Employee Sentiment and Stock Option Compensation

Nittai Bergman[1]
Dirk Jenter[2]

MIT Sloan School of Management

This Draft: January 2004

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, the Frank Batten Young Scholars Conference, the German Finance Association Meeting, the American Finance Association Meeting, and especially Paul Oyer, Aamer Sheikh, Wanda Wallace, Paul Sengmueller, and Martin Weber. We thank John Core and Wayne Guay for making their employee options data available to us. All remaining errors are our own.

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 must 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, and when employees prefer to receive an option to its market value in cash. 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, again consistent with our hypothesis.

1. Introduction

The use of equity-based compensation for employees below the executive rank has been growing rapidly during the last decade, with the most common method being stock option plans. 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 where 50% or more of the employees were eligible to receive option grants. Of these 350 companies, 17% 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. Standard portfolio selection theory would imply that employees should not own equity in their employer.

Several studies show, however, that employees do not value company stock and options as described by extant theory. For example, Benartzi (2001), Liang and Weisbenner (2002), and Huberman and Sengmüller (2002) show 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 portfolio selection framework, this observation strongly suggests that employees' valuation of company stock is higher than the prevailing market price. Additionally, with regard to stock options, Lambert and Larcker (2001) report that many employees have unrealistic expectations about future stock prices and frequently value their options substantially above Black-Scholes values. Finally, Ittner, Lambert, and Larcker (2003) report survey evidence according to which new economy firms describe "employee retention" and "employee attraction" as the most important objectives for their stock option and restricted stock programs. This suggests once more that (prospective) employees regard equity-based compensation as something desirable.

We suggest that the use of employees as "capital providers" to the firm can be explained by the observation that employees are not following standard portfolio theory. We propose 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 the offered compensation instrument. We explicitly model the optimal compensation policy of a firm faced with employees with

[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".

(positive) sentiment towards equity compensation. We establish the assumptions about employee sentiment which are necessary to support an equilibrium in which firms are obligated to pay in equity in order to attract and retain employees. We find that while employee optimism about firm equity is sufficient to make firms indifferent between paying their employees in equity or cash, it is insufficient, by itself, to *force* firms away from cash wages. The reason is that firms could simply pay employees a cash amount equal to the market value of the desired equity, and leave the decision whether to purchase equity up to the employees.

To support an equilibrium in which labor market competition forces firms to compensate employees with equity instruments it turns out to be necessary that employees strictly prefer the equity instrument to its market value in cash. Employees need to be willing to "overpay" for equity compensation in the sense that they give up more cash wages than the firm and the market's value of the equity which they receive in return. Put differently, the implicit no-arbitrage relation between the stock price and the fair value of the compensation instrument must be ignored by employees. For example, employees need to strictly prefer receiving an option from the firm to receiving its market value in cash (and then taking a long position in shares or any other equity-linked instrument). Such a situation can arise if, as is common, the compensation instrument is not itself available in the market, and employees do not regard available equity instruments as equivalent substitutes.[8] The model then shows that competition in the labor market forces firms to take advantage of employees' willingness to overpay and to compensate them in the preferred equity instrument.[9]

The model predicts further that, all else equal, an improvement in employee sentiment towards equity compensation in one firm can lead to an increase in compensation and a reduction in employment in its competitors. If there is positive sentiment in the competitors as well, then part of the additional compensation may take the form of additional equity. Thus, there can be a propagation effect whereby increases in positive sentiment in one firm increase the use of equity compensation not only in that firm but also in its competitors. These predictions fit well with anecdotal evidence from the dot-com era. Snider (2000) reports how law firms were forced to massively increase the salaries offered to associates to prevent them from leaving to internet start-ups offering equity-based compensation.[10] At the same time, newly minted MBAs from top

[8] A trivial example is that of a pre-IPO firm in which company equity is not yet traded. Even with traded equity, employees may strictly prefer an option to its market value in cash because of real or behavioral borrowing constraints which prevent them from taking leveraged positions in company equity themselves. Alternatively, employees may be willing to overpay for options simply because they are unable to compute fair option values from observed stock prices. The survey evidence in Lambert and Larcker (2001) is consistent with this view. The larger popularity of options as a compensation instrument relative to restricted stock could then be explained by employees being more likely to overpay for options than for restricted stock since a close substitute to the latter is traded in the market.

[9] Firms are forced to pay employees in equity even though firms may worry about a backlash from employees disappointed by equity performance in the future. The alternative to paying in equity is to lose employees to competitors which do.

[10] Snider (2000) quotes the chairman of one law firms as follows: "[...] the increases in associate salaries had more to do with competition for talent from companies engaged in the new economy than from law

business schools shunned previously coveted jobs in consulting and investment banking and instead chose option compensation at new economy firms. Finally, our model is also consistent with the observation that many firms repurchase (rather than issue) shares to fund option exercises by employees. Since firms in the model are forced by the labor market to compensate exuberant employees with equity, equity-based compensation moves firms away from their desired capital structure, and they may decide to offset these forced equity issuances by repurchasing shares in the market.[11]

Equity-based compensation is possible in our model even if employees are sufficiently rational to not overpay for equity relative to its market value, but in this case firms will be indifferent between cash-based and equity-based compensation. If the compensation instrument itself or a close substitute is traded in the market, then employees should be aware that they can purchase an equivalent or close-to-equivalent claim outside of the firm using the market value of the compensation instrument in cash. This means that the no-arbitrage bound between stock prices and employees' willingness-to-pay for the compensation instrument is left intact, and during compensation negotiations with the firm employees never give up more cash than the fair market value of the offered equity compensation, *even if they regard the market price as too low*. Thus, even as optimism about company equity drives employees' valuations unboundedly high, their willingness to give up cash for equity compensation is capped at the market value. This implies that firms are at most indifferent between paying optimistic employees in equity and paying them in cash (while possibly raising the necessary cash from the market). Hence even if employees do not overpay for equity relative to market values, equity-based compensation is no longer the strict puzzle identified in the literature. In fact paying exuberant employees with options becomes equivalent to issuing seasoned equity into the market – in both cases the firm is effectively selling equity at fair market value.

We believe that our base model in which exuberant employees are willing to pay more than fair market values for equity compensation fits better with both the anecdotal evidence discussed above and the empirical results presented below. Without employee overpayment for equity relative to market values, the model does not explain why firms feel the need to pay in equity to attract and retain employees. Employees would be indifferent between receiving cash and equity of equal value, and firms paying in cash would be no less attractive to employees than firms paying with equity.[12] Also, without significant overpayment relative to market values, firms subject to positive sentiment do not strongly expand in size at the expense of other firms, and other firms are not forced to strongly increase employee compensation to compete in the labor market. Furthermore, the model without overpayment relative to market values suggests that firms pay in

---

firms. We're not losing people to other law firms. [....] We're losing people to .com companies because they can offer very attractive options."

[11] The share repurchases occur when options are exercised, which is several years after they were granted. Since firms with broad-based option programs tend to grant options every year, there are nevertheless many examples of firms which broadly grant options and repurchase shares in the same year.

[12] Transaction costs employees incur when buying equity claims in the market could explain why they prefer to receive the same claim from the firm instead. Hence transaction costs can give a small advantage to firms paying with equity, arguably too small to explain the massive increases in salary required in non-sentiment firms to retain their employees (Snider, 2000).

equity as a means to *issue* equity, which is not consistent with the observation that many firms repurchase shares simultaneously to using equity compensation (Kahle, 2001). Finally, we show below that cash rich firms use option compensation the most, suggesting that these firms have little reason to sell equity, be it to employees or the equity market, unless the recipient of the equity is willing to overpay.[13]

We empirically test whether the observable cross-sectional and time-series patterns of broad-based option grants are consistent with the hypothesis that equity-based compensation is driven by employee sentiment. Option grants to non-executives are widespread in our sample of publicly traded US firms from 1992 to 2002. We define non-executive employees as all employees except the five most highly paid executives identified in the proxy statement.[14] The average firm grants options corresponding to 3.15% of shares outstanding per year. Non-executive employees receive on average 68% of these grants. We estimate the mean (median) Black-Scholes value of the average annual grant per employee to be $25,393 ($1,315).

It is difficult to directly test whether employees are irrationally exuberant about company stock, as sentiment and expectations are unobservable. However, our model of optimal employee compensation predicts that equity compensation is used in situations in which optimistic employees want to purchase company equity for their own accounts, and that this effect is stronger when 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 use of equity-based compensation by firms. This argument allows us also 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 we predict that *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.* 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*.

[13] It could be possible that these firms sell equity to employees for incentive reasons (even if the incentives effects are small), or because the firms believe their stock to be overvalued in the market.

[14] 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".

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 two-year return for companies with granting activity in the bottom quintile is 8%. It is 31% for firms with granting activity in the top quintile. Sorting firms by prior year returns, we find average (median) grants of $71,712 ($4,311) among firms in the top return quintile, and average (median) grants of only $25,885 ($1,728) 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 among the very best prior performers. Consistent with Benartzi (2001), we find that the positive relationship between 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 such determinants 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).[15] 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, Fama and French 2003): 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.[16] 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.

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. To understand the drivers behind these conflicting results, we then analyze how each component of the composite measures of

[15] 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.

[16] 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.

cash constraints is related to option grants. We find that grants are strongly positively associated with corporate cash balances and contemporaneous cash flows, and negatively related to cash outflows for debt service (interest burden, leverage).[17] Grants are also positively related to investment levels and proxies for 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. 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 the need for employees as capital providers should decline as well.[18]

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 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

[17] Most authors (Kaplan and Zingales 1997, Core and Guay 2001) interpret large corporate cash holdings as a sign that a 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 financing constraints.

[18] The observation that new economy firms were the most aggressive users of broad-based stock option plans during the dot-com 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 hypothesis: 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.

managers' views on firm value is insider trading. We identify firms with large insider selling and firms with large insider buying using a measure from Jenter (2003). Our results indicate that firms in which the top five managers cash out grant 17% more options to their employees than comparable firms, while firms in which top managers purchase equity for their own account grant around 17% less to employees than comparable firms.

We conclude that the empirical patterns of broad-based equity compensation can, to a large extent, be explained as a behavioral phenomenon in which employees excessively extrapolate the value of equity compensation from their firm's recent performance and financial condition.[19] Employees' willingness to accept options as payment seems contingent on good news about the firm that is (incorrectly) associated with positive future stock performance and option payoffs. Employers respond to employees' exuberance about their firms and lower firms' compensation costs by compensating employees in their preferred equity instrument.

Our results have implications for the ongoing discussion about how to interpret broad-based option compensation in light of current theories of capital structure. Fama and French (2003) note that many fast-growing and highly profitable firms issue moderate amounts of equity every year, in apparent contradiction to the Myers-Majluf (1984) pecking order theory. They also find that on average more than half of each year's dividend paying firms issue equity, again seemingly contradicting the pecking order theory. Fama and French note that employee stock options, grants, and other employee benefit plans are likely to play a significant role in their findings. They propose that grants of stock and options to employees involve low transaction costs and that asymmetric information problems are small. The employee sentiment hypothesis we propose together with our empirical results are consistent with the hypothesis that issuing equity to employees can be a low cost method of raising funds. Unlike Fama and French, we propose that equity based compensation is not primarily driven by firms' intention to raise equity, but argue instead that the impetus comes from exuberant employees who want to be paid in equity. Competitive pressure in the labor market forces firms to grant options, and this in turn forces firms to decide whether to offset the effect of option grants on their capital structure through equity repurchases. Unlike the low transaction cost–low asymmetric information story of Fama and French, our hypothesis is able to explain why firms issue equity and pay dividends in the same year, and why firms grant options broadly and repurchase shares in the market in the same year.[20]

[19] 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.

[20] No negative information is transmitted to the market by employee option grants in our model. The market knows that employees are exuberant and willing to overpay for options, and hence expects firms to use equity-based compensation.

In the next section we develop a simple model of optimal employee compensation when employees display sentiment towards equity-based compensation. Section 3 briefly reviews the prior literature analyzing employee stock option plans, and discusses the literature on psychological biases that employees may exhibit when thinking about company stock. Section 4 translates the model and the prior literature on the formation of employee sentiment into testable predictions. Section 5 describes the data and variable definitions, and Section 6 presents the empirical results. The final section summarizes and concludes.

2. A Simple Model of Optimal Compensation

We develop a simple one-period model in which two competing firms decide whether to pay their employees in cash or in units of a compensation instrument based on their respective shares. The equity-based instruments used by the firms may be thought of as either restricted stock or options, and we simply refer to them as equity. Employees have their own subjective valuations of the equity instruments of the two firms, and these valuations may be above or below the market value of equity. For simplicity, we assume that all employees have the same expectations about each of the two firms. Firms are assumed to maximize shareholder value.[21]

In the first version of the model, which we describe now, employees are either unable or unwilling to take positions in the equity compensation instrument or any substitute to it by themselves. This assumption can be justified on the basis that options, the most common compensation instrument, are not traded, and that employees may not regard traded stock as an acceptable substitute for options.[22] Each firm is therefore a monopoly supplier of its own compensation instrument. In the second version of the model, we allow employees to purchase the compensation instrument (or a close substitute) in the market, and we then compare the implications of these two competing sets of assumptions.

The two firms, indexed by 1 and 2, have identical production functions using labor l_1 and l_2 as sole input to produce output Y_1 and Y_2:

$$Y_1 = f(l_1)$$
$$Y_2 = f(l_2)$$
$$\text{with } f(0) = 0, f'(.) > 0, f'(0) = \infty, f''(.) < 0.$$

[21] For simplicity we set the firms' views of fundamental value equal to the market value of the equity instrument. Hence equity compensation is not simply motivated by managers thinking the equity is misvalued. We discuss later what happens if we relax this assumption.

[22] For the main results to go through it is not necessary that employees do not take positions in the underlying shares at all, but it is required that employees strictly prefer the compensation instrument to a unit of the underlying of similar fair market value. If employees regard traded shares as an inferior substitute for the compensation instrument then the share price translates into an upper bound on the employees' willingness to pay for the compensation instrument. This bound will be above the fair market value of the compensation instrument, which is all that is required for the model to work.

The two firms offer to hire l_1 and l_2 employees respectively in a competitive labor market, taking the best alternative employment offer as given. Firms offer compensation contracts consisting of a cash wage W_i and an equity component of $N_i \geq 0$ units of their respective equity compensation instrument. Whether there are vesting restrictions associated with the equity instruments is irrelevant for our model. The payoffs to the equity instruments are uncertain and given by $\widetilde{X}_i$ with expected mean $\overline{X}_i$ and variance σ_i^2, and for simplicity we assume that these payoffs are independent of each other. Again for simplicity we assume that the number of equity instruments to be issued is small relative to the number of equity instruments outstanding, so that the expected payoff to an instrument does not change when more instruments are issued.[23] We normalize the expected payoff to the equity instruments of both firms to 1 and assume a riskless rate of zero. We further set $\sigma_1^2 = \sigma_2^2$ and assume that the equity market is risk-neutral. This implies that the fair market value of an equity instrument is equal to 1 for both firms.

There is a mass of potential employees which we normalize to 1. Potential employees are homogeneous with a reservation wage of zero and are risk-averse with mean-variance preferences. Potential employees display sentiment with regard to the expected payoff to the equity compensation instruments. In particular, they believe the mean of $\widetilde{X}_i$ to be $\overline{X}_i + s_i$ rather than $\overline{X}_i$. The sentiment measure s_i can take both positive and negative values, with positive values corresponding to exuberance about equity compensation provided by firm *i*. With a risk-neutral equity market and risk-averse employees, positive sentiment is required for employees to value a unit of equity compensation at or above its fair market value.[24] Perceived expected utility is given by:

$$\hat{E}[U(W_i, N_i, s_i)] = \hat{E}\left[W_i + N_i \cdot \widetilde{X}_i\right] - \frac{1}{2} Var\left[N_i \cdot \widetilde{X}_i\right]$$

$$= W_i + N_i \cdot (1 + s_i) - \frac{1}{2} N_i^2 \cdot \sigma_i^2$$

Potential employees evaluate the compensation contracts (W_1, N_1) and (W_2, N_2) offered by the two firms and work for the firm offering the higher expected utility as long as that firm is in fact seeking additional employees.

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

[24] These assumptions are a simplified version of a more realistic setting in which systematic risk is priced and employees are allowed to invest into the risky market asset. In both settings, non-exuberant employees would never purchase the equity instrument at fair market value (if given the chance to do so). This captures the intuition described among others in Lambert, Larcker, and Verecchia (1991), Murphy (1999), Hall and Murphy (2001), and Meulbroek (2001 and 2002) that holdings of company equity by employees are inefficient.

Firms maximize shareholder value by hiring the optimal number of workers and minimizing compensation costs while taking into account that employees will work for the competing firm if its contract is more attractive. The expected cost of the compensation contract to each firm is given by

$$\begin{aligned} E[C(W_i, N_i)] &= E\left[W_i + N_i \cdot \tilde{X}_i\right] \\ &= W_i + N_i \end{aligned}$$

The firms' valuations of the compensation contracts differ from employees' valuations because firms are risk neutral while employees are risk averse, and because employees may feel sentiment towards equity compensation. The difference in risk aversion by itself would make equity-based compensation inefficient since risk is transferred to the party less able to bear it. Sufficiently positive employee sentiment may reverse this conclusion. Both firms maximize expected firm value:

$$\underset{l_i, W_i, N_i}{Max}\ E\left[f(l_i) - l_i \cdot \left(W_i + N_i \cdot \tilde{X}_i\right)\right] = f(l_i) - l_i \cdot (W_i + N_i)$$

$$s.t.\ \ \hat{E}[U(W_i, N_i, s_i)] \geq 0$$

$$\hat{E}[U(W_i, N_i, s_i)] \geq \hat{E}[U(W_j, N_j, s_j)] \ for\ i \neq j.$$

The equilibrium in this model is given by a pair of compensation contracts (W_1, N_1) and (W_2, N_2) offered by the two firms and by the resulting allocation of labor (l_1, l_2), and is described in the following Lemma:

Lemma 1 The equilibrium compensation contracts and labor allocations are such that

(a) the perceived expected utility from working for each firm is equalized.

$$\hat{E}[U(W_1^*, N_1^*, s_1)] = \hat{E}[U(W_2^*, N_2^*, s_2)]$$

(b) the optimal compensation contract offered by each firm contains equity if and only if employee sentiment for that firm's equity compensation is positive.

$$N_1^* = \frac{s_1}{\sigma^2}\ if\ \ s_1 > 0\ and\ \ N_1^* = 0\ otherwise,$$

$$N_2^* = \frac{s_2}{\sigma^2}\ if\ \ s_2 > 0\ and\ \ N_2^* = 0\ otherwise.$$

(c) the allocation of labor between the two firms is such that marginal products of labor equal actual compensation costs, and the labor market clears.

$$f'(l_1) = W_1^* + N_1^* = W_1^* + \frac{s_1}{\sigma^2}$$

$$f'(l_2) = W_2^* + N_2^* = W_2^* + \frac{s_2}{\sigma^2}$$

$$l_1 + l_2 = 1$$

Proof See Appendix.

Before interpreting the equilibrium it is helpful to consider the following corollary:

> **Corollary 1** Assume that at least one firm experiences strictly positive sentiment ($s_1 > 0$ or $s_2 > 0$, or both). Then the following holds:
> (a) The firm with the more positive employee sentiment towards equity compensation grants more equity to employees, has lower per-employee costs of compensation, has a larger number of employees under contract, produces more output, and makes higher profits.
> (b) An increase in firm *i* sentiment while holding firm j sentiment constant increases the amount of equity granted to employees of firm *i*, lowers the per-employee compensation cost of firm *i*, and increases the per-employee compensation cost of firm *j*. Furthermore, firm *j* loses employees to firm *i*.

Proof See Appendix.

In equilibrium the compensation packages offered by both firms are perceived to be of equal value by potential employees, which is the only way both firms can simultaneously attract employees.[25] The *true* expected values of the compensation packages, and therefore also the per-employee compensation costs of the firms, differ if the sentiments for equity compensation differ across the two firms (and at least one of the two sentiments is strictly positive). Consider the example of firm 1 facing positive sentiment towards its equity instrument ($s_1 > 0$), and firm 2 facing neutral sentiment ($s_2 = 0$). Firm 1 offers a compensation package containing exactly the number of firm 1 equity instruments an employee would acquire herself if the equity instrument was traded (Part (b) of Lemma 1).[26] Hence firm 1 with sentiment $s_1 > 0$ provides each of its employees with equity worth $N_1^* = \frac{s_1}{\sigma^2}$. Because of sentiment, employees feel like they are being offered equity worth $N_1^*(1 + s_1) > N_1^*$ from firm 1. Firm 2 is forced to match the perceived utility from firm 1's compensation offer. Since there is no positive sentiment towards firm 2's equity instrument, equity compensation would be inefficient and firm 2 increases its cash wage instead. In equilibrium, firm 2 has higher compensation costs and fewer employees than firm 1.

[25] Equilibria in which one firm attracts all the potential employees and the other firm shuts down are ruled out by the assumption that $f'(0) = \infty$.

[26] More precisely, if the equity instrument itself was traded or if the employee regarded a traded equity instrument as an acceptable substitute.

The example of $s_1 > 0$ and $s_2 = 0$ corresponds to the situation described in Snider (2000) where old-economy law firms ($s_2 = 0$) needed to massively increase their salaries to compete with option-granting new economy firms ($s_1 > 0$) for talent and still saw many employees leave for dot-coms. Firms faced with more positive sentiment expand at the expense of firms with less positive sentiment, which see their profits decline because of increased compensation costs. Interestingly, employees of both firms are better off in terms of ex-ante expectations compared to the no-sentiment case ($s_1 = 0$ and $s_2 = 0$), and employees of firm 2 are in fact better off ex-post due to their increased wages. Employees of firm 1 are worse off ex-post compared to the no-sentiment case. The effects on the firms' profits is the exact reverse, with the profits of firm 1 increasing and the profits of firm 2 decreasing relative to the no-sentiment case. Firm 1 benefits from being the monopoly supplier of an equity instrument which is overvalued by potential and actual employees. On net, asymmetric sentiment leads to a social welfare loss due to the misallocation of labor in the economy.

Consider next the case of symmetric exuberance ($s_1 = s_2 > 0$). In equilibrium, both firms compensate their employees with similar numbers of their respective equity instruments. The optimal grants equal the number of instruments an employee would acquire herself if the particular equity instrument was traded. The allocation of labor is unchanged from the first best allocation of $l_1 = l_2 = 0.5$ and employees receive the same value of compensation as in the no-sentiment case, equal to their first-best marginal products. The main difference from the no-sentiment case is that employees perceive their compensation as more valuable and hence have higher ex-ante utility. It is interesting to note that the two firms need to pay their employees with equity simply to earn the same level of profits as in the no-sentiment case. A firm which tries to be paternalistic towards its employees by not paying them with "overvalued" equity would need to compensate employees with cash and would lose money relative to its competitors and relative to the no-sentiment case. Pressure from capital providers is therefore likely to make such paternalism difficult to sustain.

Finally, it is interesting to note that moving away from mean-variance utility to a more realistic utility function with decreasing absolute risk aversion would generate a propagation effect through which increases in sentiment in firm 1 can lead to more equity compensation in firm 2. The intuition is that, similar to the case with mean variance utility, firm 2 will have to increase the perceived value of its compensation package in response to an improvement in firm 1 sentiment, but with a positive wealth effect, employees would want part of this increase to take the form of equity.

The driving force behind the equilibrium described in Lemma 1 is that employees are unable or unwilling to take positions in the compensation instruments (or any substitute) on their own through the equity market. This makes the firms monopoly suppliers of their respective compensation instruments, and enables them to take advantage of exuberant employees' valuations. Contrast this with a situation in which the compensation instrument (or a close substitute) is traded in the equity market, and

employees recognize its availability and the relationship of the traded asset to the compensation instrument offered by the firm. Under these modified assumptions, the employee never agrees to cut her wage by more than the market price of the compensation instrument in exchange for an additional unit of the instrument, even if her subjective valuation of it is much higher. This is because she recognizes that she can purchase the instrument herself at market prices. 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. We next derive the optimal compensation policies and the labor market equilibrium in this situation.

Given the assumption that employees can purchase equity instruments themselves, we need to consider the optimal portfolio policies of employees. As before, employees are offered a compensation contract (W_i, N_i) from each firm. Upon accepting (say) firm 1's compensation offer, the employee has to decide whether to acquire more units of the firm 1 equity instrument, and whether to acquire any units of the firm 2 equity instrument. For empirical realism, we assume that employees cannot sell the equity they receive as compensation, even though our results are unchanged without this assumption. The employee's portfolio choice problem (again assuming that the employee has accepted firm 1's offer) is given by:

$$\begin{aligned}
&\underset{\hat{N}_1, \hat{N}_2}{Max}\, \hat{E}\left[U\left(W_1, \hat{N}_1, N_1, \hat{N}_2, s_1, s_2\right)\right] \\
&= W_1 + N_1 + \hat{N}_1 \cdot s_1 + \hat{N}_2 \cdot s_2 - \frac{1}{2}\left[\hat{N}_1^2 + \hat{N}_2^2\right] \cdot \sigma^2 \\
&s.t. \quad \hat{N}_1 \geq N_1 \\
&\qquad \hat{N}_2 \geq 0 .
\end{aligned}$$

Solving the portfolio choice problem taking firm 1's compensation contract as given yields the following result:

Lemma 2 The solution of the employee's portfolio choice problem is given by:

$$\hat{N}_1 = \frac{s_1}{\sigma^2} \text{ if } \frac{s_1}{\sigma^2} > N_1, \text{ and } \hat{N}_1 = N_1 \text{ otherwise.}$$

$$\hat{N}_2 = \frac{s_2}{\sigma^2} \text{ if } s_2 > 0, \text{ and } \hat{N}_2 = 0 \text{ otherwise.}$$

Proof **S**ee Appendix.

Lemma 2 states that, upon receiving (W_1, N_1) from firm 1, employees purchase units of the two equity instruments until they reach their preferred allocation. If an employee has received more than her desired allocation of firm 1 equity as compensation, then she does not add any more on her own. In fact she would prefer to sell units of the compensation instrument, but is by assumption precluded from doing so.

Firms again maximize shareholder value by hiring the optimal number of workers and minimizing compensation costs while taking into account that employees will work for the competing firm if its contract is more attractive. The firms' maximization problem is similar to the case with non-traded equity instruments and not repeated for brevity. The equilibrium in the second model is given by a pair of compensation contracts (W_1^*, N_1^*) and (W_2^*, N_2^*) offered by the two firms, by the resulting allocation of labor (l_1, l_2), and by employees' optimal portfolio allocations. The equilibrium is described in the following Lemma:

Lemma 3 The equilibrium compensation contracts, labor allocations and portfolio allocations are such that
(a) the perceived expected utility from working for each firm is equalized

$$\hat{E}\left[U(W_1^*, N_1^*, \hat{N}_1, \hat{N}_2, s_1, s_2)\right] = \hat{E}\left[U(W_2^*, N_2^*, \hat{N}_1, \hat{N}_2, s_1, s_2)\right]$$

(b) the optimal compensation contract offered by each firm may contain equity instruments if employee sentiment for that firm's equity compensation is positive. In fact firm *i* is indifferent between using any compensation contract of a given market value and containing between 0 and $\hat{N}_i$ units of the equity instrument.

$$N_i^* \in [0, \frac{s_i}{\sigma^2}] \text{ for } i = 1, 2.$$

(c) Employees chose their portfolios optimally as described in Lemma 2. Given the optimal compensation policy of the firm, employees always hold their first-best portfolio allocation of $\hat{N}_1 = \frac{s_1}{\sigma^2}$ and $\hat{N}_2 = \frac{s_2}{\sigma^2}$.

(d) the allocation of labor between the two firms is the first best allocation $l_1 = l_2 = 0.5$ with compensation costs equal to marginal products and the labor market clears.

Proof See Appendix.

In equilibrium employees' expected utilities are again equalized across firms. Unlike in the first model however, the true values of the compensation packages are equal as well and hence the per-employee compensation costs of the firms are the same and independent of employee sentiment. Firms and employees are indifferent between any compensation contract which substitutes equity instruments for cash while holding the total market value of the package constant, as long as the equity component is weakly smaller than the employees' desired holdings of the instrument. As described in Lemma 2, the employees simply reach their preferred allocation on their own. The indifference of the firm about whether to compensate with equity even in the face of positive sentiment stems from the fact that the employee never agrees to give up more wages than the market price for a unit of equity. The firm values the equity instrument at its market value, and receives the market value for it from employees.

We conclude that equity-based compensation is possible in our model even if employees are "more rational" than initially assumed and do not overpay for equity relative to fair market values. If employees are aware that they can purchase an equivalent or close-to-equivalent claim outside of the firm then there is a no-arbitrage bound that restricts the amount of cash firms can extract from exuberant employees. This implies that firms become indifferent between paying optimistic employees in equity and paying them in cash (while possibly raising the necessary cash from the market). Firms neither lose nor gain by using optimistic employees as capital providers, and equity-based compensation is no longer the strict puzzle identified in the prior literature. In fact, paying exuberant employees with options becomes equivalent to issuing seasoned equity into the market – in both cases the firm is effectively selling equity at fair market value. Transaction costs associated with seasoned equity issues (Smith 1986, Lee, Lochhead, Ritter and Zhao 1996, and Altinkiliç and Hansen 2000) may sway cash-constrained firms to prefer paying optimistic employees with equity rather than issuing equity (Core and Guay 2001, Fama and French 2003).[27] Similarly, tax considerations or differential stock price reactions (Zheng 2003 a,b) can break the indifference between equity issues and equity compensation and get firms to pay employees with equity.[28] For our empirical tests in Section 6 we note that any of the standard motivations for firms to issue equity should also increase firms' incentive to pay optimistic employees with equity. An example which we explore in more detail below is when managers have actual or imagined inside information that the market price of equity is too high.

The situation faced by most firms is most likely somewhere between the two extreme situations we have modeled. To some extent employees are likely to be aware that the equity market offers a bet on the firm which is an alternative to the equity instruments received from the firm. Transaction costs, real or behavioral borrowing constraints, and ignorance about the exact relation between traded shares and non-traded options are likely to drive a wedge between the fair market value and employees' valuation of the compensation instrument. The existence of such a wedge in combination with employee exuberance is sufficient to ensure that firms pay with equity in equilibrium.

The anecdotal evidence discussed in the introduction and the empirical results below does, however, suggest that employees significantly overpay for equity compensation relative to its market values, implying that the first version of the model is more likely to be the more important one. A strict preference for options over cash is necessary to explain why firms in the 1990s were faced with employees who refused to join firms which did not offer options, and which left old-economy firms to join option-granting dot-coms. Without employees overpaying relative to market values, firms

[27] Our empirical results show that many of the firms using broad-based option compensation are extremely cash rich. This suggests that they should have had no reason to issue equity to employees unless employees are by themselves willing to overpay.

[28] 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. 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).

subject to positive sentiment do not expand in size at the expense of other firms, and firms who do not enjoy positive sentiment are not forced to increase compensation to compete in the labor market. Taking the firm's perspective, overpayment for options can explain why options are much more popular than restricted stock as a means of compensation: the simpler valuation anchor provided by observable stock prices makes overpayment for restricted stock less likely.

Having established the theoretical proposition that positive employee sentiment induces firms to compensate employees with equity, we next review the prior empirical and theoretical literature on broad-based option compensation. We pay particular attention to the behavioral literature on expectations formation and to the empirical literature on employee behavior towards company stock in order to derive predictions about where and when employee sentiment is likely to induce equity-based compensation.

3. Literature Review

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.[29] Oyer and Schaefer (2002) present an extensive discussion of the potential benefits of stock option usage in firms. They argue that the incentive effects from options for lower-level employees are likely to be insignificant and outweighed by the cost of exposing employees to risk.[30] 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 stock price risk are a more efficient means of providing retention incentives.[31] Lambert, Larcker, and Verecchia (1991), Murphy (1999), Hall and Murphy (2001), Meulbroek (2001 and 2002), Ingersoll (2002), and Kahl, Liu, and Longstaff (2003) quantify the deadweight loss from selling company equity and options to employees. While the answers are obviously model dependent, there is general agreement that employees' rational valuations of company stock and options are significantly below fair market values. Inderst and Müller (2003) argue that option compensation can be beneficial because it lowers a firm's compensation bill in bad states of nature in which owners should have full cashflow rights in order to induce efficient strategic decisions. Finally, Oyer and Schaefer (2002) show that option grants can induce sorting in the labor market. Potential employees may have heterogeneous assessments of a firm's prospects, providing an opportunity for firms to screen for optimistic employees by offering options.

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

[30] 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.

[31] Oyer and Schaefer (2001) are 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.

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 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. Kedia and Mozumdar (2002) corroborate the Core and Guay results on a sample of 200 large NASDAQ firms and further 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.[32] None of these studies consider employee sentiment as the main driving force behind option compensation policies.

Several recent studies have considered 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 corporate tax payments and how firms consider the tax effects of compensation when setting the corporate capital structure.[33]

[32] 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.

[33] 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

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 performance; in fact, firms with the most equity purchases among employees tend to underperform firms with the least equity purchases by an insignificant amount.[34]

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 when making decisions 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.

4. Empirical predictions

---

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.

[34] 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.

Our model presented in Section 2 predicts that equity compensation should be used when employees are optimistic about the value of equity-based compensation and are therefore willing to purchase the compensation instrument for their own private accounts. More employee exuberance should make equity compensation more likely and lead to a higher percentage of compensation through equity. The results in Benartzi (2001) and Huberman and Sengmüller (2002) suggest that prior stock returns are a major determinant of employees' willingness to invest in company stock, 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. Finally, we make use of the psychology literature on expectations formation reviewed above to understand the factors determining excessive extrapolation. These considerations lead to a number of testable hypotheses.

The hypothesized 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 options on the basis of observed stock prices, then 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, and are likely to assign low values to options after periods with low option payoffs. 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 use data on option grants. The observation that employees' private valuations 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:

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

Finally, we have argued above that any reason for managers to wish to sell equity at prevailing market prices should increase firms' propensity to pay with options. Managers who perceive their firm to be overvalued by the equity market may decide to "sell" equity to employees. Put differently, managers are likely to use actual or perceived inside information about the firm when deciding on the optimal compensation mix. This leads to our fourth hypothesis:

> *H4: 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.

5. Data Sources and Variable Definitions

Our main source of data on option grants is 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 2002. Desai (2002) has shown that it is 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.[35] 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 all grants as a proxy for the number of options granted to all employees in a given firm-year. We drop all firm-years in which the sample standard deviation of the estimates is greater than 10 percent of the mean.[36]

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.[37] We estimate the total value of options granted to *non-executive* employees by

[35] By "all employees", we mean the top five executives and all other employees.
[36] This eliminates 708 observations.
[37] 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.

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. Finally, since we extrapolate from executive grants to employee grants, we miss firm-years in which no executives received options. This also implies that firms which use options for neither top executives nor rank-and-file employees are incorrectly coded as missing rather than zeros. 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. 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 2002 period.

To check the robustness of our approach to estimating option grants, we obtain the data on option grants hand-collected by Core and Guay (2001) for a subset of our companies for the years 1995 to 1997.[38] We then extend the Core and Guay data set through further hand collection from proxy statements for the years 1998 to 2000. As a first robustness check, we calculate the correlation between our measure of options grants with the more precise measure obtained from the hand-collected data. The correlation coefficient is 0.93, providing some assurance that measurement problems are not severe. As a second robustness check, we repeat all our regression analyses in Section 6 using the smaller hand-collected data set. All our results turn out to be robust.

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 in investing activities (data item 311) less cash flow from operations (data item 308), all

[38] We are grateful to John Core and Wayne Guay for kindly making their data available to us.

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 third 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 at the 1% level 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. Following 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.[39] Similarly, Q represents investment opportunities and hence the demand for cash in this calculus.

Following 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 in growth firms. Similar to Core and Guay (2001) we 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 also control for sales (data item

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

12) to proxy for firm size, and use a long-term debt indicator as a proxy for access to debt markets.

To assess the effect of managerial inside information on compensation policy, 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.

Our main measure of stock price performance for year t is the annualized two-year return calculated from the beginning of year t-1 to the end of year t. For brevity, we call this return the previous two-year return. 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 2513 firms from the ExecuComp database for the years 1992 to 2002.

We also exclude as coding errors the 166 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. Further, we exclude from our sample the 1147 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. [40] We also exclude the 69 firm-years for which the value of options granted to all non-executive employees, calculated as described above, results in a negative value. We eliminate 708 observations for which the standard deviation of our estimates of the number of options granted in a given firm-year is greater than 10% of the mean. Finally, we exclude 7,972 firm-years because information on at least one of our variables of interest is missing. Our final sample comprises 1,805 firms and 8,814 firm-years.

Table 1 provides some descriptive statistics for the final sample. The firms in our sample have a median equity value of $0.97 billion, median sales of $ 0.89 billion, and median assets of $0.87 billion. The median number of employees is 4,700, while the median value of options granted per employee per year is $1,315.

6. Empirical Results

As an initial test of the employee sentiment hypothesis we assess the relationship between employee option grants and past stock returns. We sort firms by the value of annual option grants per employee into quintiles and calculate average two-year stock returns. Panel A of Table 2 reports the mean and median values of prior two-year 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 8% (8%) while firms with option grants in the highest 20% have prior returns of 31% (18%). Similarly, as shown in Panel B, when sorting firms by previous two-year returns, we find that firms in the bottom 20% of the return distribution grant options with a mean (median) value $25,885 ($1,728) while firms with prior returns in the top 20% grant $71,712 ($4,311). Hence, consistent with out first hypothesis, option grants are used by firms with extraordinarily good past performance.

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

6.1 The effect of past performance on employee option grants

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

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 past firm performance is measured by the return over the prior two years. 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 two-year stock returns is positive and highly statistically significant. It is also economically significant: an increase of 10 percentage points in stock returns is associated with a 4.8 to 7.8 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.[41]

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 two-year return is still positively related to option grants to employees, with a ten percentage point increase in the return associated with a 3.9 to 5 percent increase 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 two-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 prior return quintile increases the value of options granted per employee by between 44 to 77 percent, depending on the specification. The average grant size jumps by between 35 and 54 percent when moving from return quintile four to quintile five. For comparison, the average increase in grant size when moving from return quintile one to quintile four is between 9 and 23 percent only.

[41] 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.

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 two, three, four, five and six year returns.[42] 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 two-year returns we find option grants which are 47% larger in the highest return quintile compared to the lowest return quintile, with this difference increasing to 65% when sorting on previous 3-year returns and to 86% when sorting on previous 6-year returns.

6.2 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 composite measures of cash constraints in Tables 3 to 6. However, the results relating these measures of cash constraints to option grants are quite mixed. Cash flow shortfall is positively related to grants, suggesting that cash rich firms use fewer options to pay their employees than do cash constrained firms. On the other hand, KZ4 is negatively related to grants both in the firm fixed effect and in the industry fixed effect framework (Tables 4 and 5), implying that cash rich firms use option compensation more intensively than do cash constrained firms. Finally, the KZ measure and the measure of interest burden are unrelated to grants in Tables 3, 5, and 6, and are negatively related to option grants in the firm-fixed effects specification in Table 4.[43]

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. The components are cash balances, leverage, cash flow, investment, dividends, and Q. The results are presented in Table 7.

We find that the value of option compensation per non-executive employee is increasing in (normalized) cash balances,[44] 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

[42] For this exercise we restrict the sample to firms for which 6 years of past returns are available on CRSP. Also, all previous year returns are defined in way analogous to previous two-year returns. For example, previous three-year return at year t is the annualized three year return over the 36 month period comprising years t-2, t-1, and t.

[43] Interest burden is in fact positively related to option grants in Tables 3 and 5 when interest burden is the only measure of cash constraints included in the regressions. Once KZ4 and cash flow shortfall are included, the coefficients on interest burden become small and insignificant.

[44] 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 $3,304 ($611) to each employee while those in the highest cash quintile pay a mean (median) value of $98,715 ($18, 195).

activities.[45] 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 like leverage are associated with less use of option grants.

To better control for unobserved heterogeneity among firms, we 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. Additionally, in the fixed effect framework, option compensation is positively related to normalized cash flow. 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 fewer option grants.

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, low cash flow, high leverage and high interest burden) do not find option grants an efficient means of compensating their employees. Instead 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 until the end of the sample period in 2002 or until the firm is delisted. Finally, we restrict the sample to firm-year observations between 1992

[45] The fact that KZ is unrelated to option grants, while KZ4 is negatively 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 may be caused by the positive relationship between cash flow to investments and option grants.

and 1999. Hence we create a sub-sample of firms with large cash balances and require that the firms 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 $91,346 ($24,863) per year, compared to $18,844 ($1,078) in the remainder of the sample. Furthermore, the regression results in the first column of Table 9 show that option compensation per employee is still strongly increasing in prior two-year returns. The results are similar with firm fixed effects and are reported in the second column of Table 9. We conclude that the observed relationship between stock price performance and option compensation is not driven by cash constraints induced by improving investment opportunities.

6.3 Earnings Manipulation and Insider Trading by Managers

We conclude by testing our fourth hypothesis which states 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.[46] 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 10 show that earnings manipulation is positively associated with option compensation. Indeed, in the cross-section, controlling for industry effects, earnings manipulation is associated with an 18 to 43 percent higher value of option grants per employee.

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 11. Firms in which the top five managers cash out grant around 17% more

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

options to their employees than comparable firms, while firms in which top managers purchase equity for their own account grants around 17% less to employees than comparable firms (Column 5). These results suggest 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.

7. Conclusion

We propose that stock option grants to non-executive employees are a behavioral phenomenon: firms pay their employees in equity whenever employees are irrationally optimistic about the value of the offered compensation instrument. We have modeled the optimal compensation policy of a firm faced with employees with positive sentiment towards equity compensation, and have shown that equity-based compensation can indeed be part of an optimal compensation strategy.

We have established the empirical determinants of employee stock option compensation in a broad cross-section of firms between 1992 and 2002. Our results show that non-executive employee option grants are positively associated with previous stock returns, investment and investment opportunities, and with cash balances. Grants are negatively associated with interest burden and leverage.

In light of the model presented in Section 2, our interpretation of the empirical results in Section 6 is 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 suggests that options are used in firms in which employees are likely to be exuberant about equity compensation. For example, we find that firms with option grants among the largest 20% of all firm-years have prior returns of 31% over the preceding twenty-four months, while firms with option grants in the bottom 20% have prior returns of only 8%. Similar patterns obtain when we control for various firm characteristics and industry or firm fixed effects. 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.)

Fama, Eugene F., and Kenneth R. French, 2003, Financing Decisions: Who Issues Stock?, *Working Paper*, University of Chicago, July.

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.

Inderst, Roman, and Holger M. Müller, 2003, A theory of broad-based option pay, *Working Paper*, NYU Stern School of Business, November.

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.

Lambert, Richard A., and David F. Larcker, 2001, How employees value (often incorrectly) their stock options, *Kowledge@Wharton Online Article*, available at http://knowledge.wharton.upenn.edu/index.cfm?fa=viewArticle&id=363, May.

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.

Snider, Anna, 2000, Brobeck's pay boost beats NYC firms, *New York Law Journal*, January 24.

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.

Appendix

Available from the authors upon request.
Currently in the process of being written up neatly.

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.

	Mean	Median
Employees	**17,119**	**4,700**
Total Grants / Shares Outstanding	**3.15%**	**1.81%**
Employee Grants / Total Grants	**67.81%**	**71.29%**
Grants per Employee	**$25,393**	**$1,315**
Market Value of Equity (billions)	**$5.14**	**$0.97**
Assets (billions)	**$5.61**	**$0.87**
Sales (billions)	**$3.48**	**$0.89**
Q	**2.14**	**1.56**
KZ	**0.84**	**0.86**
KZ4	**0.23**	**0.28**
Cash Flow Shortfall	**1.74%**	**0.31%**
Interest Burden	**20.29%**	**12.00%**
R&D	**3.00%**	**0.00%**

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). Stock returns are constructed from the CRSP monthly return files. Quintile cutoff points are calculated using the entire pooled sample.

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

	Previous Two-Year Return	
	Mean	Median
Option Grant Quintile		
1	8%	8%
2	12%	11%
3	14%	11%
4	18%	14%
5	31%	18%

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

	Option Grant per Employee	
	Mean	Median
Return Quintile		
1	$25,885	$1,728
2	$9,568	$921
3	$6,388	$761
4	$15,344	$1,122
5	$71,712	$4,311

Table 2. (Continued)

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

	Option Grant per Employee	
	Mean	Median
Cash Balances Quintile		
1	$3,304	$611
2	$3,850	$683
3	$6,189	$967
4	$12,812	$1,846
5	$98,715	$18,195

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 two-year return for year t is the annualized return for years t-1 and t calculated from monthly 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, where missing observations are replaced by zero. T-statistics use heteroskedasticity-robust standard errors. All regressions include year dummies and three-digit SIC industry dummies.

KZ_{t-1}	**0.01**				
	0.60				
$KZ4_{t-1}$		**-0.01**			**-0.03**
		0.57			1.49
Cash Flow $Shortfall_{t-1}$			**2.31**		**2.33**
			(15.80)**		(15.48)**
Interest $Burden_{t-1}$				**0.28**	**0.00**
				(3.50)**	0.03
Q_{t-1}		**0.36**	**0.35**	**0.37**	**0.34**
		(31.10)**	(34.58)**	(34.00)**	(31.26)**
Previous two-year return	**0.78**	**0.49**	**0.52**	**0.48**	**0.52**
	(18.55)**	(13.53)**	(14.36)**	(13.36)**	(14.49)**
Log (Sales)	**-0.23**	**-0.23**	**-0.17**	**-0.22**	**-0.17**
	(19.88)**	(21.47)**	(15.66)**	(19.88)**	(15.16)**
Long Term Debt Dummy	**-0.56**	**-0.23**	**-0.36**	**-0.27**	**-0.34**
	(9.68)**	(4.39)**	(7.01)**	(5.08)**	(6.60)**
R&D	**5.05**	**3.41**	**2.78**	**3.13**	**2.79**
	(10.10)**	(7.34)**	(5.72)**	(6.58)**	(5.60)**
Constant	**7.43**	**6.78**	**6.47**	**6.68**	**6.45**
	(62.27)**	(62.37)**	(58.58)**	(59.24)**	(57.28)**
Observations	**8814**	**8814**	**8814**	**8814**	**8814**
Adj. R-squared	**61%**	**66%**	**68%**	**66%**	**68%**

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}	**-0.07**				
	(4.32)**				
$KZ4_{t-1}$		**-0.12**			**-0.10**
		(7.76)**			(6.52)**
Cash Flow $Shortfall_{t-1}$			**0.69**		**0.83**
			(4.77)**		(5.72)**
Interest $Burden_{t-1}$				**-0.75**	**-0.62**
				(7.41)**	(6.15)**
Q_{t-1}		**0.21**	**0.23**	**0.22**	**0.21**
		(20.75)**	(23.62)**	(22.17)**	(20.20)**
Previous two-year return	**0.50**	**0.39**	**0.40**	**0.40**	**0.43**
	(17.31)**	(14.39)**	(14.25)**	(14.46)**	(15.53)**
Log (Sales)	**-0.06**	**-0.12**	**-0.13**	**-0.16**	**-0.14**
	1.69	(3.90)**	(4.35)**	(5.31)**	(4.47)**
Long Term Debt Dummy	**-0.06**	**0.02**	**-0.03**	**0.00**	**0.02**
	1.07	0.44	0.66	0.06	0.39
R&D	**-1.78**	**-1.76**	**-1.94**	**-1.60**	**-1.41**
	(5.29)**	(6.08)**	(6.14)**	(5.02)**	(4.57)**
Constant	**6.58**	**6.53**	**6.60**	**6.97**	**6.73**
	(29.92)**	(32.45)**	(32.49)**	(34.18)**	(32.41)**
Observations	**8814**	**8814**	**8814**	**8814**	**8814**
Adj. R-squared	85%	87%	86%	87%	87%

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

KZ_{t-1}	**0.00**				
	0.1				
$KZ4_{t-1}$		**-0.02**			**-0.03**
		1.16			(1.97)*
Cash Flow Shortfall$_{t-1}$			**2.28**		**2.30**
			(15.80)**		(15.43)**
Interest Burden$_{t-1}$				**0.27**	**0.01**
				(3.30)**	0.15
Q_{t-1}		**0.37**	**0.36**	**0.38**	**0.35**
		(31.81)**	(35.47)**	(34.92)**	(31.95)**
Previous two-year return					
Quintile 1	**-**	**-**	**-**	**-**	**-**
Quintile 2	**0.00**	**-0.10**	**-0.05**	**-0.09**	**-0.05**
	0.04	(2.21)*	1.12	1.95	1.26
Quintile 3	**0.04**	**-0.09**	**-0.03**	**-0.08**	**-0.04**
	0.74	(2.03)*	0.7	1.73	0.87
Quintile 4	**0.23**	**0.09**	**0.15**	**0.09**	**0.15**
	(4.78)**	1.92	(3.45)**	(2.12)*	(3.36)**
Quintile 5	**0.77**	**0.44**	**0.50**	**0.44**	**0.50**
	(15.31)**	(9.74)**	(11.17)**	(9.66)**	(11.23)**
Log (Sales)	**-0.23**	**-0.22**	**-0.17**	**-0.21**	**-0.17**
	(19.32)**	(20.76)**	(15.29)**	(19.35)**	(14.74)**
Long Term Debt Dummy	**-0.57**	**-0.23**	**-0.36**	**-0.27**	**-0.34**
	(9.78)**	(4.29)**	(7.00)**	(5.09)**	(6.46)**
R&D	**4.99**	**3.31**	**2.68**	**3.03**	**2.69**
	(9.82)**	(7.10)**	(5.50)**	(6.34)**	(5.40)**
Constant	**8.16**	**7.24**	**6.94**	**7.15**	**6.92**
	(73.82)**	(69.90)**	(65.52)**	(65.75)**	(63.82)**
Observations	**8812**	**8812**	**8812**	**8812**	**8812**
Adj. R-squared	**60%**	**67%**	**67%**	**66%**	**68%**

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. All regressions include year dummies and three-digit SIC industry dummies. T-statistics use heteroskedasticity-robust standard errors.

$KZ4_{t-1}$	**0.02**	**0.03**	**0.02**	**0.02**	**0.02**
	1.08	1.26	1.23	1.07	1.04
Cash Flow $Shortfall_{t-1}$	**1.94**	**1.93**	**1.78**	**1.64**	**1.54**
	(10.36)**	(10.51)**	(9.85)**	(9.12)**	(8.42)**
$Interest\ Burden_{t-1}$	**-0.20**	**-0.16**	**-0.02**	**0.09**	**0.16**
	1.88	1.46	0.22	0.84	1.47
Q_{t-1}	**0.35**	**0.32**	**0.31**	**0.30**	**0.30**
	(27.27)**	(24.10)**	(22.63)**	(22.16)**	(21.86)**
	Previous 2-year return	**Previous 3-year return**	**Previous 4-year return**	**Previous 5-year return**	**Previous 6-year return**
Quintile 1	-	-	-	-	-
Quintile 2	**-0.05**	**0.01**	**0.14**	**0.19**	**0.26**
	-1.02	-0.14	(3.00)**	(4.06)**	(5.66)**
Quintile 3	**-0.02**	**0.13**	**0.24**	**0.32**	**0.37**
	-0.35	(2.90)**	(5.07)**	(6.73)**	(7.68)**
Quintile 4	**0.17**	**0.35**	**0.49**	**0.56**	**0.62**
	(3.44)**	(7.16)**	(10.40)**	(11.15)**	(12.58)**
Quintile 5	**0.47**	**0.65**	**0.75**	**0.82**	**0.86**
	(9.47)**	(12.68)**	(14.17)**	(15.49)**	(16.18)**
Log (Sales)	**-0.16**	**-0.16**	**-0.16**	**-0.17**	**-0.17**
	(12.77)**	(13.01)**	(13.33)**	(13.69)**	(14.03)**
Long Term Debt Dummy	**-0.39**	**-0.40**	**-0.39**	**-0.38**	**-0.38**
	(6.60)**	(6.78)**	(6.68)**	(6.51)**	(6.57)**
R&D	**2.98**	**3.23**	**3.36**	**3.36**	**3.38**
	(5.08)**	(5.49)**	(5.81)**	(5.72)**	(5.68)**
Constant	**6.93**	**6.96**	**6.82**	**6.76**	**6.79**
	(59.08)**	(60.12)**	(59.34)**	(58.98)**	(59.33)**
Observations	**7559**	**7559**	**7559**	**7559**	**7559**
Adj. R-squared	**64%**	**65%**	**65%**	**65%**	**65%**

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. All regressions include year dummies and three-digit SIC industry dummies.

Dividends$_{t-1}$	**-14.38**					**-13.94**
	(13.59)**					(13.64)**
Cash Flow$_{t-1}$		**-0.15**				**-0.16**
		0.92				1.13
Cash Balances$_{t-1}$			**1.19**			**1.04**
			(21.49)**			(18.67)**
Leverage$_{t-1}$				**-0.42**		**-0.45**
				(5.32)**		(5.91)**
Cash Flow from Investment$_{t-1}$					**2.87**	**2.01**
					(17.12)**	(11.79)**
Q_{t-1}	**0.39**	**0.37**	**0.29**	**0.35**	**0.33**	**0.30**
	(35.52)**	(30.99)**	(28.14)**	(32.46)**	(31.00)**	(27.22)**
Previous two-year return	**0.46**	**0.49**	**0.45**	**0.49**	**0.53**	**0.45**
	(12.31)**	(13.57)**	(13.63)**	(13.69)**	(14.42)**	(13.44)**
Log (Sales)	**-0.18**	**-0.23**	**-0.16**	**-0.22**	**-0.19**	**-0.09**
	(16.30)**	(20.92)**	(15.31)**	(19.97)**	(18.45)**	(7.45)**
Long Term Debt Dummy	**-0.28**	**-0.25**	**-0.12**	**-0.16**	**-0.29**	**-0.13**
	(5.46)**	(4.67)**	(2.42)*	(3.04)**	(5.69)**	(2.75)**
R&D	**3.17**	**3.30**	**2.90**	**3.41**	**4.27**	**3.23**
	(6.71)**	(6.89)**	(6.84)**	(7.60)**	(9.96)**	(8.23)**
Constant	**6.73**	**6.78**	**6.20**	**6.78**	**6.30**	**5.89**
	(63.03)**	(62.08)**	(58.58)**	(62.32)**	(57.76)**	(55.89)**
Observations	**8814**	**8814**	**8814**	**8814**	**8814**	**8814**
Adj. R-squared	**67%**	**66%**	**68%**	**66%**	**68%**	**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$_{t-1}$	**-1.26**					**-2.71**
	1.22					(2.58)**
Cash Flow$_{t-1}$		**0.97**				**0.64**
		(7.71)**				(5.07)**
Cash Balances$_{t-1}$			**0.40**			**0.29**
			(8.52)**			(6.22)**
Leverage$_{t-1}$				**-0.57**		**-0.52**
				(6.98)**		(6.22)**
Cash Flow from Investment$_{t-1}$					**1.01**	**0.90**
					(6.45)**	(5.82)**
Q$_{t-1}$	**0.23**	**0.21**	**0.21**	**0.22**	**0.23**	**0.19**
	(23.44)**	(19.68)**	(21.63)**	(21.93)**	(23.59)**	(18.22)**
Previous two-year return	**0.38**	**0.37**	**0.38**	**0.39**	**0.41**	**0.41**
	(13.67)**	(13.51)**	(13.90)**	(14.23)**	(14.37)**	(14.54)**
Log (Sales)	**-0.14**	**-0.15**	**-0.11**	**-0.13**	**-0.14**	**-0.11**
	(4.50)**	(4.94)**	(3.49)**	(4.11)**	(4.36)**	(3.60)**
Long Term Debt Dummy	**-0.02**	**-0.01**	**0.00**	**0.03**	**-0.02**	**0.05**
	0.40	0.22	0.06	0.71	0.44	0.99
R&D	**-1.98**	**-1.47**	**-1.62**	**-1.85**	**-1.31**	**-0.60**
	(6.36)**	(4.83)**	(5.23)**	(6.27)**	(4.11)**	(1.97)*
Constant	**6.68**	**6.69**	**6.39**	**6.72**	**6.48**	**6.43**
	(33.15)**	(33.33)**	(30.98)**	(33.65)**	(31.67)**	(30.78)**
Observations	**8814**	**8814**	**8814**	**8814**	**8814**	**8814**
Adj. R-squared	**86%**	**87%**	**87%**	**87%**	**87%**	**87%**

Table 9. 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 given year on, normalized cash balances remain in the top quintile until the end of the sample period in 2002 or until the firm is delisted. We also restrict the sample to firm-year observations between 1992 and 1999. This creates a sub-sample of firms with large cash balances and which remain cash rich for the remainder of the sample period. All other variables are defined as in Table 3. All regressions include year dummies and three-digit SIC industry dummies. T-statistics use heteroskedasticity-robust standard errors.

Previous two-year return	**0.58**	**0.31**
	(7.89)**	(4.42)**
Q_{t-1}	**0.20**	**0.09**
	(9.35)**	(4.33)**
Log (Sales)	**-0.19**	**-0.12**
	(5.21)**	0.86
Long Term Debt Dummy	**-0.23**	**-0.20**
	(2.18)*	1.78
R&D	**1.46**	**-2.08**
	(2.76)**	(4.47)**
Constant	**9.00**	**9.62**
	(35.16)**	(19.21)**
Observations	**796**	**796**
Adj. R-squared	**56%**	**89%**

Table 10. 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. All regressions include year dummies and three-digit SIC industry dummies. T-statistics use heteroskedasticity-robust standard errors.

Manipulator	**0.43**	**0.24**	**0.18**	**0.24**	**0.18**
	(7.36)**	(4.40)**	(3.42)**	(4.35)**	(3.46)**
KZ_{t-1}	**-0.01**				
	0.49				
$KZ4_{t-1}$		**-0.03**			**-0.04**
		1.61			(2.34)*
Cash Flow Shortfall$_{t-1}$			**2.25**		**2.27**
			(15.04)**		(14.72)**
Interest Burden$_{t-1}$				**0.26**	**0.00**
				(2.99)**	0.01
Q_{t-1}		**0.35**	**0.35**	**0.36**	**0.34**
		(29.62)**	(33.31)**	(32.58)**	(29.85)**
Previous two-year return	**0.76**	**0.48**	**0.51**	**0.47**	**0.51**
	(17.43)**	(12.40)**	(13.21)**	(12.18)**	(13.41)**
Log (Sales)	**-0.23**	**-0.24**	**-0.18**	**-0.23**	**-0.18**
	(19.11)**	(21.48)**	(16.12)**	(19.95)**	(15.57)**
Long Term Debt Dummy	**-0.54**	**-0.20**	**-0.35**	**-0.25**	**-0.32**
	(9.04)**	(3.74)**	(6.56)**	(4.63)**	(5.92)**
R&D	**5.13**	**3.44**	**2.80**	**3.18**	**2.82**
	(9.98)**	(7.26)**	(5.62)**	(6.47)**	(5.56)**
Constant	**7.45**	**6.83**	**6.56**	**6.76**	**6.53**
	(60.69)**	(61.25)**	(58.23)**	(58.54)**	(56.99)**
Observations	**8069**	**8069**	**8069**	**8069**	**8069**
Adj. R-squared	**62%**	**67%**	**68%**	**67%**	**68%**

Table 11. 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. 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. All regressions include year dummies and three-digit SIC industry dummies. T-statistics use heteroskedasticity-robust standard errors.

Manipulator	**0.43**	**0.25**	**0.19**	**0.24**	**0.19**
	(6.95)**	(4.23)**	(3.21)**	(4.17)**	(3.29)**
Buying Managers	**-0.27**	**-0.18**	**-0.17**	**-0.18**	**-0.17**
	(6.48)**	(4.71)**	(4.57)**	(4.82)**	(4.46)**
Selling Managers	**0.10**	**0.16**	**0.17**	**0.16**	**0.17**
	(2.52)*	(4.22)**	(4.53)**	(4.29)**	(4.52)**
KZ_{t-1}	**0.00**				
	0.09				
$KZ4_{t-1}$		**-0.02**			**-0.04**
		1.32			(2.19)*
Cash Flow $Shortfall_{t-1}$			**2.17**		**2.20**
			(12.86)**		(12.70)**
Interest $Burden_{t-1}$				**0.24**	**0.01**
				(2.58)**	0.10
Q_{t-1}		**0.35**	**0.35**	**0.36**	**0.34**
		(27.35)**	(30.77)**	(29.81)**	(27.80)**
Previous two-year return	**0.69**	**0.43**	**0.45**	**0.42**	**0.45**
	(15.47)**	(10.69)**	(11.32)**	(10.51)**	(11.45)**
Log (Sales)	**-0.21**	**-0.22**	**-0.17**	**-0.21**	**-0.17**
	(16.09)**	(18.55)**	(14.23)**	(17.25)**	(13.73)**
Long Term Debt Dummy	**-0.57**	**-0.23**	**-0.36**	**-0.27**	**-0.32**
	(9.07)**	(3.90)**	(6.35)**	(4.68)**	(5.72)**
R&D	**5.25**	**3.51**	**2.81**	**3.25**	**2.83**
	(9.60)**	(6.98)**	(5.36)**	(6.24)**	(5.26)**
Constant	**7.65**	**7.05**	**6.82**	**6.99**	**6.79**
	(62.66)**	(62.25)**	(59.51)**	(59.91)**	(58.73)**
Observations	**7154**	**7154**	**7154**	**7154**	**7154**
Adj. R-squared	**62%**	**70%**	**68%**	**67%**	**68%**