2004

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January 27, 2004

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ABSTRACT

This paper investigates a market-valuation-based hypothesis for employee stock options (ESOs). It examines how market valuation has affected the decision to grant ESOs, the amount of options granted, and the distribution of options among executives and rank-and-file employees. I find strong empirical evidence that firms with high market valuation and high probability of future overvaluation are more likely to adopt ESOs and grant more options to their employees. Furthermore, when top executives perceive that the current market valuation is high, they grant a smaller portion of options to themselves relative to rank-and-file employees. All these results are consistent with the market-valuation rationale for ESOs, which argues that firms use ESOs as a method to sell overvalued equity.

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Employee stock options (ESOs) have attracted a lot of attention recently as the number of option holders has grown substantially. According to the National Center for Employee Ownership (NCEO), the number of employees holding company options was roughly 1 million in 1990. As of November 2001, this number had grown to 10 million.[1] Over the past decade, stock options constituted a large portion of the compensation of many rank-and-file employees, especially those in the technology sector. However, together with the decline of the stock market, the total options granted in 2001 and 2002 decreased for both large firms and small firms. Why do firms grant more options to employees in the bull market than in the bear market? Is this just a coincidence or are there some driving factors behind this?

This paper provides a new motivation for ESOs - a market valuation rationale. This market valuation rationale states that, firms use ESOs as a way to sell their overvalued equities. Here ESOs serve the function as "back door" equity financing, which is similar to the interpretation claimed in Stein (1992) for the convertible bonds issuance. The main driving force of this market valuation rationale for ESOs is the managers' perception of "excess" market volatility. A lot of empirical evidence suggests that stock prices are more volatile than firm fundamental values. Surveys of this literature include Campbell, Lo and MacKinlay (1997), Gilles and LeRoy (1991), LeRoy (1989), Shiller (1989) etc. Although there are different explanations on why this happens, the consensus appears that market prices are much too volatile.[2] This fact is clearly summarized by Campbell, Lo and MacKinlay (1997) on page 283 of their book, *the Econometrics of Financial Markets*:

> In conclusion, the VAR approach strongly suggests that the stock market is too volatile to be consistent with the view that stock prices are optimal forecasts of future dividends discounted at a constant rate.

[1] See http://www.nceo.org.

[2] Theories to explain this behavior include time varying risk premium (Campbell (1991) etc), bubbles (Blanchard and Watson (1982), etc), noise trading (Campbell and Kyle (1993), De Long et al. (1990)), investor behavior (Benartzi and Thaler (1995)), etc. In this paper, I take this phenomenon as given and study how this affects the firms' decision on granting employees stock options.

Given that stock prices are more volatile than underlying fundamentals, stock prices may deviate from either the true fundamental values or the perceived fundamental values by managers. Options are exercised only when stock prices are higher than strike prices. As long as the strike prices of options are high enough, it is more likely the case that stocks are overvalued when options are in-the-money. Once options are exercised, firms typically issue new shares to employees and employees turn around selling these new shares to the market.[3] Through the option exercise by employees, the firm effectively sells overvalued equity to outside investors. At the time of option grant, anticipating the income from future option exercise, the firm can reduce the cash salary to employees without fear of employees leaving.[4] Therefore, future investors who buy overvalued stocks are effectively paying part of employee compensation. Granting ESOs is just another way for firms to sell their overvalued shares.

If capturing market excess volatility is one motivation for ESOs, cross-sectionally, firms with high market valuation and high probability of future overvaluation are more likely to use ESOs and grant more options to their employees. The positive correlation between the probability of future overvaluation and option grant is easily understood. If the probability of future overvaluation is high, more options can introduce more new shares to capture the future overvaluation. Hence, more options will be granted today. The relationship between current stock valuation and option grant is caused by the common practice of issuing at-the-money options: that is, options whose strike prices are set at the market price at the time of option grant. Because the majority of options are granted at-the-money, a high current market

[3]Despite all the repurchase in the 1990s, the median firm in my sample has 8% increase in number of shares outstanding from 1992 to 2001, excluding share increases from seasoned equity offerings (SEO) and merger and acquisition (M&A). Twenty-five percent of the firms in the sample has more than 44% increase in number of shares outstanding. Because increases from SEOs and M&A are excluded, the majority of these share increases comes from option exercises.

[4]It is not necessary that employees overvalue the firm. As long as they recognize that some investors may value the firm higher in the future, they will be willing to accept options as one form of compensation. On the other hand, if employees overvalue the firm, they may hold stocks from option exercise rather than sell them to outside investors. In this case, employees are exploited in the same way as outside investors.

valuation leads to a high strike price. The high strike price leads to large proceeds to the firm when options are exercised. This makes options less costly and more attractive to managers.

Both the level of option grants and the decision to grant ESOs are explored in this paper. Several measures have been used as proxies for market valuation: for example, book-to-market ratio and two measures of economic value. Economic values are computed using residual income model (RIM) with either realized earnings or analyst-forecasted earnings. I use turnover and volatility as proxies for the probability of future overvaluation. Regardless of the proxy used, the evidence strongly supports the hypothesis that firms with higher market valuations and higher overvaluation probability issue more ESOs. I also find that firms are more likely to adopt employee stock options under the same circumstances.

If managers' intent for granting options is to sell overvalued equity, their own valuation of the options will be low during periods of high market valuation. Therefore, managers would prefer to receive fewer options themselves and grant more to rank-and-file employees when market valuation of the equity is high. Because managers can decide when to grant options, the optimal strategy for managers is to grant more options to themselves when their own valuation of options is high. Empirically, it is observed that managers are indeed attempting to time the market in distributing options. Executives grant a relative larger share of options to themselves when the market valuation is low, and employees receive a relative larger share during periods of high valuation. This provides further evidence that managers use ESOs as an indirect way to sell overvalued company stocks.

Another implication is that the positive correlation between valuation and option grant is weaker for extremely overvalued firms. For firms which are extremely overvalued, employees recognize that options are less valuable and thus require a greater number of options as compensation. In this case, the correlation between option grant and market valuation is small. This hypothesis is confirmed by empirical analysis. Because this is the unique prediction from the market valuation hypothesis, empirical testing can help to differentiate this market valuation rationale from other explanations.

This paper complements the existing literature on managerial market timing. A large literature has documented the correlation between important corporate decisions and equity market valuations. For example, firms tend to repurchase stocks when the stocks are undervalued (Stephens and Weisbach (1998), D'Mello and Shroff (2000)), and seasoned equity issues tend to coincide with high market valuations (Marsh (1982), Korajcyk, Lucas and McDonald (1991), Lee (1997), Baker and Wurgler (2000) etc.). Baker, Stein and Wurgler (2003) find evidence that aggregate equity financing patterns depend on the cost of the equity. Graham and Harvey (2001) report that two-thirds of chief financial officers (CFOs) in their survey agree that "the amount by which our stock is undervalued or overvalued was an important or very important consideration" in issuing equity. In this paper, firms grant broad-based options because managers anticipate that the stocks will be overvalued in the future. Managers do not need to be sure that their firms are overvalued at the time of option grant. As long as they perceive that future stock prices are highly volatile, granting ESOs is optimal. This places a smaller burden on managers' ability to assess the true value of their firms. The empirical results suggest that managers do attempt to take advantage of future market overvaluation in the form of ESOs.

The paper is organized as follows: Section I describes the market valuation rationale for ESOs and obtains the testable hypotheses. Section II describes the data, and Section III provides the empirical results. Section IV concludes the paper.

I. Background and Hypotheses

A. Motivations for ESOs in the prior literature

The popular press has cited providing incentives and retaining employees as the two most important reasons for ESOs.[5] The incentive hypothesis is derived from public shareholders' objective to align the interests of chief executive officers (CEOs), managers and employees

[5]See, "Options for Everyone", *Business Week*, 1996.

with their own interests. Stock ownership is one way to align the interests of these disparate groups, and employee stock options are another form of stock ownership. While providing incentives is certainly an important reason for granting options to CEOs and other top managers,[6] the incentive effect provided by granting options to rank-and-file employees is at least questionable (Oyer and Schaefer (2001)). The employee retention hypothesis argues that options can discourage employees from leaving because options have vesting periods (Ittner, Lambert and Larcker (2001)) or because options can match employees' outside opportunities (Oyer (2003)).

Core and Guay (2001) suggest that broad-based employee stock options may be used to alleviate liquidity constraints. Because options can provide an alternative form of compensation, firms with financial constraints may use options to reduce cash compensations to employees. Lazear (2001), Oyer and Schaefer (2001) study the employee sorting effect of ESOs. They argue that options are used as a screening method for highly motivated employees.

B. Market valuation rationale for ESOs

This paper provides a new motivation for ESOs. I argue that firms may grant options to employees in order to capture potential future stock overvaluation. If managers and investors have different beliefs about firm values, managers might expect that overvaluation will occur sometime in the future. Options by contract design will be exercised only when the market price is above the strike price. When options are exercised, firms usually issue new shares to employees, and then employees can sell these new shares to investors. Companies receive cash proceeds from the exercise of options and employees get the difference between the market and strike prices. Because periods of market overvaluation are more likely to coincide with periods of high share prices, firms effectively sell outside investors overvalued equity through option exercise. These optimistic investors overpay for shares at the time of option exercise and subsidize firms by compensating employees. In this way, managers can use

[6] See Core, Guay and Larcker (2001) for a survey.

ESOs to reduce current employee compensation costs and capture the benefit of future market volatility.

This argument is in the same spirit as that of Shleifer and Vishny (2004), which models acquisitions as driven by market valuations. In their model, investors who buy overvalued shares of a merged firm are subsidizing the original shareholders of both the bidder firm and the target firm. In this paper, same investors are subsidizing the original shareholders. Thus, future investors are exploited by managers. This is consistent with prior studies of earnings management evidence and long-run returns, which suggest that managers aim to exploit new, rather than existing, investors. The same point is also emphasized by Baker and Wurgler (2002).

Hirshleifer and Teoh (2002) propose that if some investors have limited attention and ignore certain salient features of accounting reports, employee stock options may induce investors to overvalue stocks if options are not expensed. In their model, ESOs lead to market misvaluation. Here, I take market misvaluation as given and ask whether managers use options to take advantage of such misvaluation. Just as Stein (1992) suggested that convertible bonds may serve as "back door" equity financing, I argue that ESOs can serve the same purpose.

Employees are willing to accept options for different reasons. As noted in Core and Guay (2001), if 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 equity financing. If employees are as optimistic as future investors, then options will be highly valuable to them.[7] If employees share the same belief as managers, they are still willing to accept options as long as the volatility of stock prices is large enough.

Note that the direct way to capture high market valuation is to offer seasoned equity. However, a Seasoned Equity Offering (SEO) generally sends a bad signal to the market and leads to a decrease in share prices (Myers and Majluf (1984), Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), etc.). In contrast, the action of grant options to employees is not

[7] Bergman and Jenter (2003) argue that firms grant options to employees in order to take advantage of "excess extrapolation" by employees.

a signal of whether the current market valuation is too high or too low. This is because firms may grant employee stock options even when their stocks are currently undervalued.[8] As long as the stock prices are highly volatile, it is optimal for firms to grant options. ESOs also have other advantages over SEOs. For example, ESOs do not involve transaction costs such as brokerage fees and SEC filings. Hence, firms may use both ESOs and SEOs to capture market overvaluation. There is a large literature documenting that equity offerings are related to market valuation(Marsh (1982), Korajcyk, Lucas and McDonald (1991), Baker and Wurgler (2000)). This paper focuses on the relationship between ESOs and market valuation.

C. Testable hypotheses

Based on the valuation rationale, ESOs help firms capture possible future overvaluation. Because of the common practice of issuing at-the-money stock options, options have high strike prices if the current market value is high. When options are exercised and new shares are issued, firms receive cash flows equal to strike prices multiplied by the number of option shares exercised. Thus, a high strike price increases the direct cash proceeds from future share issues. If managers believe that market will correct its valuation in the long run, a higher strike price now implies a smaller probability that future firm value would be higher than the strike price. Thus, options appear less costly to managers. Cross-sectionally, we expect overvalued firms to issue more stock options than undervalued firms.

In addition to affecting the strike price of options, market valuation also influences option grants through expected future market valuation. If managers expect future market valuation to be high, more options are justified. If managers view market prices as random walk, (i.e., current market valuation reflects the expectation of future valuation), then high current valuation implies high future valuation and more options are granted in the equilibrium. This again leads to a positive correlation between option grant and current market valuation.

[8] For a general equilibrium analysis of this market valuation rationale, see Wang and Zhang (2003).

If there is a high probability of future overvaluation, future stock prices are more likely to exceed firm fundamental values perceived by managers. Options are more likely to be exercised because the increased probability of high stock prices. Thus, new shares can be issued to capture future overvaluation. Ex ante, managers prefer more options if they believe that there is high probability of market overvaluation of their stocks. All these arguments lead to the first hypothesis.

Hypothesis 1: Option grant is positively correlated with the current market valuation and the probability of future overvaluation.

The positive correlation between the current market valuation and option grant can not extend in the same way to extremely overvalued firms. When firms are overvalued by a large margin, the probability of option being in-the-money becomes small if employees expect that the valuation process is "mean reverting". Recognizing this effect, employees place a lower value to each option unit, and hence the saving in firm compensation costs is low. On the other hand, firms cannot issue infinite numbers of options because of the market impact of exercising these options. If there are many new shares from option exercise, prices generally fall and therefore make options even less valuable *ex ante*. Because savings in employee compensation grows less rapidly as the firm becomes more overvalued, managers will slow the pace of option grants. Even if employees believe that stock prices follow random walk process, the relationship between market valuation and option grant cannot be linear for the entire range of firm valuation. As more options are granted to capture overvaluation, the marginal benefit of an extra option decreases because the dilution effect becomes stronger. For these reasons, one may find that the correlation between market valuation and option grant is smaller in the sample of highly overvalued firms than it is in the general sample. Thus, we have the second hypothesis.

Hypothesis 2: The correlation between option grant and the current market valuation for extremely overvalued firms is not as large as it is for general firms.

If managers intend to sell overvalued equity through granting options, their own valuation of the options will be low when they think the equity is overvalued. Because managers have control over when to grant options to themselves and to employee, they would choose to receive fewer options and grant more to rank-and-file employees when market valuation of the equity is high. When market valuation is low, managers would assign a larger share of the total option grant to themselves. This leads to the following hypothesis:

Hypothesis 3: Managers' relative share of options is negatively correlated with market valuation.

Finally, the effects of current market valuation and future overvaluation extend to the decision to adopt stock options. By the same arguments, firms are more likely to use stock options if the current market valuation and the probability of future overvaluation are high. Therefore, we can test the market valuation rationale by studying the firms' decision to compensate employees with stock options.

Hypothesis 4: The probability of a firm choosing stock options is positively correlated with the current market valuation and the probability of future overvaluation.

II. Data

A. Option grant

A large sample of firms that grant options are obtained from the COMPUSTAT Executive Compensation database. The Executive Compensation database contains the number, strike price, and maturity of options granted to executives in a given year. In addition, the ratio of these option grants to total options granted to all employees is also reported. From this, I can back out the total number of options granted to all employees in a given year.[9] It is assumed

[9]Garvey and Milbourn (2001) and Mehran and Tracy (2001) use the same measure to approximate the total option grant of a firm in a given year. One problem with this measure is that firms which did not issue any options to any executives but did issue options to non-executive employees in a given year is not in the sample. As long as these firms do not follow a systematic pattern, this sample is still a representative sample of option-granting firms.

that firms grant the same options to non-executive employees at the same time that they grant options to executives. If there are multiple grants from a firm in one year, the maximum implied total option grant is used as the measure of the total number of options granted by the firm in that year. The strike price and maturity of the options are taken as the average of the multiple grants.

After removing missing observations, the base sample covers ten years from 1992 to 2001 and includes 2,032 firms and 10,794 firm years. The same industry classification as in Brav (2000) is used to assign all firms into 17 industries. Table I shows the industry breakdown of all firms and firm years. As can be seen from the table, this sample is not concentrated in any one industry.

I use several variables to measure the size of option grant to all employees. The first measure is option value (OPTVAL), the Black-Scholes value of the options granted. To estimate the Black-Scholes value, I need the option strike price, market stock price at the time of the grant, time to maturity, volatility, risk-free rate and dividend yield. The option strike price, market stock price and dividend yield are obtained from the Executive Compensation database. The database also provides the maturity date of the option grant. It is assumed that options are granted with time to maturity on a yearly unit, and thus the time to maturity is the number of years between the grant year and maturity year. The time to maturity is further reduced by a factor of 0.3 to account for early exercise of the options.[10] Volatility is obtained from the CRSP monthly returns in the previous five years or in at least the previous two years if there are not enough observations. The risk-free rate is the average of five-year Treasury constant maturity returns.[11] The second measure is option incentive (OPTINC), which is also used by Core and Guay (2001). This is defined as the change in dollar value of the option if the stock price changes by 1%. This is essentially the delta from the Black-Scholes model multiplied by 1% of the stock price. Both of these measures are an increasing function of stock price, and since stock price also appears as the denominator in my valuation measures,

[10]The same approach is used in ExecComp when Black-Scholes values of options are computed. The factor of 0.3 is not critical to the results. I tried reducing the maturity by a factor of 0.5 and found no qualitative difference.

[11]Results here are robust to the choices of maturity, the volatility measure and the risk-free rate.

this may bias my results. To avoid this problem, another measure of option grant that does not depend on stock price or volatility is included. This measure is called option amount (OPTAMT), defined as the number of options granted. OPTAMT is attractive because it does not depends on price or volatility directly, but it may be difficult to compare OPTAMT between two firms because the underlying stocks may not be similar. The approach in this paper is to look at all three measures together. If all three option grant measures suggest the same effect, then I have high confidence in the result.[12]

In addition, I also scale these three measures by the number of employees in the firm. Thus, I obtain the average option value granted per employee (OPTVALPE), option incentive per employee (OPTINCPE), and average option amount per employee (OPTAMTPE).

Table II provides the summary statistics of these measures. As shown in the table, all six measures are highly skewed to the right, with the mean estimates close to the 75th percentiles. To avoid large values dominating the regressions, logarithms of these measures are used as dependent variables in the option-grant regressions. After the transformation, these measures are much less skewed, with their means close to their medians.[13] Another measure included in Table II is the fraction of options that are granted to the top five executives in a given year (PCTEXEC). This variable is used to test whether executives treat themselves differently from rank-and-file employees in terms of granting options.

B. Market valuation measures

It is necessary to find a proxy to measure the market misvaluation, or *perceived* mispricing. The first choice is book-to-market ratio (BE/ME). This ratio has been interpreted by several authors as a proxy for mispricing (La Porta, Lakonishok, Shleifer, and Vishny (1997)). Moreover, the support for interpreting this ratio as a proxy for *perceived* mispricing is even stronger. For example, the survey by Graham and Harvey (2001) finds that managers use BE/ME ratio

[12]Another measure, option fraction, which is defined as the number of options granted over the number of shares outstanding, was also adopted as a measure of option grant. The results were the same.

[13]Core and Guay (2001) also use the logarithm transformation on the option incentive.

as an important factor in the decision to issue equity. Several empirical works have documented that, when the BE/ME is low, managers tend to issue equity,[14] and they tend to be net sellers in their personal account according to Jenter (2001). Fama and French (1992, 1996) find BE/ME has power in predicting stock returns. All these results suggest that book-to-market ratio can be a sensible proxy for *perceived* mispricing. Because high book-to-market indicates low market valuation, a negative sign between option grant and book-to-market is expected if Hypothesis 1 is true.

Both the second and third choices relate to the concept of economic value. The economic value of a firm is computed using RIM, which dates back to Preinreich (1938) and was later popularized by Ohlson (1995). In particular, Ohlson (1995) demonstrates that under a clean surplus assumption (that is, the change in book value equals earnings minus dividends), RIM is equivalent to the dividend-discounting model and discounted-cash-flow model of firm valuation. Under RIM in infinite terms, the value of a firm can be written as

$$V_t = B_t + \sum_{i=1}^{\infty}(1+r)^{-i}E_t[X_{t+i} - rB_{t+i-1}], \tag{1}$$

where V_t is the value of a firm's equity at date t, B_t is the book value at date t, X_t is the earning for period t, and r is the cost of equity capital. $X_{t+i} - rB_{t+i-1}$ can be considered as the abnormal income generated by the firm at time $t+i$.

In practice, Equation (1) needs to be implemented in a finite period. Penman and Sougiannis (1998) have shown that the RIM model outperforms the discounted-dividend model and discounted-cash-flow model in finite-period implementations because RIM model relies less heavily on the estimation of terminal values. Treating the abnormal income over the last couple of years in the finite period as a perpetuity, Equation (1) becomes

$$V_t = B_t + \sum_{i=1}^{T}(1+r)^{-i}E_t[X_{t+i} - rB_{t+i-1}] + \frac{(1+r)^{-T}}{r}TV. \tag{2}$$

where TV is the perpetual abnormal income. TV is usually restricted to be nonnegative based on the rationale that managers are not expected *ex ante* to invest in negative NPV projects.

[14] See Marsh(1982), Korajcyk, Lucas, and McDonald (1991), Pagano, Panetta, and Zingales (1998), etc.

The second choice of market valuation measure computes the economic value of a firm using realized future earnings to replace expected future earnings, as in Penman and Sougiannis (1998). This economic value normalized by the firm market value is called *value-price ratio based on realized earnings*, (VR/P). D'Mello and Shroff (2000) use this measure to show that firms tend to repurchase stocks when they are undervalued.

The third choice of market valuation measure obtains the economic value using analysts' forecasted earnings as expected earnings as in Frankel and Lee (1998), and Lee, Meyers and Swaminathan (1999). This economic value normalized by the firm market value is called *value-price ratio based on forecasted earnings,* (VF/P). Frankel and Lee (1998) have shown that VF/P is a good predictor of long-term cross-sectional returns, and it appears to contain information beyond market beta, book-to-market ratio and total market capitalization.

The cost of equity capital r is chosen as the risk-free rate plus 4.32% based on the estimation of equity premiums by Fama and French (2002). The risk-free rate is the average of the five-year Treasury constant maturity rate. Other measures of risk-free rate or equity cost do not change my results. The main concern is on cross-sectional difference of value-price measures. As argued by Lee, Meyers and Swaminathan (1999), although the economic value may be off due to underestimation or overestimation of the cost of equity or systematic bias in forecasting earnings, the value-to-price ratio can still be a good proxy as long as this ratio captures the cross-sectional variation of market mispricing.

C. Measures for probability of future overvaluation

I use turnover and volatility to proxy for probability of future overvaluation. Turnover is computed by averaging ratios between daily trading volume and the number of shares outstanding from CRSP over one year. Share turnover is used in other research as a proxy for the liquidity of a firm's common stock.[15] Baker and Stein (2002) argue that high liquidity in the presence of short-sales constraints is a symptom of the market being dominated by irrational investors.

[15] See Brennan, Chordia, and Subrahmanyam (1998) and Chordia, Subrahmanyam, and Anshuman (2001)

If managers believe that more investors trading their stocks are irrational investors, or noise traders, then stock prices are more likely to deviate from fundamental values. Assuming equal likelihood of overvaluation and undervaluation, the probability of future overvaluation is positively correlated with turnover.[16] Because turnover is highly right skewed, I use the logarithm of turnover in regression analysis.

The other proxy for probability of overvaluation is volatility. Volatility (VOL) is calculated from the CRSP monthly returns in the previous five years or in at least the previous two years if there are not enough data. As all the empirical evidence suggests that stock prices are more volatile than fundamental values, the volatility of stock prices can be a crude proxy for the probability of price deviation, or equivalently, the probability of overvaluation.

D. Other control variables

The literature has documented other effects for ESOs. Core and Guay (2001) argue that firms provide incentives more intensively to non-executives when direct monitoring of employees is costly. If this holds, then when firms are larger and more decentralized and when firms have greater growth opportunities, the direct monitoring cost will be higher. The logarithm of the sales and the number of employees are used as proxies for decentralization and firm size. If the dependent variable is firm-wide option grant measure, the logarithm transformation of sales (SALES) and number of employees (#EMP) are included. If the dependent variable is per-employee option grant measure, only Log(sales) is included to control for size effect. The research and development expenses scaled by assets is also used as a measure of growth opportunities.[17]

Firms with financial constraints will grant more options than firms without them. Because grants of stock options require no immediate cash payout, firms with cash constraints are

[16] According to Baker and Stein (2002), the probability of overvaluation is more than that of undervaluation. However, using turnover as a proxy for the probability of overvaluation remains valid.

[17] This measure of R&D expenses scaled by assets was used as proxy for growth opportunity by Kedia and Mozumdar (2002) and as proxy for capital needs by Core and Guay (2001).

expected to use this form as a substitute for cash pay (Yermack,1995). It is expected that stock option compensation will be substituted for cash pay by companies with cash constraints, high capital needs and high costs of accessing capital markets.

Financial constraints are proxied with the index created by Kaplan and Zingales (1997). This index is used in Lamont, Polk and Saa-Requejo (2001) as a proxy of financial constraints for a large sample of firms. It is also used in Baker, Stein and Wurgler (2003) in their study of equity dependence. This index has several attractive features. First, it is an objective, off-the-shelf index that has been used by other researchers as a proxy for financial constraints. Second, this creates a single index for financial constraints so that firms can be ordered in the dimension of financial constraints. Last, the index uses variables readily available from COMPUSTAT and can be easily constructed for all firms.

Following Lamont, Polk and Saa-Requejo (2001) and Baker, Stein and Wurgler (2003), a KZ index is constructed for each firm-year as the following linear combination:

$$\text{KZ index}_t = -1.002\frac{CF_t}{A_{t-1}} - 39.368\frac{DIV_t}{A_{t-1}} - 1.315\frac{CB_t}{A_{t-1}} + 3.139\,LEV_t + 0.283\,Q_t \tag{3}$$

where CF, A, DIV, CB, LEV and Q denote cash flow, assets, cash dividends, cash balances, leverage and Tobin's Q measure respectively. Details of constructing these variables can be found in Table III. Note that one of the market valuation measures is the equity book-to-market ratio, which is closely related to Q. This may be problematic in the regression of both book-to-market ratio and KZ index. As a robustness check, a four-variable KZ index without Q is constructed just as in Baker, Stein and Wurgler (2003), and the results do not change.

The marginal tax rate may be a potential determinant of option grants (Yermack(1995), Hall and Liebman (2000)). When future corporate tax rates are expected to be lower, the immediate tax deduction from cash compensation is more favorable than the deduction from deferred compensation. Therefore, *ceteris paribus*, the use of stock-based compensation is expected to be more costly for firms with high marginal tax rates. I use the marginal tax rate (TAX) as in Graham (1996) as a proxy for marginal tax rate.

Due to the constraints of vesting periods, firms can use stock options to retain employees. It is generally believed that growth firms rely more heavily on human capital. Hence, it is predicted that the importance of retaining employees is greatest in firms where human capital is more intensive. As described above, research and development expense scaled by assets is used to capture growth opportunities. Furthermore, firms may grant options to reward performance (Core and Guay (1999)). Stock returns (RET) in the current year and the previous year are used as proxies for firm performance (Yermack (1995)). Finally, industry controls are included to control for industry-mean compensation expense. This is the same approach adopted by Core and Guay (2001) in their analysis of non-executive employee options. Table III provides summary statistics for all the independent variables in the sample.

E. The choice to grant options

In addition to studying the sample of option-granting firms, I would like to study the firms' decision on granting options. In order to do this, a representative sample containing firms that use employee stock options and firms that do not needs to be constructed. This is a challenging task because it is not easy to determine that a firm is not an option user. Item 215 in COMUSTAT, shares reserved for stock options, is used to categorize firms into option granters and non-granters. This data item has been used previously by Fenn and Liang (1997) to approximate employee stock option grants. Here this item is mainly for the purpose of categorizing. This data item covers the years from 1985 to 1995. If Item 215 is positive, it is assumed that the firm granted options in that year; otherwise, the firm did not grant options in that year. The explanatory variables are computed the same way as described above. Any firm year that does not have all the explanatory variables available is deleted from the sample. This leaves us with a final sample of 38,121 firm years with 28,024 firm years of granting options and 10,097 of not granting options. Table IV presents the summary statistics of issue sample and non-issue sample. In general, non-issue firms tend to have higher value-price ratios than issue firms. For example, the median BE/ME is 0.62 for firms that use options while it is 0.84 for firms that do not adopt options. The turnover and volatility of issue firms are also higher than those of non-issue firms. This is consistent with my hypotheses that overpriced and volatile firms are more likely to grant options.

III. Empirical results

A. General results

The basic regression is as follows:

$$\begin{aligned}\log(\text{Option Grant})_t &= \beta_0 + \beta_1 \,\text{Valuation Proxy}_{t-1} + \beta_2 \,\text{Overvalue Prob. Proxy} \\ &+ \beta_3 \,\text{KZ}_t + \beta_4 \,\text{RD}_t/\text{A}_{t-1} + \beta_5 \,\text{TAX}_t + \beta_6 \,\text{RET}_t + \beta_7 \,\text{RET}_{t-1} \\ &+ \beta_8 \,\text{Log(SALES)}_{t-1} + \beta_9 \,\text{Log(\#EMP)}_{t-1} + \text{controls}. \qquad (4)\end{aligned}$$

The first measure for market valuation is equity book-to-market ratio. Because book-to-market ratio is negatively correlated with valuation, Hypothesis 1 indicates that book-to-market is negatively correlated with option grant, i.e., β_1 is negative. Other market valuation measures are discussed in the next section. Turnover is a proxy for the probability of future stock overvaluation. Since Hypothesis 1 states that option grant is positively correlated with the probability of overvaluation, β_2 is expected to be positive. Volatility is another proxy for the probability of future overvaluation. The results are similar but are not reported here.

Results from three sets of regressions are reported. The first is pooled OLS regression with heteroskedasticity-robust White (1980) t-statistics. Pooled OLS regression uses all the firm-year data in one regression and includes industry dummies to control for industry-wide effect. In the second set of regressions, I apply the procedure first introduced by Fama and MacBeth (1973). Cross-sectional regressions are run for all the available firms in each year first. And the reported coefficients are the means of all the coefficients in the annual regressions. The reported t-statistics are time series t-statistics of the mean coefficient. The third regression is a panel regression with firm level fixed effect.

Table V reports the results of these three regressions when the dependent variable is the logarithm of total option values granted (Log(OPTVAL)) and the logarithm of option values granted per employee (Log(OPTVALPE)). The coefficient of BE/ME is significantly negative in pooled regression, cross-sectional regressions and panel regression. The coefficient is also very stable in all three types of regressions. For example, using the result from the Fama-MacBeth regression, if BE/ME increases by 0.1, then the option value granted by a firm drops by 11%. The coefficient of turnover also has the predicted sign and is statistically significant. If the turnover of a firm increases by 10%, the option value granted by a firm increases by about 5%. These results provide initial evidence that supports Hypothesis 1: The amount of options granted to employees by a firm is negatively correlated with value-price ratio and positively correlated with firm turnover.

The other effects are generally consistent with the existing literature on employee stock options. The proxy for financial constraints, KZ, has a significant positive coefficient, indicating that financially constrained firms grant more options. The ratio of R&D to assets has a significantly positive coefficient, consistent with the growth opportunity scenario by Kedia and Mozumdar (2002). The coefficient on marginal tax rate (TAX) is generally insignificant. This appears to contradict the findings by Core and Guay (2001). I also use the same proxies they used for tax rate, dummy variables for high marginal tax and low marginal tax. The coefficients on these tax dummies are again insignificant in general. The main difference between my regression and theirs is the inclusion of turnover. Without turnover, marginal tax rate is significantly negative, as expected. It turns out that marginal tax rate is negatively correlated with turnover. Hence, when turnover is not included in the regression, marginal tax rate has the expected negative sign, but this might simply reflect the positive correlation between turnover and option grant. After inclusion of turnover, marginal tax rate becomes insignificant. Both current return and lagged return contribute positively to the amount of option grant. This is also consistent with the argument by Yermack (1995) that options are used as a reward for performance. Finally, the size proxy, log of sales, shows a strong positive effect on option grant at the firm level but a negative effect at the per-employee level. That is, large firms issue more options than small firms but small firms issue more options per employee.

In Table VI, results of Fama-MacBeth regressions with different measures of option grant are reported. I use total option incentives, total number of options granted and their per employee measures as proxies for the total option grant. No matter which proxy is used for option grant, the coefficient on BE/ME is always significantly negative. Note that, in the regression with the total number of options being dependent variable, book-to-market still has a significantly negative coefficient at -0.555. In other words, a 0.1 decrease of book-to-market ratio corresponds to 5% increase in the number of options granted. This provides strong support for the market valuation hypothesis for options because, unlike option value or option incentive measures, there is no inherent functional relation between the number of options and market valuation. Thus, one can not argue that the negative coefficient of option grants on valuation measure is introduced by the negative correlation between option value and the inverse of market price. The same positive effect on turnover is also observed across different option grant measures. The coefficients on turnover are quite stable across all regressions, indicating that a 10% increase of turnover results for a corresponding 4% increase in option grants. All these are consistent with the hypothesis.

B. Other market valuation measures

Using RIM, the economic value of the firm, or equivalently, the *perceived* fundamental value of the firm, is computed with two different methods. One measure, Value based on Realized earnings (VR), is computed assuming that managers have perfect foresight and using the realized earnings as the expected earnings (Penman and Sougiannis (1998), D'Mello and Shroff (2000)). The other measure, Value based on Forecasted earnings (VF), uses analysts' forecasted earnings as the expected earnings in RIM (Frankel and Lee (1998), Lee, Meyers and Swaminathan (1999)). Each measurement is divided by the market price of the stock to generate two additional measures of market valuation.

Table VII reports the regressions with these two value-price ratios in place of BE/ME in the initial regression. The effects remain the same. The coefficients on the two new value-price ratios are significantly negative, and coefficients on turnover still maintain their signs and significance.

In addition to current market valuation, option grants are related to perceived future valuation. To address this issue, I break market valuation into two components, a long-term mean and a temporary deviation from the mean. If managers believe that the valuation ratio reverts to the mean in the long run, the average value-price ratio can be a proxy for perceived future valuation. Then, the temporary deviation can be a proxy for current market valuation. The market valuation rationale predicts that the signs on both the long-term mean and temporary deviation should be negative. Cross-sectionally, overvalued firms are likely to grant more options than undervalued firms. This is the effect on the long-term mean part of the valuation. Over time, a firm is likely to grant more options when its market value is higher than its historical level. This is the effect on the temporary change.

For each firm, a time series average of all value-price ratios is defined as the long-term mean of the respective valuation ratio (Mean ratio). This is the proxy for perceived future valuation of the firm. Then, the difference between the valuation ratio in each year and the mean ratio of the firm (Dev. ratio) is used as the proxy for temporary fluctuation of valuation. These results are reported in Table VIII. Regardless of the valuation ratio, the regression coefficients on the temporary change and the long-term mean are always negative and significant. Note that the long-term mean ratio contributes more than the temporary deviation to option grant. For example, an increase of 0.1 in mean book-to-market ratio reduces the total option grant value by 10%, while a corresponding increase of 0.1 in the deviation of book-to-market ratio reduces the total option grant value by 8%. This is true for all the different value-price measures. Hence, the expected future valuation appears to be more important in determining option grant than current valuation. All these results strongly support the valuation motivation for company option grant.

C. Valuation effect in the extremely overvalued firms

Hypothesis 2 states that the correlation between market valuation and option grant does not extend to firms that are extremely overvalued. This hypothesis is tested by including an interaction term between value-price ratio and an indicator for extreme overvaluation in Equation (4). Because the coefficient between option grant and valuation ratio is negative for the whole sample, and less negative for the extremely overvalued sample, the predicted sign of the coefficient of the interaction term is positive.

Extremely overvalued firms are defined as those firms that are in the bottom decile in corresponding valuation ratio. That is, firms that have the lowest 10% valuation ratios are considered as extremely overvalued. The cutoff point of 10% is not critical for the results below. The same results are obtained if the extreme valuation threshold is selected from 5% to 30%. Results for this regression are reported in Table IX. The evidence to support Hypothesis 2 is quite strong. All interaction coefficients are significantly positive in all six reported regressions. Note that the coefficient estimate on the interaction between value-price ratio and extreme overvaluation is larger than the absolute value of the coefficient estimate on the value-price ratio. This indicates that the correlation between valuation and option grant actually changes sign for extremely overvalued firms. This can be explained if employees also believe the shares to be overvalued and they assign a low value to these options. This may cause the relationship between option grant and market valuation to have such a hump shape. All of these arguments confirm the prediction that the correlation between option grant and market valuation is weaker for extremely overvalued firms.

D. Percentage of options granted to executives

Another way to test the market valuation motivation of option grants is to look at whether executives treat themselves differently from rank-and-file employees. This is the essence of Hypothesis 3, which states that executives may assign a larger share of options to themselves when they perceive the market is undervalued. To test this hypothesis, the ratio of options granted to the top five executives over options granted to all employees, which is called *executive option fraction* (PCTEXEC), is computed. The log of the executive option fraction is used as the dependent variable in the regression. If executives grant options to capture perceived overvaluation, they will grant fewer to themselves if the market valuation of the firm is high and more if the market valuation of the firm is low. If executives consider the market overvalues the company, they anticipate the stock to underperform the market, and options with such a high strike price are less attractive to them. Granting options to rank-and-file employees, however, is a different matter. Rank-and-file employees may value options the same as managers, but they have no discretion on choosing when to receive new options. In this sense, the valuation rationale predicts that the regression coefficient between log of the executive option fraction and value-price ratio is positive. This unique prediction is derived from my hypothesis that firms grant options to employees as a method to capture future valuation fluctuation of the market.

Table X reports the Fama-MacBeth regressions with logarithm of PCTEXEC as a dependent variable and different value-price ratios as proxies for market valuation.[18] Regardless of the valuation measures, the coefficient between value-price ratio and the percentage of options granted to executives is always positive and significant. Executives appear to grant more options to themselves during periods of low valuation, and grant more options to rank-and-file employees during periods of high valuation. This is in stark contrast with what has been found about the total option grant, that is, more options are granted when valuation is high. In unreported results, when I use the options granted to executives as the dependent variable in the base regression, the coefficient on value-price is still negative. This indicates that, when valuation is high, executives grant more options to both employees and themselves, but not proportionally. A larger portion of options go to employees during times of high valuation. When market valuation is low, executives' share of all options granted increases because options are more valuable from their perspectives. The results are consistent with Hypothesis 3, that managers may try to time the share of option grants to their favor. These regressions provide strong support to the market valuation rationale proposed in this paper.

[18] I also ran pooled OLS regression and panel regression with firm fixed effects and obtained same results.

E. Differentiating from competing hypotheses

In this paper, book-to-market ratio is interpreted as a proxy for market mispricing, or *perceived* misvaluation. Hence, it is argued that the negative coefficient on BE/ME is evidence to support the market valuation rationale. However, some researchers consider BE/ME as a proxy for growth opportunities (Smith and Watts (1992)) and expect that firms with low BE/MEs have greater growth opportunities. Using this interpretation of book-to-market ratio, Kedia and Mozumdar (2002) argue that incentives are larger in firms with valuable growth opportunities, and that these firms might grant more options to align the incentives of employees with shareholders. Core and Guay (2001) consider firms with greater growth opportunities to have high capital needs and issue more options as a consequence. Both theories point to the same negative sign between option grant and BE/ME.

Results following this regression are attempts to differentiate the hypothesis in this paper with these two competing hypotheses. First, other proxies for market valuation are employed to test the hypothesis that option grant is affected by market valuation. The fundamental value for each firm is estimated using residual income model, and the ratio of this fundamental value over price is applied as a more direct proxy for market misvaluation. The results obtained with these value-price ratios are the same as those from BE/ME.

Next, two unique predictions from the market valuation rationale are tested. In particular, the market valuation rationale predicts that the negative correlation between option grant and valuation ratio is weaker for extremely overvalued firms. The other unique prediction is that executives grant a larger proportion of options to themselves when a firm's valuation is low. On the contrary, the incentive hypothesis by Kedia and Mozumdar (2002) and the capital-need hypothesis by Core and Guay (2001) do not make these predictions. In their models, the predicted correlation between option grant and BE/ME do not change with book-to-market, and there is no valuation effect on the distribution of options between executives and employees. Given the empirical evidence that supports these unique predictions, it can be concluded that the market-valuation-based rationale for granting employee stock options is valid.

F. The choice to grant options

In the study of firms' decisions to grant options to their employees, results from two sets of regressions are reported. The first is pooled logistic regression using all firm-year observations. The second uses the Fama-MacBeth (1973) procedure. That is, logistic regressions in each year are run first, and the time-series summary of the coefficients are reported. Table XI reports results of the logistic regressions with the same control effects as in Equation (4). Hypothesis 4 predicts that the sign of the coefficient on value-price ratio is negative, and that the sign of the coefficient on turnover is positive. Both of these predictions are supported in Table XI.[19] Firms with high market valuation and high probability of future overvaluation are more likely to adopt employee stock options.

The coefficient on the KZ index is positive. This suggests that financial constraints also contribute to firms' granting decisions. The other coefficients are consistent with the existing literature. High R&D spending is a proxy of high growth opportunity and large human capital. This leads to a high probability of granting options. The same effect is also predicted by Frye (2000) and Zingales (2000). In addition, marginal tax rate has a significant negative effect on the probability of firms granting options. This is expected, since high marginal tax indicates that a firm is paying high taxes at the moment. Granting options defers employees' compensation to the future, further increasing the tax burden. This is in contrast with the results reported in the regression for option grant. In that regression, marginal tax rate has no significant impact on how many options firms grant to employees. However, marginal tax rate significantly affects the firms' decision to adopt ESOs.

[19]In unreported regressions, I break the market valuation into a long-term average and a short-term deviation. Overall, the long-term average market valuation has a strong effect on corporate decisions to grant options, while the annual variation in market valuation has a less significant effect. For most firms, once the employee stock option plan is initialized, it is difficult to get rid of it. Hence, it is reasonable to expect that firms care more about long-term valuation of their stocks when making such a long-term corporate decision. The short-term swing of market valuation is less a factor in this decision-making process.

G. Robustness

Verification has been done to ensure these results are robust to different specifications. For example, as has been reported, different measures of option grants are adopted, and different measures of value-price ratio are used as proxies for market valuation. When computing the economic value by RIM, the 30-day Treasury rate was used as the risk-free rate instead of the five-year rate reported here, and the cost of equity was computed by CAPM instead of the current risk-free rate plus a fixed premium. Instead of turnover, volatility has been used as proxy for the probability of future overvaluation. For the volatility measure used in computing option values, the volatility reported in the ExecComp database was also used. None of these changes has any effect on the results. The main theme of the paper, that firms grant options to capture part of perceived market overvaluation, is robust across all these different specifications.

Different versions of the KZ index, such as a four-component index without Q, or using net plant, property and equipment (Item 8) instead of assets to scale the components of the index, were adopted. The results do not change. To make sure that the results are not sensitive to the KZ index as a measure for financial constraints, the individual components of the KZ index are used to replace the KZ index in the regression. One of the components, Q, is closely related to BE/ME, so it is not included in the regressions. In regressions including the remaining four components, cash flow (CF), dividends (DIV), cash balance (CB), and leverage (LEV), the coefficients on BE/ME and turnover do not change signs or significance.

I also split the sample in several ways to make sure that the results are not driven by one specific subsample. For example, I split the sample into two subsamples based on book-to-market and run the same regressions. The correlation between option grant and valuation or turnover does not change in either subsample. This indicates that the market valuation rationale for ESOs is not specific to either value firms or glamour firms. I also split the sample based on R&D expenses and there is no change in the results.

IV. Conclusion

There is much evidence suggesting that stock prices do not track fundamental values perfectly and stock prices are "excessively" volatile. In this paper, I argue that employee stock options can be used to sell overvalued stocks in the future. Investors who buy overpriced stocks are subsidizing firms that issue options to their employees. This paper formulates this market valuation rationale for ESOs and empirically tests whether this rationale is supported by the data.

The key cross-sectional prediction of the valuation rationale is that the option grant amount is positively correlated with market valuation, and probability of future overvaluation. Moreover, for extremely overvalued firms, the correlation between option grant and market valuation is weaker. Top executives' self-interests lead them to grant a smaller portion of options to themselves relative to rank-and-file employees when executives perceive that the current market valuation is high. All of these predictions are confirmed empirically. It is also shown that overvalued firms, especially firms that are overvalued for a long period, are more likely to adopt broad-based employee stock option plans. These results are robust to a variety of proxy variables and model specifications. Overall, this paper shows that firms are using employee stock options to capture a part of market overvaluation. Using ESOs as a "back-door" equity financing appears to be one of the motives for granting broad-based options.

Future research can look at the option cost born by issuing firms if the stock price does not track the fundamental value perfectly. This will be of great interest simply because of the wide practice of granting employee stock options in the U.S. and therefore the importance of assessing their true costs. Another interesting avenue for research would be to study market reaction to initialization of employee stock option plans, option grants and option exercise. Garvey and Milbourn (2001) is a first attempt in this direction. They have found that the market appears to anticipate a large number of option exercises. It appears that investors who have the same investment horizon as the option maturity are hurt by options. What about the long-term investors? Are they better off when firms grant options? This is a challenging question to answer empirically because of the need to estimate what the returns for long-term investors would be had firms not granted options.

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Table I: Industry breakup of the firms in the study of option grant amount.

Industry	Firms		Firm Years	
	Frequency	Percent	Frequency	Percent
Airlines	30	1.476	177	1.64
Business Service	44	2.165	196	1.816
Communications	50	2.461	234	2.168
Computer Data Processing	128	6.299	603	5.586
Computer Manufacturing	59	2.904	313	2.9
Drug	77	3.789	478	4.428
Electronic Equipment	133	6.545	672	6.226
Financial Institution	103	5.069	338	3.131
Health care	38	1.87	151	1.399
Insurance	90	4.429	486	4.503
Metal Products	73	3.593	437	4.049
Oil and Gas	128	6.299	677	6.272
Optical Scientific Equipment	78	3.839	401	3.715
Other	755	37.16	4284	39.69
Restaurant Chains	33	1.624	175	1.621
Retail	142	6.988	771	7.143
Whole Sale	71	3.494	401	3.715
Total	2032		10794	

Table II: Summary statistics of dependent variables in the study of option grant amount.

Option value (OPTVAL) is the Black-Scholes value of the total employee stock options granted in a given year. Option incentive (OPTINC) is the dollar amount of option value change if the underlying stock moves by 1%. Option amount (OPTAMT) is the number of options granted in a given year. OPTVALPE, OPTINCPE, and OPTAMTPE are option value, option incentive and option amount scaled by the number of employees. PCTEXEC is the fraction of options granted to top five executives from all options granted.

Variable	Mean	Std Dev	Q1	Median	Q3
Option value (OPTVAL)	59,596,471	500,184,540	3,345,582	9,305,165	28,104,984
Option incentive (OPTINC)	974,122	7,480,250	55,955	154,103	474,399
Option amount (OPTAMT)	3,408,350	39,659,776	352,941	816,512	2,031,250
Option value per employee (OPTVALPE)	10698.89	66315.6	564.7929	1507.932	5429.002
Option incentive per employee (OPTINCPE)	149.616	878.634	10.3644	26.25932	87.85358
Option amount per employee (OPTAMTPE)	967.7262	7766.537	50.51793	132.613	454.5455
Fraction of options granted to executives (PCTEXEC)	0.2521	0.1947	0.1067	0.2024	0.3486
Log(OPTVAL)	16.143	1.6682	15.023	16.046	17.151
Log(OPTINC)	12.06	1.6522	10.932	11.945	13.07
Log(OPTAMT)	13.695	1.408	12.774	13.613	14.524
Log(OPTVALPE)	7.5361	1.73	6.3365	7.3185	8.5995
Log(OPTINCPE)	3.4533	1.6432	2.3384	3.268	4.4757
Log(OPTAMTPE)	5.0884	1.699	3.9223	4.8874	6.1193
Log(PCTEXEC)	-1.738	0.9873	-2.238	-1.598	-1.054

Table III: Summary statistics of control variables in the study of option grant amount.

Turnover (TURNOVER) is computed as the average of the ratio between daily trading volume and shares outstanding over one year. Volatility (VOL) is computed from monthly returns in the previous five years. KZ index (KZ) is the Kaplan and Zingales (1997) index of financial constraints. This index has five components: cash flow (CF = Item 14 + Item 18) over assets (A=Item 6), cash dividends (DIV = Item 21 + Item 19) over assets, cash balances (CB = Item 1) over assets, leverage (LEV = (Item 9 + Item 34)/(Item 9 + Item 34 + Item 216)), and Q (Market value of equity (ME) plus assets minus the book value of equity (BE=Item60 + Item 74) over assets). Additional variables include research and development (RD=Item 46), marginal tax rate (TAX), SALES (Item 12), number of employees (#EMP=Item 29). VR is the share value computed using Residual Income Model with realized earning. P is share price at the end of fiscal year. VF is the share value computed using Residual Income Model with analysts' forecasted earnings. Mean value-price ratio is the average of the interested ratio for a given firm. Dev. value-price ratio is the difference between value-price ratio and the firm average. All variables are Winsorized at the 1^{st} and 99^{th} percentiles.

Variable	N	Mean	Std Dev	Q1	Median	Q3
Log(TURNOVER)$_t$	10794	-5.456	0.8008	-6.026	-5.535	-4.952
VOL$_{t-1}$	10794	0.3884	0.1673	0.2628	0.3518	0.4752
KZ$_t$	10794	1.043	1.172	0.361	1.006	1.678
RD$_t$/A$_{t-1}$	10794	0.0366	0.0696	0	0	0.0396
TAX$_t$	10794	0.2452	0.149	0.0387	0.3499	0.35
Log(SALES)$_{t-1}$	10794	20.724	1.5888	19.659	20.688	21.797
Log(#EMP)$_{t-1}$	10794	8.5207	1.6319	7.4821	8.537	9.6287
RET$_t$	10794	0.185	0.444	-0.06	0.163	0.408
RET$_{t-1}$	10794	0.225	0.44	-0.03	0.193	0.439
BE$_{t-1}$/ME$_{t-1}$	10794	0.5212	0.3592	0.2653	0.4451	0.6887
Mean BE$_t$/ME$_t$	10794	0.5027	0.4294	0.3051	0.4808	0.7074
Dev. BE$_{t-1}$/ME$_{t-1}$	10794	0.0241	0.4279	-0.129	-0.023	0.0851
VR$_{t-1}$/P$_{t-1}$	6142	0.7489	0.6218	0.3906	0.6481	0.9521
Mean VR$_{t-1}$/P$_{t-1}$	6142	0.8091	0.5162	0.5294	0.7454	0.9999
Dev. VR$_{t-1}$/P$_{t-1}$	6142	-0.06	0.4842	-0.242	-0.042	0.12
VF$_{t-1}$/P$_{t-1}$	6877	0.5474	0.3487	0.2955	0.4816	0.7219
Mean VF$_{t-1}$/P$_{t-1}$	6877	0.5708	0.2939	0.3477	0.5353	0.7508
Dev. VF$_{t-1}$/P$_{t-1}$	6877	-0.025	0.2276	-0.134	-0.03	0.0695

Table IV: Summary statistics of control variables in the study of option grant decision. See Table III for a detail description of the variables. All variables are Winsorized at the 1^{st} and 99^{th} percentiles.

Panel A. Issue sample						
Variable	N	Mean	Std Dev	Q1	Median	Q3
Log(TURNOVER)$_t$	28024	-6.207	0.9976	-6.814	-6.149	-5.537
VOL$_{t-1}$	28024	0.515	0.2314	0.3487	0.4668	0.6223
KZ$_t$	28024	1.037	1.616	0.213	0.986	1.844
RD$_t$/A$_{t-1}$	28024	0.0374	0.0721	0	0	0.0432
TAX$_t$	28024	0.19	0.1746	0	0.2596	0.34
Log(SALES)$_{t-1}$	28024	18.235	2.2506	16.756	18.237	19.717
Log(#EMP)$_{t-1}$	28024	6.4335	2.3861	4.987	6.5294	8.0275
RET$_t$	28024	0.148	0.534	-0.15	0.129	0.414
RET$_{t-1}$	28024	0.124	0.524	-0.18	0.104	0.388
BE$_{t-1}$/ME$_{t-1}$	28024	0.7501	0.6536	0.35	0.6195	0.9959
VR$_{t-1}$/P$_{t-1}$	23387	0.6883	0.9921	0.2694	0.5949	0.9698
VF$_{t-1}$/P$_{t-1}$	9134	0.6595	0.4203	0.3726	0.5841	0.8393
Panel B. Non-issue sample						
Variable	N	Mean	Std Dev	Q1	Median	Q3
Log(TURNOVER)$_t$	10097	-6.595	1.0362	-7.21	-6.556	-5.903
VOL$_{t-1}$	10097	0.3829	0.2261	0.2376	0.3153	0.4492
KZ$_t$	10097	0.692	1.921	0.059	0.819	1.831
RD$_t$/A$_{t-1}$	10097	0.0122	0.042	0	0	0
TAX$_t$	10097	0.2525	0.1642	0.0089	0.34	0.35
Log(SALES)$_{t-1}$	10097	18.837	2.4511	17.199	19.085	20.575
Log(#EMP)$_{t-1}$	10097	6.153	3.2347	4.6052	6.9745	8.4338
RET$_t$	10097	0.148	0.425	-0.06	0.144	0.353
RET$_{t-1}$	10097	0.129	0.415	-0.07	0.125	0.321
BE$_{t-1}$/ME$_{t-1}$	10097	0.9429	0.6982	0.5417	0.8357	1.161
VR$_{t-1}$/P$_{t-1}$	8438	0.9128	0.869	0.5476	0.8476	1.1499
VF$_{t-1}$/P$_{t-1}$	3213	0.8047	0.402	0.5567	0.7597	0.9714

Table V: Regressions of option grant on book-to-market, turnover and control variables

OPTVAL and OPTVALPE are used as proxies for option grant. In pooled regressions and panel regressions, the regression coefficients are reported. In Fama-MacBeth (FM) regressions, the mean coefficients of all annual regressions are reported. T-statistics are in parenthesis. T-statistics in pooled regressions and panel regressions are computed using White's (1980) robust standard errors. T-statistics in Fama-MacBeth regressions are from the time series distribution of the coefficient (mean coefficient divided by its standard deviation and multiplied by the square-root of the number of cross sections). The coefficients and statistics associated with industry control variables are not reported.

	Log(OPTVAL)			Log(OPTVALPE)		
	Pooled	FM	Panel	Pooled	FM	Panel
Intercept	5.3668*	6.1195*	-0.237	15.746*	15.995*	3.7729*
	(21.19)	(19.99)	(-0.50)	(74.53)	(44.90)	(8.14)
BE_{t-1}/ME_{t-1}	-1.186*	-1.099*	-0.728*	-1.016*	-0.9*	-0.674*
	(-32.63)	(-26.03)	(-19.62)	(-24.70)	(-33.50)	(-17.72)
$Log(TURNOVER)_t$	0.6349*	0.5343*	0.4088*	0.7102*	0.5573*	0.4138*
	(39.95)	(35.88)	(18.63)	(38.11)	(28.31)	(18.38)
KZ_t	0.0536*	0.0287*	0.0983*	0.0311*	0.0072	0.0516*
	(5.36)	(3.17)	(8.05)	(2.70)	(1.02)	(4.12)
RD_t/A_{t-1}	3.1302*	3.6385*	-0.396	3.9068*	4.4489*	-1.35*
	(14.84)	(16.13)	(-1.24)	(15.85)	(18.06)	(-4.11)
TAX_t	-0.105	-0.066	0.1507	-0.04	0.0332	0.1254
	(-1.41)	(-0.92)	(1.89)	(-0.46)	(0.61)	(1.54)
$Log(SALES)_{t-1}$	0.7291*	0.6529*	0.9208*	-0.168*	-0.204*	0.3047*
	(45.00)	(36.66)	(35.13)	(-19.75)	(-10.64)	(15.33)
$Log(\#EMP)_{t-1}$	-0.015	0.0429*	-0.029			
	(-0.93)	(2.85)	(-1.15)			
RET_t	0.1504*	0.1666*	0.0294	0.1084*	0.0863	0.0423*
	(6.07)	(2.09)	(1.54)	(3.78)	(0.90)	(2.16)
RET_{t-1}	0.0686*	0.0523	0.0895*	0.0234	0.0144	0.0632*
	(2.52)	(0.69)	(4.40)	(0.75)	(0.15)	(3.02)
Fixed effect	industry	industry	firm	industry	industry	firm
Adj. Rsq.	0.622	0.6073	0.3290	0.5165	0.5257	0.1442

* indicates significance at the 5% level.

Table VI: Regressions of different measures of option grant on book-to-market, turnover and control variables

OPTINC, OPTAMT, OPTINCPE and OPTAMTPE are used as proxies for option grant. Only Fama-MacBeth (FM) regressions are reported in this table. The mean coefficients of all annual regressions are reported. Time series t-statistics (mean coefficient divided by its standard deviation and multiplied by the square-root of the number of cross sections) are in parentheses. The coefficients and statistics associated with fixed effects are not reported.

	Log(OPTINC)	Log(OPTAMT)	Log(OPTINCPE)	Log(OPTAMTPE)
Intercept	0.4098	7.1449*	10.395*	16.751*
	(1.27)	(17.15)	(30.40)	(50.74)
BE_{t-1}/ME_{t-1}	-1.071*	-0.555*	-0.871*	-0.358*
	(-27.85)	(-15.04)	(-31.70)	(-14.15)
$Log(TURNOVER)_t$	0.4191*	0.4236*	0.4424*	0.4452*
	(32.06)	(32.71)	(23.87)	(36.57)
KZ_t	0.0015	0.041*	-0.02*	0.0191*
	(0.17)	(4.93)	(-2.39)	(2.03)
RD_t/A_{t-1}	3.5681*	3.4222*	4.3895*	4.2087*
	(16.29)	(11.27)	(18.17)	(12.66)
TAX_t	0.076	-0.513*	0.1774*	-0.422*
	(1.15)	(-7.26)	(3.60)	(-7.82)
$Log(SALES)_{t-1}$	0.7046*	0.4349*	-0.162*	-0.399*
	(35.53)	(16.68)	(-8.14)	(-17.51)
$Log(\#EMP)_{t-1}$	0.0326*	0.0684*		
	(2.24)	(4.56)		
RET_t	0.1613*	0.0488	0.0812	-0.03
	(2.04)	(0.87)	(0.84)	(-0.43)
RET_{t-1}	0.0518	-0.231*	0.0149	-0.27*
	(0.69)	(-5.21)	(0.16)	(-4.01)
Fixed effect	industry	industry	industry	industry
Adj. Rsq.	0.622	0.4583	0.49	0.5258

* indicates significance at the 5% level.

Table VII: Regressions of option grant on different value-price ratios, turnover and control variables

OPTVAL and OPTVALPE are used as proxies for option grant. Only Fama-MacBeth (FM) regressions are reported in this table. The mean coefficients of all annual regressions are reported. Time series t-statistics (mean coefficient divided by its standard deviation and multiplied by the square-root of the number of cross sections) are in parentheses. The coefficients and statistics associated with fixed effects are not reported.

	Log(OPTVAL)		Log(OPTVALPE)	
Intercept	5.978*	5.3642*	15.587*	14.806*
	(20.96)	(14.19)	(48.38)	(41.10)
VR_{t-1}/P_{t-1}	-0.247*		-0.14*	
	(-8.68)		(-3.60)	
VF_{t-1}/P_{t-1}		-1.022*		-0.894*
		(-18.39)		(-15.68)
Log(TURNOVER)_t	0.5536*	0.5436*	0.577*	0.5512*
	(22.80)	(26.33)	(24.81)	(19.63)
KZ_t	0.0208	0.0362*	0.0103	0.0201*
	(1.22)	(3.25)	(0.75)	(2.62)
RD_t/A_{t-1}	4.0757*	4.1838*	4.8811*	5.027*
	(14.59)	(16.27)	(21.70)	(22.37)
TAX_t	0.1082	-0.19*	0.2672*	0.0106
	(1.45)	(-2.89)	(3.57)	(0.16)
Log(SALES)_{t-1}	0.63*	0.6831*	-0.214*	-0.15*
	(33.68)	(28.80)	(-13.93)	(-9.60)
$\text{Log(\#EMP)}_{t-1}$	0.058*	0.0709*		
	(3.80)	(3.69)		
RET_t	0.2143*	0.143	0.054	0.0907
	(2.18)	(1.92)	(0.50)	(1.04)
RET_{t-1}	0.2284*	0.0646	0.1188	0.0058
	(2.39)	(0.86)	(1.10)	(0.06)
Fixed effect	industry	industry	industry	industry
Adj. Rsq.	0.5516	0.6327	0.484	0.554

* indicates significance at the 5% level.

Table VIII: Regressions of option grant on long term average value-price ratios, temporary deviations, turnover and control variables

Only Fama-MacBeth (FM) regressions are reported in this table. The mean coefficients of all annual regressions are reported. Time series t-statistics (mean coefficient divided by its standard deviation and multiplied by the square-root of the number of cross sections) are in parentheses. The coefficients and statistics associated with fixed effects are not reported.

	Log(OPTVAL)			Log(OPTVALPE)		
Intercept	6.069*	5.9653*	5.539*	15.942*	15.599*	15.014*
	(18.61)	(20.56)	(14.64)	(43.51)	(47.54)	(41.86)
Mean BE_t/ME_t	-1.002*			-0.816*		
	(-21.01)			(-28.44)		
Dev. BE_{t-1}/ME_{t-1}	-0.834*			-0.705*		
	(-14.11)			(-26.21)		
Mean VR_{t-1}/P_{t-1}		-0.324*			-0.159*	
		(-12.56)			(-4.47)	
Dev. VR_{t-1}/P_{t-1}		-0.095			-0.082	
		(-1.79)			(-1.28)	
Mean VF_{t-1}/P_{t-1}			-1.265*			-1.134*
			(-17.18)			(-14.88)
Dev. VF_{t-1}/P_{t-1}			-0.463*			-0.322*
			(-6.04)			(-4.19)
$Log(TURNOVER)_t$	0.5411*	0.5617*	0.5462*	0.5636*	0.579*	0.5551*
	(35.83)	(21.82)	(29.48)	(27.10)	(23.62)	(21.26)
KZ_t	0.0236*	0.0196	0.0431*	0.0037	0.0095	0.0283*
	(2.47)	(1.11)	(3.87)	(0.57)	(0.68)	(4.04)
RD_t/A_{t-1}	3.7131*	3.8558*	4.0499*	4.504*	4.7764*	4.871*
	(17.09)	(21.42)	(16.79)	(17.85)	(28.24)	(21.78)
TAX_t	-0.021	0.1242	-0.2*	0.067	0.274*	-0.006
	(-0.32)	(1.64)	(-3.25)	(1.35)	(3.66)	(-0.11)
$Log(SALES)_{t-1}$	0.6519*	0.6406*	0.6811*	-0.203*	-0.213*	-0.153*
	(32.36)	(38.93)	(27.61)	(-9.81)	(-14.34)	(-8.70)
$Log(\#EMP)_{t-1}$	0.0462*	0.0506*	0.0709*			
	(3.20)	(3.27)	(4.15)			
RET_t	0.1474	0.1982	0.0798	0.0713	0.0446	0.0241
	(1.83)	(1.97)	(1.10)	(0.74)	(0.42)	(0.28)
RET_{t-1}	0.1151	0.2945*	0.1567*	0.0581	0.1457	0.0974
	(1.41)	(3.46)	(2.00)	(0.59)	(1.49)	(1.05)
Fixed effect	industry	industry	industry	industry	industry	industry
Adj. Rsq.	0.6017	0.5526	0.6382	0.5228	0.4841	0.5596

* indicates significance at the 5% level.

Table IX: Regressions of option grant on value-price ratio, interaction between value-price ratio and extreme overvaluation indicator, turnover and control variables

OPTVAL and OPTVALPE are used as proxies for option grant. The dummy variable for an extremely overvalued firm-year (I(OV)) is set to 1 if the firm's value-price ratio belongs to the bottom 10% of all sample firms in the year, and 0 otherwise. Only Fama-MacBeth (FM) regressions are reported in this table. The mean coefficients of all annual regressions are reported. Time series t-statistics (mean coefficient divided by its standard deviation and multiplied by the square-root of the number of cross sections) are in parentheses.

	Log(OPTVAL)			Log(OPTVALPE)		
Intercept	6.1389*	6.0634*	5.3011*	15.931*	15.665*	14.673*
	(20.99)	(21.36)	(14.09)	(48.17)	(46.67)	(40.23)
BE_{t-1}/ME_{t-1}	-1.053*			-0.83*		
	(-24.53)			(-31.58)		
BE_{t-1}/ME_{t-1}*I(OV)	2.9581*			3.9975*		
	(3.29)			(4.37)		
VR_{t-1}/P_{t-1}		-0.272*			-0.167*	
		(-8.13)			(-4.22)	
VR_{t-1}/P_{t-1}*I(OV)		0.7187*			0.8269*	
		(3.10)			(3.85)	
VF_{t-1}/P_{t-1}			-0.96*			-0.817*
			(-14.91)			(-11.94)
VF_{t-1}/P_{t-1}*I(OV)			2.2484*			2.6011*
			(4.12)			(4.43)
Log(TURNOVER)_t	0.5311*	0.5519*	0.5388*	0.5516*	0.5746*	0.5441*
	(38.20)	(22.72)	(25.17)	(29.77)	(24.75)	(18.62)
KZ_t	0.027*	0.0277	0.0288*	0.0051	0.0185	0.0117
	(3.13)	(1.47)	(2.42)	(0.70)	(1.26)	(1.34)
RD_t/A_{t-1}	3.5049*	4.2195*	4.1026*	4.2428*	5.0392*	4.9253*
	(16.54)	(15.18)	(16.70)	(18.21)	(22.97)	(22.92)
TAX_t	-0.073	0.062	-0.188*	0.0204	0.2174*	0.0102
	(-1.04)	(0.85)	(-2.92)	(0.39)	(2.88)	(0.16)
Log(SALES)_{t-1}	0.6465*	0.6269*	0.6802*	-0.206*	-0.216*	-0.15*
	(37.62)	(34.69)	(28.85)	(-11.31)	(-14.80)	(-9.66)
$\text{Log(\#EMP)}_{t-1}$	0.0482*	0.0584*	0.0741*			
	(3.25)	(3.94)	(4.04)			
RET_t	0.1701*	0.2319*	0.1393	0.0933	0.0743	0.0851
	(2.14)	(2.32)	(1.87)	(0.97)	(0.68)	(0.97)
RET_{t-1}	0.0371	0.2161*	0.0373	-0.009	0.1045	-0.029
	(0.51)	(2.36)	(0.50)	(-0.10)	(1.00)	(-0.31)
Fixed effect	industry	industry	industry	industry	industry	industry
Adj. Rsq.	0.6097	0.5528	0.6349	0.5297	0.4851	0.5571

* indicates significance at the 5% level.

Table X: Regressions of executive option percentage on value-price measure, turnover and control variables

Only Fama-MacBeth (FM) regressions are reported. The mean coefficients of all annual regressions are reported. T-statistics from the time series distribution of the coefficient (mean coefficient divided by its standard deviation and multiplied by the square-root of the number of cross sections) are in parenthesis. The coefficients and statistics associated with industry control variables are not reported.

	Log(PCTEXEC)		
Intercept	1.2138*	1.615*	1.824*
	(5.17)	(4.95)	(6.68)
BE_{t-1}/ME_{t-1}	0.3132*		
	(12.22)		
VR_{t-1}/P_{t-1}		0.0424*	
		(2.85)	
VF_{t-1}/P_{t-1}			0.3614*
			(9.23)
Log(TURNOVER)_t	-0.102*	-0.112*	-0.117*
	(-13.92)	(-14.02)	(-12.55)
KZ_t	0.0228	0.0198	0.0178
	(1.94)	(1.10)	(1.20)
RD_t/A_{t-1}	-2.211*	-2.223*	-2.711*
	(-9.58)	(-14.16)	(-7.22)
TAX_t	-0.183*	-0.338*	-0.194*
	(-5.79)	(-6.94)	(-2.78)
Log(SALES)_{t-1}	-0.156*	-0.167*	-0.189*
	(-9.52)	(-6.25)	(-13.15)
$\text{Log(\#EMP)}_{t-1}$	-0.084*	-0.083*	-0.081*
	(-6.58)	(-3.83)	(-5.49)
RET_t	0.07	0.051	0.063*
	(1.59)	(0.87)	(2.03)
RET_{t-1}	0.074*	0.024	0.101*
	(2.19)	(0.73)	(2.26)
Fixed effect	industry	industry	industry
Adj. Rsq.	0.214	0.202	0.243

* indicates significance at the 5% level.

Table XI: Logistic regressions of option grant decision on value-price ratios, turnover and control variables

Both pooled logistic and Fama-MacBeth logistic regressions are reported in this table. Coefficients and t-statistics are reported for pooled logistic regressions. In Fama-MacBeth type logistic regressions, logistic regression is run each year. The mean coefficients of all annual regressions are reported. Time series t-statistics (mean coefficient divided by its standard deviation and multiplied by the square-root of the number of cross sections) are in parentheses. The coefficients and statistics associated with fixed effects are not reported.

	Option grant decision					
	Pooled	FM	Pooled	FM	Pool	FM
Intercept	4.7652*	4.9246*	5.0089*	5.2004*	7.6391*	8.117*
	(21.79)	(17.42)	(20.83)	(16.02)	(16.68)	(15.22)
BE_{t-1}/ME_{t-1}	-0.265*	-0.29*				
	(-12.99)	(-11.35)				
VR_{t-1}/P_{t-1}			-0.034*	-0.055*		
			(-2.09)	(-2.63)		
VF_{t-1}/P_{t-1}					-0.726*	-0.945*
					(-11.16)	(-5.02)
$Log(TURNOVER)_t$	0.3383*	0.3504*	0.3561*	0.3705*	0.4719*	0.5173*
	(22.87)	(15.09)	(21.69)	(16.04)	(14.18)	(13.50)
KZ_t	0.0841*	0.0894*	0.0818*	0.0878*	0.0406*	0.0528
	(9.94)	(5.44)	(8.68)	(6.31)	(2.18)	(1.42)
RD_t/A_{t-1}	1.5027*	1.6778*	1.9412*	2.1117*	2.8979*	3.191*
	(3.92)	(3.72)	(4.62)	(4.98)	(3.58)	(6.58)
TAX_t	-1.093*	-0.939*	-1.061*	-0.85*	-1.416*	-1.484*
	(-12.05)	(-8.47)	(-10.68)	(-7.57)	(-7.59)	(-6.65)
$Log(SALES)_{t-1}$	-0.257*	-0.271*	-0.267*	-0.286*	-0.332*	-0.345*
	(-24.12)	(-21.16)	(-22.85)	(-19.54)	(-15.29)	(-14.45)
$Log(\#EMP)_{t-1}$	0.1774*	0.1874*	0.1745*	0.1885*	0.1309*	0.1446*
	(20.34)	(20.15)	(18.24)	(16.08)	(7.83)	(8.32)
RET_t	0.0319	0.0263	-0.018	-0.022	0.0307	0.0696
	(1.07)	(0.46)	(-0.51)	(-0.27)	(0.43)	(0.46)
RET_{t-1}	-0.15*	-0.201*	-0.057	-0.1	-0.339*	-0.415*
	(-4.92)	(-2.89)	(-1.71)	(-1.33)	(-4.47)	(-2.83)
Fixed effect	industry	industry	industry	industry	industry	industry

* indicates significance at the 5% level.