A Note on Employee Sentiment and Stock Option Compensation

Nittai Bergman[1]
Dirk Jenter[2]

MIT Sloan School of Management

First Draft: November 2002
This Draft: October 2003

Preliminary and incomplete – Please do not distribute.[3]

[1] MIT Sloan, E52-410, Cambridge, MA 02142. E-mail: nbergman@mit.edu
[2] MIT Sloan, E52-446, Cambridge, MA 02142. E-mail: djenter@mit.edu
[3] We are grateful for comments from participants at the MIT Sloan Finance Lunch Seminar and the Frank Batten Young Scholars Conference at William & Mary, and especially Aamer Sheikh and Wanda Wallace. We thank John Core and Wayne Guay for making some of the date used in this paper available to us. All remaining errors are our own.

A Note on Employee Sentiment and Stock Option Compensation

The use of broad equity-based compensation for employees has become widespread. Its popularity for employees in the lower ranks of an organization is a puzzle for standard economic theory: any positive incentive effects should be diminished by free rider problems, and undiversified employees should discount company equity heavily. We point out that employees do not appear to value company stock as prescribed by extant theory. Employees frequently purchase company stock for their 401(k) and ESOP plans at market prices, and especially so after company stock has performed well, implying that their private valuation has to at least equal the market price. We show that using equity-based compensation under these circumstances is not a puzzle. We propose that firms pay their employees in options whenever employee sentiment towards the firm is irrationally positive. Our empirical analysis confirms that firms use broad-based option compensation when employees are likely to be excessively optimistic about company stock. We also provide evidence that managers grant more options to rank-and-file employees whenever management believes its stock to be overvalued.

1. Introduction

The use of stock-based compensation for employees below the executive rank has been growing rapidly during the last decade, with stock option plans the most common means of paying employees with equity. The National Center for Employee Ownership (2001) estimates that between 7 and 10 million US employees held options in 2000.[4] A 1999 survey of the 350 largest public corporations in the US found that 39% of these companies had broad-based stock option programs that made 50% or more of employees eligible to receive option grants. 17% of the 350 companies had actually made these grants.[5]

The popularity of equity-based compensation for employees in the lower ranks of an organization is a puzzle for standard economic theory: any positive incentive effects should be diminished by free rider problems and overshadowed by the cost of imposing risk on employees. [6] Holding stock options in their employer exposes employees to price risk which is highly correlated with the risk in their human capital.[7] Since employees are risk averse and likely to have firm-specific human capital, they should be an inefficient source of capital, at least compared to well-diversified outside investors. Model-based calibrations suggest that employees should value options on company stock at discounts anywhere between 20 and 60% below fair market value.[8]

We propose instead that using employees as capital providers to the firm can be explained by the observation that employees do not value company stock as prescribed by extant theory. Standard portfolio selection theory suggests that employees should not purchase equity in their employer. Several studies (Benartzi, 2001; Liang and Weisbenner, 2002; Huberman and Sengmüller, 2002), however, show that employees do just that: employees purchase company stock (at market prices) for their 401(k) and ESOP plans on a large scale, and especially so after company stock has performed well. In a standard portfolio selection framework, this observation strongly suggests that employees' valuation of company stock is higher than the prevailing market price. But if employees' valuation of company stock is greater than that of outside investors, then using employees as capital providers to the firm may not be a puzzle. This intuition is confirmed by the model of optimal employee compensation we develop below. We argue that stock option grants to non-executive employees are driven by a behavioral phenomenon: firms pay their employees in equity whenever employees are irrationally optimistic about the prospects of company stock (or when senior management believes this to be the case).

[4] See NCEO (2001), p. 468-469.
[5] William M. Mercer (1999), as quoted in NCEO (2001), p. 463.
[6] See Core and Guay (2001) and Oyer and Schaefer (2002), as well as Lazear (1999).
[7] In the remainder of the paper we use the term "employees" as equivalent to "non-executive employees".
[8] See Lambert, Larcker, and Verecchia (1991), Murphy (1999), Hall and Murphy (2001), Meulbroek (2001 and 2002), Ingersoll (2002), and Kahl, Liu, and Longstaff (2003).

Option grants to non-executives are widespread in our sample. We define non-executive employees as all employees except the five most highly paid executives identified in the proxy statement.[9] The average firm grants options corresponding to 2.7% of shares outstanding per year. Non-executive employees receive on average 71% of these grants. We estimate the mean (median) Black-Scholes value of the average annual grant per employee to be $25,200 ($1,228).

It is difficult to directly test whether employees are irrationally exuberant about company stock: employee sentiment and expectations are unobservable. Our model of optimal employee compensation predicts that equity-based compensation is used in situations in which optimistic employees want to purchase company equity for their own private accounts, and in which senior management has a reason to issue equity. We argue that observed purchases of company equity by employees are a strong indicator of employee optimism about the firm, and hence that the cross-sectional predictors of equity purchases by employees should also predict the broad use of equity-based compensation by firms. This argument also allows us to make a number of additional auxiliary predictions derived from the behavioral economics literature on expectation formation.

Benartzi (2001) and Huberman and Sengmüller (2002) document that employees purchase company stock after high stock returns. Hence *firms should be more likely to grant options to employees after the stock price has done well.* Griffin and Tversky (1992) document that people tend to give excessive weight to extreme information while giving insufficient regard to its weight or predictive power. Hence *options grants should be non-linearly related to past performance and concentrated among the very best past performers.* Benartzi (2001) documents that the effect of past returns on employees' purchases of company stock increases in the time frame over which past returns are measured. Therefore, *firms should be most likely to grant options to employees after the stock price has done well over several years.* Furthermore, it is reasonable to assume that employees in firms in distress are unlikely to be exuberant about the prospects of company stock. Hence *firms in financial or economic distress should be less likely to pay their employees with options.* Finally, managers may use actual or perceived inside information about the firm when deciding how many options to grant to employees. In this case *firms may grant more options to employees whenever managers have reason to view the stock as overvalued*.

These hypotheses are strongly confirmed by the data. Equity-based compensation is most common among firms with excellent prior stock price performance: the average prior year return for companies with granting activity in the bottom 20% is 14%. It is 58% for firms with granting activity in the top 20%. Sorting firms by prior year returns, we find average (median) grants of $78,700 ($3,058) among firms in the top return quintile, and average (median) grants of only $17,000 ($1,524) among firms in the bottom return quintile. Consistent with Griffin and Tversky (1992) , we find the effect of past returns on granting activity to be non-linear, with granting activity concentrated

[9] This definition is used by several studies (Core and Guay, 2001; Desai 2002) and is imposed by the available data. In the remainder of the paper we use the term "employee options" as equivalent to "non-executive employee options".

among the very best prior performers. Consistent with Benartzi (2001), we find that the positive relationship between high stock returns and option grants becomes stronger when we enlarge the window over which past returns are measured. These results hold up in a regression framework controlling for numerous other potential determinants of employee option grants.

Several explanations for the use of option compensation for employees below the executive rank have been discussed in the literature. Some authors have argued that firms with cash constraints use option grants to compensate their employees because options require no contemporaneous cash payout (Yermack 1995, Dechow et al. 1996, Core and Guay 2001).[10] Since employees are risk averse and likely to have firm-specific human capital, they should be an inefficient source of capital, at least compared to well-diversified outside investors. That they are nevertheless used as a source of capital has been attributed to lower information asymmetries (Core and Guay, 2001): if the information asymmetries between the firm and its employees are lower than those between the firm and outside investors, equity compensation can have cost advantages relative to external financing.

The finding by Kahle (2001) that many firms repurchase shares on the open market to fund employee option exercises seems to speak against this cash constraints hypothesis: Firms are using actual cash to repurchase shares which are then given to exercising employees.[11] We nevertheless control for several measures of cash constraints in our empirical analysis. The finding that stock option grants are strongly determined by past stock price performance is robust to these controls. In addition, the estimated coefficients on the various measures of cash constraints provide further insights into the option granting behavior of firms.

Prior literature (Kaplan and Zingales 1997, Lamont, Polk and Saa-Requejo 2001, Core and Guay 2001) has developed composite measures of cash constraints that include both measures of the demand for cash by the firm and measures of the supply of cash to the firm. Relating these composite measures of cash constraints to employee option compensation yields conflicting results in our regressions, with some measures positively correlated with option grants and others negatively correlated. We then analyze how each component of the composite measures of cash constraints is related to option grants. We find that grants are strongly positively associated with corporate cash balances[12], unrelated to contemporaneous cash flows, and negatively related to cash outflows for

[10] The same explanation has been advanced as a rational for employer contributions to 401(k) plans made with company stock. Benartzi (2001) reports though that between 30% and 40% of defined contribution plans acquire company stock on the open market and do not issue new shares for distribution, indicating that cash preservation cannot be their motivation to make DC plan contributions in company stock.

[11] It would be theoretically possible that firms were cash constrained when granting options and are no longer cash constrained when the options are exercised. Given the persistence of option granting behavior though it is likely that grants and exercises occur in the same year for many firms.

[12] Most authors (Kaplan and Zingales 1997, Core and Guay 2001) interpret large corporate cash holdings as a sign that the firm is not financially constrained: large cash holdings indicate that a firm has excess funds and no need to raise funds in the foreseeable future. Almeida, Campello, and Weisbach (2002) raise the possibility that large corporate cash holdings may indicate that managers have reacted to asymmetric information problems by hording cash, and may hence be positively related to cash constraints.

debt service (interest burden, leverage). Grants are also positively related to investment levels and investment opportunities.

These findings cast some doubt on the hypotheses that option granting behavior is determined by corporate cash constraints. The only components of the composite cash constraint measures which are positively related to option grants are those associated with cash outflows due to investment (cash flow from investment, R&D, Q). On the other hand, firms with a likely need to preserve cash because of large cash outflows for debt service *cut back* option grants. Even more directly, we show that firms in distress reduce their option grants aggressively, suggesting that employees are unwilling to accept options as payment from firms with the highest need to preserve cash. Finally, the empirical pattern that option grants are concentrated after high stock returns speaks in and of itself against the hypothesis that grants are used to alleviate outside financing constraints. Following positive stock price movements, information asymmetries between the firm and the market should decline (Bayless and Chaplinsky, 1996; Lang, Ofek, and Stulz, 1996; Jung, Kim and Stulz, 1996) and hence employees should not be needed as capital providers.[13]

Our results show that even if cash constraints are a determinant of option granting behavior, only cash constraints induced by high levels of investment and good investment opportunities cause higher option grants to employees. Firms suffering from cash constraints caused by debt overhang and financial distress, on the other hand, seem unable to turn to their employees for funding. These findings suggest that employee sentiment determines the ability of firms to tap their employees for funds: employees are likely to display more positive sentiment towards firms with higher cash balances, higher levels of investment, and better investment opportunities, and worse sentiment towards firms with higher levels of debt and higher interest payments.

Finally, we attempt to identify situations in which we can make inferences about managers' opinion about the fundamental value of the firm. One such situation is when managers manipulate earnings to boost the current stock price. If managers know that the current stock price is inflated because of earnings manipulation, and if earnings manipulation is not (fully) taken into account by employees, management may take advantage of the overvaluation by substituting more options for cash compensation. We measure earnings manipulation using the modified Jones model (Teoh, Welch, and Wong, 1998 a,b), and find that firms likely to have manipulated earnings grant between 20 and 40 percent more options than firms with no manipulation. Our second measure of managers' views on firm value is insider trading. We identify firms with extreme insider selling and firms with extreme insider buying using the same measure as in Jenter (2003).

[13] It could still be possible that the market would interpret an equity issue as a bad signal. The observation that New Economy firms were the most aggressive users of broad-based stock option plans during the New Economy Bubble in the late 1990s (Anderson, Banker, and Ravindran, 2000; Ittner, Lambert, and Larcker, 2002; Meulbroek, 2000 and 2001; Murphy, 2002b) seems difficult to reconcile with the asymmetric information-induced cash constraints hypotheses though: The equity market in the late 1990s was irrationally receptive to equity issues by New Economy firms (Ofek and Richardson, 2002 and 2003). Turning to employees as a source of funds in this market environment does only make sense if employees are even more exuberant than the already irrational market.

Our results indicate that firms in which the top five managers cash out grant 20% more options to their employees than comparable firms, while firms in which top managers purchase equity for their own account grant around 20% less to employees than comparable firms.

We conclude that the use of employees as a source of capital is to a large extent a behavioral phenomenon explained by employees extrapolating their firm's value from such variables as its past performance and financial condition.[14] Employees' willingness to accept options as payment seems contingent on good news about their firm that they (incorrectly) associate with positive future stock performance. Finally, irrational exuberance about company stock is also consistent with the observation that many firms feel pressured to pay their employees with options in order to be competitive in the labor market.[15] If (potential) employees valued options on company stock at below their fair market value (as theory would suggest), then any firm could improve its remuneration offering by substituting cash for options. The argument that firms grant employees options to remain competitive in the labor market is consistent with the notion that employees value these options more highly than their fair market value in cash. In this case firms can be forced to pay employees in options in order to increase the attractiveness of the remuneration package.

In the next section we briefly review the literature on psychological biases that employees may exhibit when thinking about company stock, and the prior literature analyzing employee stock option plans. Section 3 develops a simply model of optimal employee compensation in which employees, the firm, and the equity market can disagree about equity valuations. Section 4 describes the data and variable definitions, and section 5 presents the empirical results. Section 6 concludes.

2. Literature Review

There is considerable evidence that employees' thinking about company stock and employee stock options is subject to behavioral biases. Benartzi (2001) provides evidence that employees excessively extrapolate past performance when deciding about company stock holdings in their 401(k) plans. Employees of firms with the worst stock performance over the last 10 years allocate 10.37% of their discretionary contributions to company stock, whereas employees whose firms experienced the best stock performance allocate 39.7%. There is no evidence that allocations to company stock predict future

[14] We are certainly not the first to formulate the idea that behavioral effects may play a role employee stock option grants. In fact Core and Guay (2001) write in their conclusion that "the willingness of firm's lower-level employees to accept options instead of cash compensation likely depends on firm-specific factors such as the pay-off they [...] have received from previously granted options. In turn, these firm-specific factors are likely to affect how stock option plans evolve over time." This statement describes the research agenda of our project remarkably well.

[15] Ittner, Lambert, and Larcker (2002) analyze a survey of 217 New Economy firms in 1999 and 2000 and find that firms describe the attraction and retention of employees as the most important motivations for broad-based stock option plans and restricted stock plans.

performance; in fact, firms with the most equity purchases among employees tend to under perform firms with the least equity purchases by an insignificant amount.[16]

Huberman and Sengmüller (2002) analyze 401(k) allocations in a larger sample and find that employees base their decisions with regard to company stock on past returns, volatility, and business performance. Past returns, over a three-year window, predict higher inflow allocations and transfers to company stock, whereas volatility and business performance only have a weak effect. Liang and Weisbenner (2002), using a Panel of 1,000 companies during 1991 to 2000, show that the average share of participants' discretionary 401(k) allocations in company stock is almost 20%, and increasing in prior stock price performance.

The psychology and behavioral finance literature provides possible explanations for the observed biases in employee thinking about company equity: excessive extrapolation can be attributed to the representativeness heuristic described by Tversky and Kahneman (1974). They show that people expect that a sequence of events generated by a random process will resemble the essential characteristics of that process even when the sequence is short. In an extension, Griffin and Tversky (1992) document that people tend to focus on the strength or extremeness of the evidence provided while giving insufficient regard to its weight or predictive power. People tend to see trends and patterns even in random sequences and expect especially extreme sequences to continue. In the context of company equity, the representativeness heuristic may lead employees to expect extreme good and extreme bad price performance to continue into the future.

Benartzi (2001) raises the point that if all investors exhibit the same degree of extrapolation, it would be puzzling to see employees allocate more to company stock than do other investors. He argues, however, that familiarity magnifies the degree of extrapolation: Heath and Tversky (1991) find that people prefer betting on their own judgment over an equally likely chance event when they consider themselves familiar with the matter but not otherwise. A related interpretation is that the illusion of knowledge (Oskamp, 1965) gives employees the necessary (over)confidence to act on their (incorrect) assessment of the future prospects of their company's stock.[17]

An alternative explanation, which does not rely on psychological differences between employees and outside investors, is that while rational arbitrageurs serve to dampen the effect of irrational investors on market prices, there is no equivalent force that dampens employee exuberance with regard to options written on company stock. In

[16] Benartzi (2001) also conducts a survey with Morningstar.com visitors asking them to rate the performance of their companies' stock over the last five years and the next five years. Despite the fact that individual stock returns are largely unpredictable, the respondents' ratings where positively correlated with a ρ of 0.52, consistent with excessive extrapolation.

[17] Benartzi's (2001) survey indicates that employees seeing themselves as more familiar with their company display a higher positive correlation between their assessment of past and future company stock performance. Consistent with the familiarity bias, Huberman (1997) reports that people tend to invest a relatively large portion of their portfolios in their local phone company. Finally, Upal and Wang (2002) show that uncertainty aversion can lead investors to bias their portfolio holdings towards assets they are more familiar with.

particular, employees may be unable to derive the fair value of employee stock options from observed stock prices and may be willing to give up cash pay in excess of fair value. Stock options are complicated financial instruments requiring complex valuation techniques and rank-and-file employees are unlikely to have much prior experience holding options.[18] Employee misvaluation may thus well be greater than market misvaluation, and firms may prefer to compensate their employees with options rather than to sell equity at inflated prices.

The question as to why some firms encourage or even mandate holdings of company equity by non-executive employees either through option plans or other means has attracted considerable attention.[19] Oyer and Schaefer (2002) present an excellent discussion of the potential benefits of stock-option usage in firms. They argue that the incentive effects from option compensation for lower-level employees are likely to be insignificant and outweighed by the cost of exposing employees to risk.[20] They further argue that the vesting structure of option grants helps firms retain employees. Lazear (1999) and Murphy (2002) have argued that other forms of deferred compensation that do not expose employees to unnecessary risk are a more efficient means of providing retention incentives.[21] Lambert, Larcker, and Verecchia (1991), Murphy (1999), Hall and Murphy (2001), Meulbroek (2001 and 2002), Ingersoll (2002), and Kahl, Liu, and Longstaff (2003) try to quantify the deadweight loss from selling company equity and options to employees. While the answer is obviously model dependent, there is general agreement that employees' rational private valuation of company stock and options will be significantly below the fair market value. Finally, Oyer and Schaefer (2002) show that option grants may induce sorting in the labor market. Potential employees may have heterogeneous assessments of a firm's prospects, providing an opportunity for firms to reduce compensation costs by using options to attract optimistic employees.[22]

Core and Guay (2001) are the first to perform a large-sample analysis of non-executive employee stock option holdings, grants, and exercises. They document the widespread usage of stock option grants to non-executive employees in a sample of 756

[18] There is considerable evidence that employees have trouble understanding even the risks and rewards of company equity. John Hancock Financial Services ("The sixth defined contribution plan survey", 1999) reports that a majority of employees feel that their own company stock is safer than a diversified portfolio. Benartzi's survey on Morningstar.com finds that only 16.4% of the respondents believe that company stock is riskier than the overall stock market, as indicated by the likelihood of losing half its value over the next five years. Degeorge, Jenter, Moel, and Tufano (2003) find that employees at France Telecom shunned the option to secure their investments in company stock with (heavily subsidized) downside protection.

[19] An extensive discussion of the usage of company stock in defined contribution retirement plans is provided by Mitchell and Utkus (2002).

[20] Kruse and Blasi (1997) and Kruse (2002) review the evidence on the hypothesis that equity ownership by employees helps to align stakeholder interests and find mixed results at best.

[21] Oyer and Schaefer (2001) are certainly aware of the Lazear (1999) argument and argue that options may nevertheless be useful for retention purposes based on an argument in Oyer (2002). He shows that if stock prices and labor market conditions are positively correlated, then unvested options serve to index employees' deferred compensation to their outside opportunities, and hence reduce transaction costs associated with the renegotiation of compensation.

[22] This argument is closely related and complementary to our argument: Oyer and Schaefer (2002) consider the case of heterogeneous beliefs while we argue that current (as well as potential new) employees will be especially amenable to option compensation when a firm is doing extraordinarily well.

firms during 1994 to 1997. They present evidence that firms use greater stock option compensation when facing capital requirements and financing constraints. In particular, they find that grants are positively associated with investment opportunities and with the difference between cash flow from investment and cash flow from operations ("cash flow shortfall"). They also argue that their results are consistent with firms using options to attract and retain certain types of employees as well as to create incentives to increase firm value. Finally, they present evidence that employees are subject to behavioral biases in their exercise behavior similar to the ones documented by Heath, Huddard and Lang (1999). Kedia and Mozumdar (2002) largely replicate the Core and Guay (2001) results on a sample of 200 large NASDAQ firms and show that the level of employee option grants (as well as the percentage of options given to non-executives) is higher in their sample compared to that of Core and Guay.

Several papers document that stock option grants to both executives and non-executive employees are used extensively in "new economy" firms. Anderson, Banker and Ravindran (2000) as well as Ittner, Lambert and Larcker (2001) show that grants in new economy firms remain larger than in old economy firms even when controlling for differences in firm characteristics. Interestingly, and consistent with the evidence we present below, Ittner, Lambert and Larcker (2001) show that new economy companies with greater cash flows use employee options more extensively, contradicting the notion that options are used to alleviate cash constraints. Murphy (2002b) discusses these findings and provides preliminary evidence that grants in high-tech firms became smaller after the bursting of the new economy bubble.[23] None of these studies consider employee sentiment as the main driving force behind firms' option compensation policies.[24]

Several recent studies have been concerned with the effect of employee stock option plans on corporate taxes. Using the same dataset as in our study, Desai (2002) finds that employee stock option deductions substantially reduce corporate tax payments in the 1990s. Graham, Lang, and Shackelford (2002) confirm Desai's findings on a different dataset and also find substantial reductions in corporate marginal tax rates, especially for NASDAQ companies. Graham et al. furthermore find that managers seem to take option deductions and the associated reduction in marginal tax rates into account when making corporate capital structure decisions. The Desai and Graham et al. studies are complementary to our paper since they do not attempt to find the determinants of option usage by companies. Instead, their focus is on how option compensation affects

[23] Murphy (2002a and 2002b) proposes that decisions over options are made based on the "perceived cost" of options rather than their economic cost. Since options bear no accounting charge and incur no outlay of cash, managers may perceive the cost of option compensation as low and, therefore, prefer it to cash compensation. We regard this hypothesis, which assigns a behavioral misperception to managers as opposed to employees, as complementary to our hypothesis and note that it cannot explain why option grants are concentrated among successful firms with high stock returns.

[24] Zhang (2002a,b) argues that employee option grants are used by firms to sell overvalued equity to outside investors. Employee sentiment does not play a role in her model as employees' opinion about firm value is exactly the same as managers. Further, employees do not mind being granted overvalued equity in her setup. Zhang (2002b) finds that option grants are used by firms with high Q and high recent stock returns, similar to our results below.

corporate tax payments and how firms consider the tax effects of compensation when setting the corporate capital structure.[25]

3. A Simple Model of Optimal Compensation

We develop a simple model in which a firm decides whether to pay its employees in cash or in units of an equity-based instrument. This equity-based instrument may be though off as either restricted stock or options, and for simplicity we refer to it as "equity". Employees have their own subjective valuations of the equity instrument, and this valuation may be above or below the market value of equity. In compensating employees, the firm maximizes long-run shareholder value, and in doing so, it employs its own private opinion regarding fundamental firm value. The firm's perception of the fundamental value of the equity that it grants can differ from both the market value and the employees' valuations of the same instrument.[26] Initially we do not allow the firm to issue seasoned equity into the market an assumption which we relax later. For simplicity we assume for now that there is only one representative employee.

The market price of a unit of equity is given by P.[27] For simplicity, we assume that the outstanding number of shares of the firm is far greater than the number of equity units to be granted, so that the market price of equity does not change as a function of the number of equity instruments issued.[28] The firm's valuation of a unit of equity is given by P_F.[29]

The employee enjoys expected utility $U(W, N)$ from a portfolio comprising N units of equity and $\$W$ in cash, and for simplicity we assume that the utility isoquants are differentiable and convex.[30] The expected utility function incorporates both the risk aversion of the employee, as well as her subjective valuation of units of equity. For example, consider an employee exhibiting power (CRRA) utility who thinks that the future value of company equity (at the end of the relevant horizon) is given by $\widetilde{X}$, even

[25] Graham, Lang, and Shackelford (2002) point out that, despite the massive size of option-related tax deductions, the net effect of option compensation is most likely a revenue gain for the U.S. Treasury because of the income taxes that employees pay at exercise. Therefore, option compensation cannot be explained as a tax-saving strategy. Core and Guay (2001) find that high tax rate firms issue fewer options to non-executive employees, presumably because these firms would rather pay in cash and receive an immediate compensation deduction from taxable income. When future corporate taxes are expected to be higher, the future tax deduction from deferred compensation becomes more attractive relative to the immediate deduction from cash compensation. Hence, the use of option compensation should be relatively less costly for firms with low marginal tax rates.

[26] For the purpose of the model it is irrelevant which (if any) one of the three parties – the firm, the employees, or the market – is correct about the fundamental value of the equity.

[27] Note that we assume that a market price of the equity-based compensation instrument is available, either because the instrument itself is traded or because the instrument can be valued off a traded asset. We discuss below the situation in which the market value is not visible to employees.

[28] This assumption of infinitesimal dilution is similar in spirit to the "infinitesimal new loans" assumption in Stein (1998).

[29] We do not distinguish between the firm, its managers and its owners. One may think of the firm as managed by a risk-neutral majority owner trying to maximize firm value.

[30] Thus, $U(W, N)$ is differentiable and strictly quasiconcave.

though the market thinks that the future company value will be $\widetilde{P}$. This employee's expected utility is only determined by her own beliefs and preferences and is given by:[31]

$$U(W,N) = E[u(W,N)]$$
$$= E\left[\frac{1}{1+\rho}\cdot\frac{(W+N\cdot\widetilde{X})^{1-\gamma}}{1-\gamma}\right]$$

The employee is averse to the idiosyncratic return risk of the firm and may also have undiversifiable human capital risk tied to the fortunes of the firm. We assume that the equity market is risk neutral and that both the risk free rate and the return on equity (and options) is zero.[32] Hence, if the employee agrees with the stock market in the assessment of the firm's expected cash flows and risk, then she values company equity at below its market value.[33] Her subjective valuation approaches or even exceeds the market's valuation only if the employee is more optimistic about expected cash flows than the market, or if the employee perceives the cash flows as less risky than the market does.

The firm's problem is to find the optimal compensation mix of wage and equity units (W, N) with which to compensate the employee, subject to the constraint that the employee's participation constraint is fulfilled. To obtain the employees participation constraint we assume that the employee can leave the firm and earn an outside wage W_{out}. Given the outside wage, the employee constructs her optimal portfolio (W^*, N^*) satisfying

$$\underset{W,N}{Max}\ U(W,N)$$
$$s.t.\ (1)\ N\cdot P + W = W_{out}$$
$$(2)\ N \geq 0$$

Hence the reservation utility of the employee is given by $V^* \equiv U(W^*, N^*)$. The assumptions made above ensure that if the employee is not optimistic about company equity in the sense that she agrees with the markets assessment of risk and return, risk aversion makes her optimal allocation to equity equal to zero. If, on the other hand, the employee is optimistic about company equity, the employee's subjective valuation can exceed the market value and N^* can be positive. The employee's reservation level of

[31] This utility function specification is only an example, and the results presented below hold for any utility function that is differentiable and strictly quasiconcave.

[32] This assumption is a simplified version of a more realistic setting in which systematic risk is priced and the employee is allowed to invest into the risky market asset. In both settings, the employee will never invest in company equity as long as the employee agrees with the markets assessment of expected risk and return.

[33] Numerous papers have analyzed this situation and calibrated models to come up with the subjective valuations of company equity by employees who agree with the market but have to bear the idiosyncratic risk in stock returns. Estimate of the valuation discount range (in models including realistically calibrated alternative investments) from 20 to 60 percent for restricted stock and for restricted stock options. See Lambert, Larcker, and Verecchia (1991), Murphy (1999), Hall and Murphy (2001), Meulbroek (2001 and 2002), Jenter (2002), Ingersoll (2002), and Kahl, Liu, and Longstaff (2003).

utility V^* is increasing in both the outside wage level W_{out} and the employee's optimism about the firm's equity.

We assume that the employee is not allowed to sell any equity obtained as compensation from the firm.[34] On the other hand, the employee may decide to use some of the wage compensation to purchase more units of equity in the market. Thus, upon receiving ($\underline{W}$, $\underline{N}$) from the firm, the employee maximizes:

$$\begin{aligned} &Max\ U(W,N) \\ &s.t.\ (1)\ \ N\cdot P + W = \underline{W} + \underline{N}\cdot P \\ &\qquad (2)\ \ N \geq \underline{N} \end{aligned}$$

We denote by $V(\underline{W}, \underline{N})$ the employee's indirect utility from receiving ($\underline{W}$, $\underline{N}$) in compensation and then reoptimizing her portfolio. Assuming that production and investment decisions in the firm are fixed, profit maximization by the firm is equivalent to minimizing the firm's compensation expense subject to the employee's participation constraint. Hence, the firm's maximization problem is then given by:[35]

$$\begin{aligned} &\underset{\underline{N},\underline{W}}{Min}\ \underline{N}\cdot P_f + \underline{W} \\ &s.t.\ (1)\ V(\underline{W},\underline{N}) \geq V^* \\ &\qquad (2)\ \underline{N} \geq 0 \end{aligned}$$

Solving this program yields the optimal compensation mix from the firm's perspective:

Lemma 1 *The firm's optimal compensation policy is given by*

(1) If $P < P_F$, the firm grants ($\underline{W}$, $\underline{N}$) = (W_{out}, 0).
(2) If $P > P_F$, the firm grants ($\underline{W}$, $\underline{N}$) with $\underline{N} \geq N^*$.
(3) If $P = P_F$, the firm is indifferent between all ($\underline{W}$, $\underline{N}$) satisfying $\underline{W} + \underline{N}\cdot P = W_{out}$ and $N \leq N^*$.

The underlying intuition of Lemma 1 is that the employee never agrees to cut her wage by more than the market price P in return for an additional unit of equity, even if her subjective valuation of the equity is much higher than P. This is simply due to the fact that she can purchase equity in the market on her own for a price of P. Thus, there is an implicit "arbitrage relation" between the amount of cash the firm can "charge" for a unit of equity in terms of foregone cash wages and the market price. Put differently, even if an optimistic employee perceives the market price as extremely low and would like to

[34] While matching observed firm behavior in reality, this assumption is not necessary and the main results of our model would go through without it. Short-sales of company equity by employees need to be prohibited (or sufficiently costly) for the model results to hold.
[35] We implicitly assume that the employee's perception of fundamental firm value does not change as a function of the amount of equity received as compensation. In particular, when receiving equity-based compensation, the employee does not make any negative inferences about the firm's perception of fundamental value.

purchase a large number of equity units herself, the benefit of the perceived misvaluation is already incorporated into the employee's reservation utility and cannot be appropriated by the firm.

The implication for the firm's optimal compensation policy is straightforward: Since the employee never agrees to pay more than P per unit of equity, the firm only compensates with equity if it believes the equity to be (weakly) less valuable than P. If the firm believes that the fundamental value of a unit of equity is greater than P, the firm never compensates the employee with equity, regardless of the degree of optimism of the employee (Part (1) of Lemma 1).

The firm optimally grants equity to the employee as long as the employee's willingness to give up cash in exchange exceeds the firm's valuation of the equity. From the definition of (N^*, W^*), the employee's marginal willingness to pay for a unit of equity at (N^*, W^*) exactly equals P. Thus, holding the employee's utility constant at V^*, as the number of equity units given to the employee increases above N^*, the employee's willingness to give up cash for an additional unit falls below the market price. Thus, if $P_F < P$, i.e. the firm thinks the equity is overvalued, the firm increases the number of equity units granted above N^* to the point where the employee's willingness to exchange cash for a unit of equity exactly equals P_F (Part (2) of Lemma 1). If, on the other hand, the firm perceives the equity as fairly valued ($P_F = P$), the firm never grants more than N^* units of equity, and is in fact indifferent between any equity grant between zero and N^* which (together with the appropriate wage payment) leaves the employee at V^* (Part (3) of Lemma 1). Figure 1 demonstrates the optimal compensation policy (N_{opt}, W_{opt}) chosen by the firm, for the case of perceived overvaluation ($P > P_F$) in Panel A and for fairly valued equity ($P = P_F$) in Panel B.

The primary effect of an increase in employee optimism is to increase the desired number of equity units the employee wants to hold, and to increase the optimal allocation of units to the employee by the firm. An increase in optimism effectively increases the employee's capacity to absorb equity granted by the firm. Hence even with a small amount of perceived overvaluation, the firm may use large amounts of equity-based compensation if the employee exhibits a high degree of optimism. A second effect of an increase in optimism is an increase in the average amount of cash wages the employee is willing to give up per equity unit granted (up to the cap of P per unit.) This second effect is due to the employee being willing to pay the market price P for a larger number of equity units before N^* is exceeded and the employee demands a further risk premium per additional unit granted.

The model developed so far contains several obvious simplifications which we address next. First, the compensation policy of the firm contains information about the firm's private perception of fundamental value and thus the equity market may react to news about compensation policy. Second, the firm may access the equity market directly and issue seasoned equity. Third, employees may have heterogeneous beliefs about firm value. Fourth, the firm may wish to sell equity for reasons other than perceived overvaluation. Finally, we briefly discuss a version of the model in which the implicit

"arbitrage relation" between market prices and the amount of cash wages the employee is willing to give up for equity units breaks down.

Allowing the equity market to react to compensation policy

In our model the firm benefits from selling what it perceives as overpriced equity to employees. What happens if the equity market observes the compensation policy of the firm and reacts to equity-based compensation by adjusting its market price downwards? This negative market reaction to equity-based compensation would resemble the empirically observed negative market reaction to seasoned equity issues.[36]

If the negative price reaction is sufficiently strong to bring the market price P down to the firm's valuation of the equity, the firm's benefit from equity-based compensation vanishes since its only benefit in our base model stems from the perceived overvaluation of the firm by the market.[37] No equity-based compensation is used without perceived overvaluation, or if the market reacts sufficiently strongly to equity-based compensation. However, any underreaction on the part of the market to equity compensation would leave the analysis above largely unchanged.[38]

How likely is it that the market reacts fully to firms' attempts to sell overvalued equity to its employees? To the best of our knowledge, there are no studies of the stock market reaction to the announcement of equity grants to employees. Garvey and Milbourn (2003) report that firms with large broad-based stock option grants have low future stock returns, suggesting that the market does not react sufficiently negative to equity-based compensation. Looking at seasoned equity issues, the low long-run returns following SEOs documented by Stigler (1964), Ritter (1991), Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), and Baker and Wurgler (2000) show an incomplete reaction of the equity market to news about equity issuance. Given that the market does not seem to fully recognize the negative information in seasoned equity offerings, there is little reason to expect that the market should do so for the more recent phenomenon of broad-based equity compensation.[39] Finally, Graham and Harvey (2001), Jenter (2003), and Greenwood and Jenter (2003) present evidence consistent with the notion that firms actively try to take advantage of perceived misvaluations in their equity issuance decisions. Hence whether the equity market does in fact react fully to the information in

[36] The negative stock market reaction to equity issues is predicted by Myers and Majluf's (1984) model of asymmetric information, and has been empirically verified by (among others) Asquith and Mullins (1986), Masulis and Korwar (1986), and Mikkelson and Partch (1986).

[37] We assume that the employee's subjective valuation is unaffected by the drop in the market price when the compensation policy is announced. Given the on average small stock price reactions to seasoned equity offering announcements we believe that this assumption is realistic.

[38] Below we explore the possibility that the firm may want to sell equity for other reasons, e.g. to preserve cash for investments. In this case equity based compensation will still be used even if the market price drops all the way to the firm's valuation of equity.

[39] Zheng (2003a,b) argues that the stock market does not recognize equity-based compensation as opportunistic sales of overvalued equity because the market is unable to distinguish other motivations for paying in equity like incentives reasons. Another possibility is that the market learns about changes to compensation policy only with delay. Hence any negative stock market reaction would be too late to lower the amount of cash employees have given up in exchange for equity grants.

corporate announcements or not, firms and their top executives act as if the reaction was incomplete.

Allowing for direct seasoned equity issues by the firm

Why does a firm which perceives its equity as overvalued not access the equity market directly and issue seasoned equity? Under the model's assumptions employees are not willing to give up more cash per equity unit than its market price, and hence the firm should be indifferent between paying employees in equity and issuing equity to the market.[40]

There are several ways to break this indifference. Seasoned equity issues are associated with large fixed costs (Smith (1986), Lee, Lochhead, Ritter and Zhao (1996), and Altinkiliç and Hansen (2000)) and are therefore only used irregularly to raise large amounts of funds. Equity-based compensation, on the other hand, is a low cost and therefore flexible method to sell equity to employees. The model shows that if employees are optimistic about firm value, the amount of equity compensation provided to them can be large even if the perceived overvaluation is small – small enough not to merit an SEO. Thus, a different interpretation of our results is that equity based compensation and SEOs can be complements. Holding employee optimism constant, if the overvaluation is below a certain cutoff level, the firm will solely use equity compensation and not undertake an SEO, while if the overvaluation is above the cutoff level, the firm will undertake an SEO in addition to using equity compensation.

Additionally, tax considerations may make option-based compensation cheaper for some firms than a seasoned equity issue.[41] Firms which are currently paying little to no taxes may prefer to pay employees in options, thereby deferring the reduction in taxable income into the future when the options are exercised. Finally, optimistic employees may be willing to pay a premium for equity units as compensation relative to their market price because of transaction cost savings from not having to purchase the equity in the market.[42]

---

[40] An often made argument against equity based compensation (and hence in favor of seasoned equity offerings) is that a subsequent decline in equity prices will leave employees unhappy and demotivated. But note that most employees who are paid in equity in our model would have purchased equity themselves anyway.

[41] The tax treatment of stock grants is different in that stock grants are expensed at the grant date, and hence no deferral of tax shields occurs. A complete tax treatment of stock and option compensation would have to take employees' personal taxes into account as well. See Graham, Lang, and Shackelford (2002).

[42] Zheng (2003 a,b) argues that the stock market reaction to a seasoned equity offering would be more negative than the stock market reaction to equity-based compensation. In her model the market recognizes the bad news inherent in an equity issue but fails to do so for equity grants. This again breaks the indifference of the firm between equity-based compensation and SEOs by making equity-based compensation the more stealthy method of selling equity. An important difference between Zheng's model and ours is that in her model employees are not optimistic about the firm but simply flip the stock quickly into the unsuspecting market. The empirical fact that stock and option grants tend to come with fairly long vesting restrictions is difficult to explain under these assumptions. In our model, on the other hand, employees would continue to hold most or all of the granted equity even if vesting restrictions were removed.

Allowing for heterogeneous beliefs of employees about the firm

For simplicity, the model presented above treats only the case of a single representative employee. When allowing for many employees, one needs to take into account heterogeneity in the degree of optimism across employees. Since employees' beliefs are not observable by the firm, the optimal compensation scheme would be a menu of contracts with varying proportions of equity-based compensation and cash from which employees could choose (Rothschild and Stiglitz (1976)).

Empirically, the degree of equity-based compensation is in fact often part of the negotiation process about the employment contract and thus tailored to the beliefs and preferences of each employee. If, on the other hand, a large majority of employees are optimistic about company equity and would like at least some equity as part of their compensation, the firm may find it more efficient to economize on contracting costs and to use uniform contracts for groups of employees.

Reasons other than (perceived) overvaluation for issuing equity

In our model the firm pays in equity because it perceives the market value of equity as too high, and can therefore "sell" equity at prices equal or close to the market value to its employees by making it part of compensation. The firm has no motivation to pay employees in equity, or to issue equity to the market, if the firm perceives its equity as fairly valued.

However, if the firm has reasons to issue equity other than (perceived) overvaluation, equity-based compensation for optimistic employees can still be optimal. The basic insight that employee optimism leads to an equivalence of equity-based compensation with seasoned equity issues does not hinge on the assumption of perceived overvaluation. To see this, imagine a situation in which the firm needs one million dollars for an investment project. The firm can either issue seasoned equity with net proceeds of one million dollar, or it can save one million dollar in wages by paying employees with equity. If employees' subjective valuations are high enough, the firm will again be indifferent between issuing to the market and paying its employees with equity. Taxes, transaction costs and fixed costs of issuing equity can then again be used to break the indifference and make equity based compensation the optimal choice for the firm.
The conclusion is that perceived overvaluation is not a necessary ingredient for a model explaining equity-based compensation. It serves as motivation for the firm to sell equity in our model, but other motivations work as well and deliver largely similar results.[43]

Summary and implications of our basic model

[43] A difference between our model with perceived overvaluation and the simple investment model just described is that in the investment model the firm does not grant more equity than the employee would have purchased herself. The reason is that the firm regards the market price of equity as fair, and hence the budget line of the employee and the iso-profit line of the firm coincide. This is the situation depicted in Panel B of Diagram 1.

Our model demonstrates that firms may find it optimal to use equity-based compensation for low-level employees if these employees are optimistic about firms' valuations. Empirically, employees often purchase company stock at market prices with their own money. The model demonstrates that firms may find it optimal to crowd out these purchases with equity grants if the firm sees the equity as overvalued by the market, or if the firm has any other reason to sell equity to the market. The observation that many employees are willing to purchase equity at market prices demonstrates that employees do not value company stock as prescribed by extant theory, and firms are likely to take advantage of employees' optimism by "selling" equity to them. In our basic model, employees do not pay their subjective valuations for the equity but simply "pay" (give up cash wages equal to) the market price of equity. Hence in the model employees are protected against overpaying relative to the market, even though they are overpaying relative to the firm's valuation. More optimistic employees receive a larger portion of their compensation as equity.

The model leaves employees indifferent between being paid in equity, and being paid in cash and purchasing (a smaller amount of) equity themselves. Indeed, in our base model, employees would be equally happy to receive their reservation wage in cash and to purchase any desired equity themselves. In this sense the impetus for equity-based compensation in our model comes from the firm and not from employees. While this may be a good description for many firms, it fails to explain the anecdotal and survey evidence suggesting that many companies felt pressured to use options to attract and retain employees during the second half of the 1990s. Ittner, Lambert, and Larcker (2003) present evidence from a survey of 217 "new economy" firms about compensation practices in 1998 and 1999. Employee retention is the most important objective for both stock option and restricted stock programs, and employee attraction is the second most important objective for restricted stock programs and the third most important objective for option programs. In our base model, employees would be equally happy to receive their reservation wage in cash and to purchase any desired equity themselves. Hence firms have no attraction or retention advantages from shifting to equity-based compensation in the base model.[44] The next section modifies the model and explores the assumptions necessary to have employee strictly prefer equity compensation to cash compensation.

A variation of the model without the "no arbitrage" link to market prices

A model which shifts the impetus for equity compensation from firms to employees must break the link between the employee's willingness to pay for equity based compensation and its price on the market. Employees will strictly prefer equity based compensation to its market value in cash only if they fail to see that the market is offering a similar bet on the firm more cheaply. Failing to recognize the implicit "arbitrage relation" between equity granted by the firm and equity offered in the market, optimistic employees may be willing to give up more in wages in exchange for equity compensation than the market

[44] In fact tax and transaction cost considerations may be enough to get employees to strictly prefer equity compensation to its market value in cash. These effects do not seem large enough to explain by themselves the stock option frenzy of the 1990s, even though they may well have contributed to the popularity of options among employees.

value of the equity compensation. Such a model could explain why firms in the 1990s were faced with employees who strictly preferred options to cash, and who refused to join firms which did not offer options.[45]

How realistic is the notion that employees "overpay" for equity-based compensation because they fail to realize that a similar bet is available in the equity market? This breakdown in employees' valuation process seems unlikely for restricted stock grants since the price comparison to traded stock is fairly straightforward. Stock options, on the other hand, are much more difficult to understand and value. Anecdotal evidence suggests that employees are baffled by options and do not apply anything resembling an option pricing model to them, let alone make the required corrections for their non-diversifiable positions in the firms where the work. Hence it is likely that employees are unable to deduce the value of options from observed stock prices. Employees may or may not realize that the equity market offers a bet on company stock which is very similar to the bet offered by stock options, and are likely to find calculating the appropriate relative valuations excessively difficult. Under these circumstances, optimism may well translate into employees overpaying for options relative to their market value.

When employees' willingness to pay for options exceeds their market values, firms are strictly better off granting options than paying the market value in cash. In fact a competitive labor market would force firms to shift compensation to options. A breakdown in the link between equity prices on the one hand and willingness to pay for options on the other hand can explain why employees pressured firms to pay them in options and refused to work for firms which did not do so. Taking the firm's perspective, it can also explain why options are much more popular than restricted stock as a means of compensation. Employees are unable to calculate option values, and optimism may induce employees to "overpay" for options. The simpler valuation anchor provided by observable stock prices makes overpayment for restricted stock much less likely.

Empirical predictions of the model(s):

All versions of our model deliver quite similar empirical predictions. Equity compensation should be used whenever employees are very optimistic about company stock and when the firm believes the stock to be overvalued or has any other reason to want to sell equity. Furthermore, higher employee exuberance about the firm should lead to a higher percentage of compensation through equity.

Testing directly whether employees are exuberant about company stock in firms that pay rank-and-file employees with equity is difficult: employee sentiment and expectations are unobservable. At the same time though, the model implies that equity-based compensation should be employed in those situations in which employees are willing to

[45] Such a model would also imply that firms strictly prefer paying with equity to issuing equity into the market, and that firms do not need to perceive the market price of equity as too high to pay their employees in equity.

purchase company equity for their own private accounts.[46] The results in Benartzi (2001) and Huberman and Sengmüller (2002) suggest that prior stock returns are a major determinant of the willingness to invest in company stock, and hence employee sentiment, with sentiment improving with prior stock price performance. We further conjecture that other measures of high and increasing firm quality, like investment, cash balances, and R&D, are positively correlated with employee sentiment, while any signs of distress (high leverage, high interest burden) are associated with worsening sentiment. These observations lead to a number of testable hypotheses.

The link between past stock returns and employee sentiment towards equity-based compensation should exist independently of whether employees are able to deduce the (market) value of the compensation instrument from stock prices. If employees have difficulties valuing, say, options on the basis of observed stock prices, learning from past option payoff realizations is an obvious heuristic. Employees are likely to view options as very valuable after a period in which options have done well in the past, and are likely to assign low values to options after periods with low or non-existent option payoffs. Thus, we may even expect employees to extrapolate more strongly from past performance when assessing option values than when assessing restricted stock, since options do not have an obviously similar traded security from which price comparisons can be made.

We formulate our testable hypotheses in terms of stock options rather than generic equity since our empirical tests will use data on option grants. The observation that employees' private valuation of company equity seems to increase in past performance, and for many to rise above the market price, leads to our first testable hypothesis:

> *H1: Firms should be more likely to grant options and should grant more options to employees after the stock price has done well.*

Also, Griffin and Tversky (1992) document that people tend to give excessive weight to extreme information while giving insufficient regard to its weight or predictive power. We therefore conjecture that the relationship between past performance and employee sentiment is non-linear, with employee exuberance associated mostly with extraordinarily good returns. This leads to our second hypothesis:

> *H2: Options grants should be non-linearly related to past performance and concentrated among the very best past performers.*

Benartzi (2001) documents that the effect of past returns on employees' purchases of company stock increases in the time frame over which past returns are measured. We therefore conjecture that the path of past returns is important in determining employee sentiment towards the firm and propose that employee sentiment will be especially positive following a series of years with high stock returns. This leads to our third hypothesis:

[46] This corresponds to $N^*>0$ in our model. If perceived overvaluation is the firm's motivation for paying with equity, then there are some firms in which employees are "almost" willing to purchase equity with their own money, and which nevertheless find equity-based compensation optimal.

H3: Firms should be most likely to grant options and use the more options as compensation after the stock price has done well over several years.

Furthermore, we conjecture that employees in firms in financial or economic distress are unlikely to be exuberant about the prospects of company stock, and indeed are likely to exhibit negative sentiment towards it. Thus, even though distressed firms are likely to face binding cash constraints and would like to compensate their employees with equity, they will be unable to do so. Our fourth hypothesis is therefore:

H4: Firms in financial or economic distress should be less likely to pay their employees with options.

Finally, we have argued above that (perceived) overvaluation of the firm by the equity market is a reason to "sell" equity to employees. Managers are likely to use actual or perceived inside information about the firm when deciding on the optimal compensation mix. This leads to our fifth hypothesis:

H5: Firms are more likely to use options and grant more options to employees whenever managers have reason to view the stock as overvalued.

The next section describes the data sets we use to test these hypotheses.

4. Data Sources and Variable Definitions

We obtain data on option grants from the S&P ExecuComp database. The information provided through ExecuComp is taken from corporate proxy statements and focuses on option grants (and other compensation variables) to the five highest-paid executives of each firm for the period 1992 to 2001. Desai (2002) has shown that it is nevertheless possible to extrapolate firm-wide option grants due to the requirement that firms report the share of total grants represented by grants to the top five executives. In particular, the ExecuComp variable PCTTOTOP provides the percentage which each grant to executives represents of the total options granted to all employees during the fiscal year.[47] Hence we are able to obtain an estimate of the number of options granted to all employees during a fiscal year from each executive grant reported. We use the sample mean of the estimates generated from each grant as a proxy for the number of options granted to all employees in a given firm-year. We remove from our sample all firm-years in which the sample standard deviation of the estimates is greater than 10 percent of the mean.[48]

[47] By "all employees", we mean both the top 5 executives and all other employees. The estimation method misses employee option grants in firms in which none of the top five executives received any options during a given year.

[48] This eliminates 423 observations.

We use the Black-Scholes (1973) formula to value the options granted to all employees. We do not know the exact exercise prices and the stock price at which the options were granted and therefore use the average of the year high and year low stock prices. While not reported, our results do not materially change when the price at which the options are valued and their exercise price are taken to be the year open or close stock prices.[49] We estimate the total value of options granted to *non-executive* employees by subtracting the value of options granted to the top five executives, taken from ExecuComp, from the value of options granted to all employees. Finally, we divide the value of options granted to all employees by the number of employees at the beginning of the fiscal year to obtain the average value of options granted per employee.

There are obvious weaknesses to our data on employee stock options. We obtain only an estimate of annual option grants to non-executive employees and do not have information on the number of options outstanding, option exercises, and the number of options expired, forfeited or cancelled. Furthermore, we can only estimate the strike prices of the options grants, introducing noise into the grant valuations. The only method to obtain complete data on employee option grants and holdings is hand-collection from the footnotes of annual reports as performed by e.g. Core and Guay (2001), Aboody, Barth, and Kasznik (2001), Graham, Lang and Shackelford (2002), and Kedia and Mozumdar (2002). Hand collection is costly and inevitably results in small sample sizes and especially short sample periods.[50] We instead follow Desai (2002) and focus on option grants as measure of the intensity of option compensation. This enables us to look at a large cross-section of firms for the 1992 to 2001 period. To check how noisy our estimates of grant value are, we compare our estimates to the ones obtained by Core and Guay (2001) using hand-collected data for a subset of our companies in 1995 to 1997.[51] The correlation between our measure and their more precise measure of grant value is .91 providing some assurance that our measurement problems are not severe.

All accounting and firm characteristic information is taken from the Compustat Industrial files. In all our regression models we attempt to control for corporate cash constraints. Measuring cash constraints is a difficult task (Kaplan and Zingales, 1997) and we utilize several measures found in the prior literature. Conceptually, cash constraint measures are constructed using variables measuring the supply of cash to the firm (e.g. cash flow, cash balances, and dividends) and variables representing the demand for cash in the firm (e.g. investment opportunities, debt service). In our subsequent analysis, we use both the composite measures of cash constraints developed in other papers as well as their disaggregated components.

Core and Guay (2001) propose two measures of financial constraints: cash flow shortfall and interest burden. They define cash flow shortfall as the three year average of common and preferred dividends (Compustat data items 19 and 21) plus cash flow used

[49] Using year-end stock prices to evaluate options with the Black-Scholes formula may induce a spurious correlation between grant sizes and contemporaneous stock returns.
[50] We are currently in the process of collecting data to extend the Core and Guay (2001) data set for future research.
[51] We are grateful to the authors for kindly making their data available to us.

in investing activities (data item 311) less cash flow from operations (data item 308), all divided by total assets (data item 6). Interest burden is the three-year average of interest expense (data item 15) scaled by operating income before depreciation (data item 13), where interest burden is set to one when interest expense is greater than operating income before depreciation.

A further measure of financial constraints we use has been developed by Kaplan and Zingales (1997) and adopted to large-sample empirical work by Lamont, Polk and Saa-Requejo (2001). We follow Baker, Stein and Wurgler (2002) and calculate the Kaplan Zingales (KZ) measure of financial constraints as:

$$KZ_{it} = -1.002\frac{CF_{it}}{A_{it-1}} - 39.368\frac{DIV_{it}}{A_{it-1}} - 1.315\frac{C_{it}}{A_{it-1}} + 3.139LEV_{it} + 0.283Q_{it}, \qquad (1)$$

where CF_{it} is cash flow (data item 14+data item 18), A_{it-1} is lagged assets (data item 6), DIV_{it} is cash dividends (data item 21+data item 19), C_{it} is cash balances (data item 1), LEV_{it} is leverage ((data item 9 + data item 34)/ (data item 9 + data item 34+data Item 216)), and Q_{it} is the market value of equity (price times shares outstanding from Compustat) plus assets minus the book value of equity (data item 60 + data item 74) all over assets. All ingredients of KZ are winsorized before the measure is constructed.

One conceptual difficulty with the KZ measure for our purposes is that it contains both measures of the availability of funds (CF, DIV, C, LEV) and a measure of investment opportunities in Q. Similar to Baker, Stein and Wurgler (2002), we construct a cropped KZ measure called KZ4 which excludes Q. It is defined as:

$$KZ4_{it} = -1.002\frac{CF_{it}}{A_{it-1}} - 39.368\frac{DIV_{it}}{A_{it-1}} - 1.315\frac{C_{it}}{A_{it-1}} + 3.139LEV_{it}. \qquad (2)$$

We interpret KZ4 as a measure of the availability of cash with which a firm can finance its investment opportunities. Thus, in the calculus of supply and demand of cash used to construct a measure of financial constraints, we view KZ4 as representing the supply of cash to a firm.[52] Similarly, Q represents investment opportunities and hence the demand for cash in this calculus.

As in Core and Guay (2001) we attempt to further control for investment opportunities, hypothesizing that employees in firms with higher growth opportunities will be granted more options. This could be the case because providing incentives to employees is more important the greater are growth opportunities, because growth firms need to preserve cash, or because employee sentiment is higher the better the growth opportunities. We follow Core and Guay (2001) and use the three-year average of R&D (data item 46) scaled by assets as a proxy for growth opportunities. In a number of regressions we include Q as an alternative measure of growth opportunities. Finally, we

[52] It should be noted that firms with a high KZ4 measure have a *low* supply of cash.

also control for sales (data item 12) to proxy for firm size, and use a long-term debt indicator as a proxy for access to debt markets.

We are interested in the relationship between option grants to non-executive employees and earnings manipulation. We use discretionary current accruals as calculated in Teoh, Welch and Wong (1998 a,b) as our measure of earnings manipulation. The calculations are described in detail in Appendix A of Teoh, Welch and Wong (1998a). Briefly, current accruals are regressed on the change in sales in a cross-sectional regression using all firms in the same two-digit SIC code found on Compustat. The cross-sectional regression is performed each fiscal year for each sample firm, and all variables are scaled by lagged assets. The predicted (fitted) current accruals of the sample firm are calculated using the estimated regression coefficients and the actual change in sales net of the change in trade receivables. The fitted current accruals are considered to be at the level necessary to support the firm's growth in sales. The regression residual is considered to have been "managed" and is called discretionary current accruals (DCAs). After calculating DCAs for all firm years, we label firms with discretionary accruals in the top 10% of all firm-years as manipulators.

Finally, we use a measure of insider trading by managers as an indicator of their opinion about the relation between fundamental firm value and the current market value of the firm. The measure of managerial insider trading is taken from Jenter (2003) and uses the proxy statement information on managerial stock ownership reported in the ExecuComp database. To derive the number of shares bought and sold by each executive on the open market in a given year, the annual change in stock holdings is reduced by the number of shares acquired through option exercises and stock grants. Dollar values are calculated by multiplying the number of shares acquired (or sold) by the year-end stock price. We scale each manager's trades by her total exposure to company equity defined as the sum of managers' stock and option holdings at the beginning of the year plus stock and option grants during the year. We then average the scaled insider trades for all managers in a firm-year and obtain a firm-wide measure of managers' insider trades.

Annual stock returns are constructed from the CRSP monthly return files. When a firm delists midyear we complete the monthly returns through the end of the year by inserting the monthly value-weighted CRSP index. The firm is dropped from our sample as of the year following its delisting. Our initial sample comprises all 2502 firms from the ExecuComp database for the years 1992 – 2001. For computational simplicity, we analyze only firms where the fiscal year ends in December. This results in 1,722 firms and 13,830 firm-years.

We exclude the 4967 firm-years with incomplete information on any of the variables. We do so in order to focus on the decisions leading to changes in the size of option grants to non-executive employees, rather than focus on the motives that might lead a firm to set up such a plan in the first place. We also exclude as coding errors the 102 firm-years in which the number of options granted to the top five executives is

greater than the number of options granted to all employees.[53] Further, we exclude from our sample the 568 firm-years in which the minimum (maximum) exercise price of the options granted to the top five executives is less (greater) than the year low (high) equity price. We also exclude the 50 firm-years for which the value of options granted to all non-executive employees, in the process described above, results in a negative value. Finally, we eliminate 423 observations where the standard deviation of our estimate of PCTTOTOP is greater than 10% of the mean. Our final sample comprises 1595 firms and 7720 firm-years.

Table 1 provides some descriptive statistics for the final sample. The firms in our sample have a median equity value of $1.35 billion, median sales of $1.16 billion, and median assets of $1.69 billion. The median number of employees is 5,600, while the median value of options granted per employee per year is $1,228.

5. Empirical Results

Our general hypothesis is that firms grant options to employees when they exhibit positive sentiment towards their firm (i.e. value their firm's equity higher than its fundamental value) and that firms do not grant options when faced with employees with negative sentiment.

As an initial test of the sentiment hypothesis we sort firms by the value of annual option grants per employee into quintiles and calculate average stock returns over the preceding twelve months. Panel A of Table 2 reports the mean and median values of prior stock returns for each option grant quintile. Consistent with the sentiment hypothesis we find that firms which grant more options also had higher stock returns: firms with option grants in the lowest 20% have mean (median) previous year returns of 15% (11%) while firms with option grants in the highest 20% have prior returns of 58% (26%). Similarly, as shown in Panel B, when sorting firms by previous returns, we find that firms in the bottom 20% of the return distribution grant options with a mean (median) value $17,000 ($1,524) while firms with prior returns in the top 20% grant $78,700 ($3,058). Hence, consistent with out first hypothesis, option grants are used by firms with extraordinarily good performance over the previous year.

To better control for the cross-sectional determinants of employee option grants, we turn to a regression framework. Our baseline specification is:

$$Log(grants \quad per \quad employee)_{it} = \beta_0 + \beta_1 ret_{it-1} + \beta_2 FC_{it-1} + \beta_3 \widetilde{X} \,. \qquad (3)$$

Here ret_{it-1} is a measure of a firm's past stock return, FC_{it-1} is a measure of financial constraints, and X is a vector of firm characteristics. We run the baseline regression with several measures of financial constraints and several measures of past returns. All

[53] The number of options granted to the top-five executives and the strike prices of the grants are obtained from ExecuComp.

regressions include industry fixed effects based on 2-digit SIC codes as well as year fixed effects. The results are presented in Tables 3 to 10.

5.1 The effect of past performance on employee option grants

We start by testing our first hypothesis that option grants to non-executive employees should be increasing in prior stock price performance. In each column of Table 3 a different measure of financial constraints is included as an explanatory variable, and prior firm performance is measured as the stock return over the previous twelve months. The cash constraint measures employed are KZ, KZ4, average cash flow shortfall, and interest burden.

The first hypothesis is strongly supported by the data. In all specifications in Table 3 the coefficient on previous stock returns is positive and highly statistically significant. It is also economically significant: an increase of 10 percentage points in the previous year's return is associated with a 5 percent increase in the value of options granted per non-executive employee. Hence the univariate relationship between grants and past returns is confirmed in the regression framework: option grants are used more by firms with better past stock price performance.[54]

To better control for unobserved heterogeneity among firms, we repeat our analysis using firm fixed effects. As can be seen in Table 4, this does not materially change our result above. Previous year return is still positively related to option grants to employees, with a ten percentage point increase in the return associated with an increase of approximately 1.9% in option compensation per employee. It should be emphasized though that employee sentiment may very well be more closely determined by a firm's actual *level* of stock returns rather than by the deviations of the firm's return from its mean return. In this case, a fixed effects framework would obviously not be appropriate. Still, it is reassuring that in both the cross sectional and the fixed effects framework, the relationship between past returns and option grants holds.

Our second hypothesis is that the relationship between stock price performance and employee sentiment should be non-linear, so that option grants should be concentrated among the very best performers. To allow for this non-linear relationship, we sort firms by their previous year stock performance into quintiles and assign a dummy variable for each performance group. Quintile cut-off levels are constructed using the entire pooled sample. We then repeat the analysis in Table 3 but replace the prior return variable by the performance dummy variables. The results in Table 5 show that the effect of past returns on option grants is indeed highly non-linear and increasing across the five quintiles. Moving from the lowest to the highest previous year return quintile increases the value of options granted per employee by more than 100%. The jump from quintile four to

[54] The coefficient on contemporaneous stock returns is positive and significant in all the regressions, consistent with the notion that employees are more willing to be paid in options when the firm is doing well. Since the relationship between grants and contemporaneous returns may also be purely mechanical and driven by inertia in the contracting technology we focus our analysis on past stock performance.

quintile five is a 60% increase in the average grant size, while the increase from quintile one to quintile two is only 7% (first column). This nonlinearity in the effect of previous returns on grants is consistent with a sentiment hypothesis under which extreme returns generate an exuberant overreaction among employees.

Benartzi (2001) shows that the effect of past returns on employees' purchases of company stock increases in the time frame over which past returns are measured. This led to our third hypothesis: firms should be most likely to grant options to employees after the stock price has done well over several years. To test this hypothesis, we sort firms into quintiles based on prior one, two, three, four, and five year returns.[55] Table 6 shows that options are granted in a manner consistent with Benartzi's results and the employee sentiment hypothesis; the effect of past returns on option grants is increasing in the time-window over which the past returns are calculated. When sorting on previous 1-year returns we find option grants which are 64% larger in the highest return quintile compared to the lowest return quintile, with this difference increasing to 86% when sorting on previous 2-year returns and to 104% when sorting on previous 5-year returns.

5.2 The effect of cash constraints on employee option grants

The finding that stock option grants are related to our proxies for employee sentiment is robust to the inclusion of several measures of cash constraints in Tables 3 to 6. However, the relationship between these measures and stock option grants is in and of itself informative about the option granting behavior of firms.

The results for the composite measures of cash constraints KZ and KZ4 are consistent across Tables 3 and 5: KZ is unrelated to employee option grants while KZ4 is negatively related to grants. The negative coefficient on KZ4 implies that healthy firms with few cash constraints use more options to pay their employees than do ailing firms in poor cash condition. This conclusion is further strengthened by the negative coefficient on interest burden in column four in Tables 3 and 5, as firms with high cash needs for debt service are paying fewer options to their employees. On the other hand, the third composite measure of cash constraints, cash flow shortfall, is positively associated with option grants (Tables 3 and 5).[56]

The results relating composite measures of cash constraints to option grants are thus quite mixed, with the KZ4 measure negatively related to option grants and cash flow shortfall positively related to option grants. To better understand the effect of cash constraints on firms' option granting behavior we therefore analyze separately the relationship between each of the components of the composite measures and option grants. These components are cash balances, leverage, cash flow, investment, dividends, and Q. The results are presented in Table 7.

[55] For this exercise we restrict the sample to firms for which 5 years of past returns are available on CRSP.
[56] These results are also confirmed in Table 4 where firm fixed effects are used. Unlike the cross-sectional results, the KZ measure is now also negatively related to grants.

We find that the value of option compensation per non-executive employee is increasing in (normalized) cash balances,[57] increasing in Q, and decreasing in leverage. Firms with large amounts of cash grant more options, while firms with more need for cash to service debt grant fewer options. We also find that option compensation is decreasing in (normalized) dividends, and increasing in cash flow used in investing activities.[58] Taken together, our results are thus supportive of the sentiment hypothesis: variables which are arguably positively related to employee sentiment (Q, cash balances, investment) predict greater use of option grants, while variables negatively related to sentiment (leverage, interest burden) predict less use of option grants.[59]

To better control for unobserved heterogeneity among firms, we again repeat the analysis using firm fixed effects. As can be seen in Table 8, this does not materially change our results. Employee option compensation is once again increasing in (normalized) cash balances, Q, and cash flow to investment, and decreasing in leverage. Thus, keeping in mind that the coefficients in the fixed effects regressions measure the effect of within firm variation of the explanatory variables on option compensation, we find that tighter cash constraints are associated with lower option grants. However, unlike the cross-sectional result, the estimate of the effect of dividends on option compensation is now positive but statistically insignificant. This result may simply be caused by the slow-moving nature of dividends, or by cuts in dividends being associated with distressed firms and a worsening of employee sentiment.

Even more direct evidence supportive of the relationship between employee sentiment and option grants arises by examining firms headed towards bankruptcy. While these firms can reasonably be expected to have an urgent need to preserve cash and to prefer compensating their employees in options, negative employee sentiment should make it difficult for them to do so. Indeed, our fourth hypothesis was that firms in financial or economic distress should be less likely to pay their employees with options.

To test this hypothesis we construct a dummy that proxies for firms in their last year of existence prior to entering bankruptcy. The dummy takes a value of one when a firm is delisted in the following fiscal year and its previous year return is in the bottom quintile of returns. We propose that these firms have both employees with bad sentiment and a strong need to conserve cash. Table 9 shows the results of regressing the log of option grants per non-executive employee on our distress dummy variable, controlling for industry fixed-effects. In support of the sentiment hypothesis, the coefficient on this dummy variable is negative, implying that the value of per non-executive employee

[57] The positive relationship between cash balances and option grants is further illustrated in Table 2C. Firms in the lowest cash quintile pay a mean (median) value of $3,211 ($607) to each employee while those in the highest cash quintile pay a mean (median) value of $106,000 ($14,100).

[58] The fact that KZ is unrelated to option grants, while KZ4 is positively related, can therefore be attributed to the former measure's inclusion of Q which is positively related to option grants. Further, the positive relationship between cash shortfall and option grants is caused by the positive relationship between cash flow to investments and option grants.

[59] The observed negative relation may suggest that employees are more excited about growth firms than mature, dividend-paying firms. However, cutting dividends is generally seen as bad news. Hence the relationship between dividends and options grants should be positive in a fixed effects regression. This is indeed what we find Table 8 below, even though the result is only marginally significant.

compensation is lower in firms that are about to enter bankruptcy. Indeed, in their last year before delisting, the mean value of non-executive employee option compensation in these firms falls by 78 percent.[60] These results continue to hold when controlling for firm fixed effects as reported in the second column of Table 9.

The results presented so far indicate that firms which have been doing badly (as indicated by low stock returns) and which have little free cash flow (as indicated by low cash balances, high leverage and high interest burden) do not find option grants an efficient means of compensating their employees. Indeed options grants are concentrated among firms with outstanding stock price performance. This leaves the concern that high stock returns may be associated with improving investment opportunities and an investment-induced shortage of cash inside the firm. Successful firms may be granting options because their investment opportunities are good and exceed their internally available cash. We propose, though, that this is unlikely to be the case as high stock returns induced by improving investment opportunities should be associated with easy access to the outside capital markets. The fact that stock prices have risen indicates that the market appreciates the investment opportunities of the firm, and hence employees should not be needed as capital providers (Bayless and Chaplinsky, 1996).

Nevertheless, we provide further evidence against the hypothesis that the positive relation between stock performance and option grants is driven by improving investment opportunities. We identify a set of firms that are cash rich and should have no need to tap employees to finance their investment opportunities. Under the view that stock returns are proxying for improving investment opportunities we should observe no relationship between returns and option grants in these firms. Under the employee sentiment hypothesis on the other hand firms may still grant options after high stock returns in order to take advantage of employee exuberance. For this test we restrict the sample to firm-years in which normalized cash balances are in the top 20% of all firm-years. Of these firm-years we retain only those where, from a certain year on, normalized cash balances remain in the top quintile. Hence we create a sub-sample of firms with large cash balances who remain cash rich for the remainder of the sample period. According to the cash constraints hypothesis, these are firms with no need to compensate their employees with options. However, the mean (median) employee in the sub sample of cash rich firms receives $138,000 ($25,300) per year, compared to $7,900 ($922) in the remainder of the sample. Furthermore, the regression results in the first column of Table 10 show that option compensation per employee is still strongly increasing in previous year return. We conclude that the observed relationship between stock price performance and option compensation is not driven by cash constraints induced by improving investment opportunities. These results are confirmed in the second column of Table 10 where firm fixed effects are employed.

[60]Obviously, this analysis does not necessarily generalize to all distressed firms. We identify firms which are subsequently delisted, i.e. most likely firms which did not manage to recover, and show that they were unable or unwilling to conserve cash by paying their employees in options. It is at least possible that other firms were able to substitute options for cash pay and to avert the delisting.

5.3 Earnings Manipulation and Insider Trading by Managers

We conclude by testing our fifth hypothesis that firms grant more options to employees whenever managers have reason to view the stock as overvalued. We identify two situations in which we can make inferences about managers' opinion about the fundamental value of the firm in relation to its market value. One such situation is when managers manipulate earnings to boost the current stock price. The second situation we examine is identified by managers engaging in aggressive inside sales.

If managers know that the current stock price is inflated because of earnings manipulation, they may find option compensation of rank-and-file employees to be particularly opportune. In effect, we are testing the joint hypothesis that earnings manipulation has at least some effect on equity prices and that employees place at least some weight on the market price of equity when forming their opinion on firm value.[61] We measure earnings manipulation using a measure of discretionary accruals developed by Teoh, Welch, and Wong (1998 a,b). Firms with current discretionary accruals in the top 10% of all firm-years in our sample are classified as likely manipulators.

We run our standard regression specification in Equation (3) and add a dummy variable for earnings manipulators. The results presented in Table 11 show that earnings manipulation is positively associated with option compensation. Indeed, in the cross-section, controlling for industry effects, earnings manipulation is associated with a 34 percent higher value of option grants per employee. Similarly, with firm fixed-effects, the effect is 21 percent.

Our second measure of managers' views on firm value is insider trading. We identify firms with extreme insider selling and firms with extreme insider buying using the methodology of Jenter (2003). We label firms in which managers' inside buying is in the top 20% of all firm-years as "Insider Buying Firms" and firms in which managers' inside selling is in the top 20% of all firm-years as "Insider Selling Firms". The regression results for the standard specification with industry fixed effects are presented in Table 12. Firms in which the top five managers cash out grant around 20% more options to their employees than comparable firms, while firms in which top managers purchase equity for their own account grants around 20% less to employees than comparable firms. These results indicate that top executives increase option grants to rank-and-file employees when they regard the stock as overvalued, and reduce employee option grants when they regard the stock as undervalued.

6. Conclusion

We have analyzed the determinants of employee stock option compensation in a broad cross-section of firms between 1992 and 2001. Our results show that non-executive employee option grants are positively associated with previous stock returns, investment

[61] Alternatively, if employees form sentiment on the basis of earnings news, then earnings manipulation may have a direct effect on employee sentiment.

and investment opportunities, and with cash balances. Grants are negatively associated with interest burden and leverage. Firms in distress reduce their option grants aggressively, suggesting that employees are unwilling to accept options as payment from firms with the highest need to preserve cash.

We propose that firms take advantage of "excessive extrapolation" by employees and pay their employees in options whenever employee sentiment towards the firm is irrationally positive. The evidence we present is consistent with this hypothesis: firms with option grants among the largest 20% of all firm-years have prior returns of 58% over the preceding twelve months, while firms with option grants in the bottom 20% have prior returns of only 14%. Variables associated with high or improving firm quality are positively associated with option grants, while variables associated with worsening cash constraints and distress are negatively related to grants.

Employees' willingness to accept options as payment seems contingent on good news about their firm that they associate with positive future stock performance. Furthermore, managers seem to use option compensation for rank-and-file employees more aggressively whenever managers are convinced that the company stock is overvalued: employee option grants are positively related to a measure of earnings manipulation and to insider sales of equity by top executives.

REFERENCES

Aboody, David, Mary E. Barth, Ron Kasznik, 2001, SFAS 123 Stock-based compensation expense and equity market values, *Working Paper*, Stanford University.

Altinkiliç, Oya, and Robert S. Hansen, 2000, Are there economies of scale in underwriting fees? Evidence of rising external financing costs, *Review of Financial Studies*, Vol. 13 (1), p 191-218, Spring.

Anderson, M., R. Banker, and S. Ravindran, 2000, Executive compensation in the information technology industry, *Management Science* 46, 530-547.

Asquith, Paul, and David W. Mullins, Jr., 1986, Equity issues and offering dilution, *Journal of Financial Economics*, Vol. 15 (1-2), p 61-89, January-February.

Baker, Malcolm, and Jeffrey Wurgler, 2000, The Equity Share in New Issues and Aggregate Stock Returns, *Journal of Finance*, Vol. 55 (5), p 2219-57, October.

Baker, Malcolm, and Jeffrey Wurgler, 2002, Market Timing and Capital Structure, *Journal of Finance*. Vol. 57 (1), p 1-32, February.

Baker, Malcolm, Jeremy C. Stein, and Jeffrey Wurgler, 2002, When does the market matter? Stock prices and the investment of equity-dependent firms, *Working Paper*, Harvard University, July.

Bayless, Marc, and Susan Chaplinsky, 1996, Is there a window of opportunity for seasoned equity issuance?, *Journal of Finance*, 51(1), 253-278.

Benartzi, Shlomo, 2001, Excessive extrapolation and the allocation of 401(k) accounts to company stock, *Journal of Finance* Vol. 56, No. 5, 1747-1764.

Black, F. and M. Scholes, 1973, The pricing of options and corporate liabilities, *Journal of Political Economy* 81, 637-659.

Core, John, and Wayne Guay, 2001, Stock option plans for non-executive employees, *Journal of Financial Economics* 61 (2), 253-287.

Dechow, P., Hutton, A. and Sloan, R., 1996. Economic consequences of accounting for stock-based compensation. *Journal of Accounting Research* , 34, pp. 1–20.

Degeorge, François, Dirk Jenter, Alberto Moel, and Peter Tufano, "Selling company stock to reluctant employees: France Telecom's Experience", forthcoming, *Journal of Financial Economics*, 2003.

Desai, Mihir A., 2002, The divergence between book and tax income, forthcoming in *Tax Policy and the Economy*, eds. James Poterba. (NBER Working Paper 8866.)

Garvey, Gerald, and Todd Milbourn, 2003, Do stock prices incorporate the potential dilution of employee stock options?, *Working Paper*, Washington University in St. Louis, February.

Graham, John R. and Campbell R. Harvey, 2001, The Theory and Practice of Corporate Finance: Evidence from the Field, *Journal of Financial Economics*, Vol. 60 (2-3), May.

Graham, John R., Mark H. Lang, and Douglas A. Shackelford, 2002, Employee stock options, corporate taxes, and debt policy, *Working Paper*, University of North Carolina and Duke University, July.

Greenwood, Robin, and Dirk Jenter, 2003, The use of external funds in the firm, *Working Paper*, MIT Sloan School of Management, October.

Griffin, Dale, and Amos Tversky, 1992, The weighting of evidence and the determinants of confidence, *Cognitive Psychology* 3, 430-454.

Hall, Brian, and Kevin J. Murphy, 2002, Stock options for undiversified executives, *Journal of Accounting and Economics*, 33(1), 3-42.

Heath, C., Huddart, S. and Lang, M., 1999. Psychological factors and stock option exercise. *Quarterly Journal of Economics*, 114, 601–628.

Heath, Chip, and Amos Tversky, 1991, Preferences and beliefs: Ambiguity and competence in choice under uncertainty, *Journal of Risk and Uncertainty* 4, 5-28.

Hovakimian, Armen, Tim Opler, and Sheridan Titman, 2001, The Debt-Equity Choice, *Journal of Financial and Quantitative Analysis*, Vol. 36 (1), March.

Huberman, Gur, 2001, Familiarity breeds investment, *Review of Financial Studies* Vol. 14 (3), pp. 659-80.

Huberman, Gur, and Paul Sengmüller, 2002, Company Stock in 401(k) Plans, *Working Paper*, Columbia Business School, September.

Ingersoll, Jonathan E., 2002, The subjective and objective evaluation of incentive stock options, *Yale ICF Working Paper*, No. 02-07, February.

Ittner, Christopher D., Richard A. Lambert, and David F. Larcker, 2003, The structure and performance consequences of equity grants to employees of new economy firms, *Journal of Accounting and Economics*, Vol. 34, p. 89-127.

Jenter, Dirk C., 2002, Executive Compensation, Incentives, and Risk, *Working Paper*, MIT Sloan School of Management, April.

Jenter, Dirk C., 2003, Market Timing and Managerial Portfolio Decisions, *Working Paper*, MIT Sloan School of Management, May.

John Hancock Financial Services, 1999, The sixth defined contribution plan survey.

Jung, Kooyul, Yong-Cheol Kim, and Rene M. Stulz, 1996, Timing, Investment Opportunities, Managerial Discretion, and the Security Issue Decision, *Journal of Financial Economics*, Vol. 42 (2), p 159-85, October.

Kahl, Matthias, Jun Liu, and Francis A. Longstaff, 2003, Paper millionaires: How valuable is stock to a stockholder who is restricted from selling it? *Journal of Financial Economics*, 67(3), 385-410.

Kahle, Kathleen M., 2001, When a buyback isn't a buyback: open market repurchases and employee options. *Journal of Financial Economics*, 63, 235-261.

Kaplan, Steven N., and Luigi Zingales, Do financing constraints explain why investment is correlated with cash flow?, *Quarterly Journal of Economics,* February, 1997, 169-215.

Kedia, Simi, and Abon Mozumdar, 2002, Performance impact of employee stock options, *Working Paper*, Harvard Business School, August.

Kruse, Douglas and Joseph Blasi, 1997, Employee ownership, employee attitudes, and firm performance: A review of the evidence, in *Human Resources Management Handbook*, Part 1, eds. D. Lewin, D.J.B. Mitchell, and M. Zaidi. Greenwich, CT: JAI Press.

Kruse, Douglas, 2002, Research evidence on prevalence and effects of employee ownership, *Testimony for the Subcommittee on Employer-Employee Relations*, Committee on Education and the Workforce, US House of Representatives, February.

Lamont, Owen A., Christopher Polk and Jesus Saá-Réquejo, 2001, Financial Constraints and Stock Returns, *Review of Financial Studies*, 14, 529-554.

Lang, Larry, Eli Ofek, and René M. Stulz, 1996, Leverage, investment, and firm growth, *Journal of Financial Economics*, 40, 3-29.

Lazear, Edward P., 1999, Output-based pay: incentives or sorting?, *NBER Working Paper*, No. W7419.

Lee, Inmoo, Scott Lochhead, Jay Ritter, and Quanshui Zhao, 1996, The Costs of Raising Capital, *Journal of Financial Research*, Vol. 19 (1), p 59-74, Spring.

Liang, Nellie, and Scott Weisbenner, 2002, Investor behavior and the purchase of company stock in 401(k) plans – the importance of plan design, *Working Paper*, Finance and Economics Discussion Series 2002-36, Board of Governors of the Federal Reserve System, July.

Loughran, Tim, and Jay R. Ritter, 1995, The New Issues Puzzle, *Journal of Finance*, Vol. 50 (1), p 23-51, March.

Masulis, Ronald W., and Ashok N. Korwar, 1986, Seasoned equity offerings : An empirical investigation, *Journal of Financial Economics*, Vol. 15 (1-2), p 91-118, January-February.

Marsh, Paul, 1982, The Choice between Equity and Debt: An Empirical Study, *Journal of Finance*, Vol. 37 (1), p 121-44, March.

Meulbroek, Lisa, 2000, Does risk matter? Corporate insider transactions in internet-based firms, *Harvard Business School Working Paper,* No. 00-062, March.

Meulbroek, Lisa, 2001, The efficiency of equity-linked compensation: Understanding the full cost of awarding executive stock options, *Financial Management*, 30(2), 5-44.

Meulbroek, Lisa, 2002, Company stock in pension plans: How costly is it?, *Harvard Business School Working Paper*, No. 02-058, March

Mikkelson, Wayne H. and M. Megan Partch, 1986, Valuation effects of security offerings and the issuance process, *Journal of Financial Economics*, Vol. 15 (1-2), p 31-60, January-February.

Mitchell, Olivia S. and Stephen P. Utkus, 2002, The role of company stock in defined contribution plans, *NBER Working Paper* No. 9250, October.

Murphy, Kevin J., 1999, Executive compensation, in: Orley Ashenfelter and David Card (eds.), *Handbook of Labor Economics*, Vol. 3, North Holland.

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

Murphy, Kevin J., 2002(b), Stock-based pay in new economy firms, *Journal of Accounting and Economics*, forthcoming.

Murphy, Kevin J., 2003, Stock-based pay in new economy firms, *Journal of Accounting and Economics*, forthcoming.

Myers, Stewart C, and Nicholas S. Majluf, 1984, Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have, *Journal of Financial Economics*, Vol. 13 (2), p 187-221, June.

NCEO, 2001, Current practices in stock option design, Oakland, CA.

Ofek, Eli, and Matthew Richardson, 2002, The valuation and market rationality of internet stock prices, *Oxford Review of Economic Policy*, 18(3), 265-287.

Ofek, Eli, and Matthew Richardson, 2003, DotCom mania: The rise and fall of internet stock prices, *Journal of Finance*, forthcoming.

Oskamp, Stuart, 1965, Overconfidence in case-study judgments, *Journal of Consulting Psychology* 29, 261-265.

Oyer, Paul, 2002, Why do firms use incentives that have no incentive effects?, *Working Paper*, Stanford University Graduate School of Business.

Oyer, Paul, and Scott Schaefer, 2002, Why do some firms give stock options to all employees?: An empirical examination of alternative theories, *Working Paper*, Stanford University Graduate School of Business.

Ritter, Jay R., 1991, The Long-run Performance of Initial Public Offerings, *Journal of Finance*, Vol. 46 (1), p 3-27, March.

Rothschild, Michael, and Joseph Stiglitz, 1976, Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information, *The Quarterly Journal of Economics*, Vol. 90 (4), p. 629-649, November.

Smith, Clifford W., 1986, Investment banking and the capital acquisition process, *Journal of Financial Economics*, Vol. 15 (1-2), p 3-29, January-February.

Spiess, D. Katherine, and John Affleck-Graves, 1995, Underperformance in Long-Run Stock Returns Following Seasoned Equity Offerings, *Journal of Financial Economics*, Vol. 38 (3), p 243-67. July.

Stein, Jeremy, 1998, An adverse-selection model of bank asset and liability management with implications for the transmission of monetary policy, *RAND Journal of Economics*, 29(3).

Stigler, George J., 1964, Public Regulations of the Securities Markets, *Journal of Business*, Vol. 37, p 117-142.

Taggart, Robert A, Jr., 1977, A Model of Corporate Financing Decisions, *Journal of Finance*, Vol. 32 (5), p 1467-84, December.

Teoh, Siew-Hong, Ivo Welch, and T.J. Wong, 1998(a), Earnings management and the long-run market performance of initial public offerings, *Journal of Finance* 53-6, 1935-1974.

Teoh, Siew-Hong, Ivo Welch, and T.J. Wong, 1998(b), Earnings management and the post-issue underperformance in seasoned equity offerings, *Journal of Financial Economics* 50-1, 63-99.

Tversky, Amos, and Daniel Kahneman, 1974, Judgment under uncertainty: Heuristics and biases, *Science* 185, 1124-1131.

Upal, Raman, and Tan Wang, 2002, Model misspecification and under-diversification, *Working Paper*, London Business School, January.

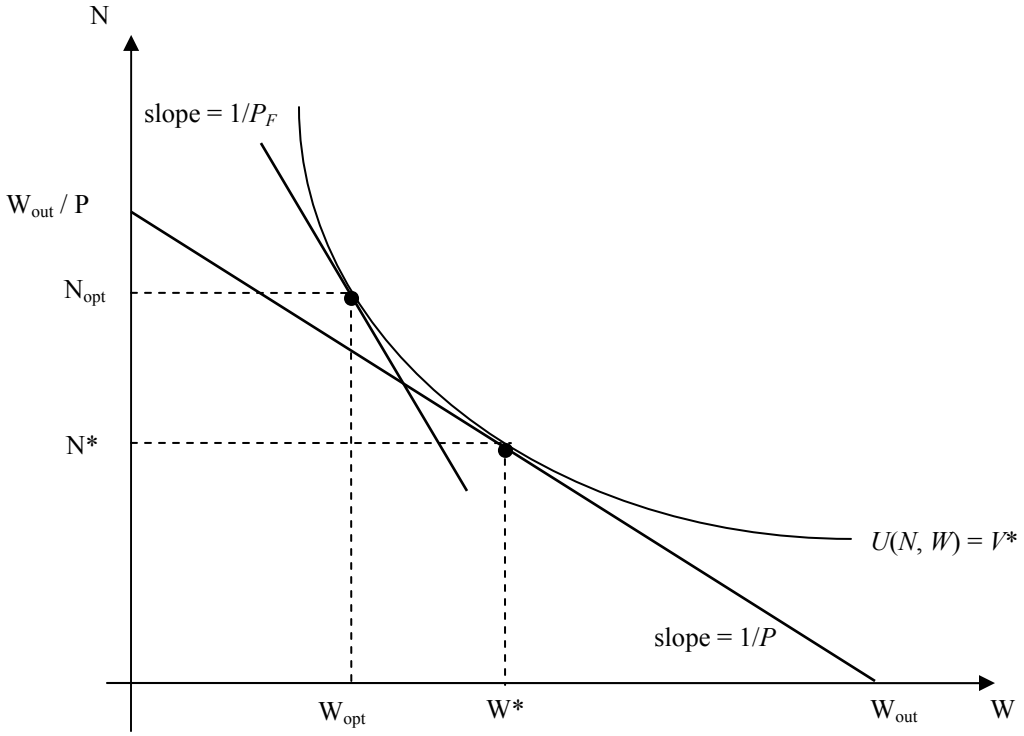
Yermack, David L., 1995, Do corporations award CEO stock options effectively?, *Journal of Financial Economics* 39, 237-269.

Zhang, Ge, 2003(a), Why do firms grant employee stock options?, *Working Paper*, Fuqua School of Business, Duke University, October.

Zhang, Ge, 2003(b), Market valuation and employee stock options, *Working Paper*, Fuqua School of Business, Duke University, October.

Diagram 1: The Optimal Compensation Policy (W_{opt}, N_{opt})

Panel A: The case of perceived overvaluation ($P > P_F$)



Panel B: The case of no perceived under- or overvaluation ($P = P_F$)

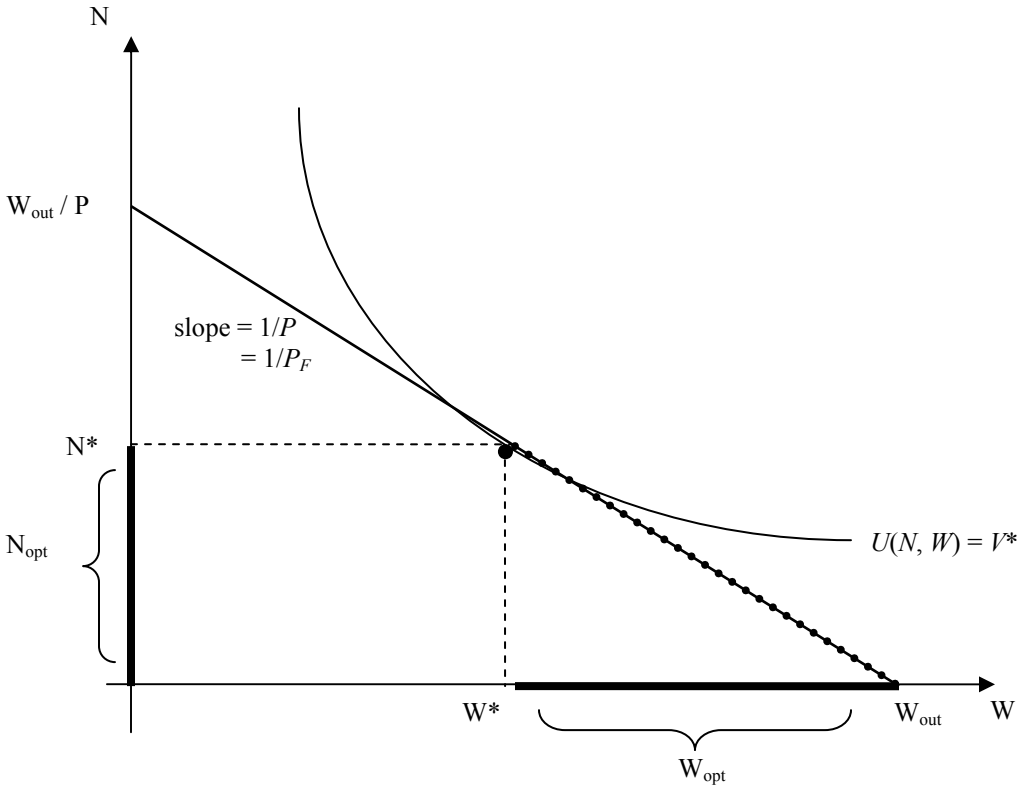


Table 1. Summary Statistics. Employees is the number of employees in each firm-year. Total Grants/Shares Outstanding is the number of options granted to employees and senior management as a percentage of shares outstanding. Employee Grants/Total Grants is the number of options granted to employees as a percentage of the total number of options granted by the firm. Grants per Employee is the total value of options granted to employees divided by the beginning of year number of employees. Total value of options granted to employees is calculated by subtracting the value of options granted to top-five executives from the total value of options granted. Market Value of Equity is the year-end share price multiplied by the number of shares outstanding (both taken from Compustat). Q is the market value of equity plus assets minus the book value of equity (data item 60 + data item 74) all over assets. KZ and KZ4 are calculated as in Baker, Stein and Wurgler (2002). Cash flow shortfall is the three year average of common and preferred dividends (Compustat data items 19 and 21) plus cash flow used in investing activities (data item 311) less cash flow from operations (data item 308), all divided by total assets (data item 6). Interest burden is the three-year average of interest expense (data item 15) scaled by operating income before depreciation (data item 13), where interest burden is set to one when interest expense is greater than operating income before depreciation. Normalized R&D is the three-year average of R&D (data item 46) scaled by assets.

	Observations	Mean	Median
Employees	**7,495**	**17,950**	**5,600**
Total Grants / Shares Outstanding	**7,716**	**2.70%**	**1.50%**
Employee Grants/Total Grants	**7,720**	**71.20%**	**75.40%**
Grants per Employee	**7,720**	**$25,200**	**$1,228**
Market Value of Equity (billions)	**7,716**	**$6.17**	**$1.35**
Assets (billions)	**7,718**	**$11.02**	**$1.69**
Sales (billions)	**7,718**	**$4.07**	**$1.16**
Q	**6,455**	**2.1**	**1.5**
KZ	**5,781**	**0.79**	**0.8**
KZ4	**6,834**	**0.29**	**0.37**
Cash Flow Shortfall	**6,996**	**0.04**	**0.01**
Interest Burden	**6,717**	**0.22**	**0.14**
R&D	**3,803**	**0.06**	**0.03**

Table 2. Prior Returns, Cash Balances and Employee Option Compensation. Option Grant per Employee is the total value of options granted to employees divided by the beginning-of-year number of employees. Total value of options granted to employees is calculated by subtracting the value of options granted to top-five executives from the total value of options granted. Normalized cash balances is cash balances (data item 1) divided by lagged assets (data item 6). Annual stock returns are constructed from the CRSP monthly return files. Quintile cutoff points are calculated using the entire pooled sample.

Panel A: Previous Year Stock Return by (Option Grant per Employee) Quintile

	Previous Year Return	
	Mean	Median
Option Grant Quintile		
1	15%	11%
2	19%	14%
3	20%	14%
4	26%	18%
5	58%	26%

Panel B: Option Grant per Employee by Previous Year Return Quintile

	Option Grant per Employee	
	Mean	Median
Previous Year Return Quintile		
1	$17,000	$1,524
2	$6,327	$814
3	$16,100	$815
4	$10,700	$1,154
5	$78,700	$3,058

Table 2. (Continued)

Panel C: Option Grant per Employee by Normalized Cash Balances Quintile

	Option Grant per Employee	
	Mean	Median
Cash Balances Quintile		
1	$3,211	$607
2	$3,882	$774
3	$4,830	$926
4	$7,334	$1,341
5	$106,600	$14,100

Table 3. Regression of Log(Option Grants per Employee) on Past Returns and Measures of Cash Constraints. Option grants per Employee is the total value of options granted to employees divided by the beginning of year number of employees. Total value of options granted to employees is calculated by subtracting the value of options granted to top-five executives from the total value of options granted. KZ and KZ4 are calculated as in Baker, Stein and Wurgler (2002). Cash Flow Shortfall is the three year average of common and preferred dividends (Compustat data items 19 and 21) plus cash flow used in investing activities (data item 311) less cash flow from operations (data item 308), all divided by total assets (data item 6). Interest Burden is the three-year average of interest expense (data item 15) scaled by operating income before depreciation (data item 13), where interest burden is set to one when interest expense is greater than operating income before depreciation. Q is the market value of equity plus assets minus the book value of equity (data item 60 + data item 74) all over assets. Previous Year Return and Current Year Return are previous and contemporaneous year stock returns calculated from CRSP data. Long Term Debt Dummy is an indicator variable taking on a value of one if a firm has long term debt and zero otherwise. R&D is the three-year average of R&D (data item 46) scaled by assets. T-statistics use heteroskedasticity-robust standard errors.

KZ_{t-1}	**0.00**				
	0.05				
$KZ4_{t-1}$		**-0.17**			**-0.05**
		-7.04			-1.68
Cash Flow Shortfall$_{t-1}$			**2.29**		**2.77**
			8.47		9.42
Interest Burden$_{t-1}$				**-0.49**	**-0.68**
				-3.51	-4.44
Q					**0.30**
					13.39
Previous Year Return	**0.53**	**0.51**	**0.50**	**0.51**	**0.34**
	10.95	11.64	10.99	11.21	8.99
Current Year Return	**0.31**	**0.30**	**0.29**	**0.31**	**0.00**
	7.94	8.85	7.85	8.70	0.07
Log (Sales)	**-0.24**	**-0.25**	**-0.19**	**-0.28**	**-0.20**
	-12.51	-13.69	-9.96	-15.04	-9.50
Long Term Debt Dummy	**-0.70**	**-0.49**	**-0.75**	**-0.57**	**-0.40**
	-6.45	-4.71	-7.15	-5.03	-3.64
R&D	**6.43**	**6.53**	**5.96**	**7.73**	**4.45**
	10.61	10.95	9.85	11.05	6.63
Constant	**16.54**	**14.49**	**13.91**	**14.44**	**14.17**
	74.60	84.05	74.10	74.80	77.92
Adj. R-squared	57%	59%	60%	59%	63%

Table 4. Regression of Log(Option Grants per Employee) on Past Returns and Measures of Cash Constraints with Firm Fixed Effects. All variables are defined as in Table 3. T-statistics use heteroskedasticity-robust standard errors.

KZ_{t-1}	**-0.054**				
	-2.17				
$KZ4_{t-1}$		**-0.144**			**-0.135**
		-5.94			-5.13
Cash Flow Shortfall$_{t-1}$			**0.703**		**0.943**
			3.05		4
Interest Burden$_{t-1}$				**-1.168**	**-1.117**
				-6.8	-6.35
Q	**0.111**	**0.093**	**0.121**	**0.115**	**0.095**
	5.9	5.09	6.63	6.25	5.08
Previous Year Return	**0.189**	**0.179**	**0.195**	**0.196**	**0.191**
	8.67	8.4	9.69	9.4	8.43
Current Year Return	**0.043**	**0.066**	**0.04**	**0.059**	**0.082**
	1.55	2.53	1.55	2.26	3.07
Log (Sales)	**-0.091**	**-0.092**	**-0.141**	**-0.202**	**-0.142**
	-1.61	-1.66	-2.79	-4.07	-2.3
Long Term Debt Dummy	**0.034**	**0.051**	**0.028**	**0.079**	**0.097**
	-0.38	-0.59	-0.33	-0.91	-1.1
R&D	**-2.029**	**-1.954**	**-2.176**	**-1.687**	**-1.313**
	-5.17	-5.28	-5.59	-4.21	-3.61
constant	**14.144**	**14.098**	**14.152**	**14.76**	**14.481**
	39.23	40.03	43.48	45.4	35.86
Adj. R-squared	0.91	0.91	0.91	0.91	0.92

Table 5. Regression of Log(Option Grants per Employee) on Past Returns and Measures of Cash Constraints. Quintiles of Previous Year Return are constructed using the entire sample. Quintile *i* is a dummy variable taking the value of one when a firm's Previous Year Return is in the *i*th Quintile, and zero otherwise. All other variables are defined as in Tables 3. T-statistics use heteroskedasticity-robust standard errors.

KZ_{t-1}	**0.00**				
	0.17				
$KZ4_{t-1}$		**-0.18**			**-0.06**
		-7.58			-1.97
Cash Flow Shortfall$_{t-1}$			**2.59**		**2.85**
			9.61		9.48
Interest Burden$_{t-1}$				**-0.40**	**-0.64**
				-2.77	-4.16
Q					**0.31**
					13.43
Previous Year Return Quintile 1	**-**	**-**	**-**	**-**	**-**
Quintile 2	**0.07**	**0.02**	**0.12**	**0.11**	**-0.03**
	0.83	0.27	1.60	1.39	-0.40
Quintile 3	**0.24**	**0.17**	**0.29**	**0.23**	**0.12**
	2.82	2.19	3.83	2.95	1.41
Quintile 4	**0.40**	**0.35**	**0.47**	**0.41**	**0.16**
	4.71	4.48	6.17	5.24	2.01
Quintile 5	**1.09**	**1.01**	**1.11**	**1.07**	**0.62**
	11.98	11.86	13.61	12.66	6.82
YrCurr	**0.31**	**0.31**	**0.29**	**0.30**	**-0.01**
	7.89	9.32	7.93	8.14	-0.18
Log (Sales)	**-0.24**	**-0.24**	**-0.19**	**-0.29**	**-0.20**
	-12.19	-13.23	-9.81	-14.99	-9.10
Long Term Debt Dummy	**-0.73**	**-0.50**	**-0.79**	**-0.61**	**-0.39**
	-6.54	-4.72	-7.50	-5.32	-3.53
R&D	**6.55**	**6.62**	**5.99**	**7.82**	**4.39**
	10.51	10.87	9.60	10.78	6.39
Constant	**16.88**	**14.81**	**14.16**	**14.79**	**14.37**
	77.34	87.41	77.85	79.32	77.39
Adj. R-squared	**57%**	**59%**	**59%**	**58%**	**62%**

Table 6. Regression of Log(Option Grants per Employee) on Past Returns and Measures of Cash Constraints. Previous Year Returns are all annualized. The sample is restricted to firms for which 5 years of past returns are available on CRSP. All other variables are defined as in Tables 3 and 5. T-statistics use heteroskedasticity-robust standard errors.

$KZ4_{t-1}$	**0.04**	**0.05**	**0.04**	**0.04**	**0.04**
	1.21	1.29	1.28	1.15	1.27
Cash Flow $Shortfall_{t-1}$	**1.95**	**1.87**	**1.70**	**1.33**	**1.33**
	5.48	5.41	4.93	3.67	3.66
Interest $Burden_{t-1}$	**-0.96**	**-0.91**	**-0.75**	**-0.55**	**-0.49**
	-5.29	-5.12	-4.15	-2.99	-2.65
Q	**0.31**	**0.27**	**0.25**	**0.24**	**0.24**
	11.33	9.65	8.84	8.56	8.53
	Previous 1-year return	**Previous 2-year return**	**Previous 3-year return**	**Previous 4-year return**	**Previous 5-year return**
Quintile 1	**-**	**-**	**-**	**-**	**-**
Quintile 2	**-0.01**	**-0.02**	**-0.13**	**0.10**	**0.16**
	-0.06	-0.23	-1.49	1.14	1.82
Quintile 3	**0.12**	**0.14**	**0.14**	**0.22**	**0.30**
	1.42	1.58	1.71	2.41	3.36
Quintile 4	**0.17**	**0.32**	**0.52**	**0.61**	**0.55**
	1.95	3.67	5.92	6.73	5.76
Quintile 5	**0.64**	**0.86**	**0.87**	**1.02**	**1.04**
	6.35	8.11	8.34	9.54	9.66
Current Year Return	**-0.02**	**0.04**	**0.08**	**0.09**	**0.09**
	-0.38	0.79	1.47	1.63	1.67
Log (Sales)	**-0.20**	**-0.20**	**-0.20**	**-0.20**	**-0.20**
	-8.82	-8.95	-9.13	-9.02	-8.99
Long Term Debt Dummy	**-0.36**	**-0.37**	**-0.37**	**-0.35**	**-0.36**
	-2.73	-2.86	-2.85	-2.69	-2.81
R&D	**5.69**	**5.96**	**6.05**	**6.31**	**6.19**
	7.08	7.40	7.50	7.84	7.59
constant	**15.95**	**15.90**	**15.87**	**15.71**	**15.68**
	69.11	70.66	72.60	71.77	71.11
Adj. R-squared	**57%**	**58%**	**58%**	**59%**	**58%**

Table 7. Regression of Log(Option Grants per Employee) on Past Returns and Measures of Cash Constraints. Dividends (data item 21+data item 19), Cash Balances (data item 1) and Leverage ((data item 9 + data item 34)/ (data item 9 + data item 34+data Item 216)) and Cash Flow from Investment (data item 311) are normalized by Lagged Assets (data item 6). All other variables are defined as in Tables 3 and 5. T-statistics use heteroskedasticity-robust standard errors.

Dividends	**-20.17**					**-16.845**
	-12.05					-10
Cash Flow		**0.31**				**-0.277**
		1.06				-1.01
Cash Balances			**1.94**			**1.711**
			15.07			14.44
Leverage				**-0.75**		**-0.703**
				-6.09		-5.99
Cash Flow from Investment					**4.1**	**3.093**
					9.95	10.6
Q	**0.38**	**0.33**	**0.27**	**0.32**	**0.289**	**0.286**
	17.91	15.33	15.22	15.90	15.09	15.35
Previous Year Return Quintile 1	**-**	**-**	**-**	**-**		**-**
Quintile 2	**-0.01**	**-0.05**	**-0.11**	**-0.07**	**-0.015**	**-0.053**
	-0.15	-0.58	-1.42	-0.91	-0.19	-0.72
Quintile 3	**0.12**	**0.07**	**0.01**	**0.05**	**0.136**	**0.071**
	1.55	0.83	0.13	0.64	1.78	0.99
Quintile 4	**0.15**	**0.14**	**0.07**	**0.13**	**0.185**	**0.073**
	1.83	1.67	0.84	1.65	2.37	1.02
Quintile 5	**0.49**	**0.58**	**0.31**	**0.56**	**0.643**	**0.276**
	5.65	6.36	3.69	6.40	7.6	3.49
Current Year Return	**-0.06**	**-0.02**	**-0.17**	**-0.02**	**0.041**	**-0.148**
	-1.43	-0.46	-4.73	-0.47	-1.08	-3.8
Log (Sales)	**-0.17**	**-0.26**	**-0.16**	**-0.23**	**-0.211**	**-0.053**
	-9.28	-13.52	-9.05	-12.56	-11.55	-2.82
Long Term Debt Dummy	**-0.51**	**-0.43**	**-0.20**	**-0.28**	**-0.47**	**-0.154**
	-5.09	-4.04	-2.02	-2.62	-4.71	-1.7
R&D	**4.25**	**5.00**	**3.32**	**4.75**	**5.84**	**3.651**
	7.33	7.98	6.38	8.11	10.06	7.24
Constant	**14.36**	**14.47**	**13.80**	**14.43**	**13.679**	**13.201**
	83.24	81.16	79.19	81.54	64.81	75.95
Adj. R-squared	**64%**	**61%**	**65%**	**62%**	**65%**	**70%**

Table 8. Regression of Log(Option Grants per Employee) on Past Returns and Measures of Cash Constraints with Firm Fixed Effects. All variables are defined as in Table 7. T-statistics use heteroskedasticity-robust standard errors.

Dividends	**3.63**					**3.06**
	1.75					1.46
Cash Flow		**0.414**				**0.138**
		2.13				0.69
Cash balances			**0.383**			**0.414**
			4.93			5.13
Leverage				**-0.372**		**-0.382**
				-2.83		-3.06
Cash Flow from Investment					**0.989**	**1.142**
					3.73	4.54
Q	**0.117**	**0.11**	**0.121**	**0.114**	**0.116**	**0.108**
	6.38	6.03	6.61	6.18	6.4	5.77
Previous Year Return	**0.19**	**0.188**	**0.165**	**0.191**	**0.206**	**0.177**
	9.61	9.27	7.74	9.66	9.79	8.29
Current Year Return	**0.036**	**0.034**	**-0.001**	**0.036**	**0.054**	**0.02**
	1.39	1.29	-0.03	1.44	2.09	0.75
Log (Sales)	**-0.142**	**-0.165**	**-0.141**	**-0.143**	**-0.135**	**-0.125**
	-2.87	-3.31	-2.84	-2.95	-2.66	-2.41
Long Term Debt Dummy	**0.037**	**0.033**	**0.043**	**0.087**	**0.04**	**0.098**
	0.43	0.39	0.51	1	0.47	1.13
R&D	**-2.353**	**-2.039**	**-2.181**	**-2.183**	**-1.635**	**-1.194**
	-5.95	-4.97	-5.49	-5.52	-3.89	-3.01
constant	**14.188**	**14.339**	**14.201**	**14.29**	**13.967**	**13.883**
	44.48	45.23	44.75	46.03	41.83	41.12
Adj. R-squared	**88%**	**88%**	**88%**	**88%**	**88%**	**88%**

Table 9. Regression of Log(Option Grants per Employee) on Distress Dummy Variable. The Distressed Firm Dummy equals one when a firm is delisted in the following fiscal year and its previous year return is in the bottom quintile of returns, and equals zero otherwise. All other variables are defined as in Table 3. T-statistics use heteroskedasticity-robust standard errors.

Distressed Firm	**-0.782**	**-0.498**
	-4.67	-4.69
$KZ4_{t-1}$	**-0.099**	**-0.127**
	-3.81	-5.24
Q	**0.349**	**0.138**
	19.23	9.54
Log (Sales)	**-0.247**	**-0.082**
	-13.68	-1.48
Long Term Debt Dummy	**-0.389**	**0.047**
	-3.68	0.55
R&D	**3.731**	**-1.797**
	5.72	-5.39
constant	**14.753**	**14.227**
	88.66	40.02
Adj. R-squared	**61%**	**91%**
	Industry Fixed Effects	**Firm Fixed Effects**

Table 10. Regression of Log(Option Grants per Employee) on Previous Year Return with Cash Rich Firms Only. Cash Rich Firms are selected by restricting the sample to firm-years in which normalized cash balances are in the top 20% of all firm-years. Of these firm-years we retain only those where, from a certain year on, normalized cash balances remain in the top quintile. All other variables are defined as in Table 3. T-statistics use heteroskedasticity-robust standard errors.

Previous Year Return	**0.306**	**0.149**
	7.51	4.53
Current Year Return	**0.082**	**0.08**
	2.54	1.75
Q	**0.158**	**0.034**
	6.86	1.38
Log (Sales)	**-0.206**	**0.131**
	-5.93	2.21
Long Term Debt Dummy	**-0.118**	**-0.042**
	-1.05	-0.36
R&D	**0.564**	**-1.635**
	1.16	-3.45
constant	**16.498**	**16.39**
	60.53	51.52
Adj. R-squared	**53%**	**87%**
	Industry Fixed Effects	**Firm Fixed Effects**

Table 11. Regression of Log(Option Grants per Employee) on Past Returns, Earnings Manipulation, and Measures of Cash Constraints. Manipulator is a dummy variable taking a value of one if a firm's current discretionary accruals are in the top 10% of all firm-years in our sample. Current discretionary accruals are calculated as a residual to a sales-based accruals model as in Teoh, Welch, and Wong (1998 a,b). All other variables are defined as in Tables 3 and 5. T-statistics use heteroskedasticity-robust standard errors.

Manipulator	**0.44**	**0.37**	**0.39**	**0.40**	**0.25**
	4.09	3.63	4.00	3.91	2.45
KZ_{t-1}	**0.00**				
	-0.06				
$KZ4_{t-1}$		**-0.18**			**-0.06**
		-7.61			-1.99
Cash Flow $Shortfall_{t-1}$			**2.50**		**2.78**
			9.07		9.12
Interest $Burden_{t-1}$				**-0.42**	**-0.66**
				-2.89	-4.24
Q					**0.30**
					13.04
Previous Year Return Quintile 1	-	-	-	-	-
Quintile 2	**0.08**	**0.03**	**0.13**	**0.12**	**-0.02**
	0.89	0.32	1.71	1.46	-0.23
Quintile 3	**0.23**	**0.17**	**0.29**	**0.22**	**0.12**
	2.67	2.06	3.76	2.82	1.41
Quintile 4	**0.39**	**0.34**	**0.46**	**0.40**	**0.16**
	4.54	4.28	5.96	5.07	1.95
Quintile 5	**1.06**	**0.98**	**1.09**	**1.04**	**0.60**
	11.46	11.37	13.10	12.12	6.50
Current Year Return	**0.30**	**0.30**	**0.28**	**0.29**	**-0.01**
	7.33	8.71	7.41	7.58	-0.29
Log (Sales)	**-0.24**	**-0.24**	**-0.19**	**-0.29**	**-0.20**
	-11.73	-13.00	-9.59	-14.59	-9.18
Long Term Debt Dummy	**-0.73**	**-0.50**	**-0.80**	**-0.61**	**-0.38**
	-6.47	-4.65	-7.48	-5.25	-3.41
R&D	**6.61**	**6.64**	**6.09**	**7.91**	**4.53**
	10.29	10.57	9.43	10.51	6.33
constant	**15.06**	**16.67**	**14.16**	**14.78**	**16.06**
	85.45	80.49	76.26	77.45	71.81
Adj. R-squared	0.5691	0.5896	0.5974	0.5818	0.6268

Table 12. Regression of Log(Option Grants per Employee) on Past Returns, Insider Trading, Earnings Manipulation, and Measures of Cash Constraints. Manipulator is a dummy variable taking on a value of one if a firm's current discretionary accruals are in the top 10% of all firm-years in our sample. Current discretionary accruals are calculated as a residual to a sales-based accruals model as in Teoh, Welch, and Wong (1998 a,b). Buying (Selling) Managers is a dummy variable taking on a value of one if the average share purchases by a firm's management are in the top (bottom) 20% of all firm-years. Managerial share purchases are calculated as in Jenter (2002). All other variables are defined as in Tables 3 and 5. T-statistics use heteroskedasticity-robust standard errors.

Manipulator	**0.42**	**0.37**	**0.35**	**0.35**	**0.23**
	3.71	3.46	3.30	3.12	2.14
Buying managers	**-0.25**	**-0.26**	**-0.25**	**-0.28**	**-0.13**
	-3.64	-4.09	-3.94	-4.32	-2.02
Selling managers	**0.23**	**0.22**	**0.22**	**0.22**	**0.17**
	3.05	3.13	3.22	3.03	2.33
KZ_{t-1}	**0.02**				
	0.69				
$KZ4_{t-1}$		**-0.16**			**-0.04**
		-6.87			-1.20
Cash Flow Shortfall$_{t-1}$			**2.24**		**2.50**
			7.59		7.85
Interest Burden$_{t-1}$				**-0.48**	**-0.73**
				-3.11	-4.31
Q					**0.30**
					12.25
Previous Year Return Quintile 1	-	-	-	-	-
Quintile 2	**0.07**	**0.02**	**0.11**	**0.08**	**-0.03**
	0.78	0.20	1.35	1.00	-0.37
Quintile 3	**0.20**	**0.14**	**0.24**	**0.20**	**0.09**
	2.32	1.69	3.00	2.37	1.02
Quintile 4	**0.35**	**0.31**	**0.41**	**0.37**	**0.13**
	4.00	3.83	5.01	4.45	1.53
Quintile 5	**1.04**	**0.94**	**1.05**	**1.00**	**0.60**
	10.92	10.72	11.88	11.07	6.31
Current Year Return	**0.27**	**0.27**	**0.26**	**0.24**	**-0.05**
	6.33	7.69	7.19	5.86	-0.92
Log (Sales)	**-0.24**	**-0.25**	**-0.20**	**-0.28**	**-0.21**
	-11.73	-12.98	-9.16	-13.36	-9.46
Long Term Debt Dummy	**-0.68**	**-0.45**	**-0.73**	**-0.52**	**-0.34**
	-5.78	-4.03	-6.42	-4.30	-2.90
R&D	**7.02**	**7.09**	**6.35**	**8.16**	**5.14**
	10.62	10.96	9.51	10.77	6.69
constant	**16.85**	**16.70**	**16.46**	**15.19**	**14.50**
	73.58	77.72	73.58	77.15	72.21