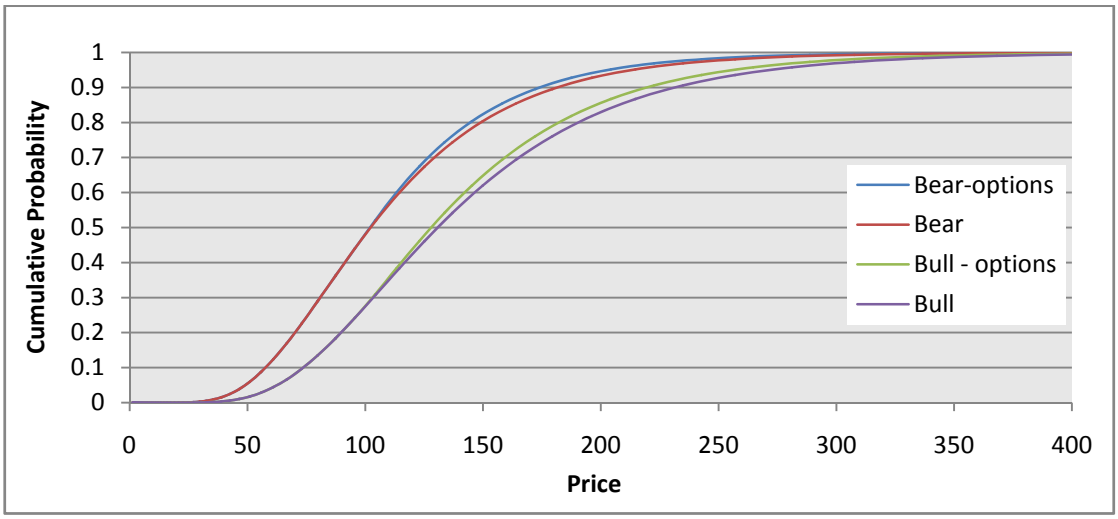
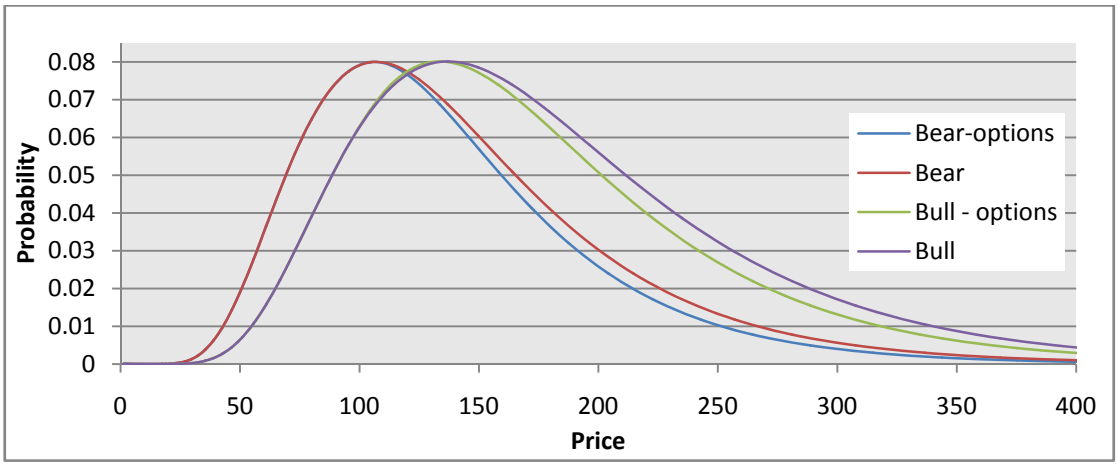


Figure 3.12: Distributions showing dilution under different market states



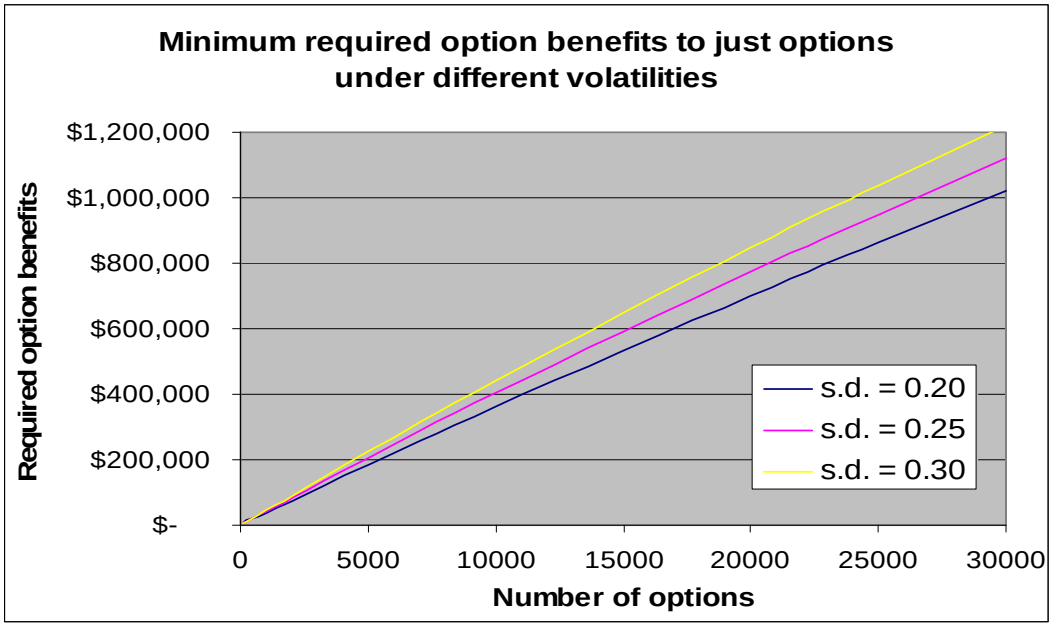
3.5.2 Minimum Required Option Benefits

Although numerous benefits have been mentioned throughout this chapter, to retain simplicity, only benefits incurred when options are granted or exercised (specifically, tax benefits) are broadly incorporated into the model, so partially conditional benefits incurred throughout the lifetime are assumed to be incurred at grant. Utilising a similar framework as before, the minimum required benefits from options at grant is calculated by finding the benefits to a firm at breakeven on the basis of differing levels of stock option grants and the associated dilution costs. In addition, differing levels of risk are also considered, as well as changing levels of skewness to observe the possible influence of a bullish and bearish market. Lastly, different tax rates are incorporated, which also serve as a general proxy for partially conditional benefits incurred upon exercise that have a nonlinear relationship with grant and price levels.

3.5.2.1 The impact of differing levels of volatility

Although the breakeven point for underwriting options does not change with volatility, this was not the case for the minimum required benefits. As can be observed in Figure 3.13, higher levels of volatility lead to the firm requiring greater benefits upon grant.

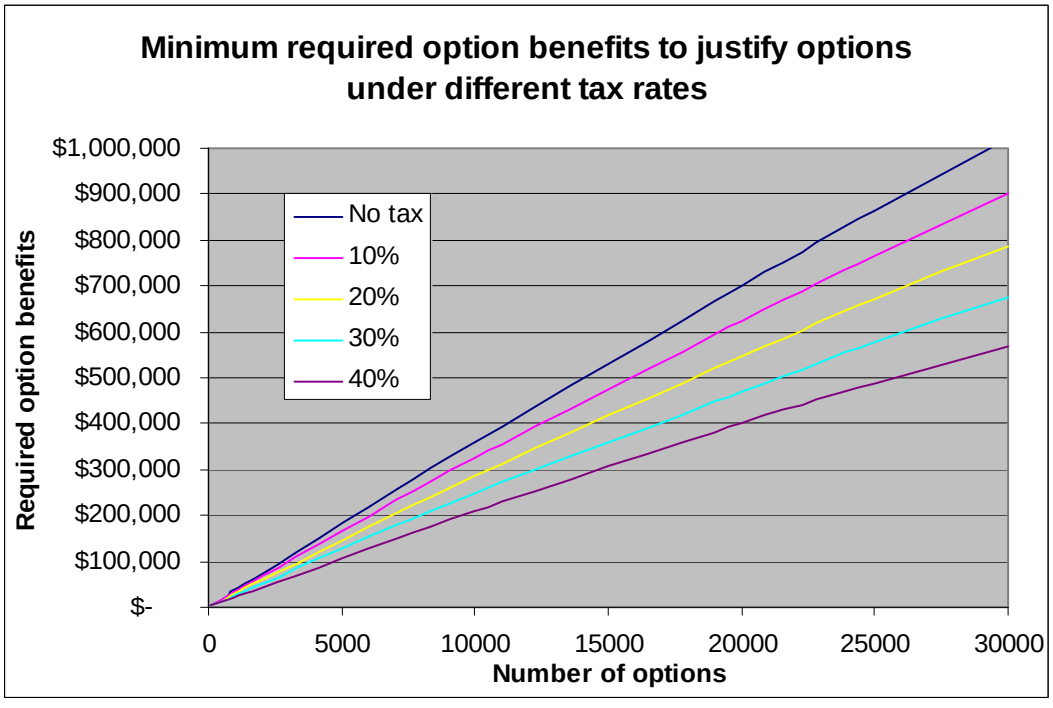
Figure 3.13: Required unconditional benefits under different volatilities



3.5.2.2 Taxes

The impact of taxes on the required option benefits to be incurred upon grant are not surprising, as can be seen from Figure 3.14 below, the higher the tax rate, the lower the required option benefits.

Figure 3.14: Required unconditional benefits under different tax rates



Based on the graph above, the minimum required option benefits for a company with volatility of 20% and granting five year options at-the money options (irrespective of stock price) can be loosely defined as:

$$\text{Minimum option benefits} = N_t[0.0037098 \cdot s_t(1-1.0075T) - 0.00000001s_t^2]$$

However, it should be made clear that this is merely, before tax option benefits.

Minimum option benefits (before tax)

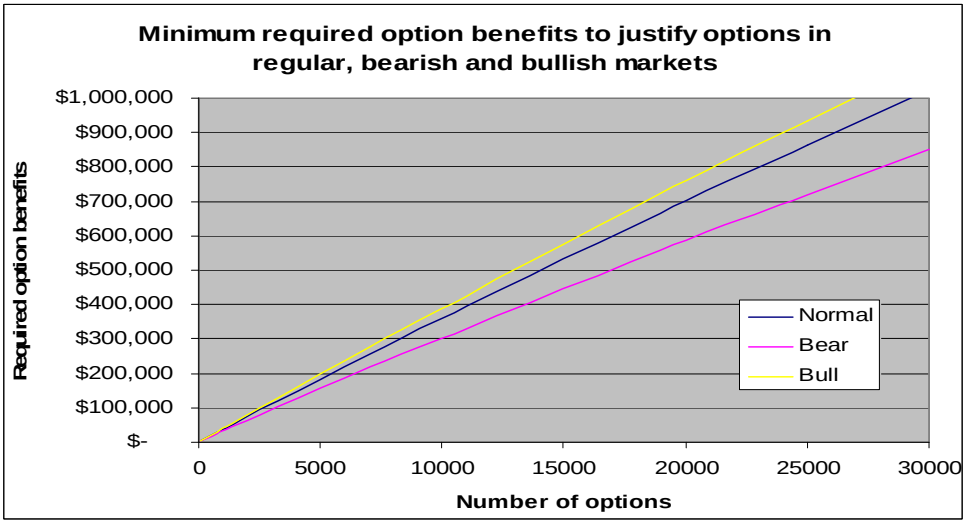
$$= \frac{N_t[0.0037098 \cdot s_t(1-1.0075T) - 0.00000001s_t^2]}{1-T}$$

Due to any extra value added also being taxed, the net benefit of claiming the tax expense from any options exercised is not as large as indicated in the figure above. Given the minimal marginal benefit from higher tax rates, there seems to be little justification for firms increasing their stock option compensation packages to take advantage of possible tax benefits.

3.5.2.3 The impact of "moneyness"

Earlier analysis of the relationship between dilution and moneyness showed that the cost of dilution increased as moneyness increased. So it is not surprising that increased moneyness in the form of a bullish market requires a firm to have more upfront benefits, as seen in Figure 3.15 below.

Figure 3.15: Moneyness and required unconditional benefits

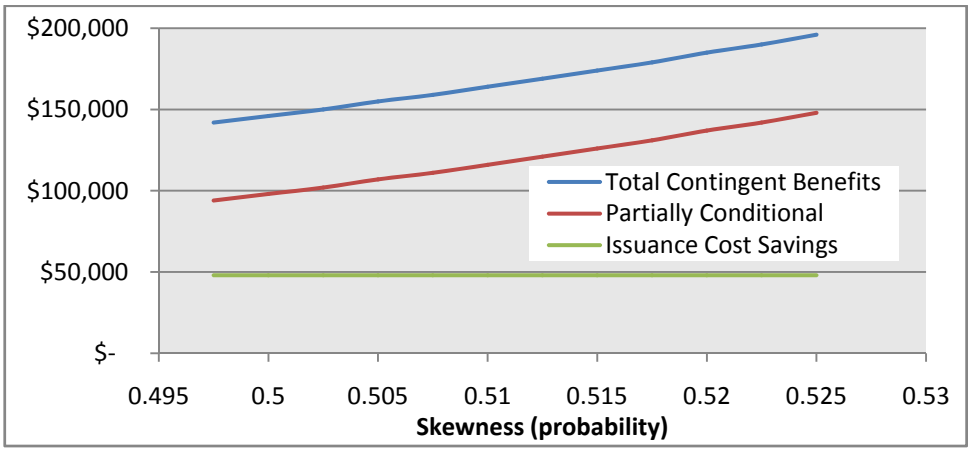


3.5.2.4 Moneyness, conditional and partially conditional benefits

With the exception of taxes, up until this point, only the minimum required level of *unconditional benefits* has been calculated. However, as unconditional benefits are constant they are independent of moneyness, and the minimum required level of benefits only increases due to dilution costs increasing with moneyness. The *expected value*s of conditional and partially conditional benefits, however, have a positive relationship with moneyness, and will increase in a bull market. Although many of the partially conditional benefits have a fixed or maximum payoff independent of price or grant size. As some of the partially unconditional benefits are very difficult to model properly, the required level of conditional benefits will serve as a general proxy for some of those benefits with a maximum value independent of price or grant size. (i.e. not selection and incentive benefits).

Technically, the required level of conditional benefits will not actually include the conditional benefits of taxes and savings from finance issuance costs as both of these are relatively easy to directly incorporate into the model. With regards to savings from finance issuance costs, it will be assumed that issuance costs are 16%, the approximate average cost for when raising less than $10 million, so the savings will be estimated as $0.16s_tX_t$. Because the required level of "conditional benefits" excludes taxes and savings from issuance costs will be in addition to these.

Figure 3.16: Moneyness and required conditional benefits (fixed number of options)

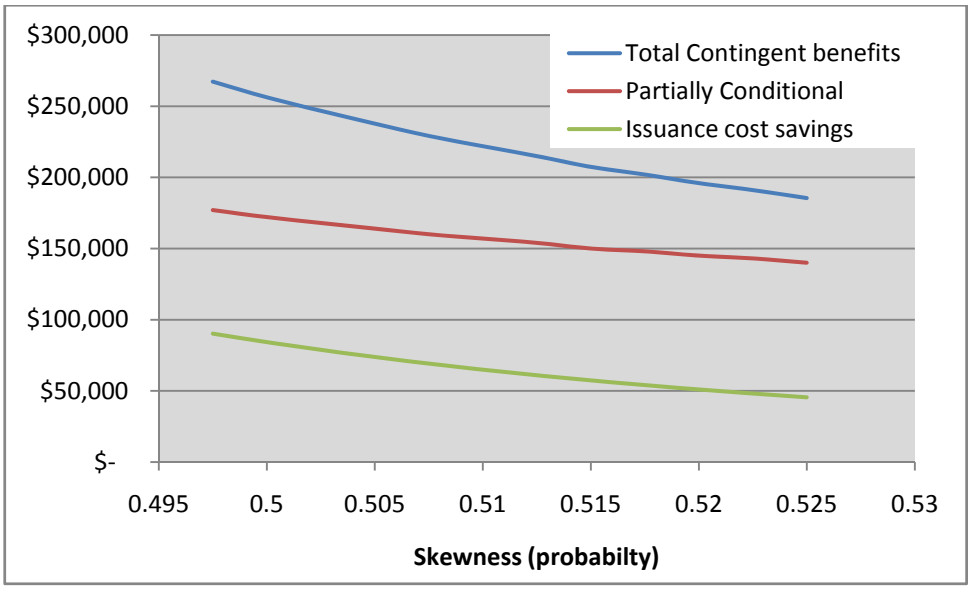


If firms were focused on fixing the number of options granted, then bullish markets would necessitate a greater minimum level of conditional benefits as can be seen in

Figure 3.16, which depicts a firm with no taxes granting 3000 options, without any unconditional benefits. However, if firms focus on fixing the value of options, the required conditional benefits to breakeven start to decrease with bullish markets that increase moneyness, as demonstrated in Figure 3.17 below, for a firm granting $100,000 worth of options. The basic reason for this relationship is that moneyness has a huge impact on price, thus affecting the number of options required to be granted to the employee. Bullish markets can effectively lower dilution because options in a bullish market are worth more, thus lowering the number of options needing to be granted. With the lower dilution costs, and higher likelihood of exercise, there is a reduced need for partially conditional benefits to justify granting options.

As with several previous results, these conclusions can be extrapolated, as long as the ratios between the benefits and number of options remain constant.

Figure 3.17: Moneyness and required conditional benefits (fixed value of options)

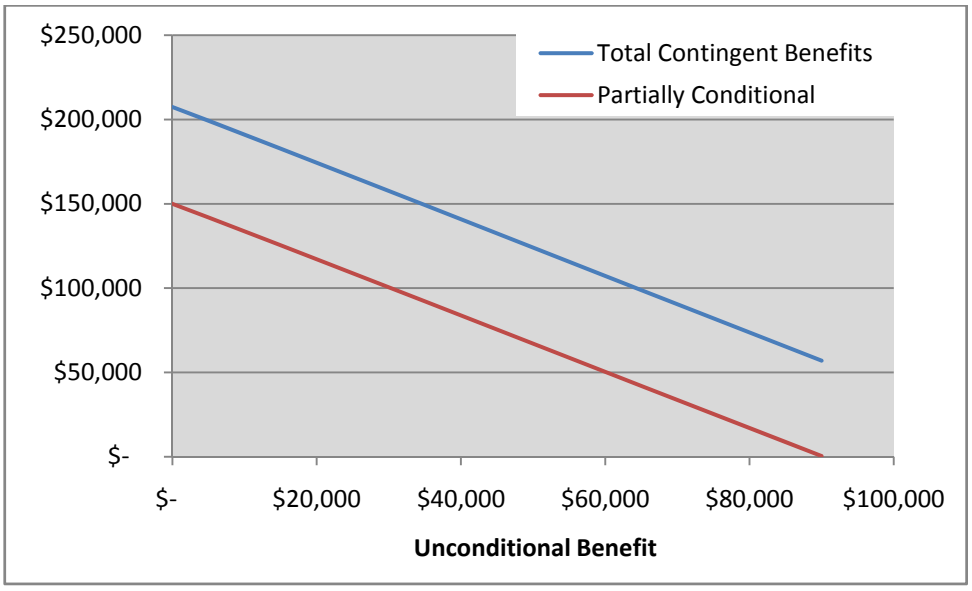


Both of the previous figures show the required conditional benefits based on the assumption that no unconditional benefits exist. However, it would be unlikely for a firm to have no unconditional benefits, so Figure 3.18 below displays how the minimum required conditional benefits will change for a firm in a normal market based on differing levels of unconditional benefits. Interestingly enough, there is essentially a negative linear relationship between the two variables, which makes it very easy to model. This figure can also be used to estimate the required unconditional benefits based on

conditional and partially conditional benefits. From this figure it can be seen that approximately $1.67 worth of partially conditional benefits equates to $1 worth of unconditional benefits, which is a relationship which holds almost independent of grant size. Therefore, required unconditional benefits with conditional benefits can be estimate based on N_t number of shares and s_t of options from:

$$N_t[0.0037098\, s_t - 0.00000001\, s_t^2] - \frac{\$ \text{ conditional benefit}}{1.67} s_t premium_t^*$$

Figure 3.18: Required conditional benefits and unconditional benefits (fixed value of options)



This relationship however does not hold as strongly at differing levels of moneyness. As moneyness impacts the slope, with bearish markets steepening the curve and bullish markets flatten the curve. This is due to bull markets still having relatively higher levels of dilution compared to bearish markets.

3.6. CONCLUSION

In recent times, executive compensation has reached unprecedented levels, largely due to the component of stock option compensation. As a result, several hypotheses have been developed to attempt to explain why these levels may be optimal or excessive as an incentive alignment tool. This chapter has added to the economic theory of the optimal contracting hypothesis from a holistic perspective, by incorporating the impact of the

various other costs and benefits resulting from granting options. These include numerous HR related benefits, such as attracting, sorting and retaining staff, as well as indirect benefits relating to a range of finance related issues, such as corporate governance, project selection, financing and tax issues. So while levels may have been the overall optimal solution, it is quite possible that levels were suboptimal or excessive from a traditional incentive alignment perspective.

As much research in this area has been retrospective, a lot of research has failed to differentiate between option premiums based on current stock prices and option premiums based on what stock prices would have been if employees had not granted options. By incorporating the impacts of the different costs and benefits resulting from granting stock options, a "what-if" framework was established to distinguish the value of the firm with and without options granted. Such a framework thus provides a basis to develop a clearer understanding of the revenues foregone.

The "what if" framework also allows for the comparison of the stock price (inclusive of benefits) post dilution with the corresponding stock price without options, with the expected difference being the *dilution cost* or gain to current stock holders. It is important to note that this dilution cost is calculated from the *dilution of value* which differs to *dilution of EPS*, which implicitly ignores possible future increases in earnings from increased capital. Whereas *dilution of EPS* is minimised by restricted stock, minimisation of *dilution of value* is achieved through out-of-the-money options. Scenario analysis also helps to show that these dilution costs diminish marginally with respect to the number of options granted, but are linear with respect to the number of options per total number of shares (including new shares from option exercise).

Having established the appropriate foregone revenues combined with dilution costs, as well as tax implications, the overall economic opportunity cost of forgoing underwriting stock options can be calculated. On a simple theoretical basis, these factors provide an argument for the economic opportunity cost of granting stock options to be much lower than what is normally considered. Scenario analysis takes this further, showing that there are no expected profits from a typical company underwriting five year stock options unless new stocks from option grants were to exceed approximately 28% of the firm's stock. If tax implications were considered, this *breakeven* point would be even greater.

Due to the required levels of grants to be unrealistically high, it is therefore argued that foregone profits from underwriting stock options should not be considered as the economic opportunity cost.

By grouping the aforementioned benefits into three categories based on the benefit's relationship with *moneyness*, a simplified model of a firm was developed to analyse the impact of differing factors on dilution costs and the minimum required benefits for a firm to grant stock options.

The relationship between dilution costs and moneyness were found to differ depending on the number of options granted or underwritten. Firstly, the breakeven point was found to be independent of the state of the market, however, this may partially be due to how the different states of market were modelled. Then any firms granting more options than the breakeven point would generate more profits as moneyness increased, and firms granting less would incur greater losses. As moneyness would increase the option revenue, dilution costs must also have been increasing.

Required unconditional benefits received upon grant are found to have a positive relationship with volatility and number of options granted, however, like dilution costs, required unconditional benefits only need to increase at a diminishing marginal rate. Once taxes are introduced, required unconditional benefits decrease slightly. Lastly, just as dilution costs (below certain grant levels) increase with moneyness, so do the required unconditional benefits.

Analysis of required conditional benefits when there are no unconditional benefits and fixed grant levels, show that required conditional benefits increase with moneyness. This is perhaps counterintuitive as expected conditional benefits increase with moneyness, however, it is indicative of the high costs involved with dilution of value. However, if option grant values are fixed instead of option grant levels, then the required conditional benefits decrease with moneyness as a result of increased moneyness decreasing the required option grant levels. When unconditional benefits are also incorporated into the model, required conditional benefits drop almost proportionately to the level of additional unconditional benefits at a ratio of 1:1.67. Under the assumption of unconditional benefits being an approximate proxy for the value added through

incentives, this helps why a company with a lot of conditional and partially conditional benefits may have compensation packages which are excessive for incentive alignment purposes. Indirectly, this chapter also supports the premise that options are vital to small companies to grow, as many of the aforementioned benefits are more prevalent and have greater values at smaller firms with untapped potential for growth.

Finally, as mentioned earlier, the model used in this analysis was simplified, leaving opportunity for other researchers to improve on it. Among the key areas for further development are incorporating the modelling of employee effort, the impact of perceived value for non-diversified employees, different levels of risk aversion of recipients, improved modelling of the majority of the benefits, particularly partially conditional benefits, different exercise prices, alternative ways of modelling bearish and bullish market states, and expansion of the model from a single stage to a multi-stage model.

Chapter IV: OPTION COMPENSATION, MARKET CYCLES, ACCOUNTING STANDARDS AND CORPORATE SCANDALS

4.1. INTRODUCTION

The famous Chinese philosopher Confucius once said “study the past if you would define the future”, so in pondering the possible future of stock option compensation it is important to properly understand why they have been granted in the past. Although a number of possible explanations have been covered in an earlier chapter, much of the evidence has mainly been anecdotal. Of the recent empirical research that has been conducted, it has only focused on individual factors such as changes in accounting standards, while ignoring the possible influence of several other factors or events which coincided within a nearby time frame. It is the aim of this chapter to better understand the drivers behind compensation practice, with the hope of gaining possible insight to what the future of options compensation is.

The years surrounding the turn of the century offer a unique timeframe to assist in better understanding changes in stock option compensation practice. Around this time period, executive stock option grants for S&P 500 companies started to decline from the peak of its popularity. In addition, from 2001-2003, there were several events which may have influenced this decline. Firstly, the stockmarket also began to weaken, coming off of its peaks in 2000, this factor is of particular interest to find possible empirical evidence to support the previous chapter’s hypothesised relationship between option costs and benefits and the moneyness of options. Secondly, new accounting transition methods were introduced to incentivise firms to voluntarily stop using footnote disclosure and start recognising stock option compensation expense. Finally, this time period highlighted poor business ethics in the form of several major accounting scandals, which some have alleged were incentivised by stock based compensation, such as options.

Although there have been more recent events, such as the collapse of major investment banks, that may have impacted compensation practice, this chapter will focus on the events surrounding 2000-2003, primarily due to the known changes in stock option compensation during this time period, and secondarily due to availability of data in the ExecuComp database used for this research.

In order to better understand the possible factors that may have led to the decreased use of stock options, it is useful to understand the early factors which potentially led to the increased usage of stock options in recent times.

Since the findings of Jensen & Murphy (1990 a & b), there has been growing academic support of the use of equity based incentives to executives to maximize shareholder value. The results of their paper suggested that equity based compensation tools were under-utilised and that there was greater need to improve pay-performance sensitivity to increase incentives. With such conclusions, some believe that this helped drive or at least justify the increasing popularity of executive stock options during the early 1990s.

4.1.1 Market Cycles

During this same period of time in the 1990s, the stock market was also experiencing a long "bull market". So many industry observers have attributed the growth in option usage to executives influencing pay to benefit from the upmarket, as opposed to company board of directors wishing to achieve greater incentive alignment. In addition, some industry observers began to question whether executives had really been adding value, or been simply benefiting from a buoyant market (e.g. Fox (1997); Greengard (1999)).

4.1.2 Accounting changes and Stock option compensation

Another suggested contributing factor to the rise in popularity of stock options has been how they are accounted for. Since the 1970s, companies have been able to expense options according to their intrinsic value at grant. In most circumstances this would result in no recognition of options being expensed because of the common practice of granting options "at-the-money", thus having no intrinsic value at grant, so stock options essentially escaped profit and loss statements. For a long time the *Financial Accounting Standards Board* (FASB) had sought to make it compulsory for companies to recognize any stock option grants as an expense using more modern valuation models. However in 1993, when they last attempted to make it compulsory, the exposure drafts for these proposed standard reforms faced great resistance. So much so, that the FASB lightened their stance, instead making it voluntary for companies to recognize stock option expenses "explicitly", but still required footnote disclosure using more accurate option

valuation models. Unsurprisingly, very few companies chose to make the voluntary transition to expense options "explicitly".

Due to these old rules many industry observers, in addition to some academics (see Murphy (2002)), believed that many companies were abusively utilizing stock options excessively due to the lack of clarity of their true cost. With some arguing that options were used more for the purposes of earnings management as opposed to a tool to align executive incentives.

In an effort to increase the number of companies to voluntarily expense options, the FASB decided to introduce several transition alternatives to ease the transition process through introducing *Statement of Financial Accounting Standards* (SFAS) 148 in December 2002. The premise of the new alternatives introduced by the FASB were based on the assumption that the major reason behind so few companies making the voluntary transition was due to a "stepwise" increase in stock option expense that would happen every year after a firm made the transition. Previously, firms making the transition to voluntarily expense their stock options would only start expensing stock options granted following the date of transition through amortizing the value of the option from the date of grant until vesting maturity, thus excluding all existing stock options. So each year, expensing would apply to an increasing amount of stock options. To nullify this "stepwise" effect, the SFAS 148 introduced two alternative transition methods: the "modified prospective" and retroactive restatement methods, which instead expense all options dating back to December 1994, in addition to also having other differences in accounting recognition affecting the balance sheets. Firms could still choose to use the existing "prospective" method as long as they made the transition prior to December 15th 2003, following this date, firms would only have the latter two alternatives available to them.

4.1.3 Corporate scandals

Although stock option compensation has been promoted as a means to grant executives incentives to avoid decisions that do not contribute to adding value to the firm, some have suggested that it may also provide an incentive to manipulate earnings. This argument became somewhat apparent in 2002 following several major bankruptcies, namely Enron, one of the largest companies in the world to ever file for bankruptcy. The

downfall of the company has become synonymous with corporate fraud, particularly accounting fraud, and shortly after there were a number of several other notable bankruptcies in 2002 related to accounting fraud, many of which were audited by the accounting firm Arthur Andersen. In response to this, the FASB and *International Accounting Standards Board* (IASB) quickly began efforts to reform accounting standards; in addition the Sarbanes-Oxley Act of 2002 was quickly established to ensure greater corporate governance to prevent any similar scenarios ever happening. Although Enron's collapse is typically associated with corporate fraud, it has also sometimes been linked to the use of stock options. Prior to the company's stock price dramatically falling, executives exercised large amounts of options during a time period when they were asking employees and investors not to sell. It is actions such as these which have led some to believe that options give managers the incentive to commit fraudulent acts. Although some have pointed out that the argument is flawed because the number of companies which have stock options that have not gone bankrupt far outnumber those that have. However, some firms may have assumed that poorly informed investors may associate stock options with corporate fraud. And as a result, if companies have ceased using stock options in order to disassociate themselves from companies which may have fraudulent dealings.

Although there has been some stock option literature examining accounting standards and corporate fraud, they have been done so independently one of another. The research in this chapter contributes to expanding the literature by examining option grants by controlling for all major potential factors that may have led to changes in option grant levels, particularly the influence of the market, as the existing academic literature on market cycles and stock option compensation is minimal. In addition, the analysis in this chapter recognizes the importance of the accounting transition method chosen by a firm, which assists in distinguishing between the possible intent behind any changes in stock option grants. Lastly, because analysis is conducted on up to top five executives from a firm as opposed to only the CEO, attempts have been made to differentiate between companywide decisions to cease granting options versus an individual employee, which is important in determining the impact of events on overall company policy, as opposed to an individual employee's circumstances.

The remainder of the chapter is structured as follows: in section two, a literature review is provided, covering the three major factors of market cycles, accounting standard changes, and corporate fraud. Section three then covers a brief overview of trends in stock option usage. Then hypotheses are discussed in Section four. Section five then covers the data and the development of the model behind the empirical analysis. Section six follows with empirical results, and finally a summary of findings and conclusion in Section seven.

4.2. RELATED LITERATURE

4.2.1 Market cycles and stock option compensation

Whereas industry observers have speculated the relationship between stock option compensation and market cycles, there is surprisingly very little academic literature at present regarding the relationship between stock option compensation and market cycles aside from brief mention or acknowledgement of the market. However, there is a lot of IPO (Initial Public Offering) literature on market cycles.

In the earlier literature regarding long-term performance of IPOs, it is argued that hot markets are mainly constituted of lower quality firms because they appear to have worse stock returns than IPOs from cold markets (Loughran and Ritter, 1995). Other literature also suggests these lower quality issues arise from managers taking advantage of bullishness from investors to demand an IPO (e.g. Lerner (1994); Field (1997)) However, more recent articles such as Helwege & Liang (2004) have shown the quality and characteristics of firms do not seem to differ much. Derrien (2005) also points out that this poor long term performance is perhaps connected to overpricing driven by other indicators in the market about investor optimism. Although some of these hypotheses have found little support in the context of IPOs, they still may shed some light as possible explanations for stock option usage. In like manner some of these hypotheses could apply to stock option compensation; some companies may issue excessive amounts of stock options simply to take advantage of the bull market. There is also the implication that option grants in a “cold” bear market cycle may some how be of higher quality.

Although there are no major articles focusing on the relationship between stock option compensation and stock market cycles, Hall & Knox (2002) developed a model that provides an interesting explanation to stock option grant levels in a possible bull or bear

market on the basis of managing incentive levels. However, contrary to the thought that option grants might decrease with a cooler market, the paper argues that option grants may instead increase in reaction to lost incentives. The article focuses on the "fragility" of incentives provided by options (with analysis based on options during a bull-market period). As the incentives provided by stock options are based on the option delta, the incentives can vary depending on the stock price, particularly when options go out-of-the-money, as the non-linear payoff of options lead to much larger changes than options moving into the money in the opposite direction. The authors note that approximately 30% of options were out-of-the-money at the peak of the bull market in the 90s, which may have impacted on the fit of their model.

4.2.2 Accounting and stock option compensation

From a finance perspective it is generally accepted that a change in accounting should not theoretically impact value, as it does not impact the underlying cashflows that contribute to a firm's value. Unless the change in accounting practice provides important information in calculating value, there should be no change, based on the assumption that the market is efficient. As under SFAS 123 companies were required to disclose details regarding their stock option compensation in footnotes, no new information would be released through any change in the accounting standard, only greater transparency by "shifting" the information. So in theory, a change in accounting standards should see companies continue business as normal (i.e. not change their equity based compensation), unless there are other considerations involved. However, the evidence behind this hypothesis is mixed.

Rees & Stott (2001) found that footnote disclosed information did provide value relevant information. Using stock option data from footnote disclosure, the authors found a significant positive relationship between company returns and stock option usage, particularly for firms with more growth opportunities. The implications of their findings being that investors had incorporated information from footnotes into their valuation of a firm; and that increased stock option usage was seen as beneficial to the firm.

However, Hassan, Espahbodi, Rezaee, & Tehranian (2002) found evidence to suggest that footnote disclosure was insufficient as a substitute for "recognition". Focusing on the impacts of company returns surrounding events in the early 1990s when the initial SFAS

123 exposure drafts requiring recognition of stock option expense and the later announcement regarding reversal of the decision to expense; the authors found that there were significant abnormal returns for firms, especially for high-tech, high-growth and start up firms. Whereas, if footnote disclosure was a substitute for recognition, then there should have been any reason for abnormal returns.

In more recent times, Carter, Lynch & Tuna (2007) examined the change in the revisions to SFAS 123, more specifically the impact of SFAS 148 in December 2002 (an amendment of SFAS 123) which gave companies new alternatives to voluntarily recognize stock options. The authors found that companies which had decided to recognize stock options, have since decreased their option grants, swapping them for restricted stock grants.

Aboody, Barth & Kasznik (2004) also focused their research surrounding the introduction of SFAS 148, however, instead of focusing on the impact of the transition on company returns, they sought to identify the characteristics of firm's that chose to voluntarily expense their options. They found that firms were more likely to have expensed if they had high participation in capital markets, and found there was no significant relationship between size of option expense to be recognized and the decision to make the transition, once other factors had been accounted for. They also found that companies which did choose to expense had significant positive returns upon announcement, especially if transparency was stated as a motivation behind the decision. The hypotheses behind these increases are that companies which disclose have a higher quality of earnings, and due to the timing of the decisions, it would reduce political costs involved with uncertainty surrounding the integrity of many companies.

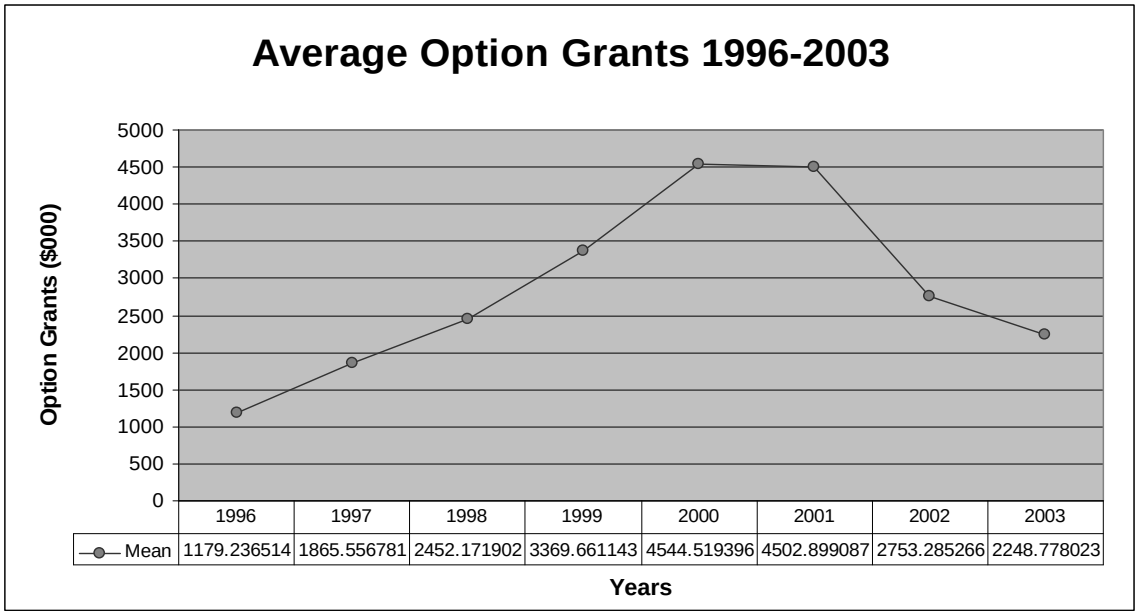
4.2.3 Corporate Scandals and executive stock option compensation

Although the argument for linking corporate scandals to executive stock option compensation is somewhat weak, it has some indirect support from Michael Jensen, one of authors behind the seminal 1990 paper supporting greater use (based on 1980s levels) of equity based compensation. Jensen (2005) points out that although stock options do not provide the initial incentive for accounting fraud, it can provide the incentive to continue to manipulate earnings if a "line has already been crossed". The rationale being, that once earnings have been manipulated once, expectations of future earnings are likely

to be raised, thus giving the incentive to continue to deceive the market through fraudulent acts in order to meet those expectations. However this only analogizes stock option compensation to a fuel to a fire, so if all efforts are made to prevent the fire, then stock option compensation is not an issue.

4.3. OPTION GRANT LEVELS AND MONEYNESS OF STOCK OPTIONS

Figure 4.1: Average option grants 1996-2003



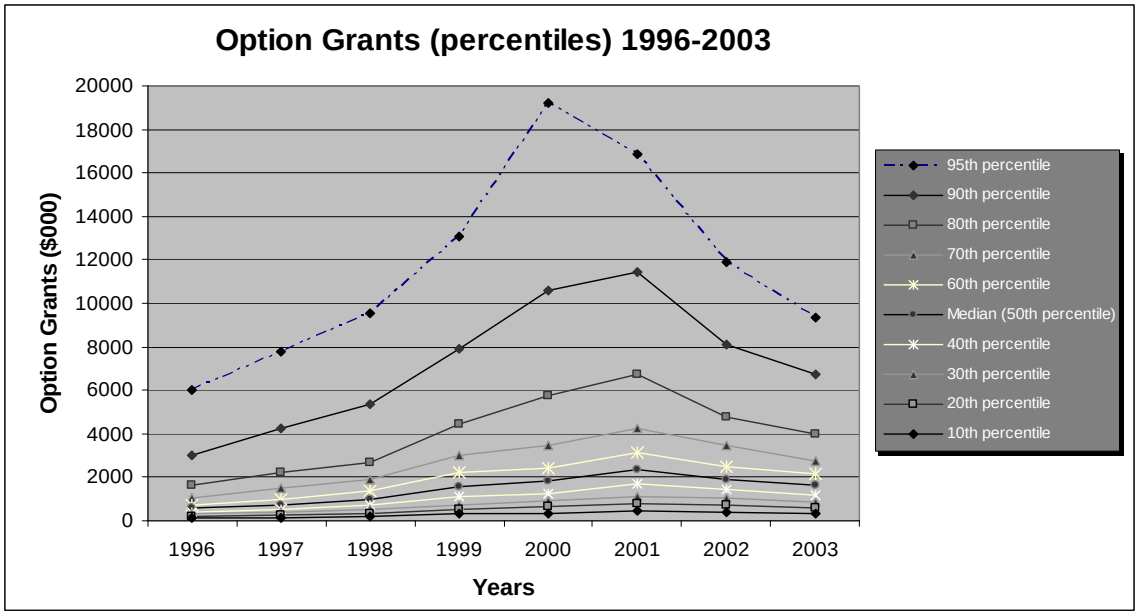
4.3.1 Option Grant Levels

Using the EXECUCOMP database with records dating from 1992 – 2003 on the top 5 executives for S&P 500, Figure 4.1 is constructed. At first glance from the average option grants from 1996-2003 it would seem that option grants plateau in 2000, followed by a more significant drop following 2001. From an initial glance it would seem that the timing of this drop could possibly be explained by a delayed response to a drop in the stock market in 2000.

However, from a closer look below at trends in stock option grants over this time period shown in Figure 4.2, which shows us the percentiles (grouped in deciles) of grants instead of rather than mean averages, it can be seen that that below the 95th percentile (the dotted line) there is actually a peak in 2001 rather than 2000. As indicated from the asymmetry in the uneven spread of the percentiles, there is a large amount of skewness in the distribution of executive stock option grants. The reason for the inconsistent stories

from means and percentiles is attributable to the highest 5% of grants pulling the mean up to show a small peak in 2000.

Figure 4.2: Option Grants (percentiles) 1996-2003



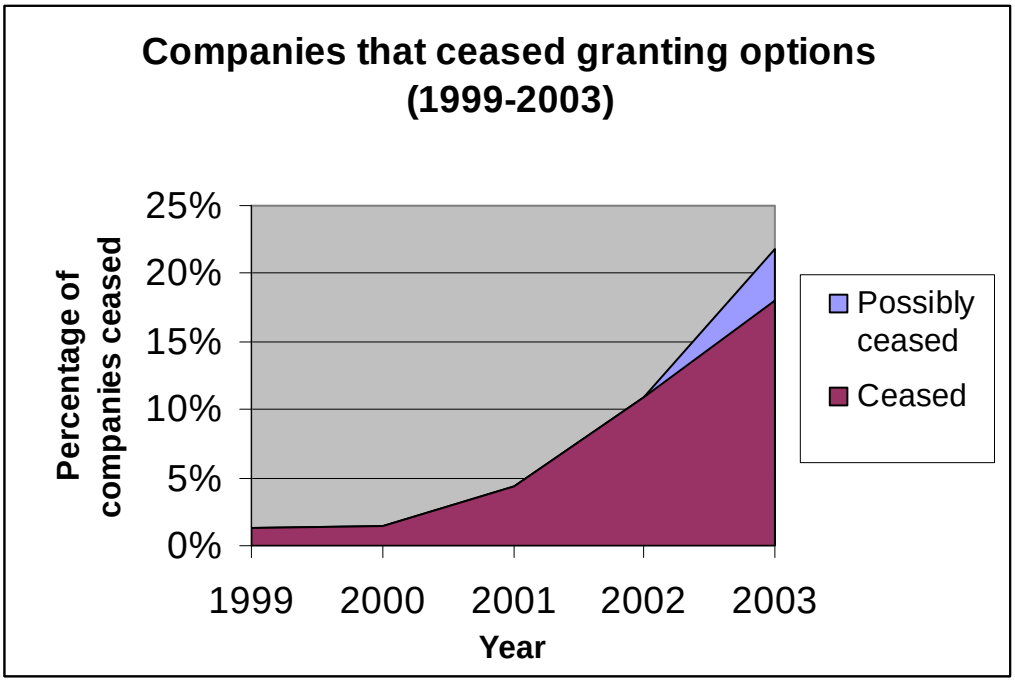
This late drop then brings into question, what has been the driving force behind these major movements in stock option grants. Was it accounting reforms, fears of corporate corruption, or a delayed response to the downturn in the share market?

4.3.2 Decreases vs ceasing

During this period, not only did the overall levels of options issuance go down, but the number of executives receiving grants also dropped (the impact of these have been ignored in the previous graphs, as "zero grants" were excluded from calculations). It is difficult to track exactly how many companies ceased using options, as many companies do not grant options to their executives every year, so it can be difficult to distinguish between a company which has recently completely ceased using options or whether they will continue to use options but not grant for the next year or two. For this reason, a company was defined as having ceased options if they had done so for at least two years. In 2003 there were fifteen firms which could not be verified according to this criteria, as information regarding their 2004 grants were not available. Thus these firms were classified as having "possibly ceased" granting stock options.

It is also important to remember, that though there were many companies moving away from options, a small number of companies decided to start using options during this period as well, so these numbers do not totally represent how the overall number of option granting companies changed.

Figure 4.3: Companies that ceased granting options (1999-2003)



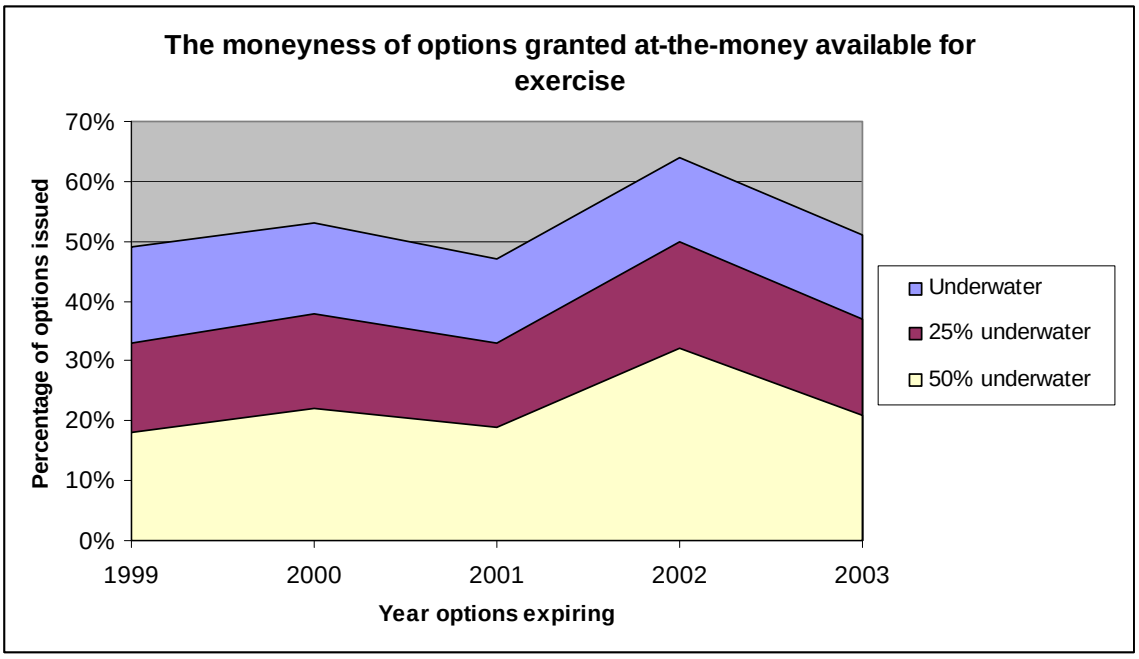
4.3.3 Moneyness of options

As mentioned earlier, Hall et al (2002) estimated approximately 30% of stock options expired out-of-the-money during a bull-market. The authors' analysis has been replicated using a smaller data set (S&P 500 companies) to examine the "moneyness" of options, that is the degree to which options may go out-of-the-money over time, during both a bullish and bearish market cycle. This has been done on the basis of assuming that firms had issued options "at-the-money" (i.e. exercise price equals the stock price on grant date), and utilising end of year prices for S&P500 firms. "Moneyness" was calculated based on the ratio between the stock price at grant (the assumed exercise price) and the stock price seven years following (estimate of stock price at expiration).

For options which had been granted 7 years prior, 2000 and 2002 are particularly bad years. However, because these results are retrospective, they do not contribute to further

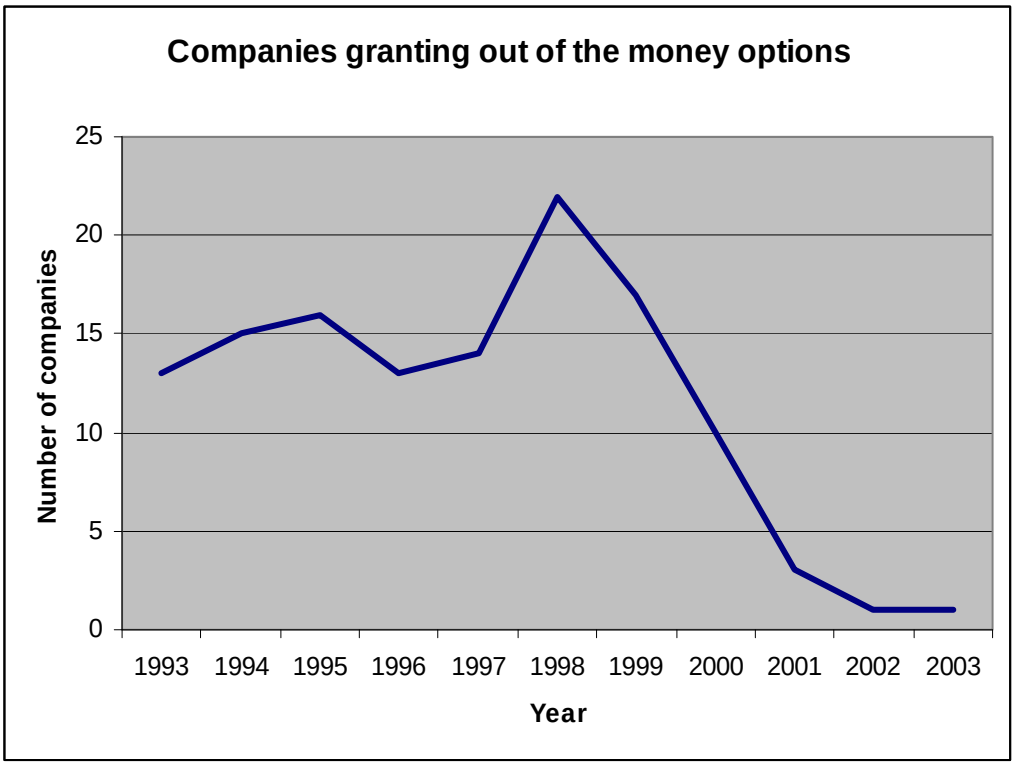
understanding options to be granted in the future as to determine their potential incentive strength.

Figure 4.4: The moneyness of options granted at-the-money



4.3.4 Out-of-the money options

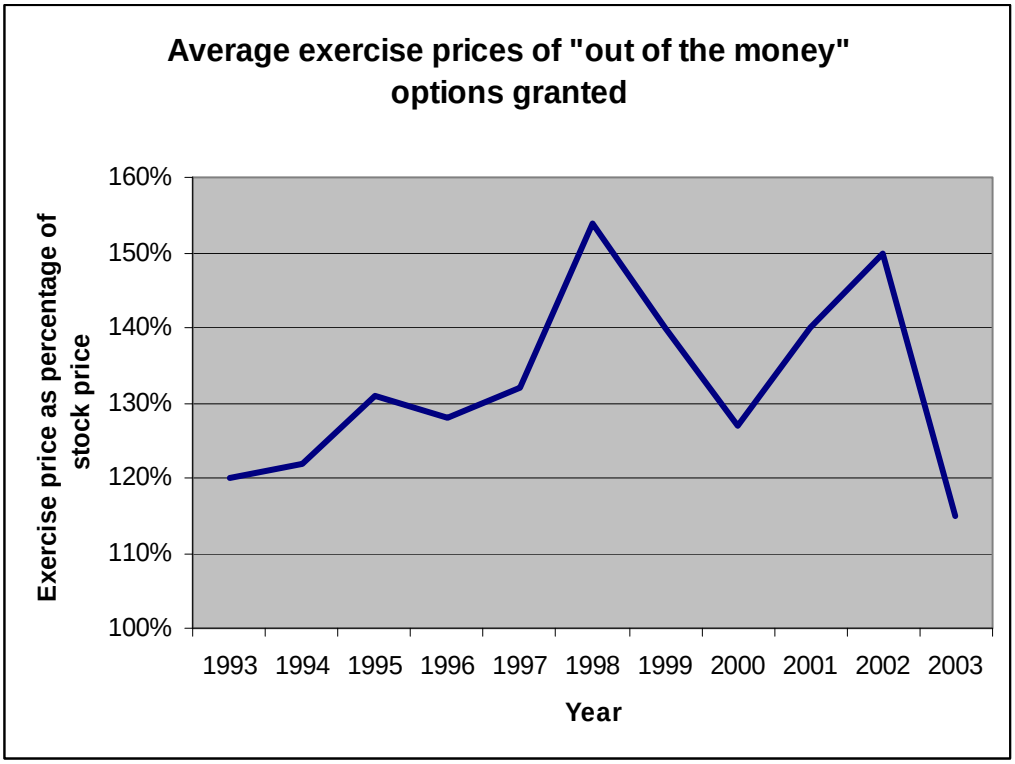
Figure 4.5: Companies granting out-of-the-money options



As a side note, though it may seem simplistic to simulate options being granted at-the-money, Hall & Liebman (2000) found that about 95% of stock options are granted at-the-money, with a very small number being granted out-of-the-money, and slightly more being granted in-the-money. To provide further evidence of the impact of the bear market on stock option grants, out-of-the-money option grants were analysed to see if they had a significant connection to market cycles.

Figures 4.5 and 4.6 are based on a brief analysis of S&P 500 companies that granted out-of-the-money stock options. From these figures, an increasing trend can be observed from 1993 up until 1998, with not only more companies granting out-of-the-money options, but also granting these options increasingly out-of-the-money (from exercise prices 20% above stock price 1993 to over 50% above stock price in 1998).

Figure 4.6: Average exercise prices of "out-of-the-money" options granted (93-03)



At first glance, there seems to be a resurgence in exercise prices in 2001 & 2002, however if the small number of companies granting out-of-the money options from 2001 onwards are considered, three or less companies, it can be concluded that the trend is not likely to be relevant due to the small sample size. If the trends post 2001 are ignored, it is

interesting to see that both exercise prices as well as the number of companies granting out-of-the money stock options peaked in 1998, two years prior to the bull-market ending. Given that so few companies that granted out-of-the-money options, perhaps these companies were "wiser" than others, and foresaw that the end of the bull-market was possibly drawing nigh. Alternatively it could be argued that the sample sizes are so small, that it is not fair to infer too much, as the sample sizes lack statistical significance.

4.4. HYPOTHESES REGARDING DRIVERS BEHIND DECREASES IN STOCK OPTION LEVELS

4.4.1 Market cycles and a temporary cut-off

Although the model developed by Hall & Knox (2002) suggests that firms may increase stock options to compensate for the lost incentives from previous grants, this may only work in a bull-market. The justification behind this hypothesis is that during a bear market, a firm will be expecting that most options that they grant will lose their incentive value, and so the firm may need to be continually "firefighting" by granting an increasing number of options as previous grants move out-of-the-money. As "firefighting" is an inefficient use of resources, it is hypothesized that at some point firms will cease "firefighting" by cutting off option grants amidst a bearish market.

H1: Indications of a persistent bear market will lead to a decrease in option grants

4.4.2 Accounting standards

It is hypothesized that a company's choice of transition method is significant as to their future stock option compensation policy, as the choice implicitly indicates whether the firm has anything to hide. Because if a firm chose a method that recognized all past option expenditure (the modified prospective method or retroactive restatement method), decreasing the coming year's stock option grants would have little impact because of previous option grants. Whereas if a company believed that footnote disclosure was irrelevant and chose the *prospective method*, which only recognizes options granted after the transition date, it may choose to decrease its stock option grant levels in order to manage earnings.

H2 (i) Companies choosing the "prospective" transition method will lower option grants

H2 (ii) Companies choosing a “transparent” transparent method will not lower options issuance (if it does, it will not be for accounting reasons)

It is important to remember, that some firms may still be aiming to be transparent by recognizing stock option expenditure, but may not be interested in the possible additional compliance costs of the latter two transition alternatives offered in SFAS 148.

4.4.3 Corporate Fraud

Fundamentally, it is believed that corporate fraud and accounting standard issues are somewhat intertwined, as the major fraud cases of recent times have been linked to earnings management and accounting fraud. So most companies seeking to disassociate themselves from possibly fraudulent firms need only to choose one of the latter two transition alternatives, rather than cease granting options. Because it is believed that companies do not regard their investors to be naïve enough to believe that stock options are the root of the problem of corporate fraud, it is hypothesized that:

H3: Corporate fraud alone will not affect stock option grants

4.5. DATA AND METHODOLOGY

4.5.1. Data

In order to conduct the analysis, information on individual employee stock option grants, company stock price data, as well as accounting footnote details for firms which chose to make an early transition needed to be collect. For employee stock option grant details, the EXECUCOMP database from Standard & Poors is used, this database has records dating from 1992 – 2003 about the top 5 executives for S&P 500, Midcaps, and small company indexes.

Company SEC Form 10-k (Annual Report) documents: Accounting Voluntary Transition Information for companies is available from these documents, under accounting footnotes regarding stock option accounting treatment. From these documents the following information was found:

- Transition/no transition
- Date of transition

- Transition method (prospective, modified prospective, or retroactive restatement)

Out of practicality, only S&P 500 companies were selected, as a major constraint was hand collecting information from company annual reports. In addition, only executives who had been with a company/position for the most recent 8 years were selected. This was then filtered once more by eliminating any executives who had not been granted stock options since 1996. This resulted in a sample only containing 397 S&P 500 companies, and a sample of 870 executives, which are used to calculate 7 years worth of data, due to lags in independent variables.

The rationale for choosing executives who had worked for at least 8 consecutive years relates to tracking changes over two different time periods, the bull market (1996-mid 2000) and the bear market (mid 2000-2003). It is also important to track executive pay over time as many companies which utilize options do not always grant every year.

4.5.1.1 Data Collection and manipulation

Using the ExecuComp database it is possible to estimate or calculate each executive's holdings of company stock and stock options at each fiscal year-end. Proxies reveal:

- Number of options;
- Expiration date;
- Strike price of options; and
- number of restricted shares, granted to each of a company's top five executives in the preceding fiscal year.

But in many cases, assumptions about each executive's initial holdings of options still must be made. Given initial holdings of options, the data in ExecuComp is used to build up each executive's portfolio of company stock and stock options over time.

4.5.1.1.1 Estimation of executive's option portfolio

An executive's portfolio of options was estimated using the equation below:

Holding = Initial + number granted – number exercised – expired out-of-the-money

Several complications related to the limitations of the ExecuComp database may have hindered the measurement of stock and option holdings. Firstly, the ExecuComp begins in 1992, sometimes hindering information about executives who held options prior to 1992. Secondly, the exercise price of an option grant is not always recorded. Thirdly, ExecuComp is based on information from proxies, it is not possible to know which options were exercised, only the dollar value and number of options exercised. Fourthly, stock splits force us to adjust option exercise prices, since exercise prices are typically changed automatically after a stock split. The majority of these problems were dealt with according to details found in Appendix A of Hall & Knox (2002).

4.5.1.1.2 Estimation of executive's initial option holdings

However, unlike Hall & Knox (2002), who assumed that initial holdings were zero if they were missing from the database, the estimated the value of the initial holdings were used instead. The rationale for doing this was that although the estimate may be wrong, the estimate is likely to be much closer to the actual than zero would be. The methodology used to estimate the initial holdings was relatively simplistic. Although the number of options in the starting year may have been missing, the intrinsic value of the options (in-the-money) was usually stated in the ExecuComp database. So it was assumed that all the options were granted the previous year at-the-money (as 95% of options normally are granted at-the-money). So to estimate the number of options, the value of options in-the-money in the database was retrieved and divided by the estimated intrinsic value based on the assumption of the exercise price being the stock price one year prior. Then for other missing information, it was assumed the options had been granted at-the-money for seven and a half years (most options are usually granted between 5-10 years term to maturity).

Using the data above, option deltas for each executive's portfolio were calculated, which were then used in conjunction with other equity holdings to calculate *incentive* levels (as measured by pay-for-performance sensitivity: ratio of $ change in executive wealth to $ change in company). Holdings were also important to calculate the percentage of options out-of-the-money.

4.5.2 The Model:

4.5.2.1 The base

It was decided to use the model developed by Hall & Knox (2002) as the base for the model, as it was essentially designed to incorporate a shift in market cycle. The model is shown below in a truncated form; the model is essentially designed to estimate the percentage change in stock option grants required to maintain incentive levels.

$$PCCM_{i,t} = \beta_1\ POSUN_{i,t} + \beta_2\ VOL_{i,t} \cdot POSUN_{i,t} + \beta_3\ POUT_{i,t} \cdot POSUN_{i,t} + \beta_4 NEGUN_{i,t} + \beta_5 VOL_{i,t} \cdot NEGUN_{i,t} + \beta_6 POUT_{i,t} \cdot NEGUN_{i,t} + \upsilon_{i,t}$$

$PCCM_{i,t}$ = Percentage Change in Company Managed Incentives

$$= \ln\left(1 + \frac{CMI_{i,t} - MI_{i,t-1}}{MI_{i,t-1}}\right)$$

$POSUN_{i,t}$ = $PCUN_{i,t} \cdot I\left\{PCUN_{i,t} \geq 1\right\}$

$NEGUN_{i,t}$ = $PCUN_{i,t} \cdot I\left\{PCUN_{i,t} < 1\right\}$

$VOL_{i,t}$ = Volatility of stock returns in given year

$POUT_{i,t}$ = Percentage of executive i's options that are out-of-the-money in period t

$PCUN_{i,t}$ = Percentage Change in Unmanaged Incentives

$$= \ln\left(1 + \frac{UI_{i,t} - MI_{i,t-1}}{MI_{i,t-1}}\right)$$

$CMI_{i,t}$ = Company managed incentives

$MI_{i,t}$ = Managed Incentives (actual incentives) of executive i in period t

$UI_{i,t}$ = Unmanaged Incentives of executive i in period t. Incentives that executive i would have had at the end of year t in the absence of any grants by the company of additional options or restricted stock, e.g. existing portfolio of equity.

Rationale for inclusion of variables

$POSUN_{i,t}$ *(P)* and $NEGUN_{i,t}$ *(N)*: This measure can be likened to considering the utility of an investor's wealth, rather than utility of isolated cashflows. It also recognizes that treatment of "downside" changes are likely to be handled differently to "upside" changes.

$VOL_{i,t}$: Volatility is an important determinant of uncertainty

$POUT_{i,t}$: Percentage of options Out-of-the-money is an important variable because it indicates how much incentive power some of the existing options in the portfolio have. If there is little, then the company will need to "manage" option fragility, but if companies are in-the-money, there is less need for companies to "manage" option fragility through option grants.

4.5.2.2 Additional components

In order to test our hypotheses, several adjustments were made to the model.

4.5.2.2.1 A downward market component

A downward semi-variance is added to the model as a means to focus on the expected negative volatility of returns. As mentioned earlier, the initial hypothesis for the model was that firms manage lost incentives from a downward shift (indicated by a decrease in percentage of options out-of-the-money and through the Positive/Negative change in unmanaged incentives) in the market by increasing the number of options. However, the hypothesis developed in this chapter differs for companies experiencing severe circumstances. The addition of a downward semi-variance component is expected to recognise that if companies expect significant future downward volatility, that they may stop trying to manage incentives lost due to existing options falling out-of-the-money, as future options will also be expected to fall out-of-the-money.

H_0: Downward semi-variance < 0

4.5.2.2.2 Accounting transition indicator variables

To identify the significance of the accounting transition method, three different indicator variables were added, each corresponding to each of the methods that companies could choose. If a firm did not make the transition, then obviously all the indicator variables equal zero. But for a firm which did expense options, the indicator variable matching their transition method choice will equal one in the year that they made the transition (either financial year for 2002 or 2003).

H_0: “Prospective”<0

H_0: Transparent methods > 0 or insignificant

4.5.2.2.3 Corporate scandals

To account for the impact of fears of corporate fraud, indicator variables for each year were simply inserted, assuming that if there was a significant drop from 2001 to 2002 (after accounting for the other variables) that these are attributable to fears of being associated with corrupt/corruptible companies.

H_0: Year 2002 will not be significantly different to Year 2001 coefficient

4.6. EMPIRICAL RESULTS

4.6.1 The influence of the market

In the original model it was hypothesised that a firm would manage incentives depending on how the market had impacted on existing incentive mechanisms. Indirectly, the influence of the market was measured through the change in unmanaged incentives, as well as the percentage of out-of-the-money options. From Table 4.1 it can be seen that the model’s original variables show reasonable significance, except for those with interactions with the indicator variable for positive changes in unmanaged incentives. This is surprising, as it would be more reasonable to assume that the model would have difficulty with how incentives are managed in a downward market as opposed to an upward market, particularly as it has already shown to be appropriate for an upward market. Contrary to the hypothesis that there would be an indication of a breakdown or a company giving up on managing incentives, the model shows that negative changes in unmanaged incentives were still being managed by increases in managed incentives.

In addition, the co-efficient for the downward semi-variance variable is so small, that it is of no surprise that it is also statistically insignificant. A possible explanation for this is that a historical semi-variance may not have been the best proxy for expectations of a downward market.

Table 4.1: OLS Regression of possible influences on stock option grants
(number of observed values = 5835)

Variable	Predicted sign	Coefficient Estimate	t-statistic
Constant		-0.9619	-23.36***
Pos		0.5809	26.94***
PxPerOUT		0.0553	1.43
PxNAS		-0.0290	-0.55
PxVolatility		-0.0704	-0.75
NxPerOUT		0.2117	5.81***
NxNAS		0.0686	2.29**
NxVolatility		0.3462	4.57***
Bear market oriented variables			
Pdwn	+/?	-0.0016	-1.85 *
Ndwn	-	0.0004	0.69
Accounting oriented variables			
Prospective	-	-0.3142	-4.36***
Modified pros	+/?	-0.0758	-0.47
Retro	+/?	0.0555	0.27
Accounting Fraud variables			
1997	?	0.7770	20.37 ***
1998	?	0.6482	17.13***
1999	?	0.7151	19.66***
2000	?	0.7020	19.60***
2001	?	0.7738	22.11***
2002	?	0.5789	16.49***

R-Sq(adj) = 26.7%

***,**,* Significant at the 1%, 5% and 10% levels, respectively, based on one-tailed tests where a sign is predicted, and two-tailed otherwise.

"POS"/"P" is PCUN if it is non-negative (and is zero otherwise). "N" is PCUN if it is negative. "VOL" is volatility, which is calculated using monthly returns over the past 36 months. "PerOUT" is the fraction of an executive's options that were out-of-the-money at the end of the previous year. "NAS" is an indicator that is one if the executive's company is listed on NASDAQ. "Pdwn" and "Ndwn" are upward and downward semi-variance measures. Accounting variables refer to transition method chosen by some firms voluntarily recognising option expense. "Prospective" refers to the prospective method, "Modified pros" refers to modified prospective, and "Retro", retroactive statement method. Indicator variables for each year are included as a means to identify any significant changes from 2001 to 2002.

4.6.2 Accounting variables

From Table 4.1, the key accounting related variables are the indicator variables showing which type of transition companies chose. The results from the table support the hypotheses behind choice of transition. Companies which chose the prospective method decreased their grants by much more than other firms, shown by the negative co-efficient of -0.31, and statistically significant t-score of -4.36. So on average, companies that chose the prospective method transition lowered their incentives by about 31% less than other companies.

The second hypothesis that companies choosing more transparent accounting transition methods would not change their stock option compensation grants (based on the accounting decision to expense stock options) was also supported by the model. The *modified pros* and *retro* indicator variables possessing relatively small co-efficients, as well as statistically insignificant p-values of 0.637 and 0.787, showing these variables had very little to do with any decision to lower or increase managed incentives.

4.6.3 Corporate Fraud

Surprisingly, the null hypothesis that corporate fraud events of 2002 would not influence stock option policy is rejected. Amidst the changes from year to year, the drop from year 2001 to 2002 is perhaps the most dramatic, with the co-efficient dropping from approximately 0.77 down to 0.58. A differences in means hypothesis test between the coefficients for years 2001 and 2002 produces a z-score of -20.87, suggesting a statistically significant drop from 2001 to 2002, This suggests, that the events in the year 2002 had a negative impact on the average company's option granting, even after considering the possibility of the influence of the market or voluntary expensing of options around this time period.

4.6.4 Cease or decrease?

As mentioned earlier, there is a difference between a company deciding to merely decrease their stock options and deciding to cease granting options completely. As the model in general did not really distinguish between the two, further analysis was conducted to focus on analysis of the decision to cease granting options. It has thus far been implicit that any such "ceasing" of option grants would be attributable to the whole firm, as only firm wide variables were used in the model. However, closer analysis of

individual firms and executives shows that firm wide decisions to cease granting options are not always the case. In nearly half the cases where companies ceased granting options to an executive, at least one other executive in the firm was still being granted options.

When analysing the decision to cease option grants, a distinction was made between option grant ceases to individuals or across the firm. It should be noted, that due to a requirement of only including executives who had been employed for at least 8 years (to have a representative sample for both bull and bear markets), there are some firms in the sample that have only one executive. In these cases, it has been assumed that the sample size is insignificant to prove a firm wide decision to cease granting options. Firm wide decisions in this analysis were considered to be those where 100% of employees no longer received option grants, and the firm had at least 2 executives in the sample.

If the results from Table 4.1 are applied to analysis of the ceasing of option grants, then there is little support to show that this decision was influenced by the market. If anything, the model would suggest that accounting standard changes and events of 2002 were the main reasons any such firm wide decision. However, in the case of an individual, accounting standards and fears of being associated with corporate corruption should not have influenced a decision to cease receiving options. Thus it is reasonable to assume that individuals sought to cease option grants due to market cycles and individual preference or utility.

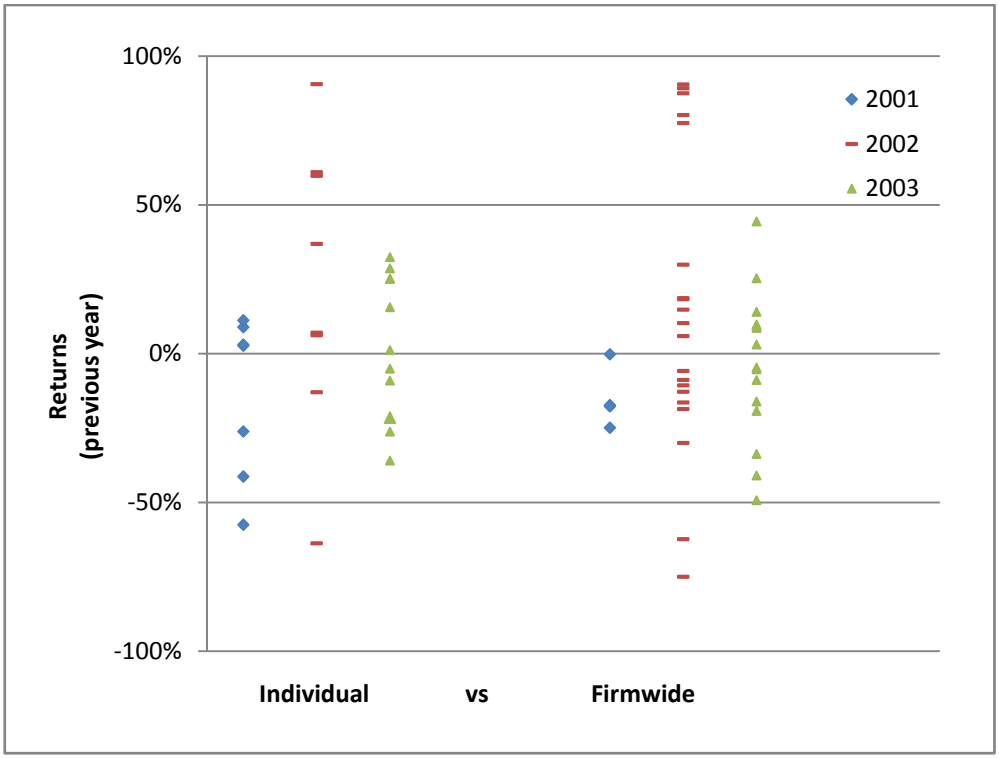
To help verify if the reasons for firms to cease granting options are the same as those that lead to decreases in stock option grants, further investigation was conducted to analyse whether there was any correlation between market changes, accounting changes, corruption fears and option grant ceases.

4.6.4.1 Market impact on decision to cease granting options

For this analysis, previous year's shareholder returns were used as a proxy for the "cut off" point for firms deciding to cease granting stock options, or possibly for individuals to request to be compensated with alternative equity compensation such as restricted stock. It was hypothesized that post 2001, risk averse executives choosing to exchange options for other compensation were likely to have based their decision on market volatility or poor returns. Whereas if a company were to make a firm wide decision to

cease granting options, accounting expensing, or company concerns of perceived corporate corruption could also influence the decision.

Figure 4.7: Returns of companies that ceased option grants 2001-2003



As can be seen from Figure 4.7, there is a small cluster of individuals from firms with returns lower than 20% which ceased granting options from 2001. This would have ranked them in the lowest 20% of returns for 2001, a very bearish year for the stock market. Surprisingly, approximately half the cases of ceased option grants for individuals had positive returns from 2002 onwards, and in several cases of company returns were in excess of 50%.

The firm-wide decision to cease granting options from 2001 appears to be related to returns, as all companies had negative returns at this time. This is supported by a hypothesis test based on the differences of means between companies that ceased and did not cease, with a statistically significant t-statistic of 6.75, indicating that the ceased sample represented poorer performing companies. Post 2001, both well performing and poor performing companies ceased granting options. With the respective means for each year of each sample that ceased granting options actually exceeding sample of firms continuing to grant options. Suggesting that that market related factors were likely to be

important in the decision to cease granting prior to 2001, but afterwards factors unrelated to the market were also taken into consideration into the firm-wide decision to cease granting options.

4.6.4.2 Accounting impact on ceasing to grant options

By identifying all the companies that appear to have made a company-wide decision to cease option grants in 2003, it was then sought to find how many had voluntarily made an accounting transition, as well as which type of transition they chose. Only three out of a maximum 15 companies were found to have voluntarily adopted an accounting transition, with two of the firms opting for accounting transitions methods (modified prospective and retroactive) which were already found to have insufficient evidence to be associated with decreases in stock option compensation. Thus, leaving one firm out of a possible 15 companies which may have made the firm-wide decision to cease issuing options due to adopting the prospective accounting transition. Therefore it is extremely unlikely that accounting standards are not related a firm's decision to cease granting options.

4.6.4.3 Corporate fraud

Looking back at Figure 4.3 it can be seen that the year 2002 shows the greatest relative increase of companies ceasing to grant options. Given that there seems to be little evidence to support market cycles or changes in accounting leading to this decrease, it would seem reasonable to assume that the events of 2002 had significant impact on firm-wide decisions to cease utilizing stock options.

4.7. CONCLUSIONS

From this chapter's findings, there seems to be inconclusive evidence of impact of stock market cycles on the levels of stock option grants. On the one hand, market performance seems to have at least influenced option exercise price setting policy, as after 1998 both the number of companies granting out-of-the-money options and the average exercise price relative to stock price dropped. There also seems to be some evidence to support the decision for companies to completely cease granting options prior to 2001, however, after that time period market performance seemed to have little impact on the decision to cease granting options. However, from the model developed in this chapter, there is little

evidence that the overall trend of lowered use of stock options is attributable to the downward market cycle.

This is rather surprising given the rise of stock option levels often being associated with the bull market of the 1990s. Though it is plausible that it was a major contributing factor, it was not the sole factor of concern in determining stock option grant levels.

This paper also supports the influence of accounting standards on economic decisions, even though they have no economic impact. However, this chapter went into greater detail than other research in the area, by making the important distinction of which type of transition was chosen by a firm. By identifying the choice of accounting methods, some of which were more transparent than others, conclusions were made regarding the likely intent behind the transition method. The key findings were that if companies had chosen the less transparent accounting transition method, option grants were more likely to decrease. However, for other firms choosing more transparent methods, there was insignificant evidence to show any decrease in option grants.

The most surprising finding of this paper is the impact of events surrounding 2001-2, which have not only led to lowered option compensation, but also companywide decisions to completely cease granting stock options. Due to limited data, the methodology in this paper did not delve into further detail regarding possible deterministic factors relating to this, so there are opportunities to further investigate possible reasons in the future.

Whether the reasons behind the decisions to either cease or decrease option grants were due to earnings management (accounting related) or firms seeking to avoid being associated with negative publicity that comes with options, there is little that will make these reasons any less relevant over time. So although some of the precise reasons behind option decreases and ceasing of option grants are not known with certainty, there is enough evidence to suggest that existing option levels may never recover to previous levels even when the stock market recovers.

Chapter V. CONCLUSIONS

5.1. Summary of Findings

In the past several decades, executive compensation has attracted much public interest and criticism due to seemingly excessive high levels of compensation, much of which is attributable to stock option compensation. Throughout this thesis, an array of events over the history of stock option compensation in the US has been covered, ranging from its early beginnings in the early twentieth century until the present day. Although the exact origins of options being used for compensation purposes are not clear, the spread of option compensation popularity appears to be evident through changes in tax law, accounting standards, business practices, legislation, academia, as well as other various events. With a basic overview of the development of stock option compensation from the first chapter as a foundation, the rest of thesis focused on theoretical and empirical explanations behind the trends in executive stock option compensation and option compensation in general, throughout the past few decades.

Throughout the history of stock option compensation there have been numerous events which either set a precedent or a benchmark for other firms to follow. The first major category of events focused on were legislative and tax events. Since 1945, a major legal precedent enabled firms to claim the value of exercised stock options as a taxable expense, thus giving firms a tax incentive to utilize stock options. Then in the 1990s an additional corporate tax incentive was given to encourage firms to use less salary and more performance based pay, with stock options being one of these choices. The US government also created preferential tax status for the recipients of options on the basis firms granted options with particular conditions.

The second category of influences investigated were instances of several companies which may be perceived as compensation market leaders, establishing a benchmark for other firms to follow, the majority of which are connected to the IT industry. This started with Fairchild semi-conductor, which in 1957, was considered as the first IT venture capital deal to use stock options. As a result persons involved with the deal eventually influenced the use of stock option compensation in firms when they left to start up major firms such as Apple and Intel. Some also consider Microsoft to have contributed to

raising the benchmark with the attention received from media reports of the company's broadbased stock option plans making thousands of employees millionaires. Then in the late 1990s, the growing number of millionaire's from internet start up companies were thought to play a role in influencing stock option usage, particularly as traditional companies started to lose executives to more start ups. Then in 2003, Microsoft was also thought to be a possible influence on firms to cease granting options upon the company's announcement to switch to restricted stock.

Although not many companies try to justify the levels of pay using academic research, in general the argument exists that academic research has to some degree led to some of the increasing levels of executive pay in the 1990s. The primary arguments are based upon Jensen & Meckling's seminal work in 1976 on agency theory, as well as Jensen & Murphy's work in the early 1990s showing levels of pay-performance sensitivity for executives had been lower than executives in several decades prior.

Some of the recent history surrounding accounting standards affecting stock option expensing has indicated that lax accounting standards have been a contributing factor to the changing levels of stock option usage by firms. This was mainly made manifest with the reaction of critics against the 1993 FASB proposed draft to require use of modern valuation models to expense stock options, with many fearing it would lead towards decreased use of options. The FASB experienced an unprecedented amount of controversy in response to the accounting standard exposure draft. Ultimately, partially in response to pressures, the FASB changed their stance to allow companies to voluntarily expense, yet compulsorily use of footnote disclosure. Ten years later, when the FASB sought to revise the standards, there was still controversy, yet not as much as there had been when compulsory expensing was initially proposed.

There is also anecdotal evidence to support the view market cycles have impacted on stock option compensation. One explanation suggests that during the bearish markets from the mid 1960s until early 1980s, some companies granted more stock options because each option had a lower perceived value by their recipients in this type of market. However, as the stock market began to become more bullish, the options granted to executives became more valuable, thus providing a higher benchmark level of pay in the future due to possible higher pay expectations. Alternatively, some observers have

suggested that due to excess managerial power managers may have been trying to take advantage of an upmarket, so that they get rewarded by factors outside of their control. So in the midst of the downmarket post 2000, executives may have lowered option compensation so they are not penalized for factors outside of their control.

Since 2002, there have been numerous notable bankruptcies related to corporate corruption, some of which blamed executive compensation packages and poor corporate governance. It has been suggested that the negative association of corporate corruption attached to tools such as stock options provides a disincentive to companies to use such tools. Additional negative media arose when it was revealed that many major companies had been deceiving the public and the SEC by backdating stock options to increase the moneyness of options being granted.

From the list of possible drivers of stock option issuance presented in the first chapter, the second chapter followed on with a theoretical perspective to help understand levels of executive stock option grants. Several major hypotheses regarding levels of stock option compensation already exist. Of these, none relate directly to some of the aforementioned factors identified in the history of stock option compensation, although taxes and market cycles could play a role in the managerial power hypothesis. Two of these hypotheses, the perceived cost hypothesis and the managerial hypothesis, both suggest levels are suboptimal. The former hypothesis suggests organizations have not properly understood the economic opportunity costs involved in granting options, and therefore have mistaken options as cheap compensation tools. Whereas the managerial hypothesis is based on the premise that there is poor governance and that manager's have excessive power to manipulate their own compensation packages. Alternatively there is the optimal contracting hypothesis which suggests that levels are actually at an optimal level.

Traditionally the optimal contracting hypothesis has been based on the notion of incentive alignment. But, in the second chapter an alternative form of the optimal contracting hypothesis is developed, from a more holistic perspective, by incorporating the impact of the various other costs and benefits resulting from granting options. These include numerous HR related benefits, such as attracting, sorting and retaining staff, as well as indirect benefits relating to a range of finance related issues, such as corporate governance, project selection, financing and tax issues. So while levels may be

considered suboptimal or excessive from a traditional incentive alignment perspective, current issuance levels may be overall optimal solution from a holistic perspective.

By analysing the different costs and benefits associated with stock option compensation, a “what-if” framework was established to distinguish the value of the firm without stock option benefits against the post-dilution value of a firm with stock option benefits. This framework proved useful in providing insight into the economic opportunity cost of option premiums foregone for a firm, as the common measure of option premiums is based on the firm’s current performance which incorporates the benefits from having granted options. In addition, by observing the net benefits of option premiums through incorporating dilution, it was found that forgoing underwriting stock options against the company under normal conditions produces a net loss. Sensitivity analysis using the framework developed helped show that dilution “costs” diminish with each additional share. Analysis based on conservative scenarios showed a typical firm would not expect to break even unless new option grants exceeded 23% of the number of shares of the firm, an unrealistically high level of options for a firm to grant. This high required level of grants would be even larger if after-tax implications and less conservative were incorporated. Thus, from a practical perspective, the net foregone benefits and costs of not underwriting options are negative, which makes it an inappropriate measure of economic opportunity cost.

As a result of identifying the costs and benefits associated with options, it was realised that the majority of these costs and benefits were found to be a function of moneyness, so costs and benefits were divided into three categories: unconditional, partially conditional, and conditional. It could be argued that conditional and partially conditional costs and benefits were dependent on the buoyancy of the market. By grouping the aforementioned benefits into three categories based on the benefit’s relationship with *moneyness*, a simplified model of a firm was developed to analyse the impact of differing factors on dilution costs and the minimum required benefits for a firm to grant stock options.

It was also found that smaller companies are more likely to benefit from stock options than larger firms due to some of the unconditional benefits. Of particular importance is the ability to attract higher quality talent. This benefit offered from stock options is like the a very important one, as attracting quality talent is usually interdependent on the

success of the firm. For small firms which benefit from attracting quality talent to fulfil potential, this can also be considered a way of increasing the moneyness of their stock.

When examining how the different types of benefits were affected by moneyness, the breakeven point for dilution costs (based on earning option premiums) were found to be independent on the state of the market. This seems to be because moneyness would increase both option revenue and dilution costs. However, for levels below the breakeven point, the increased moneyness increased the dilution costs at a faster rate than the option premiums, and vice versa for levels above the breakeven point.

The minimum value of required unconditional benefits received upon grant to break even is found to have a positive relationship with volatility and number of options granted. However, like dilution costs, required unconditional benefits only need to increase at a diminishing marginal rate. Once taxes are introduced, required unconditional benefits decrease slightly.

Analysis of required conditional benefits when there are no unconditional benefits and fixed grant levels, show that minimum required conditional benefits increase with moneyness. This is perhaps counterintuitive as expected conditional benefits increase with moneyness, however, it is indicative of the high costs involved with dilution of value. However, if option grant *values* ($) are fixed instead of option grant *levels (#)*, then the required conditional benefits decrease with moneyness as a result of increased moneyness decreasing the required option grant levels. When unconditional benefits are also incorporated into the model, required conditional benefits drop almost proportionately to the level of additional unconditional benefits at a ratio of 1:1.67. Under the assumption of unconditional benefits being an approximate proxy for the value added through incentives, this helps explain why a company with a lot of conditional and partially conditional benefits may have compensation packages which are excessive for incentive alignment purposes.

Although the second chapter established a framework that could possibly support the fact that stock option compensation levels have been optimal, without any empirical testing, it was not possible to rule out the premise that companies do not grant options at an optimal level. However, some evidence against the perceived cost hypothesis was presented,

which leaves one of two major explanations for suboptimal granting of options: the managerial power hypothesis, or an inept compensation committee.

As a means to possibly understand the intent of compensation committees, the final Chapter sought to test some of the anecdotal evidence from factors brought up in chapter one. Namely, 1) the impact of the bull market prior to and the bear market following the market crash of 2000, 2) changes in accounting standards for equity based compensation, and 3) the impact of several major bankruptcies associated with poor ethics and the resulting Sarbanes Oxley legislation.

Of these factors, only the influence of the market would support an optimal stock option compensation scheme. From either a traditional incentive alignment perspective, where an option's delta would be impacted by the market, or a number of other conditional and partially conditional benefits identified in the previous chapter, it is apparent that the market affects the magnitude of benefits that options have to offer, and therefore should influence stock option compensation policy.

On the one hand, evidence shows that market cycles seem to have played a role in relation to granting options out-of-the-money, however the practice was never common even at its peak of popularity. Evidence to support the view that a bearish market or poor stock performance influences stock option compensation itself is weak prior to 2001, as most companies that decreased or ceased granting stock options did so independently of how well their stock had been performing. The methodology used modeled the number of options granted on the basis of managing incentives, and did not incorporate other benefits and costs aforementioned in the previous chapter.

Other findings indicated the possible influence of accounting standards on economic decisions, even though they have no economic impact. On the one hand, decreases in stock option compensation levels is shown to be linked to accounting decisions, however, there is insufficient evidence to support the view firm wide decision making to cease granting stock options completely was based on accounting decisions.

This left much of the explanations of stock option compensation levels to the broad impact of events surrounding 2001-2, which seem to have not only led to lowered option

compensation, but also companywide influenced decisions to completely cease granting stock options.

5.2. Limitations and suggestions for further research

Due to a lack of data prior to 1992, chapter two was limited primarily to anecdotal evidence in attempting to identify key factors influencing stock option compensation practices. It could perhaps be of usefulness in the future, if option grants from a small sample of firms were "hand collected", and analysis undertaken to identify if significant changes did occur within a year of events identified in this chapter.

The other major factor regarding chapter two is its possible limited application outside of the US. There should be ample opportunity to track the development of option compensation in numerous other developed countries.

Although Chapter three establishes a framework to identify the optimal option compensation package via the impact on the value the firm from the costs and benefits from stock options, unfortunately the model was not used to actually determine an optimal solution. Future research using more sophisticated computer programming techniques, and simulation modelling should assist in "fine tuning" a more practical optimisation model. If the model is to be used in empirical modelling, in needs to be remembered that certain inputs are based retrospectively on events which did not happen, making it more difficult to use retrospectively than prospectively.

The final chapter, was limited by the sample requirements, and hand collected data. In particular, this limited the sample to larger publicly listed firms, only executives, of which had worked a minimum number of years. So the conclusions in the chapter were limited to executive stock option compensation at larger firms. Future research can be conducted in this area using more up-to-date data, as well as a larger data set, incorporating both broadbased options and executive stock options.

REFERENCES

Aboody, D., Barth, M.E, & Kasznik. R. (2004) Firms' voluntary recognition of stock-based compensation expense. *Journal of Accounting Research*, 42(2), 123-150.

AICPA (1973) *Accounting Principles Board: Accounting Principles Original Announcements*. Vol II.

Amroomin, G. & Lian, N. (2003) Hedging employee stock options, corporate taxes, and debt. *National Tax Journal*, 56 (3), 513-533.

Aristotle (translated by Jowett, B.) (2000) Politics: Aristotle. Dover publications, Incorporated.

Arnold, G.C. & Hatzopoulos, P.D. (2000) The theory-practice gap in capital budgeting: evidence from the United Kingdom. *Journal of Business Finance and Accounting*, 27(5/6), 603-626.

Arya, A. & Mittendorf, B. (2005) Offering stock options to gauge managerial talent. *Journal of Accounting and Economics* 40(1), 189-210.

Baker, A.J. (2004). The stock options book (6th ed.). Oakland:NCEO.

Baker, T., Collins, D., & Reitenga, A. (2003) Stock Option Compensation and Earnings management incentives. *Journal of Accounting, Auditing and Finance*. 18 (4), 557-582.

Balachandran, S., Kogut, B., and Harnal, H. (2010) The probability of default, excessive risk, and executive compensation: A study of financial services firms from 1995 to 2008.

Bebchuk, L.A., Fried, J.M., & Walker, D.I. (2002) Managerial power and rent extraction in the design of executive compensation. *The University of Chicago Law Review*, 69(3), 751-846.

Bebchuk, L.A., Cohen, A., & Spamann, H. (2010) The wages of failure: Executive compensation at Bear Sterns and Lehman 2000-2008. *Yale Journal on Regulation, forthcoming*.

Beck, P.J. & Zorn, T.S. (1982) Managerial incentives in a stock market economy. *The Journal of Finance*, 37 (5), 1151-1167.

Bens, D.A., Nagar, V., Skinner, D.J. & Wong, M.H.F. (2003) Employee stock options, EPS dilution, and stock repurchases. *Journal of Accounting & Economics*, 36(1), 51-90.

Bhagat, S., Brickley J.A. & Lease, R.C. (1985) Incentive effects of stock purchase plans. *Journal of Financial Economics*, 14(2), 195-215.

Black, F. & Scholes, M. (1973). The pricing of options and corporate liabilities. *The Journal of Political Economy*, 81(3), 637-654.

Broussard, J.P., Buchenroth, S.A, & Pilotte, E.A. (2004) CEO incentives, cash flow, and investment. *Financial Management*, 33(2), 51-70.

Bryan, S., Hwang, L., & Lilien, S. (2000) CEO Stock based compensation: An empirical analysis of Incentive-Intensity, relative mix, and economic determinants. *Journal of Business*, 73(4), 661-693.

Cadenillas, A., Cvitanic, J. & Zapatero, F. (2004) Executive stock options with effort disutility and choice of volatility. *Journal of Financial Economics*, 73(1), 71-92.

Carpenter, J.N. (2000) Does option compensation increase in managerial risk appetite? *The Journal of Finance*, 55 (5), 2311-2331.

Carter, M.E., Lynch, L.J., & Luann, S.L.C. (2004) The effect of stock option repricing on employee turnover. *Journal of Accounting and Economics*. 37(1), 91-112.

Carter, M.E., Lynch, L.J., & Tuna, I. (2007) The role of accounting in the design of CEO equity compensation. *Accounting Review*. 82(2), 327-357.

Carter, M.E., Lynch, L.J., & Zechman, S.L.C. (2002) The relation between executive compensation and earnings management: Changes in the post-Sarbanes-Oxley era. *Working paper*, University of Pennsylvania.

Chance, D.M. (1998) An introduction to derivatives. (4th ed.). Fort Worth, TX: The Dryden Press.

Chen, C.R., Steiner, T.L., & Whyte, A.M. (2006) Does stock option-based executive compensation induce risk-taking? An analysis of the banking industry. *Journal of Banking & Finance*, 30(3), 915-945.

Cheng, I., Hong, H.G., & Scheinkman, J.A. (2009) Yesterdays heroes: Compensation and creative risk taking

Ciccotello, C.S., Grant C.T., & Grant G.H. (2004) Impact of Employee Stock Options on Cash Flow. *Financial Analysts Journal*, 60 (2), 39-46.

Cipriano, M., Collins, D.W., & Hribar, P. (2001) An empirical analysis of the tax benefit from employee stock options. *Working paper*, University of Iowa.

Coles, J.L., Daniel, N.D, & Naveen, L. (2006) Managerial incentives and risk taking. *Journal of Financial Economics*, 79(2), 431-468.

Core, J.E. & Guay, W.R. (2001) Stock option plans for non-executive employees. *Journal of Financial Economics*, 61 (2), 253-287.

Crystal, G.S. (1968) What's ahead in Executive Compensation? In Moore, R.F.(Eds), Compensating executive worth New York: American Management Association.

De Angelo, H., & Masulis, R. (1980) Optimal capital structure under corporate and personal taxation. *Journal of Financial Economics*, 8 (1), 3-29.

Defusco, R.A., & Johnson, R.R., & Zorn. T.S.(1990) The effect of executive stock option plans on stockholders and bondholders. *The Journal of Finance*, 45 (2), 617-627.

Derrien, F. (2005) IPO Pricing in "Hot" Market Conditions: Who Leaves Money on the Table? *The Journal of Finance*, 60 (1), 487-521.

Dunbar, N. (2000) Inventing Money: the story of Long-Term Capital Management and the legends behind it. England: John Wiley & Sons:.

Emmanuel, C., Otley, D. & Merchant, K. (1990) Accounting for management control. (2nd ed.). London: Chapman and Hall.

Erkens, D., Hung, M., & Matos, P. (2009) Corporate governance in the 2007-2008 financial crisis: evidence from financial institutions worldwide.

Evans, T.G. (2003) Accounting theory: Contemporary accounting issues. New York: Thomson.

Farmer, R.E., & Winter, R.A. (1986) The role of options in the resolution of agency problems: a comment. *The Journal of Finance*, 41 (5) 1157-1170.

FASB (1995) Statement of Financial Accounting Standards no. 123

FASB (2000) FASB Interpretation no. 44

FASB (2002) Statement of Financial Accounting Standards no. 148

FASB 123 (2004) Statement of Financial Accounting Standards no. 123 (exposure draft)

FASB 123 (2004) Statement of Financial Accounting Standards no. 123 (Revised 2004)

Financial Accounting Standards Board. (2004). *FASB FAS 123R equity based*

compensation. Retrieved 1 December 2004, from http://www.fasb.org/projects/equity-based_comp.shtml

Fee, C.E., & Hadlock, C.J. (2003) Raids, rewards, and reputations in the market for managerial talent. *Review of Financial Studies*, 16 (4), 1315-1357.

Fenn, G.W., & Liang, N. (2001) Corporate payout policy and managerial stock incentives. *Journal of Financial Economics*, 60(1), 45-72.

Ferraro, P., & Taylor, L. (2005) Do Economists Recognize an Opportunity Cost When They See One? A Dismal Performance from the Dismal Science. *Contributions to Economic Analysis & Policy*, 4(1), 1469-1469.

Field, L. (1997) Is the institutional ownership of Initial Public Offerings Related to the long-run performance of these firms? *Unpublished manuscript. Pennsylvania State University.*

Fox, J. (1997) The next best thing to free money, *Fortune*, 136 (1), 52-59.

Graham, J.R., Lang. M.H. & Shackelford, D.A. (2004) Employee Stock Options, corporate taxes and debt policy. *The Journal of Finance*. 59 (4) 1585-1618.

Greengard, S. (1999), Stock options have their ups and downs. *Workforce*, 78 (12), 44-47.

Hall, B.J. & Knox, T. (2002) Managing option fragility. *Working paper*, NBER. Hall, B.J. & Liebman J.B. (2000) Tax policy and the economy. Cambridge: MIT Press.

Hall, B.J. & Murphy, K.J. (2002) Stock options for undiversified executives. *Journal of Accounting & Economics*, 33 (1), 3-42.

Hall, B.J., & Murphy, K.J. (2000) Optimal Exercise Prices for Executive Stock Options. *The American Economic Review*, 90(2), 209-214.

Harvard Business School Alumni. (1997). *Arthur Rock*, Retrieved 1 December 2004, from http://www.alumni.hbs.edu/bulletin/1997/december/rock.html

Hassan, E., Espahbodi, P., Rezaee, Z., & Tehranian H. (2002) Stock price reaction and value relevance of recognition versus disclosure: the case of stock based-compensation. *Journal of Accounting and Economics*, 33(3) , 343-373.

Haugen, R.A., & Senbet, L.W. (1981) Resolving the agency problems of external capital through options. *The Journal of Finance*, 36(3), 629-647.

Hellman, T. & Puri, M. (2002) Venture capital and the professionalization of start-up firms: empirical evidence. *The Journal of Finance*, 57 (1) 169-197.

Helwege, J. & Liang, N. (2004) Initial Public Offerings in Hot and Cold Markets. *Journal of Financial & Quantitative Analysis*, 39 (3), 541-569.

Hollan, L.C & Elder, E.M. (2006) Employee stock options in compensation agreements: A financing explanation. *Journal of Corporate Finance*, 12(2), 367-379.

IASB (2004) International Financial Reporting Standards Draft: Share Based Payments.

Internal Revenue Service (n.d.). *Untitled.* Retrieved 1 December 2004, http://www.irs.gov/businesses/page/0,,id%3D6971,00.html

Ittner, C.D., Lambert R.A. & Larker D.F. (2003) The structure and performance consequences of equity grants to employees of new economy firms. *Journal of Accounting & Economics*, 34 (1), 89-127.

Jensen, M.C. (2005) Agency costs of overvalued equity. *Financial management*, 34(2) 5-19.

Jensen, C. M, and Meckling, W.H. (1976) Theory of the firm: Managerial behavior, agency cost, and capital structure. *Journal of Financial Economics*, 3(4), 305-360.

Jensen, M.C. & Murphy, K.J. (1990a) CEO incentives – it's not how much you pay, but how. *Harvard Business Review*, 68(3), 138-149.

Jensen, M.C. & Murphy, K.J. (1990b) Performance pay and top-management incentives. *Journal of Political Economy*, 98(2) 225-264.

Johnson, S.A. & Tian, Y.S. (2000) The value and incentive effects of nontraditional executive stock option plans. *Journal of Financial Economics*, 57 (1), 3-34.

Kahle, K.M. (2002) When a buyback isn't a buyback: open market repurchases and employee options. *Journal of Financial Economics*, 63(2), 235-261.

Kahle, K.M., Shastri, K. (2005) Firm performance, capital structure and the tax benefits of employee stock options. *Journal of Financial and Quantitative Analysis*, 40(1), 135-160.

Kato, H.K., Lemmon, M., Luo, M., & Schallheim, J. (2005) An empirical examination of the costs and benefits of executive stock options: evidence from Japan. *Journal of Financial Economics*, 78(2), 435-461.

Kim, N.J. (1990) Do long-term incentive plans matter? *Business Forum*, 15 (2), 15-17.

King, P. (1975) Is the emphasis of capital budgeting theory misplaced? *Journal of Business Finance and Accounting*, 2(1), 69.

Kirschenheiter, M., Mathur, R. & Thomas, J.K. Accounting for employee stock options. *Accounting Horizons*, 18(2), 135-156.

Kobes, D. & Burman, L.E. (2004) *Preferential Capital Gains Tax Rates* . Retrieved 1 December 2004, from

http://www.taxpolicycenter.org/publications/template.cfm?PubID=1000588

Larker, D.F. (2003) Discussion of "employee stock options, EPS dilution, and stock repurchases." *Journal of Accounting & Economics*, 36(1), 45.

Lazear, E. (1995) *Personnel economics: Wicksell Lectures*. Cambridge and London: MIT Press.

Lerner, J. (1994) Venture capitalists and the decision to go public. *Journal of Financial Economics*, 35(3), 293-316.

Lee, I., Lochhead, S., Ritter, J. & Zhao, Q.(1996) The costs of raising capital. *Journal of Financial Research*, 19(1), 59-74.

Loughran, T. & Ritter., J. (1995) The new issues puzzle. *The Journal of Finance*, 50(1), 23-51.

Luckock, H. (2000). *A history of financial mathematics*. Retrieved 1 December 2004, from http://www.maths.usyd.edu.au:8000/u/hughl/Financial_Mathematics/history.html

Malkiel, B. G. (1973). A Random Walk Down Wall Street, (6th ed.). New York: W.W. Norton & Company, Inc.

Martin, K.J. & Thomas, R.S. (2005) When is enough, enough? Market reaction to highly dilutive stock option plans and the subsequent impact on CEO compensation. *Journal of Corporate Finance*, 11 (1-2), 61-83.

Miller, R.L. (2001) Economics Today. Boston: Addison Wesley Longman, Inc.

Muelbroek, L.K. (2001) The Efficiency of Equity-Linked Compensation: Understanding the Full Cost of Awarding Executive Stock Options. *Financial Management*, 30(2), 5-44.

Murphy, K.J. (2002) Explaining executive compensation: managerial power versus the perceived cost of stock options. *The University of Chicago Law Review*, 69(3), 847-869.

Nagaoka, S. (2005) Determinants of the introduction of stock options by Japanese firms: Analysis from the incentive and selection perspectives. *Journal of Business*, 78 (6), 2289-2315.

Nam, J., Ottoo, R.E., & Thornton Jr., J.H. (2003) The effect of managerial incentive to bear risk on corporate capital structure and R&D investment. *The Financial Review*, 38(1), 77-101.

Nohel, T. & Todd, S. (2005) Compensation for managers with career concerns: the role of stock options in optimal contracts. *Journal of Corporate Finance*, 11(1-2), 229-251.

Nordquist, K. & Ellingson, D.A. (1997) The controversy over accounting for stock options: a historical perspective, *Mid-American Journal of Business*., 12(2), 29-38.

Oyer, P.O. & Schaefer, S. (2005) Why do some firms give stock options to all employees?: An empirical examination of alternative theories. *Journal of Financial Economics*. 76(1), 99-113.

Park, W.K, & Smith, T. (2004) On the Progress of Option-Regulating Legislation *Working paper*. The University of New Hampshire.

Parkin, M. (2005) Economics. Boston: Addison Wesley Longman.

Public Broadcasting Service (n.d.). *Frontline:bigger than Enron: congress and the accounting wars.* Retrieved 1 December 2004, from http://www.pbs.org/wgbh/pages/frontline/shows/regulation/congress/

Rees, L. & Stott, D.M. (2001) The Value-Relevance Of Stock-Based Employee Compensation Disclosures. *Journal of Applied Business Research*, 17 (2), 105-117.

Robinson, D. & Burton, D. (2004) Discretion in Financial Reporting: The voluntary adoption of Fair Value accounting for Employee Stock Options. *Accounting Horizons*, 18 (2), 97-108.

Ryan Jr., H.E., & Wiggins, R.A. III (2001) The influence of firm-and manager-specific characteristics on structure of executive compensation. *Journal of Corporate Finance*, 7(2), 101-123

Ryan Jr., H.E., & Wiggins, R.A. III (2002) The interactions between R&D Investment decisions and compensation policy. *Financial Management*, 31(1), 5-29.

Samuelson P.A & Merton R.C. (1969) A complete model of warrant pricing that maximizes utility. *Industrial Management Review*, 10(1), 17-46.

Samuelson P.A. (1965) Rational theory of warrant pricing. *Industrial Management Review*, 13-32. Reprinted in Cootner

Schrand, K. (2004) Discussion of "Firms' voluntary recognition of stock-based compensation expense". *Journal of Accounting Research*, 42(2), 151-158.

Seethamraju, C. & Zach, T. (2004) Expensing stock options: The role of publicity *Working paper*, Washington University in St Louis.

Sprenkle, C. (1961) Warrant prices as indications of expectations. *Yale Econ Essays*, 179-232. Reprinted in Cootner

Tian, Y.S. (2004) Too much of a good incentive? The case of executive stock options. *Journal of Banking & Finance*, 28(6), 1225-1245.

Wettling, R.E. (1968) An up-to-date look at stock options and their use. In Moore, R.F.(Eds), Compensating executive worth New York: American Management Association.

Wong, D. (2003). *Untitled.* Retrieved Retrieved 1 December 2004, from ,http://www.grahamdunn.com/cybergrahams/dfw_August2003.htm

Yermack, D. (1995) Do corporations award CEO stock options effectively. *Journal of Financial Economics*, 39(2-3), 237-269.