EVIDENCE THAT STOCK OPTIONS WORK FOR CEOS – BUT NOT FOR INCENTIVE REASONS

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Abstract

We document the first evidence of a structure of timing returns, award discounts/premia and CEO dilution costs relative to shareholders set at award and before the CEO invests marginal effort. All three factors affect CEOs' effective exercise price and hence incentive to expend marginal effort. Exercised options, which exhibit the highest CEO and shareholder returns, are characterized by CEO acceptance of high dilution cost and high sensitivity to award premiums. CEO and shareholder returns for lapsed options and annual/biannual awards show high dependency on the dilution cost factor. Irregular awards are characterized by active pre-effort positioning by shareholders *to reduce CEO opportunism*.

Keywords: Executive compensation, CEO performance, stock option awards, discounted options, award timing

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Introduction

Meulbroek (2001) and Hall & Murphy (2000, 2002) show that risk-averse and undiversified executives exposed to total firm risk but rewarded only for the systematic component of that risk value non-tradeable stock options below their market (or Black-Scholes) value, which is the opportunity cost of the option to shareholders. A valuation divergence or 'gap' impairs stock options' effectiveness as incentive-aligning devices, and also reduces their effectiveness relative to stock ownership *(see endnote 1).* This gap widens as the difference between the market value of these granted instruments and the value executives place on them as substitutes for cash compensation widens. Using simulations, Hall & Murphy (2002) show that awards (or grants) of at-the-money options maximise incentive when stock options are an add-on to existing compensation packages, while restricted stock is preferred when awards are a cash-substitute.

Stock options create incentive by virtue of their design, but as the gap widens, lose their effectiveness relative to other forms of equity-compensation. From the viewpoint of the CEO, any contractual provisions that raise the effective exercise price, while decreasing the cost to shareholders, depress executives' own valuation and hence their effectiveness in reducing agency costs of equity. Provisions that potentially do this include awards of premium options, exercise restrictions generally (including vesting periods, hurdle prices and rationing of volumes exercised) and lower dilution protection relative to shareholders, as well as denial of the right to reprice in the event of substantial stock price declines. Given a valuation gap, it is important to realise that granting or awarding options at-the-money (using market value of Black-Scholes valuation as a benchmark) is in effect an award of premium options relative to executives' lower valuation. For analytical purposes, incentive may be defined as the partial derivative of the executive's value (V) with respect to the stock price (P). Hence, any contracting provision that raises (lowers) $\partial V / \partial P$ is an incentive (disincentive).

In addition to these considerations, allowing executives the right to *time* their awards allows executives to take advantage of information asymmetry. Even for annual awards there is some scope for varying the award date by a few weeks or months to precede anticipated stock price runups *(see endnote 2).* Yermack (1997) infers 'good' timing from the tendency of US firms to time awards *prior to* quarterly earnings increases, but interprets this as 'bad' for shareholders because the options are

effectively discounted which makes exercise more likely, perhaps through luck. While this may be so, discounted options also narrow the valuation gap and therefore increase the efficiency of options as incentive devices.

In this paper we report evidence on the trade-offs or exchanges that take place at the time of award, which has not hitherto been reported. Subsequent risk-return exchanges that are contingent on stock performance, such as repricing of deep out-of-the-money options, are excluded from the study *(see endnote 3).* The trade-offs examined include option premia, dilution protection, exercise restrictions and award timing. All require exercise to be activated. The extent of dilution protection relative to shareholders' and any exercise restrictions are likely to have been incorporated in the stock option plan when first adopted by shareholders, but even so these provisions remain part of the set of trade-offs for any given award and are likely to influence option premia and award timing. The actual cost of inferior dilution protection accepted by executives is not known until later capital changes (specifically, rights and bonus issues and capital reconstructions) actually occur, so executives necessarily accept this cost in anticipation of such events. The structure of trade-offs identified at award is then related to subsequent CEO and shareholder returns in order to infer incentive consequences. We are able to observe shareholder (and CEO) returns over the life of option contracts because Australian companies are required to disclose comprehensive information about both awards (as in the US) and outcomes (unlike the US), in many cases enabling identification of the exercise date. In common with the incentives literature we focus upon stock options awarded to CEOs rather than the entire board.

Our main findings are as follows. We document evidence that exercised options are awarded at-the-money (with some tendency to a discount), have the lowest dilution protection (incentive decreasing), and show no timing gains or losses. In contrast, lapsed options are found to be granted at a premium (incentive decreasing), but have the highest dilution protection (incentive increasing relative to exercised options) and show timing gains (incentive increasing). Exercised and lapsed options are important sub-groups because they represent cases where the posterior probability of incentives having worked is high and low, respectively. Of course, exercise through good luck (noise) or private information (affecting the prior probability of exercise) cannot be ruled out. At-the-money awards are predicted by Hall and Murphy (2000) because they maximize pay/performance incentives for risk averse, undiversified executives when stock options are an *add-on* to their existing sources of compensation. If they are right, then our observation of at-the-money grants for exercised options implies that stock options are add-ons and not cash substitutes. However, these regularities do not mirror the valuation consequences. Shareholder returns across both sub-groups are found to be decreasing in both relative dilution protection and award returns, with some substitutability between the two according to the sub-group. Timing returns and exercise restrictions have no impact. In other words, shareholder returns are *highest* when dilution protection is lowest and options are granted at a premium (both incentive *decreasing*). Both effects are opposite to those predicted by Hall and Murphy because both factors would reduce executives' valuation of their granted options.

The only explanation that fits the data is that exercised options have a higher prior probability of exercise in the first place, and hence a higher executive's valuation. Information asymmetry is present to the extent that shareholders do not have access to the same information as executives. Although premium options and inferior capital dilution protection are both incentive decreasing, CEOs rationally will always prefer relatively lower dilution protection to an award premium because the cost to the CEO of inferior dilution protection is contingent on the specified capital changes occurring in the future, while a premium option locks in a higher exercise price from the start across all states. We test the proposition that CEOs accept lower dilution protection when no capital changes are expected. An absence of timing gains on exercised options is further evidence in support of our conjecture that CEOs do not need incentives when the prior probability of exercise is already high. A major implication is that CEOs value subsequently exercised options at higher values than surmised (but not observed) by Meulbroek (2001) and Hall & Murphy (2000, 2002).

By corollary, lapsed options (for which shareholder returns are around zero) are those for which the prior probability of exercise must have been lowest. Although some lapsed options in our sample were granted at higher premia (incentive reducing), most were granted at-the-money and had higher relative dilution protection and also exhibited 'good' timing (both incentive increasing). If just out-of-the-money or 'marginal' lapsed options had a higher prior probability of exercise than options lapsing deep out-of-the-money, then CEOs may have been expected to bargain for higher incentives. The evidence (albeit thin, n=19) is exactly the opposite:

'marginal' lapsed options have lower dilution protection and lower timing gains than deep out-of-the-money lapsed options, suggesting these disincentive effects may have been crucial in contributing to the lapsation.

We conclude that stock options as incentive devices *do not work*, although they remain effective vehicles for delivering bonuses to CEOs. If stock options are expected to be add-ons, as suggested by Hall and Murphy (2002), then it also follows that most exercised stock options represent wealth transfers to CEOs from shareholders.

The paper is organised as follows. The next section reviews the evidence, identifies opportunities for exchanging risks at award (or earlier on adoption) and defines the ensuing returns. Section II explicates CEO and shareholder return measures. Section III details the sample and provides descriptive statistics. Analysis is performed in Section IV, which is followed by summary and conclusions in the final Section.

I. Review and Analysis

Evidence suggesting that stock options are effective in aligning incentives is surprisingly sparse. DeFusco, Johnson and Zorn (1990) document higher stock price variance following adoption of stock option plans, implying a wealth transfer from bondholders to stockholders. Yermack (1997) documents increasing abnormal stock returns following awards to CEOs, which are linked to earnings improvements. Successful incentives will generate these outcomes, but so will "good timing" where CEOs influence awards to occur before good news known to themselves. Yermack infers award timing from the tendency in U.S. companies for awards to precede quarterly earnings increases, which implies *de facto* awards of discounted ESOs *(see endnote 4).* Several competing explanations, including insider trading, problems in writing compensation contracts, taxation, CEO manipulation of news releases, and out-of –the-money awards are dismissed on *a priori* grounds. Jin & Meulbroek (2002) report that long-dated stock options retain their incentive-aligning power (through delta arguments) even in years when stock indexes fall, provided volatility increases as stock prices fall. A positive association between voluntary liquidations and CEO stock/option ownership reported by Mehran, Nogler and Schwartz (1998) is consistent with the incentive-aligning motivation of stock options.

Contrary evidence is more extensive. Lambert, Lanen and Larcker (1989) report lower than expected dividends after adoption of stock option plans, while Fenn and Liang (2001) find an inverse relation between stock option holdings and dividend payouts (but a positive association with stock repurchases). In apparent contrast to Yermack (1997), Gerety, Hoi and Robin (2001) document zero stock market reaction to proposals for equity-linked incentive plans for CEOs. There is also sporadic evidence of executive compensation contracts appearing to increase agency costs, including diversion of cash windfalls to increase executive compensation (Blanchard, Lopez-de-Silanes, and Shleifer (1994)), lower than expected dividends after executive stock option (ESO) adoptions (Lambert, Lanen and Larcker (1989)), an inverse relation between ESO holdings and dividend payouts but a positive association with stock repurchases (Fenn and Liang (2001)), and lower special dividend payouts for optioned *versus* non-optioned firms (Hollis (2001)).

In this paper we focus on trade-offs observed at or before award that impact on the effective exercise price, *X*. The trade-offs or exchanges observed are: option premia, timing returns, exercise restrictions and protection against capital dilution relative to that of shareholders. Premium (discount) options are created when the exercise price exceeds (is less than) the market price on the award date. Since exercise prices are often set in relation to stock prices over the preceding five trading days, some discounts (premia) may be observed because stock prices in the preceding week were below (above) the stock price at award. However, in contrast to Lambert, Lanen and Larcker (1989), there is such a wide distribution of award discounts/premia in our sample (with a central tendency of zero) that we are pressed to doubt a 'prior-week' explanation *(see endnote 5).* Discounts to market directly reduce the exercise price or, equivalently, imply acquisition of underpriced stock. Premium options have the reverse properties.

CEO timing returns are positive (i.e., timing gains) when there has been a pre-award stock price rundown. Conversely, a pre-award runup creates a timing loss for the CEO. Timing gains are a deadweight cost to shareholders when the CEO expends no effort in return. Their existence would imply that either CEOs are able to influence award terms and conditions through their compensation committees, or shareholders are willing to grant timing rights in exchange for other concessions. Exercise restrictions may also be costly to CEOs either by prohibiting exercise outright until a hurdle stock price is reached, or capping the quantity of options that may be exercised per period, which amounts to deferral of exercise with respect to some or all options that are presently in-the-money (and may not remain so).

However, while such restrictions limit take-home gains, they do not impinge on the exercise price, and as a consequence CEO incentive should be unaffected.

The level of CEO dilution protection relative to shareholders' is specified in the stock option plan as approved by shareholders, and applies to all subsequent awards under the plan until varied by shareholders. The return consequences depend on whether capital changes for which protection is not granted occur during the life of the awarded options. When protection is afforded for all capitalization changes, the CEO suffers no dilution on exercise *vis à vis* shareholders. Inferior dilution protection always reduces a CEO's return relative to shareholders. When uninsured capitalization changes occur, the CEO suffers a dilution cost (or negative return) that effectively increases the exercise price or, equivalently, requires the CEO to purchase overpriced stock. In Australia, CEOs are typically afforded protection against some or all of bonus issues, rights issues and capital restructures, but not dividends.

Although contingent on exercise, timing and award gains (losses) are potentially costly (beneficial) to shareholders because they combine to reduce the exercise price before marginal effort is expended. Shareholders do not benefit when timing and award gains do not induce extra CEO effort. Likewise, CEOs would not accept up-front timing and award losses because even full dilution protection and zero exercise restrictions would not provide higher returns than shareholders. Inferior dilution protection reduces the payoffs of exercise, so equivalently increases the exercise price and hence creates an incentive for a CEO to invest marginal effort to ensure exercise: the incentive is higher as the relative level of dilution protection is lower.

In the absence of exercise restrictions, shareholders face the risk of CEOs exercising their stock options before tendering marginal effort, i.e., on the first occasion the stock price peaks above the exercise price. The risk is presumably highest for awards made at a discount after a rundown and where CEOs have full dilution protection. Shareholders can limit the costs of early exercise by outright prohibition or by setting hurdle prices, but such restrictions do nothing to augment the incentive to tender marginal effort. Our evidence suggests that lower dilution protection relative to shareholders is the primary mechanism used to boost CEOs' incentive to cause exercise.

II. Measurement of CEO and shareholder returns

CEO and shareholder returns are measured directly. To do this, we require full information on the terms and conditions of an award, capital dilutions during the currency of the options and the dates and prices at which the options are exercised or lapse through expiry. We use Australian data on stock options grants to CEOs for which exercise dates are available. This means that CEO and shareholder returns for both exercised and lapsed (i.e., expired) options can be directly measured, which provides a more complete measure of valuation consequences than analysis of cumulative abnormal returns around award announcements, which as Yermack (1997, p. 457) notes are often deferred until release of the next earnings report.

The institutional and regulatory framework in Australia is similar to those of both the United States and the United Kingdom. In Australia, as in the United States, shareholders must approve ESO plans put to them by company compensation committees, usually in Annual General Meeting. During the sample period, Australian Stock Exchange (ASX) *Listing Rule* 10.14 prescribed shareholder approval by special resolution for issues of securities to related parties (which include CEOs) by way of employee incentive schemes. The resolution must have been passed at a general meeting held no earlier than the last annual general meeting of the company. Issues of ordinary securities (the American equivalent is common stock) or claims thereon through such schemes and without ordinary shareholders' approval were capped at 15% of outstanding ordinary share capital (*Listing Rule* 7.1). Irregular grants outside such schemes similarly required shareholder approval (*Listing Rule* 10.11), but the 15% cap did not apply. The Corporations Act (s. 205G) set a maximum period of 14 calendar days within which a company was to notify the ASX of any change, acquisition or disposal of company-issued securities held by directors, including stock options. A convenient source of announcements concerning awards and ASX notifications was provided by Huntleys' *Dat Analysis* service. Once shareholder approval is given, the compensation usually has discretion as to the frequency, size and timing of awards, as well as determination of the exercise price. CEOs are invariably not members of their compensation committees, but this does not preclude CEO influence over their deliberations *(see endnote 6).*

In Australia, ESO award plans tie CEO rewards to the company's raw or non-risk-adjusted stock price, but often with protection against dilution caused by

rights issues, bonus issues and capital reconstructions, but not dividends. Some awards carry only partial protection against capitalization changes (for example, only reconstructions may be allowed for), so in these cases fewer adjustments are applied. Anti-dilution protection varies from the same level implicitly enjoyed by shareholders (all three sources of dilution) to zero protection. Three CEO returns and a shareholder return are calculated. Two of the CEO returns are determined at t_0, the award date:

$$\text{Timing return} = \frac{P_{-30} - P_0}{P_0}, \text{ and}$$

$$\text{Award return} = \frac{P_0 - X_0}{P_0}.$$

P_{-30} is the company's stock price at the close of trading 30 calendar days before the ESO award date, and is adjusted for all capitalization changes made before award. P_0 is the stock price at award, and X_0 is the exercise price *(see endnote 7)*. The timing return is an *ex post* measure of the *opportunity* for timing. The timing return is positive (negative) when an award is made after a stock price rundown (runup). When an award is made (day 0), the timing return is already *ex post*, but is included in the aggregation of CEO returns because it is contingent on exercise along with the two other CEO returns. The award return is instantaneous and positive when an award is made at a discount to the stock price ($X_0 < P_0$), and negative when made at a premium ($X_0 > P_0$).

A CEO's holding return accrues from the award date until termination (through exercise or lapse). It is the same as that accruing to shareholders over the same period *plus* (*minus*) any option discount (premium), but *minus* the costs of lower relative dilution protection, both conditional on later exercise. The CEO holding return is also reduced by exercise restrictions. When dilution costs and exercise restrictions are present, the CEO holding return is likely lower than the shareholder return, unless timing and award gains are offsetting. The shareholder return over the same interval therefore reflects the wealth increments resulting from tendered CEO effort, while the CEO holding return yields insights into the incentive structure generating these shareholder returns.

A CEO's (*ex post*) holding return is measured as the stock return accruing from award to the earlier of exercise or lapse. Although exercise restrictions potentially reduce the dollar value of take-home gains available to a CEO, they do not impact on return calculations. For instance, rationing of exercised options to 25% per annum does not affect the return *per option*; likewise, a hurdle price might prevent exercise but it does not affect the CEO's holding return. The CEO holding return is the same as the shareholder return *plus* any award return and the effect of lower dilution protection for CEOs relative to shareholders, which we term the relative dilution cost factor. The shareholder return incorporating CEO dilution cost is given by

$$\frac{P_T - X_T}{P_0},$$

where P_T is the stock price at the time of exercise or lapse (*T*) and is adjusted for all capitalization changes, and X_T is the exercise price at *T* adjusted only for bonuses, rights issues and capital reconstructions as specified in the award plan. Deducting the award return yields the CEO holding return:

$$\frac{P_T - X_T - (P_0 - X_0)}{P_0}.$$

When CEOs have no dilution protection, $X_T = X_0$; but as the level of CEO protection rises toward that of shareholders, $X_T < X_0$. Finally, the

$$\text{shareholder return} = \frac{P_T - P_0}{P_0}.$$

The CEO holding return is lower than the shareholder return whenever CEO dilution protection is less than shareholders'. When shareholder returns exceed CEO returns this means the relative dilution disadvantage faced by CEOs more than offsets any timing and award gains. A reverse inequality is therefore caused by timing and award returns outweighing CEOs' inferior dilution protection and exercise restrictions. For instance, if there are no capitalization changes during the CEO holding period and no conditions placed on exercise, then total CEO return will exceed shareholder return when timing and award returns are net positive.

Although the level of CEO protection is set at or before award, the effect on future CEO returns can be assessed only by tracking capitalization changes during the term of the options. To the extent CEOs are able to anticipate these changes, the realized dilution cost (relative to shareholders) matches its expected

value. Since CEOs almost certainly have ready access to private information, we proceed on this assumption. The relative dilution cost factor is therefore the cumulative shareholder return *minus* the cumulative stock return accruing to the CEO, where the difference is caused by the dilution factor as implied by an award never exceeding the dilution factor applicable to shareholders. The dilution cost factor is zero when CEO dilution protection matches that of shareholders, and positive (unbounded) otherwise.

III. Sample and descriptive statistics

The sample consists of 207 awards made by 56 companies for fiscal 1985-1999; 158 awards were made by industrially-listed companies and the remainder by companies listed on the mining and oil board *(see endnote 8).* Table I presents descriptive statistics. Irregular awards (n = 151) dominate the sample.

$^{129}/_{207}$ or 62.3% of all awards end up being exercised, with the remainder lapsing unexercised.

The percentage exercised is more than double the exercise rate commonly observed in the stock options market generally. The percentage of cases with exercise restrictions contained in award agreements is highest for lapsed options (48.7%) and lowest for exercised options (22.5%).

Unlike Yermack's (1997) sample, there is no evidence of awards being timed to precede earnings/investment increases. Earnings returns are computed by dividing bottom-line half-year earnings (which accrue to shareholders) by the market value of the company's outstanding stock at the start of the half-year period *(see endnote 9).* Award timing is most likely to show up in irregular awards, but the pre- to post-award earnings changes for this and all other groups do not differ significantly from zero, although the median pre-award earnings return is lower than the preceding half-year earnings return for two groups. Raw earnings changes (not reported here) not standardized for the value of investment show a small but also insignificant increase pre- to post-award. To the extent that earnings revisions drive stock prices, timing returns as measured by pre-award stock price runups and rundowns are therefore expected to average approximately zero as well. The median intervals to exercise or expiry (measured in calendar days) are closely similar, implying infrequent early exercise.

Half-yearly, quarterly and monthly and 10 day timing returns are reported in Table II. Recall that the timing return

$$\frac{P_t - P_0}{P_0},$$

where P_t is a company's closing stock price adjusted for all capitalization changes t days pre-award, respectively, and P_0 is the stock price on the award date *(see endnote 10).* Negative timing returns (stock price runups) are observed for exercised options and positive timing returns are observed (stock price rundowns) for lapsed options. The [-10, -30] differences are significant or nearly so for both exercised and lapsed options, but the [-30, -90] differences are not. The former difference appears driven by market anticipation of at least some awards, for the timing returns are increasing for exercised options but decreasing before awards of lapsed options. Since the timing returns for these groups do not differ for day –90 and day –30, and the difference tests for lapsed options suggest the day –180 returns are becoming unstable, timing returns are hereafter computed relative to the shorter period, viz., day –30.

Table III looks at CEO timing, award and holding returns together with shareholder returns for the whole sample and major sub-groupings. Relative dilution cost is also reported. For the whole sample, the median CEO holding return is 45.32% over a median holding term of 1216 days, which works out to a modest annualized return of 11.87%; for shareholders the annualized return is 13.08%. Several regularities are apparent. Timing returns tend to zero across the whole sample, so at an aggregate level there is no evidence of opportunistic timing of awards *(see endnote 11).* However, small timing gains from pre-award rundowns are indicated for lapsed options. Award losses (exercise prices set at a premium to market) are indicated for some lapsed options and irregular awards; award discounts are absent. Thus, there is no evidence of opportunism, where CEOs receive "good deals", *viz.*, award discounts after a stock price rundown. CEO holding returns are negative only for the lapsed group and strongly positive elsewhere; the negative returns are lost to CEOs through non-exercise that is also in shareholders' interest. The association of lapsed options with pre-award stock price rundowns is consistent with the market already anticipating declining returns for this group, which has a shareholder return of –19.33% from award to expiry (more than three years). Option awards in this group appear to make little or no difference to this trend.

This is, of course, the scenario in which incentives are most needed, but at the same time the CEO may rationally have decided that extra effort will not alter the outcome (as already anticipated by the market). Options awarded annually/biannually are, on average, awarded at market with no timing gains *(see endnote 12).* Not surprisingly, *ex post* selection guarantees that exercised options have the highest CEO holding and shareholder returns and lapsed options the lowest. None of the returns for annual/biannual *versus* irregular awards differ significantly (difference tests are not reported).

Relative dilution cost is at a maximum (median -.1635) for exercised options, and lowest for annual/biannual awards (-.0519), closely followed by lapsed options (-.0695). In other words, holders of exercised options accept the least dilution protection, while holders of annually/biannually awarded options have the highest dilution protection relative to shareholders. Table IV indicates that pre-effort bargaining is unevenly distributed across large and small issuing companies. CEOs of large companies accept much less dilution protection than small companies (in terms of median cost, -.1998 *versus* -.0013). There is some evidence of pre-award stock price falls for some small companies, which appear to be more than offset by award premiums. Exercise restrictions for large companies occur at about twice the rate for small companies. A similar inequality is observed for below-median award size *vis à vis* above-median award size. In contrast, relative award size is not a major source of differences. The strongest result from Table IV is that CEOs of large companies accept less dilution protection and bear more exercise restrictions, both of which serve to lower CEO holding returns. Since, as indicated, Top 100 companies have about half the total risk of non-Top 100 companies, this inequality is in the right direction.

IV. Analysis

Tables V and VI look at interactions between risk and award attributes. Table V partitions all returns into high and low risk categories, according to above- and below-median standard deviations of stock returns for one year pre-award *(see endnote 13).* The CEO holding and total returns together with the shareholder return are higher for the high risk group than for the low risk group, which is an expected result. However, the relation breaks down for timing and award returns. Since there are more lapsed options in the high risk group (exercise rate = 60.6% *versus* 64.1% for the low risk group), the results presented here are consistent with those for lapsed options in Table III, which possibly have a higher *prior* probability of non-exercise than awards in general. However, Table VI shows that group standard deviations (all of which differ significantly from zero) do not differ between exercised/lapsed options and regular/irregular awards. At this stage, risk differences appear not to be a major cause of return differences between these groups.

Table VII relates CEO holding returns to the pre-effort arguments. Exercise restrictions are excluded from the set of explanatory variables because they affect only realized or "take-home" returns and not CEO holding returns. All regression parameters are highly satisfactory. For the whole sample, CEO holding returns are decreasing in award returns but increasing in relative dilution cost. Award discounts therefore reduce CEO holding returns, while award premiums increase CEO holding returns. Thus, award discounts (which may be seen as leverage of CEO holding returns) appear to reduce rather than increase CEO incentive. Likewise, as relative dilution protection falls, i.e, the cost to the CEO of inferior dilution cost is higher, the observed CEO holding return rises. Both results suggest a more general finding: up-front award discounts and relatively high dilution protection do not enhance CEOs' incentive. By corollary, lower dilution protection induces more effort if the CEO is to exercise. The CEO holding return is lower if the issuing company is in the Top 100, as suggested earlier by the results of Table IV. The sum of the standardized coefficients on the three returns determined at award is positive (.555) for all groups, which reflects the incentive potential of stock options and can be interpreted as an incentive index. In summary, holding returns are increased when CEOs have lower dilution protection and are awarded options at a premium.

The structure of pre-effort exchanges varies across option outcomes and award frequency. For exercised options, CEO holding returns respond more positively to an award premium (three times the sample average) but show less response to lower relative dilution protection (coefficient 3.749 *vs.* 5.773). The incentive index value for exercised options at .227 is the lowest for all groups, which at first sight is surprising given the highest relative dilution cost borne by CEOs in this group, as reported in Table III. However, our interpretation is that CEOs in this group *expect* a lower stock return response coefficient on their dilution cost bearing. In other words, CEOs' payoff for bearing dilution risk is lower, and hence so is their incentive for investing marginal effort. In contrast, lapsed options show the highest

return sensitivity for dilution cost (7.777), and a higher incentive index value (.609 *vs*. .227). Given that holders of lapsed options bear lower dilution risk (refer Table III), the market places a higher reward per unit of relative dilution cost that is borne, but comparatively higher effort is required to generate a sufficient return to guarantee exercise, so the options lapse. Annual/biannual awards are almost indistinguishable from lapsed options in an incentive context.

For irregular awards, CEO holding returns are decreasing in both timing and award returns and increasing in relative dilution cost. The return coefficient on dilution cost and the incentive index value are similar to those for exercised options and the award return sensitivity is close to the sample average, but timing returns enter the set of pre-effort exchanges for the first time. Here, pre-award stock price runups are associated with higher CEO holding returns. In general, from an incentive perspective, runups and award premiums are mutually reinforcing, whereas rundowns and award premiums are not. Irregular awards suggest opportunism, implying that CEOs have private information of future earnings increases. Even if the market has partially anticipated this information, it would still pay a CEO to accept an award despite an upward trend in the stock price. Hence, for irregular awards, we expect to observe stock price runups. We argue that the same reasoning does not extend to award premiums because award returns are negatively signed across all groups; in particular, lapsed options would seem to have the lowest propensity for good news. The low incentive index value (.264) reflects the lower payoff on bearing dilution risk.

If early exercise is not prohibited, shareholders run the risk that granted options will be exercised at the first opportunity when the stock price peaks above the exercise price without the CEO expending extra effort. The risk is higher for awards made after a rundown and at a discount and where CEOs have full dilution protection. Shareholders can limit the costs of early exercise by setting hurdle prices or prohibit early exercise outright, but such restrictions are incentive-weakening. Table VIII therefore explores the relation between the returns on pre-effort exchanges and CEO holding returns with and without exercise restrictions in order to reveal the impact of exercise restrictions. For this purpose the three pre-effort returns are summed. Aggregate pre-effort returns are found to be negative irrespective of exercise restrictions, reflecting the dominance of inferior CEO dilution protection. The negative correlation between pre-effort returns and the CEO holding return remains when exercise restrictions are absent, implying that the positive incentive effect of inferior CEO dilution protection is robust across an exercise restriction switch. We conclude that exercise restrictions do not materially impact on pre-effort exchanges.

Table IX shows the impact of timing and award returns and relative dilution cost on shareholder returns after controlling for possible intervening factors. Zero CEO marginal effort is unlikely to reduce CEO holding gains to zero as well because profitable operations are likely to continue irrespective of CEO quality, but high CEO holding gains are more likely the result of extra CEO effort. CEO holding returns that do not vary with CEO effort are most likely to vary according to cross-sectional risk differences. The standard deviation of pre-award stock returns is therefore included in the regressions to control for this effect. Variables are also included to represent award size relative to outstanding capital and Top 100 membership. Table IX shows that the addition of intervening variables (particularly risk) do not materially disturb the structure of pre-effort exchanges identified in Table VII for CEO holding returns, subject to an important exception. For irregular awards, award returns do not influence shareholder return, despite influencing the CEO holding return (refer Table VII). For this group, we infer that award premiums exist because future earnings growth would make the options "too easy" to exercise without an award premium. Interestingly, risk has significance only for exercised options, implying the probability of exercise is increasing in underlying risk, which is a standard result. Somewhat surprisingly, award size is not a consideration in any group, so if opportunism exists it does not extend to the relative size of the award.

High CEO holding gains do not guarantee exercise, for either the exercise price may be too high or exercise restrictions may be invoked. Table X presents logistic regressions on exercise (=1) in order to assess the impact of exercise restrictions and exchanges bargained at award. Regressions of CEO holding returns alone on the exercise/lapse outcome are also reported *(see endnote 14).* Overall, the expectation is that the fit will improve as the realized CEO holding return measured over $[t_0,T]$ is substituted for the set of pre-effort exchanges at t_0. For all awards, the percentage of cases correctly classified increases markedly (from 66.7 to 86.0) as the scenario moves forward in time. At t_0, the probability of exercise is shown to be increasing only in the award return, which is expected because award discounts directly lower the exercise price. There is no indication that pre-award stock price movements, i.e., award timing,

relative dilution protection and exercise restrictions affect the likelihood of exercise. The latter is result is construed to mean that CEOs do not accept exercise restrictions if there is any material likelihood of exercise being affected.

The estimation for annual/biannual awards at award is not successful, from which we infer that exercise of annual/biannual awards is determined by exogenous factors, such as changes in business and financial risks. In contrast, irregular awards show strong evidence of active pre-effort bargaining. For these awards, pre-award runups increase the likelihood of exercise, as does lower dilution protection, i.e., higher relative dilution cost. Again, exercise restrictions do not affect the likelihood of exercise.

V. Summary and conclusions

This paper documents a structure of timing returns, award returns and relative dilution costs at award. The structure varies according to option outcomes and award frequency. CEO holding returns generally are found to be decreasing in award returns and increasing in relative dilution cost. Award discounts (premiums) reduce (increase) CEO holding returns, from which we infer that award discounts (which may be seen as leverage of CEO holding returns) reduce rather than increase CEOs' incentive. As relative dilution protection falls, i.e, the cost to the CEO of inferior dilution cost is higher, CEO holding returns increase. We conclude that up-front award discounts and relatively high dilution protection lower CEO incentive. By corollary, lower dilution protection induces more effort if the CEO is to exercise. With the lone exception of irregular awards, timing returns (pre-award stock price runups/rundowns) do not impinge on shareholder returns. Thus, we do not corroborate the suggestion by Yermack (1997) that CEOs influencing their awards to occur before earnings increases are acting opportunistically. The CEO holding return is lower if the issuing company is in the Top 100, which we attribute to lower uncertainty rather than less incentive.

For exercised options, CEO holding returns respond more positively to an award premium but show less response to lower relative dilution protection, which we interpret as CEOs expecting a lower stock return response coefficient on their dilution cost bearing. In other words, CEOs' payoff for bearing dilution risk is lower, and hence so is their incentive for investing marginal effort. In contrast, lapsed options show the highest return sensitivity for dilution cost. Given that holders of lapsed options bear lower dilution risk (refer Table III), the market places a higher reward per unit of relative dilution cost that is borne, but comparatively higher effort is required to generate a sufficient return to guarantee exercise, so the options lapse. Annual/biannual awards are almost indistinguishable from lapsed options in an incentive context. However, for irregular awards, award returns do not influence shareholder return, despite influencing the CEO holding return. For this group, we infer that award premiums exist because future earnings growth would make the options "too easy" to exercise without an award premium. The fact that exercise restrictions do not impact on exercise suggests that CEOs do not accept restrictions if they are at all likely to impede exercise. It appears that inferior CEO dilution protection may substitute for exercise restrictions, which is logical because capitalization changes are automatically insured against as they occur, whereas exercise restrictions are absolute and hence a relatively inefficient mechanism to achieve the same end.

In summary, our evidence is that award returns and relative dilution cost combine to influence CEO incentives and, as a consequence, shareholder returns and hence exercise. Timing returns and exercise restrictions have comparatively minor and zero impact, respectively. Contrary to popular belief, award discounts do not act as incentives, so the implicit leverage does not work. Exercised options have the highest relative dilution cost factor and the highest sensitivity to award returns: specifically, an award premium adds more value for shareholders in this group than in any other. In contrast, lapsed options have a low dilution cost factor and a less sensitive response to award premiums. The comparatively flat structure of pre-effort exchanges for annual/biannual awards suggests low shareholder intervention in setting the terms and conditions of awards. This contrasts with evidence of higher shareholder intervention with respect to all other awards. For lapsed options, we conclude that the pre-effort exchanges were not able to affect CEO incentive sufficiently to lead to exercise; in many cases we suspect that no amount of up-front bargaining can reverse a stock price decline. We interpret runups prior to irregular awards as reflecting shareholders' intention to elicit more CEO effort in the face of impending good news. Restrictions on pre-effort bargaining are likely to lower the probability of exercise and harm shareholders' interest. It would therefore be informative to see if agency problems suggested by investment and financing regularities observed for optioned firms are positively related to flat pre-effort exchanges possibly caused by outside restrictions on pre-effort bargaining.

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Appendices

Table I. Descriptive statistics

An earning return is bottom-line half-year earnings divided by the market value of the company's outstanding stock at the start of the half-year period, and is not annualized. Irregular stock option awards are all awards not made annually or biannually. Exercise restrictions include hurdle prices and yearly limits on the portion of an award that may be exercised.

	All awards	Exercised options	Lapsed options	Annual/ biannual awards	Irregular awards
Observations	*207*	*129*	*78*	*56*	*151*
Percentage of cases with increases in half-year earnings return:					
pre- to post-award	47.8	48.8	46.2	50.0	47.0
12 months to 6 months pre-award	44.0	43.4	44.9	41.1	45.0
Percentage of cases with options exercised	62.3	100.0	0	66.1	60.9
Percentage of cases with exercise restrictions	32.3	22.5	48.7	25.0	35.1
Pre- to post-award change in half-year earnings return					
mean	.0066	.0162	-.0094	.0326	-.0030
t statistic	.725	1.645	-.531	1.592	-.311
median	-.0015	-.0009	-.0016	-.0001	-.0015
Wilcoxon *Z* statistic	-.114	-.429	-.316	-1.371	-.630
12 months' prior to 6 months' prior change in half-year earnings return					
mean	-.0039	-.0061	-.0003	-.0287	.0053
t statistic	-.478	-.657	-.021	-1.410	.648
median	-.0016	-.0019	-.0009	-.0065	-.0008
Wilcoxon *Z* statistic	-1.626	-1.723*	-.449	-2.272**	-.530
Calendar days from award to post-award earnings announcement date:					
mean	74	82	63	69	77
median	63	63	45	71	60
Calendar days from award to option termination:					
mean	1193	1148	1269	1088	1233
median	1216	1202	1257	1019	1311

** denotes two-tailed significance for $.01 < \alpha \leq .05$

* denotes two-tailed significance for $.05 < \alpha \leq .10$

Table II. Half-yearly, quarterly, monthly and ten-day pre-award timing returns

Timing return = $\frac{P_t - P_0}{P_0}$, where P_t is a company's stock price at the close of trading (t) 180, 90, 30 and 10 calendar days before the ESO award date, respectively, adjusted for all capitalization changes. P_0 is the stock price on the award date. Irregular stock option awards are all awards not made annually or biannually.

	Base day for timing return			
	day-180	day –90	day –30	day –10
All awards (*n=207*)				
Mean	.0027	.0148	.0133	.0164
t *statistic*	.143	1.023	1.125	1.627
median	-.0318	.0000	.0000	.0034
Wilcoxon *Z* statistic	-1.283	-.693	-.075	.669
Annual/biannual awards (*n=56*)				
Mean	-.0064	.0117	.0143	.0031
t *statistic*	-.172	.429	.860	.246
median	-.0476	-.0201	.0000	.0113
Wilcoxon *Z* statistic	-1.150	-.297	-.602	.916
Irregular awards (*n=151*)				
mean	.0060	.0159	.0129	.0214
t *statistic*	.278	.932	.861	1.642
median	-.0318	.0000	.0000	.0000
Wilcoxon *Z* statistic	-.785	-.682	-.236	.911
Exercised options (*n=129*)				
mean	-.0240	-.0205	-.0170	-.0009
t *statistic*	-1.142	-1.523	-1.709*	-.118
median	-.0480	.0000	.0000	.0033
Wilcoxon *Z* statistic	-1.742*	-1.918*	-1.452	.151
mean difference				
t statistic	.199	.325	1.773*	
median difference				
Wilcoxon *Z* statistic	.933	.413	1.248	
Lapsed options (*n=78*)				
mean	.0468	.0732	.0632	.0452
t *statistic*	1.331	2.428**	2.454**	1.944*
median	-.0229	.0028	.0071	.0049
Wilcoxon *Z* statistic	-.088	1.307	2.124**	1.289
mean difference				
t statistic	1.581	.483	1.771*	
median difference				
Wilcoxon *Z* statistic	1.914*	.314	1.595	

** denotes two-tailed significance for $.01 < \alpha \leq .05$

* denotes two-tailed significance for $.05 < \alpha \leq .10$

Table III. CEO timing, award and holding returns, relative dilution cost and shareholder returns by option outcome and award frequency

Timing return = $\frac{P_{-30} - P_0}{P_0}$, and award return = $\frac{P_0 - X_0}{P_0}$. P_{-30} is the company's stock price at the close of trading 30 calendar days before the ESO award date, and is adjusted for all capitalization changes made before award. P_0 is the stock price at award, and X_0 is the exercise price at award. Relative dilution cost is the cumulative shareholder return *minus* the cumulative CEO stock return, where the difference is caused by a CEO dilution factor as given by the award never exceeding the dilution factor applicable to shareholders; the minimum value of the factor is zero. CEO holding return = $\frac{P_T - X_T - (P_0 - X_0)}{P_0}$, where P_T is the stock price at the time of exercise or lapse (i.e., expiry) and is adjusted for all capitalization changes, and X_T is the exercise price at T adjusted only for bonuses, rights issues and capital reconstructions as specified in the award plan. The award gain or loss $(P_0 - X_0)$ is necessarily subtracted. Shareholder return = $\frac{P_T - P_0}{P_0}$. Returns are not adjusted for differing intervals. Irregular stock option awards are all awards not made annually or biannually.

	Timing return $[t_{-30}, t_0]$	Award return $[t_0]$	Relative dilution cost $[t_0,T]$	CEO holding return $[t_0,T]$	Shareholder return $[t_0,T]$
All awards (*n=207*)					
mean	.0133	-.0726	.1650	.8409	.8967
t	1.125	-2.390**	12.397***	7.618***	8.001***
median	.0000	.0064	.1072	.4532	.5062
Wilcoxon *Z*	-.075	.110	11.074***	7.565***	8.803***
Exercised options (*n=129*)					
mean	-.0170	.0280	.1883	1.2451	1.3059
t	-1.709*	1.260	11.646***	10.499***	10.830***
median	.0000	.0081	.1635	.8787	.8873
Wilcoxon *Z*	-1.452	1.639	8.937***	9.707***	9.752***
Lapsed options (*n=78*)					
mean	.0632	-.2390	.1264	.1726	.2198
t	2.454**	-3.517***	5.610***	.879	1.104
median	.0071	.0000	.0695	-.2095	-.1933
Wilcoxon *Z*	2.124**	1.716*	6.567***	-3.821***	-3.252***
Annual/biannual awards (*n=56*)					
mean	.0143	.0145	.1669	1.195	1.2819
t	.860	.314	5.187***	4.351***	4.530***
median	.0000	.0117	.0519	.5331	.5331
Wilcoxon *Z*	.602	1.239	5.512***	3.606***	3.630***
Irregular awards (*n=151*)					
mean	.0129	-.1049	.1643	.7096	.7538
t	.861	-2.784***	11.836***	6.409***	6.810***
median	.0000	.0050	.1191	.4467	.4987
Wilcoxon *Z*	.236	.517	9.624***	6.607***	7.146***

*** denotes two-tailed significance for $\alpha \leq .01$.
** denotes two-tailed significance for $.01 < \alpha \leq .05$
* denotes two-tailed significance for $.05 < \alpha \leq .10$

Table IV. Cross-tabulations of relative dilution cost, timing and award returns and exercise restrictions by issuer and award size

Relative dilution cost is the cumulative CEO stock return *minus* the cumulative shareholder stock return, where the difference is caused by a CEO dilution factor as given by the award never exceeding the dilution factor applicable to shareholders; the maximum value of the factor is zero. Timing return = $\frac{P_{-30} - P_0}{P_0}$ and award return = $\frac{P_0 - X_0}{P_0}$, where P_{-30} is the company's stock price at the close of trading 30 calendar days before the ESO award date, and is adjusted for all capitalization changes made before award. P_0 is the stock price at award, and X_0 is the exercise price at award. Inclusion of a company in the Top 100 means the issuing company's total assets at book in a given year are large enough for inclusion in this group. Relative award size is the number of options awarded divided by the number of outstanding ordinary shares. The standard deviation of pre-award stock returns is calculated from adjusted weekly returns for one year prior to award. Irregular stock option awards are all awards not made annually or biannually.

	Top 100 membership		Relative award size	
	Top 100	Non-top 100	Above-median	Below-median
n	*104*	*103*	*103*	*104*
Relative dilution cost				
mean	-.2310	-.0098	-.1526	-.1773
t	-11.272***	-6.882***	-8.275***	-9.232***
median	-.1998	-.0013	-.0840	-.1210
Wilcoxon *Z*	-8.768***	-6.792***	-7.374***	-8.284***
difference:				
t	-5.303***		.928	
Mann-Whitney *U*	2510.0***		4598.0*	
Timing return				
mean	-.0107	.0374	.0362	-.0094
t	-1.336	1.695*	1.674*	-1.021
median	-.0011	.0000	.0000	-.0011
Wilcoxon *Z*	-.567	.678	.913	-.846
difference:				
t	-2.048**		1.941*	
Mann-Whitney *U*	4867.0		4809.5	
Award return				
mean	.0115	-.1575	-.1008	-.0447
t	.815	-2.701***	-1.885*	-1.528
median	.0064	.0050	.0000	.0071
Wilcoxon *Z*	.399	.759	.094	.531
difference:				
t	2.817***		-.921	
Mann-Whitney *U*	5194.5		5352.0	
Percentage of awards with exercise restrictions	41.35	23.30	24.27	40.78
Standard deviation of				

pre-award returns				
mean	.0354	.0680	.0559	.0474
median	.0279	.0527	.0483	.0360
difference:				
t	5.206***		1.280	
Mann-Whitney *U*	1954.0***		3800.0***	

Table V. CEO timing, award and CEO holding returns and shareholder returns by risk

Timing return = $\frac{P_{-30} - P_0}{P_0}$, and award return = $\frac{P_0 - X_0}{P_0}$. P_{-30} is the company's stock price at the close of trading 30 calendar days before the ESO award date, and is adjusted for all capitalization changes made before award. P_0 is the stock price at award, and X_0 is the exercise price at award. CEO holding return = $\frac{P_T - X_T - (P_0 - X_0)}{P_0}$, where P_T is the stock price at the time of exercise or lapse (i.e., expiry) and is adjusted for all capitalization changes, and X_T is the exercise price at T adjusted only for bonuses, rights issues and capital reconstructions as specified in the award plan. The award gain or loss ($P_0 - X_0$) is necessarily subtracted. Total CEO return is the sum of timing, award and CEO holding returns, and shareholder return = $\frac{P_T - P_0}{P_0}$. Returns are not adjusted for differing intervals. The standard deviation of pre-award stock returns was estimated from weekly returns for one year prior to award.

	(1) Timing return $[t_{-30}, t_0]$	(2) Award return $[t_0]$	(3) CEO holding return $[t_0,T]$	(4) = (1)+(2)+(3) Total CEO return $[t_{-30}, T]$	(5) Shareholder return $[t_0,T]$
Above-median pre-award standard deviation of stock returns (n=104); percentage exercised = 60.6					
mean	.0347	-.1549	1.1189	.9987	1.1849
t	1.529	-2.714***	5.902***	5.166***	6.160***
median	.0000	.0000	.5331	.5331	.6259
Wilcoxon *Z*	.592	.599	5.541***	4.767***	5.784***
Below-median pre-award standard deviation of stock returns (n=103); percentage exercised = 64.1					
mean	-.0084	.0105	.5603	.5624	.6056
t	-1.563	.620	5.275***	5.340***	5.625***
median	-.0011	.0078	.3695	.4038	.4557
Wilcoxon *Z*	-.902	.793	5.317***	5.399***	5.718***
Above- less below-median group return					
t	1.840*	2.767**	2.571**	1.982**	2.628***
Mann-Whitney *U*	4748	5188.5	4817	4896	4775

*** denotes two-tailed significance for $\alpha \leq .01$.
** denotes two-tailed significance for $.01 < \alpha \leq .05$
* denotes two-tailed significance for $.05 < \alpha \leq .10$

Table VI. Risk of pre-award stock returns by option outcome and award frequency

Irregular stock option awards are all awards not made annually or biannually. The standard deviation of pre-award stock returns was estimated from weekly returns for one year prior to award.

	All awards	Exercised options	Lapsed options	Annual/ biannual awards	Irregular awards
n	*207*	*129*	*78*	*56*	*151*
Standard deviation of pre-award stock returns					
mean	.0516	.0470	.0593	.0487	.0527
median	.0397	.0396	.0427	.0355	.0385
Irregular *less* annual/biannual awards					
t				.735	
Mann-Whitney *U*				3947	
Exercised *less* lapsed options					
t		-1.507			
Mann-Whitney *U*		4407.5			

Table VII. OLS regressions on CEO holding returns by option outcomes and award frequency

Timing return = $\frac{P_{-30} - P_0}{P_0}$, and award return = $\frac{P_0 - X_0}{P_0}$. P_{-30} is the company's stock price at the close of trading 30 calendar days before the ESO award date, and is adjusted for all capitalization changes made before award. P_0 is the stock price at award, and X_0 is the exercise price at award. CEO holding return = $\frac{P_T - X_T - (P_0 - X_0)}{P_0}$, where P_T is the stock price at the time of exercise or lapse (i.e., expiry) and is adjusted for all capitalization changes, and X_T is the exercise price at T adjusted only for bonuses, rights issues and capital reconstructions as specified in the award plan. The award gain or loss ($P_0 - X_0$) is necessarily subtracted. Total CEO return is the sum of timing, award and CEO holding returns, and shareholder return = $\frac{P_T - P_0}{P_0}$. Returns are not adjusted for differing intervals. The relative dilution cost factor is the cumulative shareholder return *minus* the cumulative CEO holding return, where the difference is caused by a CEO dilution factor as given by the award never exceeding the dilution factor applicable to shareholders; the minimum value of the factor is zero. Inclusion of a company in the Top 100 means the issuing company's total assets at book in a given year are large enough for inclusion in this group. Relative size of an award is the number of options awarded divided by the number of outstanding ordinary shares at the award date. Irregular stock option awards are all awards not made annually or biannually. The numbers below coefficients are *t* statistics.

	All awards	Exercised options	Lapsed options	Annual/ biannual awards	Irregular awards
n	*207*	*129*	*78*	*56*	*151*
Dependent variable: CEO holding returns					
mean	.8409***	1.2451***	.1726	1.195***	.7096***
median	.4532***	.8787***	-.2095***	.5331***	.4467***
Percentage of cases with options exercised	62.3	100.0	0	66.1	60.9
Adjusted R^2	.433	.306	.740	.560	.346

F	40.364***	15.122***	55.664***	18.465***	20.844***
Constant	.185 1.410	.944 5.928***	-.874 -5.051***	.182 .754	.180 1.125
[t_{-30}, t_0] Timing return	-.927 -1.644	-.410 -.448	-.501 -.956	1.461 .954	-1.343 -2.286**
[t_0] Award return	-.513 -2.331**	-1.516 -3.727***	-.821 -3.969***	-.936 -1.740*	-.518 -2.134**
[t_0, T] Relative dilution cost	5.773 12.368***	3.749 6.391***	7.777 14.482***	6.828 8.146***	4.961 8.710***
Top 100 (=1)	-.640 -3.565***	-.722 -3.382***	-.207 -.903	-.468 -1.076	-.553 -2.723***
Sum of standardized coefficients on significant return variables	.555	.227	.609	.642	.264

*** denotes two-tailed significance for $\alpha \leq .01$.
** denotes two-tailed significance for $.01 < \alpha \leq .05$
* denotes two-tailed significance for $.05 < \alpha \leq .10$

Table VIII. Relationship between bargained gains and CEO holding returns with/without restrictions on exercise

Timing return = $\frac{P_{-30} - P_0}{P_0}$, and award return = $\frac{P_0 - X_0}{P_0}$. P_{-30} is the company's stock price at the close of trading 30 calendar days before the ESO award date, and is adjusted for all capitalization changes made before award. P_0 is the stock price at award, and X_0 is the exercise price at award. The relative dilution cost factor is the cumulative shareholder return *minus* the cumulative CEO stock return, where the difference is caused by a CEO dilution factor as given by the award never exceeding the dilution factor applicable to shareholders; the minimum value of the factor is zero. CEO holding return = $\frac{P_T - X_T - (P_0 - X_0)}{P_0}$, where P_T is the stock price at the time of exercise or lapse (i.e., expiry) and is adjusted for all capitalization changes, and X_T is the exercise price at T adjusted only for bonuses, rights issues and capital reconstructions as specified in the award plan. The award gain or loss ($P_0 - X_0$) is necessarily subtracted. Exercise restrictions include hurdle prices and yearly limits on the portion of an award that may be exercised.

	(1) Timing return [t_{-30}, t_0]	(2) Award return [t_0]	(3) Relative dilution cost [t_0, T]	(4) =(1)+(2)-(3) Total [t_0]	(5) CEO holding return [t_0,T]
Exercise restrictions (*n=67*)					
mean	.0128	-.0195	.5306	-.6260	.7575
t	1.489	-1.824*	2.345**	-.2723***	3.415***
median	.0116	.0064	.1072	-.1316	.1561
Wilcoxon *Z*	1.498	.161	6.510***	-4.801***	3.492***
Correlation between pre-effort exchange and CEO holding returns					-.859***
No exercise restrictions (*n=140*)					
mean	.0135	-.0549	.1615	-.2029	.8807
t	.794	-1.588	10.821***	-6.645***	7.078***
median	-.0006	.0073	.1062	-.1516	.5147
Wilcoxon *Z*	-.790	.331	8.979***	-6.379***	6.709***

Correlation between pre-effort exchange and CEO holding returns				-.337***	
Exercise restrictions *less* no exercise restrictions					
t	-.033	.787	1.628*	-2.569**	-.483
Mann-Whitney *U*	4077.5	4490	4622.5	4665.5	4123

*** denotes two-tailed significance for $\alpha \leq .01$.
** denotes two-tailed significance for $.01 < \alpha \leq .05$
* denotes two-tailed significance for $.05 < \alpha \leq .10$

Table IX. OLS regressions on shareholder return by option outcomes and award frequency

Timing return = $\frac{P_{-30} - P_0}{P_0}$, and award return = $\frac{P_0 - X_0}{P_0}$. P_{-30} is the company's stock price at the close of trading 30 calendar days before the ESO award date, and is adjusted for all capitalization changes made before award. P_0 is the stock price at award, and X_0 is the exercise price at award. CEO holding return = $\frac{P_T - X_T - (P_0 - X_0)}{P_0}$, where P_T is the stock price at the time of exercise or lapse (i.e., expiry) and is adjusted for all capitalization changes, and X_T is the exercise price at *T* adjusted only for bonuses, rights issues and capital reconstructions as specified in the award plan. The award gain or loss ($P_0 - X_0$) is necessarily subtracted. Total CEO return is the sum of timing, award and CEO holding returns, and shareholder return = $\frac{P_T - P_0}{P_0}$. Returns are not adjusted for differing intervals. The relative dilution cost factor is the cumulative shareholder return *minus* the cumulative CEO stock return, where the difference is caused by a CEO dilution factor as given by the award never exceeding the dilution factor applicable to shareholders; the minimum value of the factor is zero. Inclusion of a company in the Top 100 means the issuing company's total assets at book in a given year are large enough for inclusion in this group. Relative size of an award is the number of options awarded divided by the number of outstanding ordinary shares at the award date. Irregular stock option awards are all awards not made annually or biannually. The standard deviation of pre-award stock returns was estimated from weekly returns for one year prior to award. The numbers below coefficients are *t* statistics.

	All awards	Exercised options	Lapsed options	Annual/ biannual awards	Irregular awards
n	*207*	*129*	*78*	*56*	*151*
Dependent variable: Shareholder return					
mean	.8967***	1.3059***	.2198	1.2819***	.7538***
median	.5062***	.8873***	-.1933***	.5331***	.4987***
Percentage of cases with options exercised	62.3	100.0	0	66.1	60.9
Adjusted R^2	.444	.364	.747	.542	.359
F	28.412***	13.200***	38.793***	11.839***	14.975***
Constant	.142	.131	-.708	.012	.096
	.441	.681	-3.335***	.022	.462
[t_{-30}, t_0] Timing return	-.910	.094	-.565	1.348	-1.315
	-1.596	.100	-1.073	.814	-2.245**
[t_0] Award return	-.420	-1.260	-.864	-.916	-.396
	-1.786*	-3.084***	-3.857***	-1.560	-1.558
[t_0, *T*] Relative dilution cost	6.032	4.106	7.903	7.050	5.167
	12.641***	6.532***	14.647***	7.799***	8.787***

Top 100 (=1)	-.667 -3.511***	-.432 -1.843*	-.291 -1.225	-.443 -.902	-.546 -2.552**
Standard deviation of pre-award stock returns	2.323 1.161	14.077 3.119***	-.662 -.401	3.393 .372	2.385 1.250
Relative size of award	-10.720 -1.199	-.431 -.038	-13.702 -1.219	24.238 .239	-4.669 -.552

*** denotes two-tailed significance for $\alpha \leq .01$.
** denotes two-tailed significance for $.01 < \alpha \leq .05$
* denotes two-tailed significance for $.05 < \alpha \leq .10$

Table X. Logistic regressions on exercise by award frequency

Timing return = $\frac{P_{-30} - P_0}{P_0}$, and award return = $\frac{P_0 - X_0}{P_0}$. P_{-30} is the company's stock price at the close of trading 30 calendar days before the ESO award date, and is adjusted for all capitalization changes made before award. P_0 is the stock price at award, and X_0 is the exercise price at award. The relative dilution cost factor is the cumulative shareholder return *minus* the cumulative CEO stock return, where the difference is caused by a CEO dilution factor as given by the award never exceeding the dilution factor applicable to shareholders; the maximum value of the factor is zero. CEO holding return = $\frac{P_T - X_T - (P_0 - X_0)}{P_0}$, where P_T is the stock price at the time of exercise or lapse (i.e., expiry) and is adjusted for all capitalization changes, and X_T is the exercise price at T adjusted only for bonuses, rights issues and capital reconstructions as specified in the award plan. The award gain or loss ($P_0 - X_0$) is necessarily subtracted. Irregular stock option awards are all awards not made annually or biannually. The numbers below coefficients are Wald statistics.

	All awards (*n=207*)		Annual/biannual awards (*n=56*)		Irregular awards (*n=151*)	
Percentage of cases correctly classified	66.7	86.0	64.3	66.1	69.5	88.1
Cox & Snell R^2	.116	.145	.092	.057	.150	.233
χ^2	25.440***	32.528***	5.424	3.284	24.592***	40.007***
Constant	.454 3.881**	.038 .051	.921 2.512*	.302 2.542	.149 .270	-.203 .923
[t_{-30}, t_0] Timing return	-2.205 2.330		-.934 .118		-3.323 3.033*	
[t_0] Award return	1.329 7.031***		2.141 2.092		1.026 3.324*	
[t_{-30}, T] Relative dilution cost	1.443 2.519		-.326 .063		3.154 5.235**	
Exercise restrictions (=1)	-.228 .494		-.592 .837		-.281 .511	
[t_{-30}, T] CEO holding return		.857 18.818***		.376 1.366		1.550 22.740***

*** denotes two-tailed significance for $\alpha \leq .01$.
** denotes two-tailed significance for $.01 < \alpha \leq .05$
* denotes two-tailed significance for $.05 < \alpha \leq .10$

Endnotes

[1] In this paper we do not explore the substitutability between stock ownership and stock options. A recent survey of the theoretical literature is provided in Henderson (2001) and further insights are offered by Hall and Murphy (2002).
[2] although CEOs rarely sit on their compensation committees, this is not to suggest they do not influence committee deliberations. This would seem especially so for founder CEOs.
[3] This issue is addressed in a number of papers in the special issue of Journal of Financial Economics devoted to ESOs (a Symposium on Executive Stock Options, July 2000).
[4] Yermack (1997) infers award timing with respect to quarterly earnings announcements. Three-day abnormal returns on earnings announcements are significantly positive when an award is made in the preceding week, but not otherwise. As well as post-award stock price runups, Yermack also documents significant pre- to post-award quarterly earnings increases, whether measured as earnings surprises (more than two standard deviations from the mean analyst forecast) or changes in earnings/investment. Awards made at irregular intervals attract higher post-award runups than annual awards.
[5] Another possibility is that discounted options may be awarded *after* successful CEO effort as a risk-free reward. We consider this less likely than bonuses or other non-contingent benefits because both are less risky means of delivering rewards than options.
[6] Yermack (1997) cites two examples of companies acknowledging management CEO influence over the terms and conditions of CEO awards, but no such instances were observed during collection of our sample.
[7] The choice of day –30 for the base price is justified in the next section.
[8] Where portions of an awarded tranche of ESOs are exercised on different dates or lapse, each portion is counted as an award for the purposes of this study,
[9] The earnings returns are therefore not annualised.
[10] Intervals less than 30 days pre-award were not considered because some awards may have been anticipated, which would tend to show runups even where the stock price had been declining since day –90.
[11] The results are closely similar when timing returns are recalculated using day –90 as a starting point.
[12] Total CEO returns (defined as the sum of timing, award and holding returns) and shareholder returns are highly positively correlated for all groups, with the lapsed options having the lowest r at .907, with p=.000.
[13] The standard deviation of pre-award stock returns was calculated from adjusted weekly returns for one year prior to award. Weekly returns were preferred to daily returns in order to eliminate the effect of very short term price fluctuations.
[14] The standard deviation of pre-award stock returns, relative award size and Top 100 were initially included as an explanatory variables, but are omitted from our reported results owing to lack of significance in all cases.