Consequences of stock option expensing with FAS 123R in the US high-tech industry

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Abstract

With significant equity incentives in its compensation structure, stock option expensing approval affects the compensation structure in the US high-tech industry. A large sample analysis shows that in response to FAS 123R in 2005, the proportion of options offered to CEOs and Top 5 Executives at high-tech firms has decreased, with significance. This in turn does not seem to change, significantly, risk-taking incentives, measured by vega, of CEOs and Top 5 Executives in this industry.

Following the same tendency, a small sample of 10 US high-tech companies presents that non-named executives and employees have suffered a decrease in options offerings from 2002 to 2006 accompanied by the introduction of restricted stock units (RSUs) and the introduction (in some cases) of a binomial option-pricing model. Contradicting this tendency non-employee directors have seen an increase in the level of options granted in the light of FAS 123R.

Key Words: FAS 123R, US, High-tech, Stock options, CEOs, Top 5 Executives, Non-named Employee executives, Non-employee directors

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Chapter 1 – Introduction

1.1 Motivation

With the intention of extending equity compensation studies for other influential industries, this dissertation focuses in the role of equity incentives – stock options – in US high-tech industry. The technology sector has not only revolutionized traditional business models since the internet boom in the 1990's, but has also been linked to an interesting remuneration system aimed at creating a "bond" between the employee and the company with the use of equity – namely stock and stock options. Therefore, I intend to study how the introduction of a new regulation demanding stock options expensing – FAS 123R – affected the compensation structure in the high-tech industry and what potential consequences can it have to management's risk-taking incentives. I will start by measuring the impact of FAS 123R on stock options offerings and risk-taking incentives for CEOs and TOP 5 Executives to further extend the analysis to lower hierarchical levels in the sector.

However before examining the influence of stock option in high-tech one has to frame the role of stock options in the overall compensation structure over the years. Generally, over the last decades one was able to witness remarkable changes over the usage of stock options has a compensation component to reward top executives. According to Murphy (2012), the 1990's marked a time were stock-option usage more than tripled, boosting CEO pay of S&P 500 from 1990 to 1999. However the beginning of the new century was accompanied by a decrease in executives overall pay not only in the US[1] but also internationally, especially

[1] Fernandes *et al.* (2013)

during the economic crises of 2008-09. In addition, new regulatory measures[2] not only slowed down the usage of stock options but also substituted it as a reward mechanism for restricted stock. Actually, several streams of literature have been focusing on the fact that companies used to perceive stock as a "free grant" with no expenses attached[3]. As Hall and Murphy (2003) argue, as a result of a favourable accounting treatment, companies used to perceive the cost of options to be lower than its economic cost. But the array of corporate accounting scandals since the 2000s, such as the Enron corporate scandal[4] and the Worldcom internal auditing fraud[5], call out to the attention of regulators for improved accounting measures. Similar to this issue, Carter *et al.* (2007) argues that the non-expensing of stock might be one of the reasons why CEO compensation has been increasing over the years. To reduce the public scrutiny surrounding options accounting treatment, FASB stated it would start considering a regulation demanding an accounting expense of stocks[6] to have tangible implementation by early 2004. This proposition has since been supported by the International Accounting Standard Board[7] that aims at expensing stock in international companies. The influence of the accounting impact implicit in this regulation change seems to be something that concerns not only practitioners but also researchers. Hayes *et al.* (2012) and Carter *et al.* (2007) share the same view that accounting represents a major influencer when it comes to the design of compensation contracts. As

[2] Details of regulation are described in Hall and Murphy (2003).

[3] As stated in Hall and Murphy (2003).

[4] For a more detailed overview of the major developments surrounding this case, more information can be found at: http://www.economist.com/node/940091

[5] One of the major frauds in recent years with major implications for the auditing industry. Overview of this case at: http://news.bbc.co.uk/1/hi/business/2066731.stm

[6] Detailed description of the regulation can be found at: http://www.fasb.org/news/nr073102.shtml

[7] The IASB as always shown concern over fair value practices related to stock options expensing. Especially, after the major accounting scandals in the US: http://online.wsj.com/news/articles/SB107713353964432916

Hayes *et al.* (2012) refer, companies foreseeing high damages in earnings arising from stock options expensing are expected to reduce more their option usage than other companies. This might lead one to question if companies that give major importance to option usage for increasing convexity will favour the accounting impact over risk-taking incentives. High-tech companies serve as a good example of this problematic, because they need to incentivise managers to take risks by disrupting with innovative products, but also, maintain their accounts sustainable.

Considering the above mentioned, it would be interesting to understand how US companies in the technology sector, that rely heavily on stock options incentive plans to attract and retain key employees, reacted to this unfavourable accounting treatment. Additionally, it would be important to understand what are the implications of this measure on the level of convexity of compensations contracts measured by vega. This seems not only relevant for high-tech companies but also to the overall set of public corporations[8]. How high-tech companies changed their equity compensation plans? Will the size of stock options be reduced in compensation contracts? Will stock options grants be granted to fewer employees? Will companies make an effort to maintain management risk-taking incentives measured by vega? These are all questions that seem worth exploring.

[8] By relying less in stock option grants, one would expect non-high-tech companies to be less impacted by this regulation.

1.2 Outline

In this dissertation I analyse the impact of FAS 123R on high-tech US companies at several hierarchical levels on a large sample using an ExecuComp dataset, from 2000 to 2007. Firstly, I put my focus on the consequences of FAS 123R stock option offerings for CEOs and Top 5 Executives. I was able to understand that the proportion of options has diminished significantly on CEOs and Top 5 Executives at high-tech firms from 2005 onwards. The average CEO in a high-tech firm as suffered an incremental decrease of 10.7 percentage points in the proportion of options offered after 2005, comparing to all public companies in the sample period. Furthermore, by defining vega as my proxy for measuring risk-taking incentives I recognize that CEOs and Top 5 Executives' current and total vega for high-tech firms do not seem to be affected with significance by this regulation change. In contrast all other companies (excluding high-tech) in my sample have seen a decrease in CEO and Top 5 Executive's current and total vega values. This fact – that contradicts my initial hypothesis – led me to a more qualitative research on proxy statements and annual reports of high-tech companies that would enable me to have a solid interpretation of these results. This made me hypothesize that to maintain risk-taking incentives (vega values) high-tech companies recurred to other compensation mechanisms that were creating similar incentives: restricted stock units and indexed stock options are among the most used alternatives.

Finally, I decided to extend my analysis to lower hierarchical levels, with the objective of understanding if non-named executives and employees that still have a major influence at high-tech companies, have seen their level of stock options decrease. By constructing a small sample of 10 major US players in the high-tech

business, I realized that since 2005 companies have been reducing the amount of stock options they offer to non-employees. From this overall sample the number of options has decreased almost 52% from 695,721 to 361,165. Inclusively, foreseeing the negative effects of FAS 123R, some companies have excluded options from their compensation mechanisms. Also, it was perceptible that some companies in my sample have adopted a binomial option pricing model – instead of the Black-Scholes module – with the objective of reaching a better precision in valuing options, which is in accordance with FAS 123R principles. The last focus of my study goes to the changes in stock options offerings to non-employee directors, that apparently have seen their level of options increase within the 2002-2006 period. A fact that contradicts the overall tendency of options usage after 2005.

Chapter 2 – Literature Review

2.1 Introduction and basic concepts

Agency theory predicts that managers, who are provided with indirect equity holdings, such as stock options, have greater incentives to improve the economic value of the firm (Larcker and Tayan, 2011). This concept relies on the underpinnings of the principal-agent agency problem where the principal cannot perfectly observe the agents actions giving rise to an ex-ante (adverse selection) or ex-post (moral hazard) asymmetric information issue. Also, measuring incentives provided by equity components has always been undermined by endogeneity issues. As Roberts *et al.* (2012) put it, the major implication related to endogeneity, is that it will bias any regression results, avoiding research to measure the real magnitude of the desired object of study. Nonetheless, stock options usage as a compensation component has always been a relevant topic in academia. And, when measuring incentives from stock options (or any other equity component) researchers focus their attention into two different dimensions of the pay-for-performance relation: ownership and convexity.

2.1.1 Ownership and Convexity

In estimating ownership arising from stock options, one has to weight the extent to which options are in or out of the money, which can be assessed using option delta – change in the value of stock option for an incremental change in the stock price. Incentives end up to be low when options are out-of-the-money and eventually comparable to that of stocks when in the money. Aiming to study the magnitude of several incentive mechanisms in compensation policy, Jensen and Murphy (1990)[9] suggest a dollar-for-dollar measure for option delta closely associated to managerial percentage ownership[10]: change in CEO wealth per $1,000 change in shareholder wealth. According to them, the median pay-for-performance sensitivity for stocks and stock options is $2.50 per $1,000 change in shareholder wealth. To a larger extent, the authors advocate that the pay-for-performance sensitivity has been reduced since the 1930s translated into a CEO wealth change of $3.25 for every $1,000 change in shareholders wealth[11]. However, Hall and Liebman (1998)[12] argue that not only Jensen and Murphy's measures rely on a time horizon associated with the burst of stock options issuance, but also that they focus entirely on CEO wealth changes relative to firm value. So, they propose an alternative way to account for option delta that takes into account the dollar change in option value with respect to a 1% change in stock price. Although they agree that pay-performance sensitivity is majorly driven by changes in the value of stock and stock options – according to them

[9] Jensen and Murphy (1990) study composes Executive Compensation Surveys published by Forbes between 1974 and 1986, comprising a total of 1,688 executives from 1,068 firms.

[10] Managerial percentage ownership usually refers to the effective CEO ownership that arises from stock, restricted stock and stock options.

[11] The authors justify this reduction in sensibility by hypothesizing that public and private forces might impose constrains to reduce pay-for-performance sensibility.

[12] Hall and Liebman (1998) analyses runs from 1980 to 1994 and agglomerates CEO compensation from proxy statements and 10-K files.

stock and stock options revaluations rise median CEO wealth by $1.5 million for a 10% increase in firm value for US firms – they oppose to Jensen and Murphy (1990) reflection, arguing that CEO compensation and pay-for-performance sensitivity has increased from 1980-1994. To sustain their point they segment firms into percentiles according with their stock performance and explain that total compensation for the median CEO is $1 million if the companies' stock has a "thirtieth percentile annual return (- 7.0 percent) and is $5 million if the firm's stock has a seventieth percentile annual return (20.5 percent)". This shows a great difference in pay between poor performing and good performing companies, indicating great sensibility in the pay-for-performance relation.

Although the slope of the wealth-performance relation – option delta – provides guidance in aligning incentives of managers with those of shareholders, a higher delta might expose managers to too much firm risk. This gives place to the two side-effect of the performance-based pay, arising from the risk-related agency problem: the wealth effect that aligns managers' incentives with the interests of shareholders, versus, the risk-aversion effect arising from an increased delta that exposes risk-averse managers to more risk. As documented by Smith and Stulz (1985), risk-averse managers might avoid risky, positive net present value projects because they have much of their wealth tied to the firm. May (1995) goes even further and presents empirical findings consistent with the fact that managers with "large stock holdings undertake risk-reducing acquisitions". This is when convexity "plays its role" in mitigating risk related agency problems arising from delta. Convexity denoted in the wealth-performance relation assesses the sensitivity of managers' wealth to the volatility of stock price and is majorly measured through option vega: value of managers' stock options for a given

change in stock-return volatility. By measuring vega of options, "as the Black-Scholes partial derivative of option value with respect to a 0.01 change in stock return volatility" Guay (1999) documents that stock options significantly influence the increase in convexity in CEO's equity-based pay. The author's results are even complacent with the fact that companies are willing to introduce more convexity in compensation contracts when they know beforehand that the downside of underinvestment by a risk-averse agent is too large (situation that is likely to occur for companies that have substantial investment opportunities). This association study – and not causal effect – motivated further research over the determinants of vega in an attempt to establish a causal relation between vega and corporate policies.

2.2 Causality in vega-firm risk relation

Establishing the direction of causality on the vega-firm risk relation as always proved to be a problem for research, mainly attributed to endogeneity concerns. This works the same when trying to measure the effects of vega on corporate policies or risk, which leads to the question if there is any "underlying and omitted primitive factor" that determines the association between vega and equity risk. By controlling for CEO delta and using refined modelling and econometric empirical methods to control for endogenous issues, Coles *et al.* (2006) make an effort to go further in research and establish causality between vega and corporate policies. By hypothesizing that higher vega values must result in higher R&D spending, less capital expenditures, decreased diversification and higher leverage, the authors claim to have discovered that a high vega leads to the implementation of riskier policy choices. Fact that leads to the general overview that a higher sensitivity to stock price volatility associated to CEO compensation

schemes incentivises managers to pursue riskier policy choices. Moreover, in an effort to extend risk-taking causality analysis to other corporate roles, Chava and Purnanandam (2010) centre their study in CEOs and CFOs different reactions towards financial polices when exposed to different risk-taking incentives. The study explains that CEOs risk incentives are associated with leverage and cash balances while CFOs risk motivations relate more to debt-maturity and "earnings smoothing throw accounting accruals". It is worth to mention, that the authors come up with a different approach to establish causality by exploiting the accounting standard SFAS 123 (R) that demands stock options expensing (which made options a less attractive remuneration tool). Still, since all companies get affected by this regulation it becomes difficult to create a control group that would track the normal course of events and make it possible to establish a difference-in-difference analysis. Nonetheless, it is generally accepted that stock options influence significantly convexity levels in compensation contracts. Also as Hemmer *et al.* (1990) state, it seems optimal to increase convexity in manager's contracts when there is an interaction between incentives and firm risk.

2.3 Risk-taking incentives in banks

Given the importance of risk-taking incentives in manager's actions, several streams of literature were devoted to narrow down this topic and understand how key institutions with major socio-economic roles, such as banks, behave. Risk taking incentives in banks reveals itself as an interesting topic of research due to the role that deposit insurances perform as a self-guard mechanism for depositor's savings. By reducing incentives to "run to the bank" in case of financial trouble, depositors lose as well their interest in monitoring banks activities giving rise to a moral hazard problem. Bank shareholders are then incentivised to shift risk from the bank to the deposit insurance agency by changing the incentives mechanism given to their top executives. One can actually see the issue as deposit insurances being a put option of shareholders intended to sell the banks' assets to the deposit insurance entity. Thus, literature devoted to explain the mechanics behind compensation policies in banks is mainly surrounding two main theories: the moral hazard hypothesis stating that compensation policies in banks encourages risk taking in order to maximize the put option value embedded on fixed rate deposit insurances; and the contracting hypothesis that defends compensation policies are just the mere reflection in firm's investment opportunities set. Based on these opposing views Houston and James (1995) devoted themselves to understand if the level and structure of pay for CEOs in banks is different from industrial firms. According to them banks seem to have a lower market-to-book ratio reflecting that investment opportunities are smaller in banks as this is a heavily regulated industry. Comparing with non-banks, banks present a lower market value of CEO stock holdings, option holdings and value of options granted per year. This appears to offer support for the contracting hypothesis claiming that

due to banking regulation limits the investment opportunity set decreases, leading to less need for incentive-based compensation. Also, by controlling for firm size, risk characteristics and bank charter value of 134 commercial banks, the authors' results present more alignment with the contracting hypothesis. They observe a positive relation between CEO total stock outstanding and market-to-book, supporting the view that higher growth opportunities lead to higher ownership, and vice-versa. In addition, there seems to be no evidence that banks that appear to be "too-big-to-fail"[13] receive more equity incentives. Which overall, may lead one to conclude that compensation in banks, although different, it does not incentivize CEOs to take excessive risks. Similar to this problematic John and Qian (2003) devoted themselves to understand if CEO compensation in banks was different from that in manufacturing firms. Based on the fact that banks are regulated, highly leveraged and have a deposit insurance mechanism, they compare pay-performance sensitivities in banks with the sensitivity in manufacturing companies. Using the Jensen and Murphy (1990) measure of dollar change in CEO compensation per $1,000 dollar change in shareholder value these researchers conclude that pay-for-performance sensitivity is lower in banks comparing with manufacturing companies. After regressing direct and firm-related wealth changes towards size, risk and debt ratio, John and Qian (2003) conclude that debt ratios have a significant impact in reducing the pay-performance sensitivity. Although the authors attribute the lower sensitivity to leverage, prior findings of Hirschey and Pappas (1981) or Carroll and Ciscel (1982) attribute also some responsibility to the lower pay-for-performance

[13] In this study the term "too-big-to-fail" is meant to refer to banks that have such a huge weight in the overall economy, making regulators believe that any governing body would try to avoid their collapse and prevent bankruptcy.

sensitivity in banks due to the role of regulation. Regulation can serve as substitute mechanism for monitoring top executives actions, which consequently may lower pay-performance sensitivity. Also, if one considers that large banks are usually monitored by several investment analysts, this can actually contribute to increase transparency levels compared to other industries. On the other hand, despite all regulatory measures, banks have been the target of public scrutiny as a consequence of the latest financial crises. Major financial institutions were struggling to survive financial distress periods while being overwhelmed with some corporate scandals violating banks regulation. This fact has called the attention of researchers and practitioners that question themselves if top executives in banking were receiving the right incentives. Some critics defend that one of the major causes was related to the poor long-term incentives put in place for top executives. The excessive bonus plans, for example, made bank CEOs to focus only on short-term performance indicators in detriment to long-term sustainability. Also, stock option plans recalled the previous moral hazard hypothesis by taking the blame of incentivizing CEOs to increase call option values of equity to a less than optimal scenario. Despite that, it is still reasonable to assume that overall equity incentives would make CEOs focus on the long-term. Following this line of thought, Fahlenbrach and Stulz (2011) became interested in understanding if bank performance throughout the financial crises had something to do with the incentives being provided by shareholders before the crisis. The focus is not in the size of compensation but on the incentives effect of the compensation. In their sample of S&P ExecuComp 95 bank holding companies and investment banks it is perceptible that the majority of CEO compensation comes from performance-based pay. The value of the equity

portfolio is in fact more important to CEOs comparing to non-executives that value more cash bonus awards. Hence it would be expected that CEOs with better incentive alignment – meaning more wealth tied to the firm – would take less risky investments once they had more to loss. And by risking less it could be that better performance would be expected in the future, especially in financial distress periods. Opposing to this view the authors actually state that banks with better incentive alignment perform worst during the financial crisis. Along with decreases in performance it appears that CEOs have suffered great losses on their overall wealth, with some of them increasing their percentage holdings right before the eruption of the crisis events.

2.4 FAS 123 R conceptual framework

Equity-based compensation accounting regulation dates as late as 1972 when the Accounting Principles Board (APB) issued APB Option 25. This piece of regulation stated that stock-based compensation should be recorded at its intrinsic value. By intrinsic value one refers to the difference between the market price of the stock and its exercise price. Also, APB 25 only demanded the expense of stock compensation if the exercise price was less than the existent price at the grant date (the date where the exercise price and the number of shares are known). However, in 1993 the Financial Accounting Standards Board (FASB) – the successor of APB – emitted a draft requiring companies to state the value of stock-option grants granted to employees as a compensation expense in the year the grant was made. This urged a round of protest from some industries – especially from the high-tech sector – that were granting large amounts of stocks options and feared a downturn on performance indicators with the reduction of earnings. With this concern in mind FASB issued a final regulation, FAS 123, that although was appealing companies to expense stock option grants, it was allowing them to use APB 25 as a reporting reference. Thus, between 1995 and 2005, companies were reporting equity-based compensation under FAS 123 having the option to expense (or not) stock-option grants.

Everything appeared to be stable when FASB decided to challenge the *status quo* and released an amended version of FAS 123 in 2004. This revision, named FAS 123R, forced companies to comply with the principal of fair value accounting in the Income Statement. Meaning that from June 15, 2005[14], all

[14] Later on this date was revised for January 2006 following the polemics created by this rule in certain industries.

public companies – that do not file as a small business issuer – were obliged to expense stock-options at fair value. The major implication of this was that, before FAS 123R firms were allowed to expense stock options at its intrinsic value. Considering most companies grant their options "at the money", firms ended up not recognising any expenses for option-based compensations in its annual reports. This (favourable) accounting treatment represented a major advantage for companies, especially if they attribute more value to the perceived cost of options than to its economic cost. In fact, Hall and Murphy (2003) argue that this practice makes the perceived cost of options to be lower than their economic cost. However, after 2005, FAS 123R mandated that all stock options must be expensed at fair value. Now, stock options are measured by fair value resulting in a compensation expense in the Income Statement. So, if firms give more value to the perceived cost (instead of economic cost) of options, they will presumably change their incentive plans and executive compensation packages to offset the disadvantages of stock options accounting treatments[15]. If one considers that the high-tech sector is mainly characterized by offering substantial equity awards – mainly stock and stock option – to retain key employees, FAS 123R will have a major impact on this sector's activity. Not only in reformulating its compensation structure but also in maintaining convexity in compensation contracts with options offerings. Therefore, Chapter 3 and 4 will focus on the influence of FAS 123R in stock options usage and major implications in risk-taking incentives for all public firms with major focus in high-tech companies at several hierarchical levels: CEO; Top 5 Executives; Non-executive employees; Non-Employee Directors.

[15] In relation to other equity forms of compensation they were not so majorly affected by FAS 123R. Restricted Stock, for example, is essentially viewed "as a fixed option with an exercise price of zero" (Hayes *et al.* 2012), so its accounting treatment is its fair value at the grant-date. Additionally, although equity awards and long-term equity incentives awards has suffered slighter changes it did not have the same impact compared to stock options.

Chapter 3 – Large Sample Analysis

3.1 Introduction, data and summary statistics

I use the ExecuComp database as my source to calculate CEO and Top 5 Executives[16] compensation separately. This dataset contains compensation information from fiscal year 2000 to 2012. My panel data analysis measures changes in compensation structure from 2000 through 2007. FAS 123R became mandatory for all public entities – that do not file as a small business issuers – at June 15, 2005[17]. I decide to define the post-FAS 123R period as January 2006 to December 2007, with my pre- period being from January 2000 to December 2005. This will allow me to capture the real effect of this measure after the adjustment period that companies had to pass by in 2005. Although there were some early adopters[18] already implementing this procedure in their reports, I strongly believe they are a small minority that will not influence final results. In addition, my intention is to establish the strongest relation possible between the ruling introduction, changes in options grating and consequently changes in vega. Extending my analysis further than 2007 could undermine the overall regression analysis, considering the financial crisis period that follows. Dodd-Frank Act

[16] My variable for Top 5 Executives was created by sorting the data by total compensation and generating a dummy variable that would assemble a number for 1 to 5, excluding the CEO, for the 5 highest paid executives in each firm.

[17] It is worth mention that although the general rule was June, 2005 several exceptions were opened and FAS 123R became completely mandatory for some companies in January 2006.

[18] Some companies were already expensing stock options in their accounts to mitigate the abrupt change in performance indicators in 2006. Microsoft, for example, started as early as 2003. However, it is worth mention that including 2005 in the post-FAS 123R period does not change the magnitude of my results. Also, Warren Buffet was a major proponent of this law approval. So basically all the companies he was the major stockholder of companies where he was serving at the board of directors started the early adoption of FAS 123R. The Coca Cola Company, The New York Times, The Washington Post (owned by Graham Holdings Company) are some of the most sounding examples of early adoption.

(2010)[19] combined with other legislation, introduced several changes around executive compensation that make it more difficult to extract the real effect of FAS 123R on high-tech or any other company. Also, I require that all firms have at least one year of data in the pre- and post-FAS 123R period. In resemblance to Hayes *et al.* (2012), I exclude financial firms – with standard industrial classification (SIC) code from 6000 to 6999 – and utility firms – with SIC code from 4900 to 4999. These firms operate in a quite specific market environment, abiding to detailed regulation and restrictions that influences their overall behaviour. As Fama and French (1992) put it, financial firms, for example, have high leverage ratios which are considered normal for the industry, but might be interpreted as financial distress comparing with other activities. So, excluding them seems to be a better option for the sake of results interpretation.

Moving on to qualitative characteristics of the data it is worth mention one detail. All of the data collected – for the proportion of salary, bonus, grants of stock options, grants of restricted stock and long-term incentive awards – does not take into consideration further changes in reporting requirements implemented by SEC within this period. In contrast to Hayes *et al.* (2012) I do not incorporate new disclosure rules that end up redefining some compensation components as the case of bonus[20]. Because I take for granted the assurance of consistency in

[19] The Dodd-Frank was signed in July 2010 by President Barack Obama and is majorly aimed at regulating financial market in an attempt to avoid another financial crisis similar to the one started in 2008. The introduction of a new independent organization to protect consumers, the extinction of the Too big to fail rule, the introduction of rules to protect investors such as "say on pay" and the introduction of tougher rules for transparency and accountability are among some of the new measures brought up by this act (www. http://www.cftc.gov/lawregulation/doddfrankact/index.htm).

[20] Hayes *et al.* (2012) mention new disclosure rules end up reclassifying some bonuses as non-equity incentives compensation, which changes the way this component is accounted for proxy statements.

measurements across time, I believe that changes within this period will not affect my main variables of study: option grants and vega.

Besides the compensation components for the CEO and Top 5 Executives I present summary statistics for high-tech firms, extracted with Compustat from 2000 to 2007. Market-to-book (MTB) is computed as the market value of equity plus total liabilities (TL), divided by total assets (TA). Research and development (RD) is deflated by Total Assets (RD/TA) and capital expenditures (CAPEX) is deflated by total assets (CAPEX/TA). Size is the logarithm of total assets and tenure represents the years the CEO is on the job.

I merge both the ExecuComp data with Compustat for the CEO in one file and similar to that for the Top 5 Executives in a separate file. In both merged files I create a dummy variable to segment the data for high-tech (High_tech) companies. High-tech companies are defined using the Fama and French classification of 48 industry groups, taking the value of 1 if the firm is operating in an industry with a four-digit SIC code equal to: 3570, 3571, 3572, 3576, 3577, 3661, 3674, 4812, 4813, 5045, 5961, 7370, 7371, 7372 or 7373.

The full sample for the CEO and Top 5 Executives, for high-tech companies is presented in Table 1. Details about the calculation of the proportion of each compensation component are presented in Appendix A. I follow previous literature (Guay, 1999; Coles *et al.* 2006) to compute the sensitivities of annual compensation to changes in stock price expressed by vega. Thus, current vega (VegaC_opt) is calculated as the change in value of CEO or Top 5 Executives' annual equity-based compensation for a 0.01 change in stock price volatility. Similarly, I compute the sensitivities for the CEO and Top 5 Executives' total

portfolio of current and outstanding prior grants of shares and options, expressed by Vega_tot. Detailed description about these variables follows in Appendix A, as well.

Table 1 states summary statistics from 2000-07 in high-tech firms. Firstly, I present statistics regarding the fraction of total compensation arising from each pay element. On average, stock represents the biggest proportional component (P_option) of compensation packages for CEOs in high-tech firms – 45.8 % of total compensation. The same is true for Top 5 Executives with 39.4% of stock options, on average[21]. In relation to incentive measures, namely vega[22] both current and total vega present higher values for CEOs in high-tech, comparing with Top 5 Executives. For example, a 0.01 change in stock return volatility implies an average change in CEO current stock option value of $46,035 comparing with $14,418 for the Top 5 Executives. Being the CEO offered more stock options it would be reasonably expected higher sensitivity. Assuming as well that the CEO is responsible for taking major corporate decisions in a firm it is expected a higher pay-for-performance sensibility attached to this role, in the hopes of avoiding deviations from optimal performance levels. However, there is an important detail there is worth mention: vega values seem to present significant higher values for the average when compared to the median for CEOs and Top 5 Executives. For example, VegaC_opt for a CEO in a high-tech company is $46,035 on average when compared to $10,783 for the median. This indicates that the distribution is positively skewed.

[21] Although the proportion of salary it is quite close to the same level with Top 5 Executives receiving 37.9% of its compensation in salary.

[22] Values expressed in thousands of dollars.

Table 1 – *Summary statistics, all sample years (2000-07)*

Variable	N	Mean	Sd	p25	p50	p75	Variable	N	Mean	Sd	p25	p50	p75
For CEO in High-Tech							**For Top 5 Executives in High-Tech**						
Percentage of CEO compensation							**Percentage of Top 5 Executives compensation**						
P_salary	1526	0.317	0.309	0.091	0.191	0.439	P_salary	6920	0.379	0.292	0.147	0.292	0.559
P_bonus	1526	0.119	0.174	0	0.046	0.172	P_bonus	6920	0.127	0.165	0	0.068	0.189
P_option	1526	0.458	0.355	0	0.518	0.782	P_option	6920	0.394	0.331	0	0.410	0.683
P_RS	1526	0.097	0.221	0	0	0	P_RS	6920	0.093	0.203	0	0	0
P_LTIP	1526	0.009	0.061	0	0	0	P_LTIP	6920	0.007	0.055	0	0	0
Vega values (thousands of dollars)							**Vega values (thousands of dollars)**						
VegaC_opt	1531	46.035	156.037	0	10.783	40.291	VegaC_opt	6922	14.418	49.331	0	3.350	11.550
Vega_tot	1531	237.478	535.181	21.202	68.963	226.652	Vega_tot	6922	60.140	150.241	4.882	17.547	49.501
Num_Option_c (thousands)	1531	3.092	5.93	0	1.322	3.678	Num_Option_c (thousands)	6922	1.01	2.475	0	0.361	1.078
Other Variables							**Other Variables**						
Size	1531	6.985	1.697	5.758	6.793	7.900	Size	6922	7.042	1.680	5.811	6.838	7.944
RD/TA	1531	0.090	0.084	0.034	0.081	0.132	RD/TA	6922	0.089	0.079	0.034	0.081	0.131
MTB	1520	2.653	2.482	1.383	2.000	3.135	MTB	6873	2.664	2.536	1.386	2.001	3.137
CAPEX/TA	1525	0.041	0.039	0.015	0.027	0.052	CAPEX/TA	6897	0.041	0.039	0.015	0.028	0.053
ROA	1527	0.091	0.154	0.045	0.108	0.162	ROA	6902	0.093	0.147	0.046	0.108	0.162

Notes. Summary Statistics for CEO and Top 5 Executives in high-tech firms over the entire sample period. The sample contains observation from 2000 through 2007. Details about the construction of the percentage variables of each compensation component and definition of sensitivity measures of pay are presented in Appendix A. Size is the logarithmic value of total assets; RD/TA is R&D expenses deducted by total assets; MTB is the Market-to-book value; CAPEX/TA is CAPEX deducted by total assets; ROA refers to Return on Assets.

Table 2 presents summary statistics for the pre- and post-FAS 123R periods for the CEO in high-tech companies. On average, the proportion of options (P_options) for the CEO in high-tech firms seems to have diminished expressively – from 51.4% to 29.5%. The proportion of salary (P_salary) and restricted stock (P_RS) increased for the CEO in the post- FAS123R period, especially P_RS: from 4.3% to 25.7%. This might be an indication that foreseeing the accounting impact associated with options, high-tech companies decided to substitute options for other pay components. Also, median current vega has decreased for CEOs in high-tech, in the post-FAS 123R: the median CEO in an high-tech decreased current vega (VegaC_opt) by half from $12,330 to $6,402 as of a 0.01 change in stock return volatility. Considering that options are the major component in compensation that increases convexity, measured by vega, it would be reasonably expected that with the reduction of option usage vega values would decrease. In contrast, total vega (Vega_tot) for CEOs seems to have increased on median, but decreased on the average. What seems to be relevant, as well, it is the number of options granted (Num_opt_share_c) before and after FAS 123R for this industry. On average, the number of options granted to CEOs in high-tech decreased from 3,538 to 1,777. This reduction acts in favour of Hayes *et al.* (2012) argument stating that companies foreseeing a big accounting impact with the use of stock drove compensation to other components.

Table 2 – *Summary statistics pre- and post- period CEO (2000-07)*

Pre-FAS 123R period							*Post-FAS 123R period*						
Variable	N	Mean	Sd	p25	p50	p75	Variable	N	Mean	Sd	p25	p50	p75
For CEO in High-Tech							**For CEO in High-Tech**						
Percentage of CEO compensation							**Percentage of CEO compensation**						
P_salary	1140	0.294	0.300	0.078	0.174	0.403	P_salary	386	0.384	0.324	0.133	0.259	0.527
P_bonus	1140	0.139	0.179	0	0.072	0.200	P_bonus	386	0.059	0.145	0	0	0.023
P_option	1140	0.514	0.353	0.063	0.604	0.832	P_option	386	0.295	0.308	0	0.215	0.555
P_RS	1140	0.043	0.137	0	0	0	P_RS	386	0.257	0.321	0	0	0.524
P_LTIP	1140	0.010	0.066	0	0	0	P_LTIP	386	0.005	0.046	0	0	0
Vega (thousands of dollars)							**Vega (thousands of dollars)**						
VegaC_opt	1143	50.149	168.110	0.185	12.330	46.087	VegaC_opt	388	33.914	112.538	0	6.402	26.963
Vega_tot	1143	238.575	560.910	19.349	64.096	222.379	Vega_tot	388	234.246	451.581	31.102	82.372	228.500
Num_Option_c (thousands)	1143	3.538	6.411	0.026	1.625	4.224	Num_Option_c (thousands)	388	1.777	3.926	0	0.509	2.14
Other Variables							**Other Variables**						
Size	1143	6.912	1.680	5.652	6.711	7.825	Size	388	7.200	1.730	6.054	6.994	8.126
RD/TA	1143	0.090	0.076	0.034	0.083	0.131	RD/TA	388	0.091	0.106	0.028	0.079	0.133
MTB	1136	2.771	2.727	1.388	2.041	3.288	MTB	384	2.305	1.492	1.366	1.907	2.854
CAPEX/TA	1137	0.043	0.041	0.016	0.028	0.056	CAPEX/TA	388	0.034	0.031	0.013	0.023	0.045
ROA	1139	0.091	0.145	0.040	0.108	0.164	ROA	388	0.093	0.178	0.053	0.107	0.157

Notes. Pre- and Post- FAS 123R period for CEOs in high-tech companies. Pre-FAS 123R, is from January 2000 to December 2005. Post-FAS 123R period is defined as January, 2006 to December 2007. Details about percentage variables compensation components and definition of sensitivity measures of pay are presented in Appendix A. Size is the logarithmic value of total assets; RD/TA is R&D deducted by total assets; MTB is the Market-to-book value; CAPEX/TA is CAPEX deducted by total assets; ROA, Return on Assets.

Table 3 presents summary statistics for the pre- and post- FAS 123R periods for the Top 5 Executives in high-tech. The median Top 5 Executives in high-tech firms suffered a substantial reduction in P_option they were receiving – from 43.9% to 25.9% in the post-period. In resemblance to CEOs, except from bonus (P_bonus) and long-term incentive plans (P_LTIP) all the components of pay have increased in the post- period. The increase in the level of restricted stock (P_RS), on average, seems to be quite relevant: from 4.5% to 23.6%. Top 5 Executives vega values appear to remain stable with no major changes in both periods with a slight increase for current vega (VegaC_opt). Despite the fact that the number of options (Num_Option_c) granted in both the pre- and post- period as changed substantially: from 1,156 to 572.

Overall, there is reason to believe FAS 123R introduced some changes to the structure of compensation contracts. This might indicate that companies are quite reactive to regulation that might impact accounting numbers. Specially, when the foreseeable accounting impact is expected to be high (Hayes *et al*. 2012). Which is the case for high-tech companies. Additionally, as one can realize the CEO is not the only one who gets majorly impacted by these changes. Top 5 Executives see their compensation changing as well. Also, regarding firm characteristics it appears no major changes occurred in this period influenced by FAS 123R. MTB ratio diminished slightly, on average. CAPEX/TA, ROA and RD expenses remained barely within the same values.

Table 3 - *Summary statistics pre- and post- period Top 5 Executives (2000-07)*

Pre-FAS 123R period							*Post-FAS 123R period*						
Variable	N	Mean	Sd	p25	p50	p75	Variable	N	Mean	Sd	p25	p50	p75
For Top 5 Executives in High-Tech							**For Top 5 Executives in High-Tech**						
Percentage of Top 5 Executives compensation							**Percentage of Top 5 Executives compensation**						
P_salary	5183	0.359	0.285	0.136	0.268	0.533	P_salary	1737	0.439	0.303	0.193	0.367	0.622
P_bonus	5183	0.149	0.169	0.016	0.095	0.216	P_bonus	1737	0.063	0.135	0	0	0.059
P_option	5183	0.439	0.337	0	0.487	0.733	P_option	1737	0.259	0.273	0	0.194	0.455
P_RS	5183	0.045	0.135	0	0	0	P_RS	1737	0.236	0.287	0	0.055	0.463
P_LTIP	5183	0.009	0.060	0	0	0	P_LTIP	1737	0.004	0.036	0	0	0
Vega values (thousands of dollars)							**Vega values (thousands of dollars)**						
VegaC_opt	5183	15.321	52.847	0	3.712	12.267	VegaC_opt	1739	11.729	36.802	0	2.456	9.272
Vega_tot	5183	60.117	153.179	4.293	16.469	48.832	Vega_tot	1739	60.208	141.165	6.596	20.256	52.363
Num_Option_c (thousands)	5183	1.156	2.756	0	0.434	1.278	Num_Option_c (thousands)	1739	0.572	1.219	0	0.195	0.583
Other Variables							**Other Variables**						
Size	5183	6.975	1.667	5.752	6.773	7.872	Size	1739	7.24	1.705	6.096	7.013	8.191
RD/TA	5183	0.089	0.075	0.035	0.083	0.131	RD/TA	1739	0.088	0.090	0.026	0.077	0.132
MTB	5152	2.789	2.793	1.403	2.044	3.302	MTB	1721	2.291	1.464	1.363	1.912	2.820
CAPEX/TA	5158	0.043	0.041	0.016	0.029	0.057	CAPEX/TA	1739	0.034	0.031	0.013	0.024	0.046
ROA	5163	0.092	0.145	0.042	0.108	0.164	ROA	1739	0.096	0.153	0.054	0.107	0.156

Notes. Pre- and Post- FAS 123R period for the Top 5 Executives in High-Tech firms. . Pre-FAS 123R, is from January 2000 to December 2005. Post-FAS 123R period is defined as January, 2006 to December 2007. Details about percentage variables compensation components and definition of sensitivity measures of pay are presented in Appendix A. Size is the logarithmic value of total assets; RD/TA is R&D deducted by total assets; MTB is the Market-to-book value; CAPEX/TA is CAPEX deducted by total assets; ROA is Return on Assets.

3.2 Hypothesis Development

3.2.1 Post- FAS 123R and stock option usage

Stock option offerings are the major ignition of convexity in compensation contracts. Convexity plays a role in managers' daily lives because it gives the right incentives to maintain firm risk when deciding on financial and investment policies. Thus, by offering options to managers, shareholders try to mitigate to wealth-firm risk agency problem, incentivising management to pursue positive NPV risky projects. This fact, gains even more relevance if we consider that opposing to shareholders, managers are risk-averse undiversified individuals, who have the possibility of changing firm risk with their investment policy choices. It is empirically proven that management teams might be willing to forgo positive NPV projects if the costs to increase firm risk seem higher than the potential benefits arising from firm value. As Amihud and Lev (1981) state, risk-averse managers are likely to pursue less than optimal firm risk with the objective of protecting their own "firm-specific human capital".

Therefore, the approval of FAS 123R favouring fair-value expensing of stock options, is seen as a negative aspect among shareholders for offering options to managers. Especially, if companies attribute more value to the perceived cost of options than to their economic cost has argued by Hall and Murphy (2003). This might have led shareholders to decrease the proportion of options offered to the CEO. Consequently, it seems relevant to understand the impact of this measure in lower levels of the hierarchical structure, namely the Top 5 Executives in the firm, excluding the CEO.

Furthermore, changes might have been even more severe in industries where stock option usage stands out as a major compensation component such as in the high-tech industry. Because, as Hayes *et al.* (2012) demonstrate, the decline in option usage with FAS 123R is higher for companies that would face higher account charges. Although firms are aware of the benefits of option usage in contracts, they give great important to the accounting impact of the regulation. Therefore, my main hypothesis is divided into two parts:

Hypothesis 1A: The changes in accounting treatment proposed by FAS 123R are associated with a decrease of stock options usage after 2005 for the CEO and Top 5 Executives in public listed companies in the US.

Hypothesis 1B: The reduction in stock options usage, for CEO and Top 5 Executives, associated with the post-FAS 123R period will be higher for high-tech firms when comparing with other firms.

3.2.2 Stock option usage and risk-taking behaviour

As Smith and Stulz (1985) formalize, equity incentives in the form of stock options can increase managerial risk-taking "because increases in stock return volatility increase the value of the options". But, one must consider the dual side effect of equity-based incentives. It is a fact that more equity in contracts helps to incentive the manager to take more risks and reach an optimal performance level. However, equity translates as well in more sensitivity of the manager's portfolio to movements in the stock price of companies, which in turn might not be translated into more risk-taking (Hirshleifer and Suh 1992). This is the reason why, empirical researchers separate their analysis between the sensitivity of manager's wealth to stock price, measured by delta, and the sensitivity of manager's wealth to stock return volatility, measured by vega.

This dissertation analyses the implications of FAS 123R for high-tech companies in managers risk-taking incentives, measured by vega. As Guay (1999) and Hayes *et al.* (2012) have shown, vega maintains a positive relation with the use stock options. In fact, companies such as high-tech offer their management great amounts of stock options in the hopes of incentivising risk-taking translated into high vega values. High-tech companies are more avid to take risk and pursue innovative and challenging projects in the hopes of reaching a great business idea. Both the CEO and Top 5 Executives are then incentivised to pursue risky projects and their compensation contracts reflect the importance in maintaining vega value at high levels. Considering the above stated, I analyse if high-tech companies

will be able to maintain vega values after FAS 123R introduction. And what is the impact of this regulation in vega.

Based on the argument of Hayes *et al.* (2012) that companies facing more accounting charges are more inclined to reduce their option offering I hypothesize that vega will be more impacted in high-tech comparing with other public firms. This leads to my second hypothesis that is divided into 2 parts:

Hypothesis 2A – After 2005, there will be a decrease in managers' risk-taking incentives, measured by vega, for the CEO and Top 5 Executives in public listed companies in the US.

Hypothesis 2B – The incremental decrease in managers' risk-taking incentives (measured by vega) will be higher for the CEO and Top 5 Executives in high-tech companies, comparing with other firms, since the decline in option usage is more pronounced in firms that potentially face higher accounting charges with FAS 123R.

3.3 Analysis

All the tests performed have in consideration the hypothesis developed in the previous chapter. To extract the real effect caused by this exogenous shock and avoid endogeneity issues Appendix C explains why to perform a firm fixed effects regressions that "control for any time-invariant heterogeneity across firms" (Hayes *et al.* 2012). The use of control variables in my regression analysis is intend to rule out the effect of predictive variables on my dependent variable and to check whether the effect of these control variables is in fact significant. Thus, by holding a set of variables constant, I isolate the effect of FAS 123R in an attempt to attribute more meaningful results to my study.

3.3.1 Changes in CEO and Top 5 Executives stock options

I begin by examining how options offerings to the CEO and Top 5 Executives was affected by the introduction of FAS 123R. I use a regression analysis that separately presents results for the CEO and Top 5 Executives. This regression has P_option as the dependent variable and a series of dummy and control variables.

Controlling for firm size becomes important since different companies with different size are expected to offer different amounts of stock to their executives. The sign of the relation between option offerings and size might be uncertain. There is the view that larger companies, usually facing more monitoring costs, are expected to offer more options to their employees with the aim of providing the right incentives. Core and Guay (2001) observe that companies with bigger size and more decentralized structure are expected to offer more equity incentives as a consequence of higher direct monitoring costs. Additionally, it is fair to say that larger companies enjoy more tax benefits[23] by issuing and granting stocks to their employees[24]. Comparing with smaller firms one could argue that larger companies have more incentives to maintain their proportion of options offered, despite the upcoming unfavourable treatments. On the other hand, if we consider that larger companies offer more options they would consequently face higher accounting expenses in the event of FAS 123R approval. This can actually

[23] Apple, for example, realized $3.19 billion in tax savings from stock options issuance between 2010 and 2012.

[24] According to Forbes, the use of stock options in recent years made some of the largest companies in the US to report extensive tax savings. These cases have been more pronounced in industries were stock option offerings is substantial, such as technology and investment banking. For more details: http://www.forbes.com/sites/janetnovack/2013/04/24/stock-options-meant-big-tax-savings-for-apple-and-jp-morgan-as-well-as-facebook/

imply a negative correlation between size and proportion of options for my sample period if companies give great importance to the accounting impact of the regulation, and if most of them are considered large companies. The inclusion of other components of the compensation scheme – cash compensation, restricted stock (RS) and long-term incentive plans (LTIP) – serve as a control mechanism for the alternative options shareholders have to deviate from option offerings. So it would be expected a negative relation between the proportion of options and cash compensation, RS and LTIP.

This regression will count with two dummy variables. The first term (postFAS 123R) serves as an indicator for the post-FAS 123R period. This variable measures the effect of FAS 123R on all firms concerning the proportion of options given to the CEO or Top 5 Executives. The second dummy, (postFAS 123R_High_Tech) is aimed at evaluating the incremental effect of FAS 123R for CEOs or Top 5 Executives in High-Tech companies in the post- period. The empirical regression is stated as follows:

$$P_{options} = \beta_0 + \beta_1 postFAS\ 123R + \beta_2 postFAS\ 123R\_High\_Tech + \varepsilon \quad (1)$$

Panel A, of Table 4, presents regression results for P_option given to the CEO. The coefficient in the postFAS 123R variable is negative and statistically significant, meaning that the proportion of options offered to the CEO has diminished in the post-FAS 123R for all firms. There is a 9.5 percentage point's decrease, on average, in the proportion of options given

to the CEO in the post- period. The economic significance of this result might be questionable. If we consider the average CEO in any firm, for my sample, is being offered 1,531 in current option grants, this would be translated in less 145 options in the post- period. The sign of the coefficient in the postFAS 123R_High_Tech dummy is negative and statistically significant, denoting that FAS 123R had a negative incremental effect of 10.9 percentage points, in the proportion of options offered to high-tech companies[25]. On average, CEOs in high-tech were being offered 3,538 options in the pre- FAS 123R period which would be translated into less 625 options after 2005. Size appears to have a negative, but not significant, relation with the proportion of options, possibly due to the fact the sample analysed contains a lot of large public companies that foreseeing the accounting costs of expensing stocks have reduced them. Cash Compensation, RS and LTIP have a negative and significant relation with P_option, although the economic significance seems to be low[26]. For last, the sign of the constant β_0, (given by the designation _cons in the table) tells us that when the postFAS 123R dummy is equal to 0 one can expect a positive sign in the proportion of options of 0.517. Considering that postFAS 123R equal to 0 refers to the pre- FAS 123R period, this indicates that there is a positive and significant relation of the options offered to the CEO before FAS 123R approval[27]. Also, spearman's correlation coefficient

[25] These facts seem to be in accordance with the initial hypothesis developed. Maybe foreseeing the high accounting impact that could have been occurred by maintaining the same level of stock options grants, high-tech firms took the initiative to reduce options grants.

[26] For example, for a 1 percentage point increase in the proportion of stock one would predict a decrease in the proportion of restricted stock to the CEO of 0.000012.

[27] This might lead one to believe that before the introduction of FAS 123R there was a favourable accounting treatment towards options that made it more attractable to shareholders as a compensation component.

tests[28] presented in Appendix B.1.1 do not show much correlation between variables[29]. In addition, variance inflation tests (VIF) presented in Appendix B.1.2 present values between 1 and 1.5 indicating a low multicollinearity [30].

Table 4 – *Regression Results for proportion of options (P_option)*

Panel A: CEO						
P_option	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
postFAS 123R	-0.095	0.008	-11.44	0.000	-0.111	-0.078
postFAS 123R_High_Tech	-0.109	0.020	-5.41	0.000	-0.149	-0.070
Size	-0.014	0.011	-1.35	0.177	-0.036	0.007
RS	-1.3E-05	2.1E-06	-6.14	0.000	-1.7E-05	-8.8E-06
LTIP	-1.2E-06	3.9E-07	-2.99	0.003	-1.9E-06	-4.0E-07
Cash Compensation	-1.7E-05	2.9E-06	-5.95	0.000	-2.3E-05	-1.2E-05
_cons	0.517	0.076	6.82	0.000	0.368	0.666
Panel B: Top 5 Executives						
P_option	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
postFAS 123R	-0.077	0.006	-12.73	0.000	-0.089	-0.065
postFAS 123R_High_Tech	-0.082	0.015	-5.41	0.000	-0.112	-0.053
Size	0.000	0.008	0.04	0.966	-0.015	0.016
RS	-2.7E-05	3.3E-06	-8.11	0.000	-3.4E-05	-2.1E-05
LTIP	-1.9E-06	3.6E-07	-5.23	0.000	-2.6E-06	-1.2E-06
Cash Compensation	-3.7E-06	1.3E-06	-2.84	0.005	-6.3E-06	-1.2E-06
_cons	0.320	0.058	5.56	0.000	0.207	0.433

Notes. Panel A presents regression results for roughly 390 CEOs in high-tech companies. Panel B presents regression results for around 1,740 Top 5 Executives in high-tech companies. Data ranges from 2000 to 2007. Values for CEO and Top 5 Executives extracted from ExecuComp, while firm characteristics extracted from Compustat. The postFAS 123R dummy takes the value of 1 for the post-FAS 123R period for all firms in the sample and 0 otherwise. The postFAS 123R_High_Tech takes the value of 1 for all high-tech companies in the post-FAS 123R period and 0 otherwise. Control variables are described in Appendix A. Spearman Correlation and VIF tests can be found in Appendix: B.1.1; B.1.2; B.2.1; B.2.2.

Panel B, of Table 4 presents regression results for Top 5 Executives for P_option in the post-FAS 123R period. The postFAS 123R dummy reveals

[28] This test is aimed at evaluating the monotonic relation between these pairs of control variables.

[29] Cash Compensation appears to be significantly correlated with size with a coefficient of 60%. Except from this all the remaining variables appear to have a correlation inferior to 35%.

[30] The rule of thumb says values inferior to 4 indicate low multicollinearity.

that Top 5 Executives in all firms have received less 7.7 percentage points, on average, in options in the post period. The postFAS 123R_High_Tech, indicates high-tech companies suffered an incremental negative effect of 8.2 percentage points, in the number or options offered to Top 5 Executives after 2005. Despite the statistical significance, the results might have low economic significance. Top 5 Executives in the pre- period were receiving 1,156 options, on average, which would mean that after FAS 123R approval this result would be reduced by 177 options. Size has a positive (not significant) relation with P_option, and surprisingly, Cash Compensation is positively related to P_option, as well. Also, although, the β_0 coefficient of 0.320 is positive, it is much lower when compared to CEOs[31]. Spearman correlation tests for Top 5 Executives regression (Appendix B.2.1) do not indicate too much relation among variables[32]. Also, with a mean VIF (Appendix B.2.2) of 1.18, variables appear to have a low multicollinearity.

[31] Fact, that is justifiable by previous evidence that the proportion of stock options received by CEOs in compensation contracts is much higher than for other executive roles in high-tech companies.

[32] The highest correlation is attributed to cash compensation and size – 59.8%.

3.3.2 Changes in CEO and Top 5 Executives vega

Being stock options a major driver of convexity in compensation contracts, I will start by analysing the changes in current risk-taking incentives for the post-FAS 123R period for CEOs and Top 5 Executives.

This fixed effect regression has vegaC_opt, as the dependent variable that will serve as a proxy for management's current risk-taking incentives. The regression presents the same dummy and control variables expressed in the previous analysis. However, some control variables have a different interpretation. As in Guay (1999) it is important to control for Size due to the circumstance that larger companies have a higher probability of adopting incentive compensation plans, such as stock option plans, which consequently increases vega values[33]. Also, cash compensation (salary + bonus) is controlled for due to the fact that the more cash compensation that can be invested outside the firm, the more diversified is an executive in a firm (Guay 1999)[34]. Restricted stock (RS) and long-term incentive plans (LTIP) represent alternative forms of compensation and serve as control variables with the same purpose as the previous regression.

[33] A positive relation between Size and vega is expected.

[34] This fact can actually induce a positive relation between cash compensation and vega, due to the fact that the much diversified is an executive the more necessary to offer him/her a convex contract.

This being said the regression is empirically expressed as:

$$Vega_{Copt} = \beta_0 + \beta_1 postFAS\ 123R + \beta_2 postFAS\ 123R\_High\_Tech + \varepsilon \quad (2)$$

Table 5 present regression results for both the CEO (Panel A) and Top 5 Executives (Panel B) on current vega. In Panel A, one can realize that the postFAS 123R dummy presents a negative and significant coefficient, meaning that in the post-FAS 123R period CEOs from all firms decreased their current vega. In fact, CEOs saw a decrease in convexity of $7,922 or 15.79% in relation to annual compensation in the pre-FAS 123R period. The postFAS 123R_High_Tech presents an incremental negative coefficient for current vega, but with no statistical significance[35]. All the remaining control variables seem to present the expected coefficient sign. Apart from that, Appendix B.3.1 can tell that there is no major correlation among the variables of the regression[36]. The VIF analysis (Appendix B.3.2) can also express low correlation among variables.

[35] Although the industry appears to have seen an incremental decrease in convexity of $1,028 in the post-FAS 123R period, this result appears to be not statistically significant.

[36] Except from a strong correlation coefficient between cash compensation and size of 60%.

Table 5 – *Regression Results for current vega (VegaC_opt)*

Panel A: CEO						
VegaC_opt	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
postFAS 123R	-7.922	1.852	-4.28	0.000	-11.556	-4.287
postFAS 123R_High_Tech	-11.703	7.220	-1.62	0.105	-25.867	2.461
Size	9.534	3.570	2.67	0.008	2.530	16.538
RS	0.002	0.002	0.85	0.398	-0.002	0.005
LTIP	-6.6E-05	6.9E-05	-0.95	0.343	-2.0E-04	7.0E-05
Cash Compensation	0.001	0.003	0.4	0.686	-0.004	0.007
_cons	-35.185	25.073	-1.4	0.161	-84.377	14.007
Panel B: Top 5 Executives						
VegaC_opt	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
postFAS 123R	-3.046	0.952	-3.2	0.001	-4.915	-1.177
postFAS 123R_High_Tech	-2.839	2.267	-1.25	0.211	-7.287	1.609
Size	4.290	1.460	2.94	0.003	1.426	7.153
RS	0.003	0.002	2.05	0.041	0.000	0.006
LTIP	1.2E-04	8.4E-05	1.47	0.142	-4.1E-05	2.9E-04
Cash Compensation	0.003	0.002	1.35	0.177	-0.001	0.008
_cons	-22.760	9.683	-2.35	0.019	-41.757	-3.763

Notes. Panel A presents regression results for roughly 390 CEOs in high-tech companies. Panel B presents regression results for around 1,740 Top 5 Executives in high-tech companies. Data ranges from 2000 to 2007. Values for CEO and Top 5 Executives extracted from ExecuComp, while firm characteristics extracted from Compustat. The postFAS 123R dummy takes the value of 1 for the post-FAS 123R period for all firms in the sample and 0 otherwise. The postFAS 123R_High_Tech takes the value of 1 for all high-tech companies in the post-FAS 123R period and 0 otherwise. Control variables are described in Appendix A. Spearman Correlation and VIF tests can be found in Appendix: B.3.1; B.3.2; B.4.1; B.4.2.

On Panel B, one can acknowledge that the effects of FAS 123R in Top 5 Executives seem to be significant for all public listed companies or high-tech[37]. However, Top 5 Executives in high-tech companies do not seem to suffer any major changes in their risk-taking incentives after FAS 123R approval. The postFAS 123R_High_Tech dummy presents a negative but

[37] By presenting a negative and significant value, the postFAS 123R dummy is telling us that risk-taking incentives have decreased for Top 5 Executives in all firms. As it can be perceptible the magnitude of this decrease is much lower when compared to the coefficient for CEOs: vega decreased $3,046 for Top 5 Executives after 2005, compared to $7,922 for CEOs. Considering CEOs receive a higher slice of their compensation in options it is reasonable to assume that they will be more impacted with this regulation than other top executives that receive more cash compensation.

not significant coefficient. All the remaining control variables present the expected signs. Correlation tests for the regression expressed in Appendix B.4.1 and Appendix B.4.2 present lower levels of correlation among variables.

Although major changes are expected in current vega it would be interesting to study what happens to total vega (Vega_tot) for CEOs and Top 5 Executives after FAS 123R approval. To analyse this, the same regression is elaborated but with Vega_tot as dependent variable:

$$Vega_{tot} = \beta_0 + \beta_1 postFAS\ 123R + \beta_2 postFAS\ 123R\_High\_Tech + \varepsilon \quad (3)$$

Table 6 presents present regression results for both the CEO (Panel A) and Top 5 Executives (Panel B) in relation to total vega. Panel A postFAS 123R dummy presents a negative and significant coefficient, meaning that in the post-FAS 123R period CEOs from all firms decreased their total vegas values[38]. Opposed to this fact, the results for high-tech companies seem to be positive but and not statistically significant[39]. Accordingly, the total vega values for the Top 5 Executives in Panel B, for the postFAS 123R and the postFAS 123R_High_Tech dummies present significant (negative) and non-significant (positive) coefficients, respectively. Alongside with this, tests for correlation between variables (Appendix B.5.1) and VIF tests (Appendix B.6.2) for regressions in Table 6 present low levels of correlation among variables.

[38] This decrease seems quite substantial with a decrease in convexity of $25,879 in relation to the pre-FAS 123R period.

[39] Although not significant the positive sign in this coefficient seems to be surprising according with previous assumptions.

Table 6 – *Regression Results for total vega (Vega_tot)*

Panel A: CEO						
Vega_tot	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
postFAS 123R	-25.879	7.942	-3.26	0.001	-41.460	-10.297
postFAS 123R_High_Tech	16.477	17.378	0.95	0.343	-17.618	50.572
Size	61.118	12.280	4.98	0.000	37.025	85.212
RS	-0.001	0.002	-0.45	0.651	-0.006	0.004
LTIP	5.5E-05	2.4E-04	0.22	0.822	-4.2E-04	0.001
Cash Compensation	0.023	0.005	4.42	0.000	0.013	0.033
_cons	-300.537	89.488	-3.36	0.001	-476.104	-124.970
Panel B: Top 5 Executives						
Vega_tot	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
postFAS 123R	-6.594	2.732	-2.410	0.016	-11.953	-1.235
postFAS 123R_High_Tech	3.687	5.883	0.630	0.531	-7.855	15.230
Size	14.780	3.498	4.220	0.000	7.917	21.644
RS	0.006	0.003	1.820	0.069	-4.3E-04	0.012
LTIP	0.001	0.000	2.560	0.011	1.8E-04	0.001
Cash Compensation	0.017	0.011	1.560	0.120	-0.004	0.038
_cons	-75.261	22.232	-3.390	0.001	-118.879	-31.643

Notes. Panel A presents regression results for roughly 390 CEOs in high-tech companies. Panel B presents regression results for around 1,740 Top 5 Executives in high-tech companies. Data ranges from 2000 to 2007. Values for CEO and Top 5 Executives extracted from ExecuComp, while firm characteristics extracted from Compustat. The postFAS 123R dummy takes the value of 1 for the post-FAS 123R period for all firms in the sample and 0 otherwise. The postFAS 123R_High_Tech takes the value of 1 for all high-tech companies in the post-FAS 123R period and 0 otherwise. Control variables are described in Appendix A. Spearman Correlation and VIF tests can be found in Appendix: B.5.1; B.5.2; B.6.1; B.6.2.

Chapter 4 – Small Sample Analysis

4.1 Objectives and sample description

On the large sample analysis one was able to realize that FAS 123R might have contributed to alter the *status quo* in executive compensation, especially in what regards to stock option attribution in high-tech firms. However, the previous data analysis was majorly focused in high-level executive pay disregarding the effects of FAS 123R in lower hierarchical levels of the labour market. It seems important to understand if any changes occurred in the compensation structure of those lower level employees that do not have any executive role but are granted with options in their compensation contracts. Although one must bear in mind that options have great importance at high hierarchical levels, especially due to their risk-taking incentive, the high-tech sector is remarkably known for offering options and other equity grants, to other employees. This fact not only contributes to create a certain identity with the firm but also motivates bottom line employees to have a risk-taking mind-set necessary to succeed in the industry.

I believe that a deeper analysis of high-tech companies' annual reports and proxy statements can provide a more detailed description of the sector's response towards FAS 123R issuance. With this in mind in this small sample analysis I am intended to study the evolution of non-executive employee compensation of 10 high-tech US firms from 2002 to 2007[40]. This

[40] For comparison reasons the time horizon resembles to the same mentioned in the large sample analysis.

analysis will not only focus on the quantitative aspect of the changes (if any) in the number of stock options offers, but will also try to understand the major initiatives taken by high-tech companies in response to FAS 123R.

Table 7 presents the list of companies analysed in this sample with the respective year in which they stated implementing FAS 123R ruling. As it can be perceptible there are no early adopters in this sample, meaning that all the companies analysed have only complied with stock option expensing in the beginning of 2006 (mandatory date by law).

Table 7 – *Companies for small sample analysis*

Company Name:	Fiscal Year of FAS 123 R adoption:
Adobe Systems Inc.	2006
Advanced Micro Devices Inc.	2006
Cisco Systems Inc.	2006
Dell Inc.	2006
Electronic Arts Inc.	2006
Hewlett Packard Co.	2006
Intel Corp.	2006
Qualcomm Inc.	2006
SPSS Inc.	2006
Texas Instruments Inc.	2006

Notes. List of high-tech companies that make part of the small sample analysis in relation to non-executive employee stock options offer. All the companies presented are given by the dummy variable High_tech created for the Large Sample that includes the group of US companies that belong to the high-tech sector.

4.2 Major adjustments to stock options expensing

A detailed analysis of this companies' proxy statements can lead one to realize that FAS 123R introduced some changes in the structure and content regarding executive compensation disclosures. A common pattern was that some companies decision to change their method of valuating stock options upon FAS 123R adoption. For example, in its 2008 proxy statement Qualcomm Inc. stated it would pass from a Black-Scholes valuation model

of stock options to a "lattice binomial option-pricing model". This represents a positive change for a better precision in pricing options at certain points in time. Although both the Black-Scholes and Binomial models have the same theoretical foundations[41], the Black-Scholes model presents a major disadvantage towards stock option valuation that is more emphasized in the case of US companies: the Black-Scholes model cannot be used to precisely calculate the price of options that have an American-style exercise period[42], because it only calculates the option price at one point in time, which is the date the option expires. As one can realize, each year several employees, from the CEO to other management positions, exercise their options before its expiration date. Meaning that with a binomial valuation approach one can accurately state the price of the option at its exercise date and avoid a deterioration of its value that otherwise would be lost by using the Black-Scholes model[43]. This represents a good approach towards a fair valuation of options as a compensation expense for companies.

Another relevant aspect is the change in the eligibility criteria regarding stock options offerings. In its 2005 proxy statement Cisco Systems Inc. approved the new 2005 Stock Initiative Plan (to substitute the for the previous 1996 Stock Incentive Plan) clearly stating that Cisco will no longer

[41] To state an example both the Black-Scholes model and the Binomial model have the same geometric Brownian motion theory of stock price behaviour and risk-neutral valuation.

[42] American and European options have major difference regarding its exercise date. Generically speaking American options can be exercised at any point in time, while European options can only be exercise at its expiration date.

[43] It is important to state that there is an exception surrounding this line of reasoning: if an investor buys an American call option this option will have the same value as a European call option. The reason behind this is that there seems to be no advantage in exercising the American call option before its expiration date, it is always better to wait and see how the market evolves.

automatically renew its stock option compensation granted each year to its non-employee executives. Instead, the company will start offering discretionary awards that follow specific criteria settled at Board Meetings. Similar to this practice, in its 2007 proxy statement Qualcomm Inc. stated that in light of the introduction of FAS 123R it would replace its combination of stock option awards and consequent renewal "with a single annual award prorated in the first year of a director's service". This might contribute to strategically grant option awards to those who have good performance indicators and decrease the annual expenses associated with automatic grants. Also, under its Internal Revenue Code (Section 162m) Cisco states that "all stock options must be granted with an exercise price not less than 100% of fair market value" – contrasting with past practices where grants with an exercise price of 80% of fair market value were allowed.

An alternative tendency was also the decision of companies of start granting restricted stock units[44] (RSUs) instead of options grants only. SPSS Inc. compensation committee ruled in its 2007 proxy that the move from option grants to RSUs seemed to be motivated by the fact "that public companies in general have begun to grants RSUs instead of options grants". In some cases companies even changed to a compensation structure based on a mix of option awards and RSUs which is the case of Advanced Micro

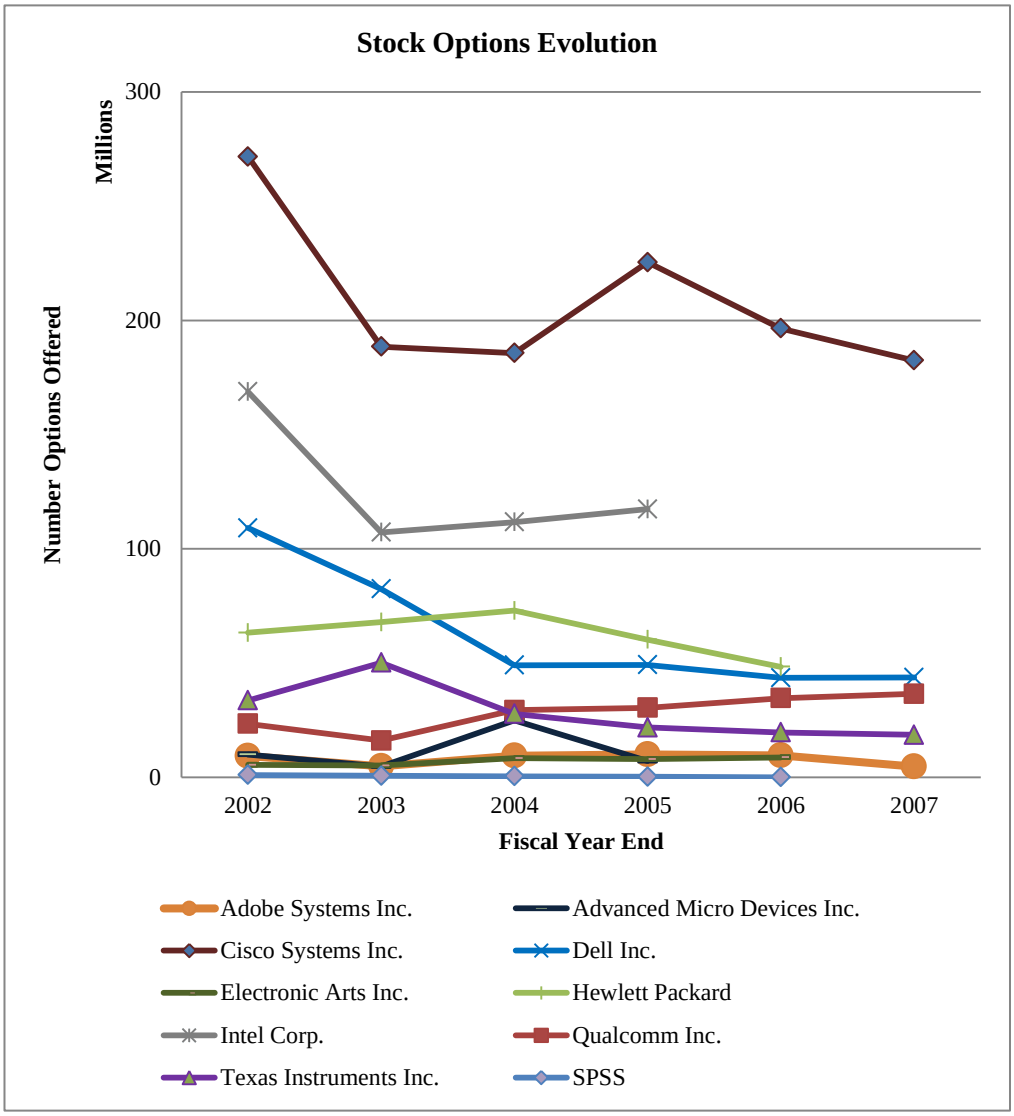
[44] Restricted Stock Units represent a compensation mechanism composed by a companies' stock. The particularity in RSUs is that the employee does not receive all the stock in one moment in time, but in conformity with a vesting plan that is dependent on performance indicators achieved (or not) by the employee. Also, RSUs involve a certain commitment of the employee with the institution to which he/she is working for, because the employer is only eligible to receive them upon reaching a certain length of time with the company (Hull, John C., "Options Futures and other Derivatives." *Prentice-Hall International, Inc* 5 (2000): 275-292).

Devices Inc. as stated in its 2006 proxy statement. As discussed earlier RSUs are also fundamental to maintain the incentive levels of employees by providing them stock gradually according with the company performance. At the same time they work as an alternative instrument to avoid the use of stock options (sometimes considered excessive) and its negative consequences in the income statement brought by FAS 123R.

4.3 Stock options to non-named paid executives and employees

After generally reviewing the major structural changes observed in proxy statements it is time to analyse the number of stock options offered to other employees below the CEO and Top 5 named paid executives. Figure 1 illustrates the evolution of stock options majorly offered to non-named executives and employees for the 10 US high-tech companies analysed. Except from Qualcomm Inc. and Electronic Arts Inc. all the remaining 8 companies reduced the number of stock options offered in 2007 comparing with 2002 values. For example, Dell Inc. offered to their non-named executives and employees less 60% of stock options in 2007 reducing from a value of 109,142,046 to 43,661,288. In fact, the company clearly states in its 2003 proxy statement that foreseeing the upcoming events with the approval of stock options expensing the company wants to start an action programme to reduce its dependence of options use as a compensation component. Also, from 2006 onwards, half of the companies started offering a mix of stock options and RSUs which makes it not only difficult to assess the number of options offered but also confirms some tendency to move away from options.

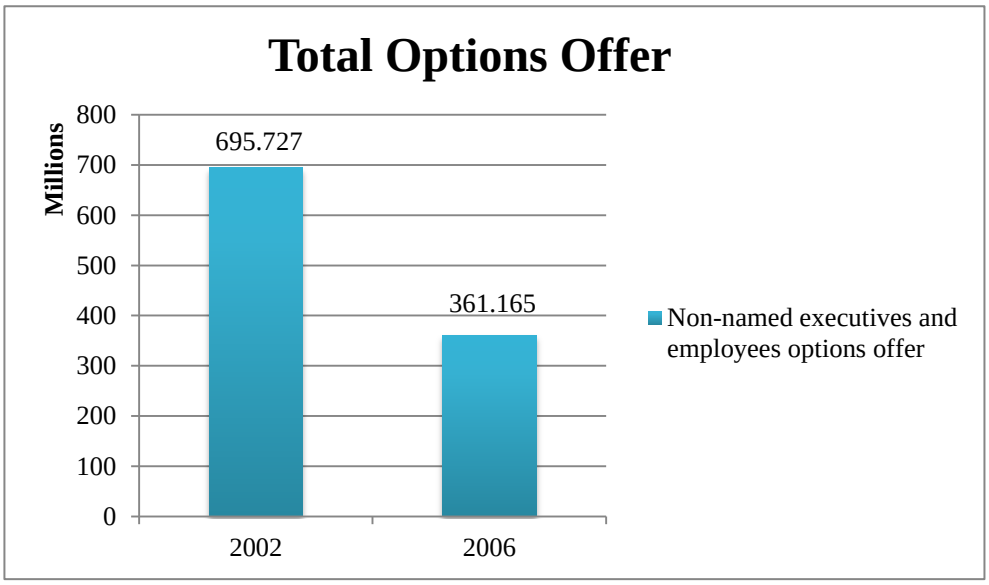
Figure 1 – *Options offers to non-named executives and employees*



Notes. Evolution of stock options offering to non-named executives and employees for 10 US high-tech firms from 2002 to 2007 fiscal year. The number of options was calculated by deducting the number of options offered to top named executives from the total number of options offered each year. The number of stock options offered by Intel Inc. and Advanced Micro Devices Inc. for 2006 and 2007 are not stated because both companies use a combination of RSUs and stock options without stating the separate values for each component. The number of stock options offered by SPSS Inc., Electronic Arts Inc. and Hewlett Packard Co. for 2006 and 2007 are not stated because both companies use a combination of RSUs and stock options without stating the separate values for each component. All the values stated in this figure were extracted from firms' proxy statements between 2002 and 2008. All the values presented in this graph can be found in Appendix D.1.

To get a better perspective on this, Figure 2 illustrates the total amount of stock options offered in 2002 and 2006 to non-named executives. As it

Figure 2 – *Total stock options offer 2002, 2006*



Notes. Total number of options offered to non-named employees for 10 US high-tech firms in 2002 and 2006. The number of options offered in 2006 for Intel Inc. and Advanced Micro Devices Inc. is not accounted because both these companies have a bundle package of options and RSUs that is only stated in the 2006 proxy statements as a total amount.

can be perceptible the number of options offered is almost reduced to half, from around 697 million to 361 million.

Broadly speaking, one could say that amid the approval of FAS 123R the 10 US high-tech companies have reduced their usage of stock options as a compensation mechanism to non-executive employees. If one considers that FAS 123R became mandatory in 2006 for all public companies this fact gains even more relevance. I believe one of the most sounding examples that illustrate this is related to Microsoft Corp[45]. In fiscal year 2004 Microsoft Corp. announced in its annual report of 2005 that it would initiate

[45] Microsoft Corp. does not make part of my small sample of 10 US high-tech companies. Still, I decided to mention this case considering the relevance of this example to the object of study of this dissertation.

an “employee stock option transfer programme” stating that all employees could transfer their vested and unvested stock options to JP Morgan “with a strike price of $33 or higher”. This was not only a possibility of taking thousands of options of the hands of their employees and avoid a substantial expenses in the income statement, but also a motivation for the majority of the employees that were stuck with options with no value due to unfavourable events in the stock market. In fact, as Conyon (2014) reports, from 2000 onwards US public companies started to put “more emphasis on grants of restricted stock as opposed to stock options”. According with the author the amount of stock options as diminished from 42% of total pay in 2001 to 14% in 2012. Contrasting to this restricted stock has pulled from about 6% of total pay in 2001 to 35% in 2012. Also, according with Choudhary et al. (2009) several companies between 2004 and 2005 accelerated the vesting of employee stock options in the upcoming event of FAS 123R approval. This procedure would avoid the foreseeable losses in the income statement that would be incurred with stock options expensing and potentially avoid downgrades in financial analyst’s recommendations. All these moves can lead one to consider that in accordance with proponents of FAS 123R approval, stock options were being excessively used due to their reporting advantages. Although valuing options might sound tricky, academics and investors insisted in the idea that stock options are an expense, and therefore must be accounted as such in the income statement. One of the major proponents was Warren Buffett that once proclaimed: “If stock options aren't a form of compensation, what are they? If compensation

isn't an expense, what is it? And, if expenses shouldn't go into the calculation of earnings, where in the world do they go?"[46]

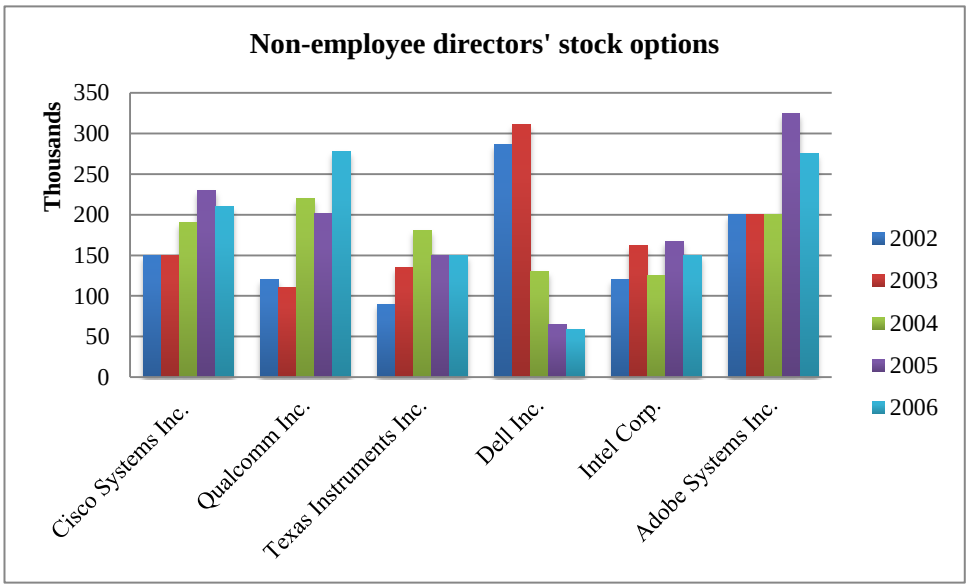
4.4 Stock options to non-employee directors

Apart from the cash component given to the non-employees directors' group for attending board meeting or taking conference calls, shareholders usually try to maintain a certain level of incentive alignment by rewarding them with stock options (and also stock). For this group, equity compensation becomes also important, so directors feel themselves incentivized to put their best judgment and effort to every single business decision. Out of the 10 high-tech companies in my sample, 6 of them have a pronounced tendency to reward their non-employee directors with stock options. To understand how options granting to non-employee directors has evolved before and after FAS 123R approval, I analyse the level of stock options granted to this group from 2002 to 2006 for this 6 high-tech companies.

[46] The Economist, July 18th 2002 (http://www.economist.com/node/1234972)

Figure 3 presents non-employees director's stock option offers from 2002 to 2006:

Figure 3 – *Non-employee directors' stock options 2002-06*



Notes. All the numbers stated in the figure were taken from firms proxy statements from 2002 to 2006. Appendix D.2 states in detail the number of option for each company.

As it can be observed in Figure 3, except from Dell Inc. that has diminished almost 80% the level of stock options offered from 2002 (286,128 options) to 2006 (58,273 options), all the other high-tech companies seem to have increase the amount of stock offered to non-employee directors. This fact seems to contradict the tendency observed in the previous analysis regarding stock options offerings to non-named executives and employees. As mentioned earlier in this chapter although these high-techs are granting more options to their non-employee directors, they are no longer granting automatic grants. Instead, from 2005 onwards grants at Cisco Systems Inc., Intel Corp. and Qualcomm Inc. are given according with objectives achieved by the board and company performance.

4.5 Main takeaways

Overall, employee stock options seem to have decreased motivated by FAS 123R. Still it is important to scrutinize some particular cases on my sample to understand the environment in which companies were operating. From the graph in Figure 1 the cases of Cisco System Inc. and Dell Inc. are worth mention due to the magnitude in decrease of options. Although aware of the advantages of stock options[47] Cisco was severely penalized in profits with FAS 123R. Between 2002 and 2006 the impact of FAS 123R has been quite severe on net income. Table 8 depicts the impact on net impact with stock options expensing after adjustments from 2001 to 2006:

Table 8 – *Cisco Systems Inc. impact on net income FAS 123R*

	2001	**2002**	**2003**	**2004**	**2005**	**2006**
Impact on net income with pro forma FAS 123R ($ millions)	-1.691	-1.520	-1.259	-1.215	-1.034	0.756

Notes. Impact on net income with pro forma FAS 123R is calculated by taking the difference between the reported Net Incomce and Operating compensation expenses, net of tax. Values for this calculatin were extracted from Poitras, G. (xxxx) 'Accounting standards for employee stock option disclosure', Int. J. Business Governance and Ethics, Vol. X, No. Y, pp.000–000

This can be the main reason behind the decrease in option usage expressed in Figure 1. And once again as Hayes *et al.* (2012) theory confirms, the decline in options usage is more pronounced in companies with higher accounting impact.

On the other hand Dell Inc. case can also provide an interesting perspective. The company settled a strategy in 1996[48] of speculation in the

[47] The advantages mainly refer to risk-taking incentives mentioned in Chapter 2 – Literature Review.

[48] For more information on Dell's strategy: http://www.nytimes.com/2013/01/18/business/how-dell-became-entangled-in-options.html?pagewanted=all&_r=0

options market in its own stock: it was buying call options[49] and selling put options[50] at the same time. The combination strategy was favourable when the stock price was increasing and unfavourable otherwise. This worked for a couple of years, but in 2001 Dell Inc. was prosecuted for an accounting fraud that last until 2006[51]. By this time the stock price started falling reaching half the price – from $40.52 in August 2005 to $21.65 in August 2006[52] – which forced Dell to exercise the put options by buying stock for much more than the stock was valued. This fact added to the approval of options expensing with FAS 123R forced to company to leave away from options and increase the amount of restricted stock offered. Using options in excess is in fact one the reasons behind the accounting fraud. Since Dell executives were receiving more than half of their wealth in options they would profit more if the stock price would go up. To make this happen, for several years management recommended several stock repurchase programs that would increase stock price rather than distributing a dividend to shareholders. Especially when the stock price was rising. This example can lead one to think if options settle the right risk-taking incentives. Also, it leaves space for reflection of the extent to which options were being used in excess due to their favourable accounting treatment.

[49] Buying a call option gives you the right, but not the obligation to buy a share at fixed price for a certain period of time.

[50] Selling a put option mandates the seller to buy back the shares at a pre-set price for a certain period of time.

[51] In general terms the company pumped up profits because it was accepting undisclosed payments for Intel. For more information about the case see: http://www.nytimes.com/2010/07/23/business/23dell.html

[52] The prices for Dell Inc. share were obtained by consulting historic share prices on Google Finance.

Chapter 5 – Conclusion and further remarks

The general overview that one could take from the large sample analysis is that although the proportion of stock options have significantly diminished in high-tech firms for CEOs and Top 5 Executives, the vega for this industry do not present (surprisingly) significant changes. In other words one could say that even though stock options where being less used, risk-taking incentives do not seem to be affected significantly. Considering that this fact contradicts the initial hypothesis, I have conducted further research through the observations of selective high-tech annual reports and proxy statements in the hopes of reaching a more elucidative perspective about the behaviour of companies surrounding this event. A first guess on why the vega values remain steady while the number of options offered decreases would go for the fact that high-tech companies have substituted stock options for other compensation mechanisms that maintain great risk-taking incentives. Annual reports and proxy statements from 2002 to 2007 of some of the major high-tech firms in the US seem to indicate that these companies started offering to CEOs and Top 5 Executives a mix of options and RSUs. Companies such as Intel Corp. or Hewlett Packard Co. have followed this path[53]. Also, Microsoft announced in its 2003 proxy statement that it would stop granting options and it would start increasing its grants of restricted stock. Although it is understandable that RSUs don't have the same effect as options, they might create a good incentive on high-tech employees that want to remain in the firm in the long-term, to preserve a

[53] In their annual proxy statements of 2006 Intel Corp. and Hewlett Packard Co. have stated that that from 2006 onwards their executives will have a more performance oriented compensation with the introduction of RSUs.

risk-taking attitude in order to value the companies' stock and get the most benefit out of it. Alternatively, some academics argue that indexed options and performance options are good alternative mechanisms for companies that are more dependent on options to preserve risk-taking incentives. In addition, these alternatives assure that executives are not rewarded only because the market evolved in a favourable tendency, but because they had the right risk-taking mentality[54].

Although I was not able to find any factual evidence on this I believe companies might have pondered other ideas that would be more external to the company in order to keep compensating employees with options. For example, high-tech companies could have pondered to issue their options to a third party – meaning an underwriter such as an investment bank (e.g. JP Morgan Chase, Goldman Sachs) – and pay employees with the money received from those options[55]. To sum up because there are several alternative methods to maintain vega and consequently convexity in a compensation contract, the results obtained for the regressions on current and total vega do not seem to be a expressive as I initially predicted in the development of my hypothesis. Both CEOs and Top 5 Executives in high-tech might have started to receive less options grants as the large sample suggests. But it would be to naïve to consider that high-tech companies

[54] In the upcoming events of FAS 123R approval and its consequences on the high-tech US industry several authors such as Zvi Bodie, Robert S. Kaplan, and Robert C. Merton recommended high-tech companies to substitute stock options with other mechanisms. Index options and performance options are the most suggested mechanisms.

[55] Zvi Bodie, Robert S. Kaplan, and Robert C. Merton argue in favour of this strategy even considering that the market might put a higher value on options than the employees actually do. This could even mean that companies could end up with more cash available.

would remain passive with such changes in regulation that could arm their business.

Following the same tendency as in the large sample analysis, I was able to realize that non-named executives and employees have seen their level of option grants diminishing with FAS 123R. The small sample analysis made it clear that option usage at employee level as also decrease for half the its value when comparing 2002 with 2006. Except from this it was interesting to understand how high-tech companies have adapt to stock options expensing with the introduction of RSUs and by progressing to a binomial option pricing model. For last, the tendency of decrease in stock option usage was broken by analysing the evolution of option grants to non-employee directors. With no relevant ties to the company I believe options serve as an important mechanism for incentive alignment in this group.

I cannot fail to point out that the magnitude of my results might be affected by the time period chosen for the analysis. Still, as I mentioned previously, for the sake of interpretation I am confident this was the best time period for analysis purposes. Though, it would be interesting for further research to extend the analysis in the years to come to extract more meaningful results in the consequences of stock option expensing to the high-tech industry. Possibly this would lead us to a more elucidative conclusion on why has vega does not seem to be significantly affected with a decrease in stock option compensation.

Appendices

Appendix A – Variables Definition

Variable	Database	Type	Units	Description
P_salary	ExecuComp	Num	%	salary valued in dollars divided by the value of total compensation in dollars that includes cash compensation, long-term incentive plans, restricted stock and stock options
P_bonus	ExecuComp	Num	%	bonus valued in dollars divided by the value of total compensation in dollars that includes cash compensation, long-term incentive plans, restricted stock and stock options
P_option	ExecuComp	Num	%	stock options valued in dollars divided by the value of total compensation in dollars that includes cash compensation, long-term incentive plans, restricted stock and stock options
P_RS	ExecuComp	Num	%	restricted stock valued in dollars divided by the value of total compensation in dollars that includes cash compensation, long-term incentive plans, restricted stock and stock options
P_LTIP	ExecuComp	Num	%	long-term incentive plans valued in dollars divided by the value of total compensation in dollars that includes cash compensation, long-term incentive plans, restricted stock and stock options
VegaC_opt	ExecuComp	Num	$ thousands	aggregate option vega of an executives arising from current equity grants. Measured as the dollar change in current equity-based compensation per 0.01 change in stock price volatility
Vega_tot	ExecuComp	Num	$ thousands	(VegaC_opt+VegaP_opt) aggregate option vega of an executives arising from overall equity grants (current and past). Measured as the dollar change in the overall equity-based compensation per 1% change in stock price volatility
Num_Option_c	ExecuComp	Num	thousands	nº options granted in current year (Nopt_C/shrout)*1000

(cont.)				
Size	Compustat	Num	log(at)	logarithmic value of total assets
RD/TA	Compustat	Num	%	total R&D expenses divided by total assets: xrd/at
MTB	Compustat	Num	%	market value of equity + liabilities) / book value of total assets: (prcc_f * csho + lt) / at
CAPEX/TA	Compustat	Num	%	capital expenditures divided by total assets: capx / at
ROA	Compustat	Num	%	return on assets: oibdp / at
postFAS 123R	N/A	-	-	equal to 1 for the post-FAS 123R period (defined from January, 2006 to December 2007) and zero otherwise
postFAS 123R_High_Tech	N/A	-	-	equal to 1 for High-Tech firms in the post-FAS 123R period
Cash Compensation	Compustat	Num	$	salary + bonus

Appendix B – Additional tests to Large Sample regression results

Appendix B.1.1 – *Spearman Correlation Coefficient Test for regression in Table 4 Panel A*

	P_option	postFAS 123R	postFAS 123R_High_Tech	Size	RS	LTIP	Cash Comp.
P_option	1						
postFAS 123R	-0.1890	1					
postFAS 123R_High_Tech	-0.0233	0.3016	1				
Size	0.0740	0.1092	-0.0274	1			
RS	-0.1645	0.2786	0.0574	0.3388	1		
LTIP	-0.1223	0.1963	-0.0164	0.3326	0.3218	1	
Cash Comp.	0.0537	-0.2056	-0.1667	0.6000	0.2003	0.2084	1

Appendix B.1.2 – *Variance Inflation Factor test for for regression in Table 4 Panel A*

Variable	VIF	1/VIF
Size	1.36	0.736795
Cash Compensation	1.26	0.79576
postFAS 123R	1.17	0.854954
RS	1.16	0.863411
postFAS 123R_High_Tech	1.11	0.904872
LTIP	1.03	0.966252
Mean VIF	1.18	

Appendix B.2.1 – *Spearman Correlation Coefficient Test for regression in Table 4 Panel B*

	P_option	postFAS 123R	postFAS 123R_High_Tech	Size	RS	LTIP	Cash Comp
P_option	1						
postFAS 123R	-0.1143	1					
postFAS 123R_High_Tech	0.0018	0.3080	1				
Size	0.0738	0.0886	-0.0266	1			
RS	-0.0877	0.2607	0.0730	0.3373	1		
LTIP	-0.0200	0.1869	-0.0146	0.2927	0.3152	1	
Cash Comp	0.1565	-0.1479	-0.0964	0.5982	0.2311	0.2107	1

Appendix B.2.2 – *Variance Inflation Factor test for regression in Table 4 Panel B*

Variable	VIF	1/VIF
Size	1.31	0.761705
Cash Compensation	1.26	0.793144
RS	1.2	0.833713
postFAS 123R	1.16	0.864778
postFAS 123R_High_Tech	1.12	0.894491
LTIP	1.03	0.972478
Mean VIF	1.18	

Appendix B.3.1 - *Spearman Correlation Coefficient Test for regression in Table 5 Panel A*

	vegaC_opt	postFAS 123R	postFAS 123R_High_Tech	Size	RS	LTIP	Cash Comp
vegaC_opt	1						
postFAS 123R	-0.0836	1					
postFAS 123R_High_Tech	-0.0369	0.3019	1				
Size	0.3984	0.1087	-0.028	1			
RS	0.1163	0.2776	0.0564	0.3397	1		
LTIP	0.1235	0.1957	-0.0169	0.3330	0.3223	1	
Cash Comp	0.3558	-0.2059	-0.1675	0.6011	0.2022	0.2095	1

Appendix B.3.2 – *Variance Inflation Factor test for regression in Table 5 Panel A*

Variable	VIF	1/VIF
Size	1.36	0.736258
Cash Compensation	1.26	0.795063
postFAS 123R	1.17	0.854792
RS	1.16	0.863333
postFAS 123R_High_Tech	1.11	0.904639
LTIP	1.03	0.966238
Mean VIF	1.18	

Appendix B.4.1 – *Spearman Correlation Coefficient Test for regression in Table 5 Panel B*

	vegaC_opt	postFAS 123R	postFAS 123R_High_Tech	Size	RS	LTIP	Cash Comp
vegaC_opt	1						
postFAS 123R	-0.0342	1					
postFAS 123R_High_Tech	0.0044	0.3083	1				
Size	0.3051	0.0884	-0.0271	1			
RS	0.1163	0.2602	0.0722	0.3374	1		
LTIP	0.1587	0.1866	-0.015	0.2927	0.3153	1	
Cash Comp	0.3677	-0.1484	-0.0974	0.5982	0.2318	0.2110	1

Appendix B.4.2 – *Variance Inflation Factor test for regression in Table 5 Panel B*

Variable	VIF	1/VIF
Size	1.31	0.761659
Cash Compensation	1.26	0.792948
RS	1.20	0.833757
postFAS 123R	1.16	0.864627
postFAS 123R_High_Tech	1.12	0.894325
LTIP	1.03	0.972477
Mean VIF	1.18	

Appendix B.5.1 – *Spearman Correlation Coefficient Test for regression in Table 6 Panel A*

	vega_tot	postFAS 123R	postFAS 123R_High _Tech	Size	RS	LTIP	Cash Comp
vega_tot	1						
postFAS 123R	-0.0539	1					
postFAS 123R_High_ Tech	0.0497	0.3019	1				
Size	0.5757	0.1087	-0.028	1			
RS	0.1709	0.2776	0.0564	0.3397	1		
LTIP	0.1803	0.1957	-0.0169	0.333	0.3223	1	
Cash Comp	0.4985	-0.2059	-0.1675	0.6011	0.2022	0.2095	1

Appendix B.5.2 – *Variance Inflation Factor test for regression in Table 6 Panel A*

Variable	VIF	1/VIF
Size	1.36	0.736258
Cash Compensation	1.26	0.795063
postFAS 123R	1.17	0.854792
RS	1.16	0.863333
postFAS123R_High_Tech	1.11	0.904639
LTIP	1.03	0.966238
Mean VIF	1.18	

Appendix B.6.1 – *Spearman Correlation Coefficient Test for regression in Table 6 Panel B*

	vega_tot	postFAS 123R	postFAS 123R_High_Tech	Size	RS	LTIP	Cash Comp
vega_tot	1						
postFAS 123R	0.003	1					
postFAS 123R_High_Tech	0.0623	0.3083	1				
Size	0.4037	0.0884	-0.0271	1			
RS	0.1829	0.2602	0.0722	0.3374	1		
LTIP	0.2115	0.1866	-0.015	0.2927	0.3153	1	
Cash Comp	0.5043	-0.1484	-0.0974	0.5982	0.2318	0.211	1

Appendix B.6.2 – *Variance Inflation Factor test for regression in Table 6 Panel B*

Variable	VIF	1/VIF
Size	1.31	0.761659
Cash Compensation	1.26	0.792948
RS	1.2	0.833757
postFAS 123R	1.16	0.864627
postFAS 123R_High_Tech	1.12	0.894325
LTIP	1.03	0.972477
Mean VIF	1.18	

Appendix C – Explaining Fixed Effects Regression

My regression resembles a basic regression framework expressed as:

$$Y = \beta_0 + \beta_1 x1 + \beta_2 x2 + \varepsilon \quad (4)$$

I am interested in the relation between x and y in the extent that I am trying to understand if Δx "causes" Δy. This represents the basic framework for an ordinary least squares regression (OLS) that has the following assumption: there is a random sample of observations on y and x; there is a mean zero error term (E(ε) = 0); there is no linear relationship among the explanatory variables (i.e. no perfect collinearity); and the error term, ε has an expected value of 0 given any values of the explanatory variable ($E(\varepsilon \mid x_i) = 0$; for i = 1,…, k (zero conditional mean).

Bearing this in mind I assume that the error expressed as, ε is divided in two parts:

$$\varepsilon = a + u \quad (5)$$

where, a represents an unobserved fixed effect, once I suppose that there is a factor in my regression that I cannot observe and that influences the regression that I am trying to study[56]. On my view it would be too much "optimistic" to expect a perfect cause and effect relation strictly linear between my dependent variable y and my independent variable x without the interference of any other factor (e.g. decline in high-tech sector).

[56] In this case I am assuming that there some external influence that for example is related with the use of stock options and a certain period of time rather than the regulation FAS 123R (the main target of my study).

Still, the main question here is to understand into what extent is the "unobserved factor", a correlated with $x_1$which in my regression is represented by postFAS 123R. So if:

- $Cov\ (a, x_1) = 0$, this is referred to as "random effect". In this case endogeneity is not a problem. Since a makes part of the error term, ε the error is always correlated with the regression in any moment in time. A random effects regression can be used.
- $Cov\ (a, x_1) \neq 0$, this is referred to as "fixed effects". In this case endogeneity is a problem and a fixed effects regression should be used.

In order to understand if $Cov\ (a, x_1)$ is equal or different from 0 I have used the Hausman Test[57] where my null hypothesis H0 is:

- $H0: Cov\ (a, x_1) = 0$
- $H1: Cov\ (a, x_1) \neq 0$

The formula for the Hausman test is defined as:

$$W = \frac{[(\beta_1 FE) - (\beta_1 RE)]^2}{[(Var\beta_1 FE) - (Var\beta_1 RE)]^2} \quad (5)$$

where, $\beta_1 FE$ is the estimator for x_1 in the fixed effects regression; $\beta_1 RE$ is the estimator for x_1 in the random effects regression; $Var\beta_1 FE$ is the variance for x_1 in the fixed effects regression; $Var\beta_1 RE$ is the variance for x_1 in the random effects regression.

[57] The Hausman test is mainly used to decide whether a fixed effects or random effects regression is appropriate.

By doing the fixed and random effects regressions having the proportion of options (P_option) and current (VegaC_opt) and total vega (Vega_tot) as independent variables, I have calculated the hausman coefficient for each one of the regressions. The coefficients obtained were all different from 0. This mean that I should reject the null hyphotesis H0 and run a fixed effects regression for all the sample tests. For example, W = 10.95 for the fixed effects regression with P_options has the dependent variable. By rejecting H0 I am aware that it is better to perform a fixed effects regression.

Appendix D – Small Sample Analysis data

Appendix D. 1 – *Stock Option Evolution illustrated in Figure 1. All the values presented were extracted from companies' proxy statements information from 2002 to 2008*

	2002	2003	2004	2005	2006	2007
Cisco Systems Inc.	271,684,407	188,514,686	185,719,925	225,437,680	196,515,555	182,506,000
Qualcomm Inc.	23,405,000	16,052,500	29,378,947	30,444,118	34,640,000	36,519,154
Texas Instruments Inc.	33,683,904	50,204,492	27,763,703	21,827,273	19,640,300	18,604,600
Dell Inc.	109,142,047	82,399,883	49,098,052	49,224,138	43,577,586	43,661,288
Intel Corp.	168,778,029	107,240,110	111,693,226	117,372,619	Options + RSUs	Options + RSUs
Adobe Systems Inc.	9,340,417	4,789,601	9,443,664	10,019,102	9,665,026	4,676,483
Hewlett Packard Co.	63,334,615	67,950,000	73,000,000	60,286,364	48,370,000	Options + RSUs
Electronic Arts Inc.	5,408,776	5,131,076	8,353,420	7,974,558	8,711,100	Options + RSUs
Advanced Micro Devices Inc.	9,966,808	4,802,265	24,974,569	7,187,642	Options + RSUs	Options + RSUs
SPSS Inc.	982,959	675,965	449,285	248,397	44,985	Options + RSUs

Appendix D. 2 –*Stock options offered to non-employee directors from 2002 to 20006*

	2002	2003	2004	2005	2006
Cisco Systems Inc.	150,000	150,000	190,000	230,000	210,000
Qualcomm Inc.	120,000	110,000	220,000	202,000	278,000
Texas Instruments Inc.	90,000	135,000	180,000	150,000	150,000
Dell Inc.	286,128	311,560	129,560	64,993	58,273
Intel Corp.	120,000	162,500	125,000	167,000	150,000
Adobe Systems Inc.	200,000	200,000	200,000	325,000	275,000

Appendix E – List of Proxy Statements used for small sample

Firm	SIC Code	Type of Report	Filing Date	Database
Adobe Systems Inc.	7273	Form DEF 14 A	28/02/2002	Edgar – www.sec.gv
Adobe Systems Inc.	7273	Form DEF 14 A	17/03/2003	Edgar – www.sec.gv
Adobe Systems Inc.	7273	Form DEF 14 A	12/03/2004	Edgar – www.sec.gv
Adobe Systems Inc.	7273	Form DEF 14 A	14/03/2005	Edgar – www.sec.gv
Adobe Systems Inc.	7273	Form DEF 14 A	24/02/2006	Edgar – www.sec.gv
Adobe Systems Inc.	7273	Form DEF 14 A	02/03/2007	Edgar – www.sec.gv
Advanced Micro Devices Inc.	3674	Form DEF 14 A	08/03/2002	Edgar – www.sec.gv
Advanced Micro Devices Inc.	3674	Form DEF 14 A	14/03/2003	Edgar – www.sec.gv
Advanced Micro Devices Inc.	3674	Form DEF 14 A	11/03/2004	Edgar – www.sec.gv
Advanced Micro Devices Inc.	3674	Form DEF 14 A	03/03/2005	Edgar – www.sec.gv
Advanced Micro Devices Inc.	3674	Form DEF 14 A	23/03/2006	Edgar – www.sec.gv
Advanced Micro Devices Inc.	3674	Form DEF 14 A	15/03/2007	Edgar – www.sec.gv
Cisco Systems Inc.	3576	Form DEF 14 A	03/10/2002	Edgar – www.sec.gv
Cisco Systems Inc.	3576	Form DEF 14 A	18/09/2003	Edgar – www.sec.gv
Cisco Systems Inc.	3576	Form DEF 14 A	28/09/2004	Edgar – www.sec.gv
Cisco Systems Inc.	3576	Form DEF 14 A	26/09/2005	Edgar – www.sec.gv
Cisco Systems Inc.	3576	Form DEF 14 A	25/09/2006	Edgar – www.sec.gv
Cisco Systems Inc.	3576	Form DEF 14 A	26/09/2007	Edgar – www.sec.gv
Dell Inc.	3571	Form DEF 14 A	29/05/2002	Edgar – www.sec.gv
Dell Inc.	3571	Form DEF 14 A	30/05/2003	Edgar – www.sec.gv
Dell Inc.	3571	Form DEF 14 A	27/05/2004	Edgar – www.sec.gv
Dell Inc.	3571	Form DEF 14 A	31/05/2005	Edgar – www.sec.gv

(continued)

(continued)

Dell Inc.	3571	Form DEF 14 A	05/06/2006	Edgar – www.sec.gv
Dell Inc.	3571	Form DEF 14 A	31/10/2007	Edgar – www.sec.gv
Electronic Arts Inc.	7372	Form DEF 14 A	28/06/2002	Edgar – www.sec.gv
Electronic Arts Inc.	7372	Form DEF 14 A	30/06/2003	Edgar – www.sec.gv
Electronic Arts Inc.	7372	Form DEF 14 A	28/06/2004	Edgar – www.sec.gv
Electronic Arts Inc.	7372	Form DEF 14 A	24/06/2005	Edgar – www.sec.gv
Electronic Arts Inc.	7372	Form DEF 14 A	30/06/2006	Edgar – www.sec.gv
Electronic Arts Inc.	7372	Form DEF 14 A	20/06/2007	Edgar – www.sec.gv
Hewlett Packard Co.	3570	Form DEF 14 A	04/04/2002	Edgar – www.sec.gv
Hewlett Packard Co.	3570	Form DEF 14 A	27/02/2003	Edgar – www.sec.gv
Hewlett Packard Co.	3570	Form DEF 14 A	23/01/2004	Edgar – www.sec.gv
Hewlett Packard Co.	3570	Form DEF 14 A	11/02/2005	Edgar – www.sec.gv
Hewlett Packard Co.	3570	Form DEF 14 A	21/06/2006	Edgar – www.sec.gv
Hewlett Packard Co.	3570	Form DEF 14 A	23/01/2007	Edgar – www.sec.gv
Intel Corp.	3674	Form DEF 14 A	10/04/2002	Edgar – www.sec.gv
Intel Corp.	3674	Form DEF 14 A	02/04/2003	Edgar – www.sec.gv
Intel Corp.	3674	Form DEF 14 A	31/03/2004	Edgar – www.sec.gv
Intel Corp.	3674	Form DEF 14 A	29/03/2005	Edgar – www.sec.gv
Intel Corp.	3674	Form DEF 14 A	28/03/2006	Edgar – www.sec.gv
Intel Corp.	3674	Form DEF 14 A	27/03/2007	Edgar – www.sec.gv
Qualcomm Inc.	3663	Form DEF 14 A	06/01/2003	Edgar – www.sec.gv
Qualcomm Inc.	3663	Form DEF 14 A	09/01/2004	Edgar – www.sec.gv
Qualcomm Inc.	3663	Form DEF 14 A	14/01/2005	Edgar – www.sec.gv
Qualcomm Inc.	3663	Form DEF 14 A	12/01/2006	Edgar – www.sec.gv
Qualcomm Inc.	3663	Form DEF 14 A	18/01/2007	Edgar – www.sec.gv

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Qualcomm Inc.	3663	Form DEF 14 A	18/01/2008	Edgar – www.sec.gv
SPSS Inc.	7372	Form DEF 14 A	13/05/2002	Edgar – www.sec.gv
SPSS Inc.	7372	Form DEF 14 A	19/05/2003	Edgar – www.sec.gv
SPSS Inc.	7372	Form DEF 14 A	28/09/2004	Edgar – www.sec.gv
SPSS Inc.	7372	Form DEF 14 A	16/05/2005	Edgar – www.sec.gv
SPSS Inc.	7372	Form DEF 14 A	28/03/2006	Edgar – www.sec.gv
SPSS Inc.	7372	Form DEF 14 A	27/03/2007	Edgar – www.sec.gv
Texas Instruments Inc.	3674	Form DEF 14 A	01/03/2002	Edgar – www.sec.gv
Texas Instruments Inc.	3674	Form DEF 14 A	28/02/2003	Edgar – www.sec.gv
Texas Instruments Inc.	3674	Form DEF 14 A	12/03/2004	Edgar – www.sec.gv
Texas Instruments Inc.	3674	Form DEF 14 A	11/03/2005	Edgar – www.sec.gv
Texas Instruments Inc.	3674	Form DEF 14 A	09/03/2006	Edgar – www.sec.gv
Texas Instruments Inc.	3674	Form DEF 14 A	09/03/2007	Edgar – www.sec.gv

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